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CONCENTRATED USE AREAS:

CHARACTERISTICS AND MANAGEMENT STRATEGIES ON

THE UINTA-WASATCH-CACHE NATIONAL FOREST

by

Zachary Ford Maughan

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF LANDSCAPE ARCHITECTURE

Approved:

Sean E. Michael, PhD Major Professor	Michael L. Timmons Committee Member
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UTAH STATE UNIVERSITY
Logan, Utah

2015

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ABSTRACT

Concentrated Use Areas:

Characteristics and Management Strategies on the Uinta-Wasatch-Cache National Forest

by

Zachary F. Maughan, Master of Landscape Architecture

Utah State University, 2015

Major Professor: Dr. Sean E. Michael
Department: Landscape Architecture and Environmental Planning

Dispersed recreation management is a form of management that has emerged over the past century of outdoor recreation management on public lands in the United States. Techniques used in dispersed recreation management seek to disperse recreation use, recreational areas, and their impacts across landscapes and ecosystems or to concentrate such use to areas that remain undeveloped. This study is a mixed-methods, descriptive study of dispersed recreation management on national forest lands. In particular, this study focuses on United States Forest Service (USFS) management Concentrated Use Areas (CUAs) on Uinta-Wasatch-Cache National Forest (UWCNF), as identified in the 2003 Revised Forest Plan of the Wasatch-Cache National Forest. A qualitative approach of inventorying past management actions, observing CUAs, and interviewing recreation managers and resource specialists on the UWCNF was used. The qualitative aspects of this study were also coupled with a quantitative analysis of Geographic Positioning

System (GPS) based data using Geographic Information Systems (GIS) to better understand characteristics of CUAs and their management in dispersed recreation settings.

Overall, this study draws many conclusions involving the definition of, and management and design solutions for CUAs. CUAs can be described as easily accessible, flat areas adjacent to roads, with good access to water, and shade. These areas are often used for camping of various types, with trailers and groups being a predominant use. ATVs and motorized use are also associated with these areas. Use is generally considered high and continual during the summer season, with sites often being used year after year by families and groups of friends. Loss of vegetation, soil compaction, and soil erosion are common impacts attributed to concentrated recreational use.

Another finding was that recreation resource managers and resource specialists have similar views of what CUAs are and how they are managed. Management actions generally consist of both indirect and direct management actions focused on limiting environmental impacts caused by recreation uses. Management actions are conducted on both large and small scales within districts, and dispersed recreation protocol was found that called on management to reduce biophysical impacts. However, management techniques lack official targets and metrics for measuring the success of management. Design is also a component of CUA management. The design of CUAs generally consists of adapting user-created recreation areas into more structured and defined areas.

(284 pages)

PUBLIC ABSTRACT

Concentrated Use Areas:
Characteristics and Management Strategies on the Uinta-Wasatch-Cache National Forest
Zachary F. Maughan

Outdoor recreation management has become common practice on public lands over the past century. The United States Forest Service (USFS) has been a leader in the category of recreation management during that time period as well. One management niche associated specifically with national forest land is the field of dispersed recreation. Within the field of dispersed recreation management, USFS staff address recreation use in a variety of ways. One such method has been the development of Concentrated Use Areas (CUAs) in dispersed recreation settings. These areas are generally defined as undeveloped recreation areas that sustain resource impacts and require management time and dollars. Several studies have looked at how dispersed recreation is managed and what it consists of in terms of recreational uses and natural resource impacts. Despite research describing dispersed recreation and its management, very little research has specifically studied the managerial phenomenon of CUAs. Uinta-Wasatch-Cache National Forest (UWCNF) managers identified CUAs in their forest management plans, and defined monitoring protocol for collecting data involving their locations and management. This study focused on the management of CUAs on the UWCNF to better understand CUAs on USFS lands and the management techniques used in these areas. This study takes a qualitative and quantitative, mixed-methods approach to better define CUAs and their management on the UWCNF. In particular, this study approaches CUAs by inventorying CUA data on various districts, quantitatively analyzing GPS-based data, and qualitatively analyzing interviews of recreation and resource personnel. The study focused on recreation occurring in the non-winter seasons.

Overall, data were analyzed from all districts, including GPS-based data that consisted of over 8000 GPS data points. Several management documents were examined to understand techniques used on the UWCNF to manage CUAs. Moreover, twenty-one interviews were conducted with twenty-four recreation and resource personnel. Overall, these three approaches resulted in a more robust definition of CUAs and their management. Generally speaking, GPS data and interviews determined that CUAs are generally undeveloped areas in a dispersed setting that are managed with an emphasis on balancing resource protection and recreational use. CUAs generally have characteristics defining them as located in relatively flat areas in the landscape that are very accessible to use via a travel system, and within close proximity to a natural water feature and shade. These areas are managed using a mixture of direct and indirect management techniques designed to reduce impacts to natural resources while still allowing a high amount of use. CUAs are also commonly designed sites that rely heavily on user-created recreation patterns to determine the location of future designated sites. These areas, despite their design, generally are developed at such a low level, that they are still considered undeveloped when compared to a developed campground or similar facility.

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Zachary F. Maughan

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CHAPTER I

INTRODUCTION

Public lands over the past century have witnessed the rise of recreational activity. Motorized and non-motorized trail use, camping, and leisure activities are impacting public lands. Public land managers have developed management strategies to mitigate impacts and preserve the natural functions of landscapes, while continuing to provide recreational opportunities.

Principles of outdoor recreation have been developed, stressing that "the resource environment, the social environment, and the management environment" should be considered when making decisions involving outdoor recreation (Manning, 2011). This study will focus on describing managerial aspects of outdoor recreation planning and design with regard to Concentrated Use Areas (CUAs) on United States Forest Service (USFS) land. During this process, aspects of the resource environment and the social environment will also be discussed, but from a managerial perspective. In particular, the study will strive to better define CUAs and managerial approaches to these areas on the Uinta-Wasatch-Cache National Forest (UWCNF). A forth element, design, will also be explored in this study. For the purposes of this study, design is defined as planning, envisioning, or sketching the form, structure, or future condition of an area yet to be implemented, created, or designated.

The USFS (2011) defined a CUA as "an undeveloped site or area where management time or dollars is [sic] invested because recreation use in the location leaves evident impacts, such as litter; vandalism; or soil compaction such as dispersed campsite,

or as large as a climbing area, or as complex as an all-terrain vehicle hill climb area." The UWCNF is one area managed for high levels of recreation and concentrated use. Being an "urban National Forest," a result of its nearness to large metropolitan areas, recreation patterns often result in activities focused on particular sites (USFS, n.d.-a). The 2003 Revised Forest Plan (RFP) for the Wasatch-Cache National Forest established inventorying and monitoring guidelines that have been applied throughout the entire UWCNF, including after the 2007 merger of the Uinta National Forest and the Wasatch-Cache National Forest (USFS, 2003b). Despite the guidelines provided by the RFP and the Forest Service Manual, information on how CUAs are defined and managed within the UWCNF is sparse. This study will seek to fill this gap in the knowledge base.

Literature discusses concentrated use patterns and managing use concentration to alleviate resource impacts (Cole, Petersen, & Lucas, 1987; Hammitt & Cole, 1998; Manning, 2011; Marion & Farrell, 2002). The concentration of use has been studied in terms of campsite size and transformation, trail alterations, and use impacts on the ecological factors of a site (Hammitt & Cole, 1998; Manning, 2011). Some literature has focused on defining spaces within developed campsites and trails to better understand how best to manage areas for outdoor recreation (Hammitt & Cole, 1998; McEwen & Tocher, 1976). Dispersed recreation and displacement of activities have been studied to some extent (Hammitt & Cole, 1998; Leung & Marion, 2000a). Management strategies have developed into practices considered either direct or indirect (Manning, 2011). Use patterns and distribution have been analyzed to give managers an idea of what factors may be accounted for when considering a management area (Cole et al., 1987; Hammitt & Cole, 1998). Despite the useful information these studies lend to the topic of CUAs,

they do not directly address the complexities managers encounter when defining or designating CUAs, how CUAs are managed, and what design factors are used when designating CUAs.

Therefore, the purpose of this study is to better define CUAs within a discrete study area, the UWCNF, and understand management strategies, including principles, discrepancies, and design elements encountered when attempting to manage CUAs. The aim of this study is to define CUAs on the UWCNF while identifying and describing management frameworks and potential design guidelines involved in the management of CUAs. The assembly of this knowledge base is intended to be used for addressing the management of CUAs in the future on various public lands.

Recreational activities occurring on the UWCNF often occur in undeveloped areas and result in impacts to the natural environment. While undeveloped, many of these sites become CUAs that require management and funding to control environmental impacts and user conflict. This study began with the assumption that these areas are currently defined and managed to some degree by managers within local districts. However, despite the existence of CUAs on the UWCNF, very little is known about how managers are defining these sites and what management and design principles are being employed during their management. Therefore, this study proposes to examine CUAs and their management on the UWCNF in order to provide a better definition, identify management strategies, and capture design principles involving impact mitigation. The goal of this study is to produce a knowledge base for understanding CUAs on a forest-wide and individual site basis. For the purpose of the landscape architecture profession,

this study will also seek to understand how these areas are designed and what role the profession may have in the future management of CUAs.

CHAPTER II

LITERATURE REVIEW

Background

The history of National Forests in the United States began officially with the passing of the Forest Reserve Act of 1891. The passing of this act allowed the president of the United States to actively set aside forested lands considered public in domain (USFS, 2013a). Despite the setting aside of millions of acres of Forest Reserves after the passing of the Forest Reserve Act, management of these forests did not actively begin until the passing of the Organic Act in 1897, which set in motion management of timber and natural resources (Wellman & Propst, 2004). As William Tweed (1989) noted, by 1902 it had become apparent that National Forests would need to be managed for recreation, and not just natural resources.

Early recreation management needed to address camping, picnicking, and sanitation issues. These responsibilities ultimately fell on the USFS and with its founding in 1905. By 1916, and the founding National Park Service, the Forest Service began to hire professionally trained landscape architects to oversee recreation use areas and facilities (Tweed, 1989). In particular, Frank Waugh, a renowned landscape architect and professor, was hired in 1917 to document recreation uses on National Forests. Waugh released multiple reports capturing early recreational uses, design guidelines for built facilities, and a plan for development in and around the South Rim of the Grand Canyon. Despite these early reports detailing the need to manage recreation and its impacts— along with developing recreation facilities on USFS land— recreation did not become

codified as a resource in need of management on public, federal lands until the passing of the Multiple-Use and Sustained Yield Act of 1961 (MUSYA). The identification of recreation as a key forest use in MUSYA was soon added to by the National Forest Management Act (1976) and its call on the USFS to develop management plans that "…provide for outdoor recreation (including wilderness), range, timber, watershed, wildlife, and fish" (p. 5). The National Forest Management Act (NFMA) also couples with the USFS's mission of "caring for the land and serving people," and with the agency's responsibility of sustaining "the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations" (USFS, 2013b). These congressional acts, along with the continued use of USFS land, have led to research in the topics of resource impacts. Sanitation, restricting and authorizing use, visitor satisfaction, use amounts, type of use trends, recreation ecology, management strategies, and facility design have become common threads in the research and management of national forest land. Furthermore, research has come to define trends and attitudes in the management of recreation on both public and private lands.

The study of wildland recreation and its management is generally considered in three broad categories that are interconnected with one another (Manning, 2011). First, recreation ecology focuses on how recreationists impact the biophysical setting in which they recreate. Second, recreation sociology, or human dimensions, focuses on how people interact with one another, and how they interact with nature from a human perspective, involving recreation. Third, recreation management surveys how we manage recreational settings both from an ecological standpoint, but also from a sociological perspective. Manning (2011) described how these three aspects of recreation intertwine to form the

discipline of wildland recreation, while also giving a comprehensive review of the social aspects of wildland recreation management and research. Hammitt and Cole (1998) released a comprehensive survey of recreation ecology and its relationship to wildland recreation management. Since this thesis is focused on CUAs and dispersed recreation management on forest service land, ecological, social, and managerial factors will be described in more detail in the following literature review.

Defining Dispersed Recreation

Within recreation on USFS lands, management has focused on dispersed recreation and developed recreation as separate management settings. The separation of management areas is based largely on the research of Clark and Stankey (1979), which sought to "answer questions concerning both allocation and management of opportunities for recreation (p. 1). Dispersed recreation encompasses a large variety of uses, impacts, and management techniques. Historically, dispersed recreation has been defined simply as "recreational activities along forest roads at unofficial undeveloped sites" (Moutsinas, 1976, p. 5). Furthermore, these activities can be generally considered "day activities or camping at informal, undeveloped sites along forest roads (Downing & Moutsinas, 1978). Another early description defined dispersed recreation as recreation occurring outside of developed sites or areas designed to concentrate use (Shafer & Lucas, 1979). In 1979, a symposium at Utah State University (USU) convened in an attempt to better define dispersed recreation and its management (Shaw, 1979). Ultimately, the symposium defined a variety of factors, from visitor uses to impacts that involve dispersed recreation. Lewis (1979) described at the symposium that dispersed recreation is multiple use

recreation, spread over a large scaled area that is often difficult to survey and manage. Green (1979) described dispersed recreation as varying in definition amongst users, but also transitory in nature because it is made up of recreationists moving between places or "staging areas" (p. 5). Despite these early attempts at defining dispersed recreation management, needs of dispersed recreation at the time were still not clearly defined, and there was a lack of research in social, managerial, and ecological disciplines (Shafer & Lucas, 1979). Clark and Stankey (1979) used their Recreation Opportunity Spectrum to frame levels of use concentration based on opportunity settings and commonly defined use type categories, such as primitive, motorized and non-motorized. In addressing dispersed recreation, Stankey (1979) also stated, "dispersed recreation cannot be defined in terms of activities; it is more accurately a description of the style and setting in which an activity takes place" (p. 88) and "labels" of concentration and dispersal matter little to visitors, and are primarily of importance to managers and scholars. Leung and Marion (2000a) later described dispersed camping as a management ethos that tries to spread out use to reduce impacts or limits heavy use to more defined areas to reduce the scope of impacts. Later definition would come to see dispersed recreation as "outdoor recreation in which visitors are diffused over relatively large areas. Where facilities or developments are provided, they are primarily for access and protection of the environment rather than comfort or convenience of the user" (Regional Ecosystem Office, 2003). This definition is also used by the USFS for dispersed recreation management (USFS, 2003b). According to Manning (2011), dispersed recreation management has been generally considered a management philosophy that attempts to mitigate natural resource impacts. Within this philosophy of managing use impacts, two

different strategies are employed: concentration of heavy use to a designated site, and/or dispersal of use over a greater area (Hammitt & Cole, 1998; Manning, 2011). Hammitt and Cole (1998) gave further clarification, describing dispersed recreation management as a strategy that seeks to reduce ecological impacts and user crowding through distributing use in three different ways: distancing users within limited sites, distributing use without limiting sites, or distributing use through time, regardless of spacing and site numbers. For the purpose of this study, the USFS (2003b) definition from the Wasatch-Cache National Forest Revised Forest Plan will be used. Dispersed recreation is:

> …where undeveloped recreation activities and their associated impacts are dispersed throughout the Forest. Any constructed amenities or management are for resource protection rather than user convenience. Undeveloped Recreation and Concentrated Use Area[s] are included in Dispersed Recreation. (p. GL-6)

The term CUA will be explored and defined in this study in order to better understand its context within dispersed recreation. Dispersed Recreation will be used as the main context to focus the following literature. The main focus of this study is areas outside of the wilderness setting and use occurring during the non-winter seasons. Wilderness setting research will be explored to an extent in the literature review of this study, but it will not be the main focus of this study and its literature review. Particular emphasis will be attributed to CUAs when literature applies.

Ecological Issues

A variety of ecological impacts have been documented in association with outdoor recreation, especially in wilderness settings. Impacts include the damage and

trampling of vegetation, soil compaction and erosion, disturbance of wildlife, impacts to water quality, and human waste issues. Most individual research projects involving recreation impacts have been conducted in wilderness settings or in relation to specific use types. Leung and Marion (2000a) presented a comprehensive review of recreation impacts associated with wilderness use. Hammitt and Cole (1998) provided general description of wildland recreation impacts on the broader context of recreation ecology and management. Hart and DeByle (1979) examined impacts to vegetation, soils, and water involving dispersed recreation. Research involving recreation impacts in a dispersed recreation setting are somewhat limited, and often have been conducted in a wilderness setting.

Vegetation impacts. Vegetation impacts have been well documented in campsites with particular focus on vegetation cover and trampling, composition, and tree damage (Hammitt & Cole, 1998). Hart and DeByle (1979) reported on the vegetation impacts in dispersed recreation, with major concerns being reduction in ground cover and damaged trees involving camping, trail use from hiking, horseback riding and off-highway vehicle (OHV) use. Overall, this early study states that vegetative covers of grasses in more arid environments are more resilient than shrubs and forested areas (p. 43). Furthermore, managers in the Hart and DeByle (1979) study viewed uses such as hiking and camping to have low impacts on vegetation when compared with OHVs.

Cole (1981) surveyed studies of vegetative cover loss from various uses, with results suggesting that light to heavy use along trails and campsites from hiking and pack-stock results in loss of vegetative cover, damage to trees, and loss of diversity in plant types. Some experimental studies have focused on frequency of use and its correlation

with vegetation loss. Cole and Bayfield (1993) established indicators and procedures for surveying trampling effects on vegetation by walking and hiking. Cole (1993a) provided information on trampling in four regions in the United States, including the Northwest, Intermountain West, Northeast and Southeast. A study by Marion and Cole (1996) discussed how trampling effects in a dispersed setting are affected by camping, especially in regards to dispersal and concentration of use strategies, and how forested areas are less resistant to impacts than grassy meadows. Marion (1998) gave further notion that trampling of various degrees affects vegetation cover, height and recovery time, especially when coupled with vegetation types of various resistance; furthermore, he also relates vegetation ecology findings to suggestions for future recreation management using dispersal and containment strategies. Hammitt and Cole (1998) gave a comprehensive view of many other methods that have been used to collect vegetation impact data and how various studies have concluded that impacts to trees, shrubs and ground covers are affected by use type and amount of use, with critical stages of vegetation loss occurring early in the impact phases of camping, hiking, and other uses.

Other studies have explored how vegetation recovery times are affected by amount of use and vegetation types. Marion (1998) discussed this with regard to meadow areas and areas beneath coniferous tree canopies, with coniferous locations being less resilient to impacts. Cole and Monz (2004) conducted an experimental study in the Wind River Wilderness Area that backs Marion's claim; campsites beneath forested areas were less resilient to camping impacts than meadow areas. In addition, the Cole and Monz (2004) study also showed that use patterns resulted in greater vegetation loss near points of interest in a camping area, such as a heat or cooking source. An earlier Cole and Monz

study (2003) conducted in the same wilderness area also concluded that vegetation recovery in forested areas were likely to recover slower than in meadow areas. To better understand recovery and restoration, Cole and Spildie (2007) conducted experiments to determine the effectiveness of closures and vegetation restoration through scarification, composting, planting and seeding. Their results showed that closure is often not enough to restore an impacted camping area; rather scarification, transplanting, nutrient replenishment, and seeding are required for limited restoration success. A more recent study showed that in some cases, short-term tent camping using low-impact techniques may limit long-term vegetation impacts (Growcock & Pickering, 2011). Many other studies have explored campsite classification using vegetation loss and tree damage as factors to determine campsite scope and impact (Cole, 2013; Leung & Marion, 2000a; Marion, 1991; Monz & Twardock, 2010). However, Monz, Pickering, and Hadmen (2013) warned that using vegetation as a primary indicator of impact may be overly simplistic, and managers and researchers should seek more holistic approaches when classifying impacts and their scope of concern.

However, other uses outside of camping have been documented as well, such as trail use, both motorized and non-motorized. Trails generally see vegetation loss during establishment and over time (Leung & Marion, 1996). A study of trail conditions by Cole (1991) reported that over a ten year period, trails lost vegetation on the edges of their tread. Furthermore, several sources discuss the effects of trails and trail construction on vegetation, reporting that vegetation loss occurs on the tread surface of a trail, but also in the general corridor, resulting in lower vegetation heights and changed vegetation types, including introduced non-native and invasive species along the edges of trails and

recreation areas (Barros, Gonnet, & Pickering, 2013; Hammitt & Cole, 1998; Marion & Leung, 2001; Wimpey & Marion, 2011). Of greatest concern are trails that are user created, as they result in vegetation loss from unauthorized recreation use (Barros et al., 2013; Wimpey & Marion, 2011). OHV use is one form of impact that can create vegetation loss around trails and campsites, with the larger and heavier modes of transportation resulting in greater impacts (Hammitt & Cole, 1998; Ouren et al., 2007). Other research has shown that vehicles can act as major transmitters for seeds, including invasive and noxious varieties (Pickering & Mount, 2010; Taylor, Brummer, Taper, Wing, & Rew, 2012). Other research has shown that hiking, mountain biking and equestrian use impact vegetation by reducing cover, compacting soils, and increasing the likelihood of the spread of non-native and invasive plants and pathogens (Ansong & Pickering, 2013; Cushman & Meentemyer, 2008; Hammitt & Cole, 1998; Pickering, Hill, Newsome, & Leung, 2010).

Soil impacts. Soil impacts associated with dispersed recreation usually involve camping, hiking, equestrian use, and motorized use. Impacts to soil are often closely related to impacts involving vegetation, since vegetation often requires certain soil conditions to grow (Hammitt & Cole, 1998). Soil impacts are generally a product of trampling and classified under categories of compaction, loss of organic material, and erosion (Hammitt & Cole, 1998). Marion (1998) asserted that soil impacts occur as levels of use intensify and increase chances of compaction, erosion, and loss of organic compounds in the upper soil strata. A study by Marion and Cole (1996) demonstrated soils' resistance to the penetration of water increased, along with a correlation of decreased vegetation cover and vegetation diversity in dispersed camping areas. Marion

and Leung (2001) described how soil impacts stemming from loss of vegetation result in water quality issues of turbidity and sedimentation, while also affecting user access to recreation areas due to exposed rocks and root structures. A survey of soil impacts involving trails and camping can be further seen in a report by Leung and Marion (2000a). Cole and Spildie (2007) demonstrated in a restoration study that restoring soil characteristics to impacted sites through mulching and nutrient additions is a long-term commitment with limited success. An early survey of recreation managers cited uses, such as camping, OHVing, and horseback riding, as impacting soil conditions in a dispersed recreation setting (Hart & DeByle, 1979). Another early report defines ideal soil conditions for dispersed recreation sites, and constraints that accompany various soils and potential impacts (Leonard & Plumley, 1979). More recent research has explored impacts to trails and erosion by showing that use frequency and use intensity decrease soil conditions (Barros et al., 2013; Olive & Marion, 2009). Equestrian use has been shown to have greater impacts on soil than hiking and mountain biking because of the greater weight exerted by horses onto the land (Pickering et al., 2010). Mountain biking has been shown to also impact soils through compaction and loss of organic matter (Hale & Zwick, 2002; Pickering et al., 2010). Ouren and colleagues (2007) reported that OHV use has resulted in greater soil compaction, resistance to water infiltration, reduced soils stabilization, and increased erosion rates, all of which may reduce vegetation growth and soil fertility. Another recent study by Zhevelev, Sarah, and Oz (2013) has shown that high pressure use in an urban park setting corresponds with loss of organic matter, lack of penetration for water, and increased sodium concentration. Despite the research previously conducted, research still lacks an understanding of soil impacts caused by

large trailers in a dispersed camping setting, and cumulative effects of multiple uses occurring in a single space.

Water quality impacts. Studies of dispersed recreation and its impacts to water quality are limited and do not fully conclude the extent of impacts. Hammitt and Cole (1998) reported that sediment loading from camping has been reported by previous research and can contribute to phosphorus loading in lakes and increased eutrophic qualities. Varness, Pacha, and Lapen (1978) surveyed dispersed camping areas for their effect on surface water quality. Their study concluded that increased dispersed recreation near streams, especially during peak season times, decreases water quality while increasing chance of illness from water contamination downstream from recreation sites. Hart and DeByle (1979) also stated that dispersed recreation near lakes and streams increases microbiological activity from human and livestock sources. Cole (2000a) surveyed impacts to water quality from dispersed recreation, finding that risks of pathogens and contamination from human waste were present in dispersed camp settings, yet difficult to quantify. Furthermore, research indicated that motorized use is more impactful to water quality due to its increased impacts on soil and vegetation compared to non-motorized use (Cole, 2000a; Ouren et al., 2007). Ibarra and Zipperer (2000) surveyed concentrated recreation sites and their water quality issues and reported that areas used by motorized use and trailers can be at higher risk for contamination from chemicals associated with motorized use, such as gasoline. This increased risk of pollutants has also been identified as a risk specifically associated with OHV use (Ouren et al., 2007). Hadwen, Arthington, and Boonington (2008) have conducted research that provides a multitude of indicators that need further research to discover their potential regarding

dispersed recreation. However, more research is needed to find out how water quality and dispersed recreation interact and what indicators would best suit future research (Cole, 2000a; Hadwen et al., 2008).

Wildlife impacts. Dispersed recreation and wildlife impacts have been studied in terms of various uses and spatial considerations. Hammitt and Cole (1998) provided a thorough examination of various impacts involving outdoor recreation and wildlife, with direct and indirect impacts resulting from recreation, such as disturbance, displacement, and changes in wildlife behavior and reproduction. It is also important to note that the species of animal is important to consider when evaluating wildlife/recreation impacts. Knight and Cole (1991) suggested four means by which recreation impacts wildlife: harvesting, habitat modification, pollution, and disturbance. These factors can be seen as affecting individuals, populations, and communities, with impacts varying from immediate to long-term, and varying with the character, duration, location, frequency, predictability, and timing of impact. For instance, a short duration impact in winter months may be detrimental to an animal living in a harsh climate, where energy exertion cannot be recovered after a flight response.

Gaines, Singleton, and Ross (2003) have presented models of how to assess wildlife impacts along linear recreation corridors, with an emphasis on adaptive management techniques. Ouren and colleagues (2007) explored the impacts that OHV-use has on wildlife, reporting that noise is a major impact resulting in the alteration of animal behavior, breeding patterns, and the ability to detect predators. Furthermore, habitat fragmentation is a major concern involving OHV-use as roads and trails create

more edge habitat, while detracting from interior habitat which can be crucial to breeding and life cycle events (Ouren et al., 2007).

Marzano and Dandy (2012) conducted an extensive literature review on recreation impacts involving wildlife, finding that recreational activities affect wildlife in three main ways: habitat change, behavior change, and introduction of invasive species, pests or diseases. Habitat change occurs through "soil compaction; soil erosion; decreased biodiversity; habitat fragmentation; vegetation change; and canopy loss" (p. 2974), with a variety of recreation activities affecting the rate and severity of such alterations. Behavior changes are considered "increased alertness, 'flight' (anti-predator response), food conditioning, displacement of favored habitat, and habituation to people" (p. 2975). A limited amount of evidence suggests the introduction of invasive species and pathogens through recreation activities such as horseback riding, mountain biking, and off-road vehicle use. Another important finding from Marzano and Dandy is that little research was found that synthesized ecological and social management principles when addressing wildlife impacts involving recreation activities. Some research has focused specifically on dispersed recreation as well. Ward and Cupal (1979) found that elk heart rates increased when animals were in proximity to certain recreation activities, such as walking, and close-range gun shooting; while recreation involving motor vehicles and aircraft had less effect. Another study, by Reed and Merenlender (2008), concluded that recreation, such as walking and camping, can negatively impact large carnivores and their use of habitat through causing displacement.

Overall, there exists a great deal of ecological literature surveying and discussing recreation impacts to wildlife, soil, vegetation, and water quality. Despite the extensive

resources available, little research was found that dealt primarily with dispersed camping, and ecological impacts associated with dispersed use involving motorized vehicles, trailers, and multiple uses occurring within a dispersed recreation site. Most research was found to address a wilderness setting, which could be applicable to dispersed recreation in a non-motorized, non-wilderness setting through careful selection and extrapolation of factors that exist in both settings. However, addressing cumulative effects of multiple use recreation areas in a non-wilderness setting is an evident gap in recreation ecology.

Social Issues

Outdoor recreation on National Forests also consists of social issues that revolve around use. Sociological issues in recreation have been studied in a "serious" manner since 1958 with the founding of the Outdoor Recreation Resources Review Committee (ORRRC) (Manning, 2011, pp. 7). Hammitt (1990) stated that all issues involving recreation impacts, including those involving ecosystems, are given importance because of their correlation with human values. Because of the dynamic that recreation and the environment have with the user, issues will inevitably arise within various recreation settings. Jacob and Schreyer (1980) identified conflict as arising from "goal interference" involving four major factors: activity style, resource specificity, mode of experience, and lifestyle tolerance (p. 369). In some settings, user preferences will influence how sociological issues are framed and influence the recreation experience and user satisfaction. In other cases, this may lead to issues with crowding and use displacement, or conflict will arise out of varying goals and norms associated with use and user preferences.

Use types and users. Use types and users of sites (or visitors) vary in dispersed recreation. Moutsinas (1976) identified dispersed recreation uses as "hiking, trailbike riding, hunting, fishing, etc." (p. 5). These uses can be expanded further to include: equestrian use, ATV and OHV use, rock climbing, mountain biking, shooting, camping (trailer, car, tent), paintballing, bird watching, along with many other types of recreation (Brooks & Champ, 2006; Hammitt & Cole, 1998; USFS, 2003a, 2003b). All of these use types have varying impacts on the landscape and can be managed in various ways. Dispersed recreation management seeks limit recreationists' impacts to some degree through the distribution of use and users across the landscape, concentration of use in limited areas throughout the landscape, or restriction of use and users' access to recreation areas during certain times of the year (Hammitt & Cole, 1998). With these various management tactics, social issues can arise between users, along with their perception of their recreation experience.

User preferences. In order to better understand the sociological aspects of outdoor recreation, studies have sought to understand user preferences within various settings. Preferences are categorized generally as either resource setting based preferences, recreational experience based preferences, or management preferences (Manning, 2011). A study by Dwyer and Childs (2004) highlighted a modern difficulty with preferences, where increased mobility, changing demographics, and increases in technology and development have muddled traditional ideas of landscapes and our understanding of user preferences. Manning (2011) stated user preferences may also be partially linked to previous experiences at facilities previously visited by recreationists.

Studies of user preferences in a dispersed recreation setting usually involved wilderness and backcountry studies, although early studies of campsites have revealed trends involving site selection (Manning, 2011). These desired preferences may be useful in understanding dispersed campsite selection. Several studies have looked at differences in user preference between motorized and non-motorized recreation, with preferences being divergent based on use type (Kil, Holland, & Stein, 2012; Schilling, Boggs, & Reed, 2012).

Other studies have looked at user preferences for camping. McFarlane, Haener, and Shapansky (2003) surveyed dispersed camping visitors to determine preference of facilities such as toilets, water, campfire rings, and other developed campground amenities. Only 47% of visitors responded as wanting such facilities, with toilets and garbage facilities showing the most positive responses. Whitcomb, Parker, Carr, Gobster, and Schroeder (2002) studied dispersed camping preferences by determining landscape types of campsite locations, with water and vegetation being main draws to areas for camping. While these studies are valuable, it is still unclear if there are site preference differences between various types of camping, such as car, tent, and RV camping.

Conflict. A major social issue involving dispersed recreation is user conflict. Conflict is generally classified as "goal interference attributed to others' behavior, however, it can also result from differences in activity style, resource specificity, mode of experience, and lifestyle tolerance (Jacob & Shreyer, 1980, p. 368). Manning and Valliere (2001) discussed how, as a result of conflict, people adopt coping mechanisms, which include displacement, product shifts, and rationalization. These factors generally make satisfaction measurement in outdoor recreation difficult. Marcouiller, Scott, and

Prey (2005) further elucidated recreation conflict as resulting from supplementary, competitive, and antagonist interactions. Conflict also is commonly asymmetrical, with one group perceiving conflict while the other is relatively unaware that uses are conflicting (Manning, 2011). Conflict appears relatively understudied in a dispersed or CUA setting, with exceptions occurring primarily in wilderness and backcountry settings. Watson, Niccolucci, and Williams (1994) studied hiking and equestrian uses in the Sierra-Nevada Range and concluded that conflict between these user groups results from personal perceptions of one another, rather than goal interference. Kil and colleagues (2012) studied OHV and non-OHV users, and determined that conflict results from differences in setting resource specificity, and lifestyle tolerance. A study by Reis and Higham (2009) showed that conflict between hunters and hikers in New Zealand results mostly from issues involving the use of motor vehicles accessing sites, causing noise pollution, and littering. However, hunters generally did not perceive their activities as sources of conflict. Crowding and conflict have also been closely associated with one another in several studies and are pertinent to dispersed recreation settings (Cole, 1993b; Cole & Hall, 2008; Manning, Lawson, & Valliere, 2009).

Crowding and use displacement. Crowding has been of concern when looking at outdoor recreation areas in terms of user perceived quality, satisfaction, and use carrying capacity (Manning, 2011). Crowding generally occurs when too many people compete for limited resources associated with a recreational use. Backcountry literature has determined the proliferation of sites as an indicator of crowding (Leung & Marion, 1999; Manning & Valliere, 2001). Other useful indicators of crowding have been the number of groups one encounters over a period of time, the number of sites passed over

because of use, and the amount of time in sight of other groups (Manning et al., 2009). However, a broad variety of other indicators can be used, especially when considering specific sites or settings (Manning, 2007). However, crowding has also been explained as a phenomenon that humans adapt to over time, therefore making it difficult to discern the scope, level of use, and visitor displacement involving crowding (Cole & Hall, 2008; Hall & Cole, 2007).

Use displacement has been addressed in several studies. Cole and Hall (2008) determined in a study of wilderness areas that population levels for displaced use are most likely 5-15 percent of users of an area. However, Hall and Cole (2007) stated that because of human abilities to adapt to change in recreation experiences and setting, few people would be "absolutely" displaced (p. 26). Arnberger and Brandenburg (2007) studied displacement and determined that it varies across user groups and therefore requires various management strategies to address the issue for a single area. Displacement has also been seen as an indicator of crowding (Cole & Hall, 2008; Hall & Cole, 2007; Manning, 2011). Despite these studies, more research needs to be done to determine other aspects of users and uses involving different camping styles (e.g., tent, trailer, RV, car) and recreation styles (e.g., mountain biking, hiking, horseback riding, and motorized and non-motorized use) in dispersed recreation settings in the frontcountry.

Management Strategies

Management of recreation usually involves strategies that can be considered direct or indirect in nature. Indirect management techniques are considered management

actions that seek to change a person's decision making process through persuasion and education. Direct management techniques are more confrontational in nature and include actions such as passing of laws and regulations, law enforcement, closing sites, and limiting access to areas deemed unsuitable for recreation activities. Often times, management of areas and visitors results in a combined effort of indirect and direct management prescriptions (Hammitt & Cole, 1998; Manning, 2011). This section will review the management strategies and techniques associated with dispersed recreation management and CUAs.

Indirect management. Indirect management has been used to influence dispersed recreation behavioral responses to landscapes. Manning (2011) defined the main aspects of indirect management as practices that seek to affect behavior while still allowing a visitor freedom of choice in how an activity is carried out. The most obvious indirect management techniques involving dispersed recreation use are educational messages directed at minimal impact practices. Main techniques associated with indirect management include signing (interpretive or sanctioning) and education programs (Manning, 2011). Duncan and Martin (2002) conducted a study to find out the effectiveness of interpretive versus sanctioning signage in managing user behavior. Results showed that interpretive signage is just as effective as sanction signage in most cases. Marion and Reid (2007) conducted a study to understand the effectiveness of low-impact education (such as Leave No Trace) in recreation management. The study concluded that education programs focused on low-impact behavior advancement are effective in changing behavior and knowledge for their targeted goals, which include reducing recreation impacts in wildland environments. However, another study by Park,

Manning, Marion, Lawson, and Jacobi (2008) found limited success in using indirect management techniques of signing disturbed areas adjacent to a trail to alter visitor behavior. Management frameworks such as the Recreation Opportunity Spectrum (ROS) and Limits of Acceptable Change (LAC) have been shown to be successful tools for limiting impacts (McCool, Clark, & Stankey, 2007). That said, Brunson (1997) pointed out that LAC strategies have been difficult to implement in frontcountry settings.

One last area that has received consideration is site design and layout. Orr (1971) emphasized layout and placement of a site as the second most important factor influencing pedestrian impacts of vegetation. Others have emphasized the layout of sites as essential to limiting impacts, especially when implementing a linear route to access sites, rather than a circular loop that leads to a more spider-webbed effect of trails and campsite impacts (Hammitt & Cole, 1998; Manning, 2011). Also, providing a designed site can reduce impacts from stock, even if the design is minimal in constructed features (Spildie, Cole, & Walker, 2000). Allowing vegetation to grow and remain at certain heights is also a way to deter use and its impacts (Roovers, Dumont, Gulinck, & Hermy, 2006). No literature was found describing visitor behavioral changes in response to improvement (or neglecting improvement) of sites experiencing impacts. No studies involving the use of hardened sites have been found. In addition, no studies examining user perceptions and behavior involved with allowing a road or trail to degrade (implying limited access) have been found. Studies involving these topics would be useful in determining the full scope of indirect management techniques and their effectiveness.

Direct management. Direct management is a more aggressive approach that seeks to deter behavior deemed by management as undesirable or impactful to

environmental and social aspects of recreation. Direct management techniques have been found to be effective management tools for reducing impacts associated with user behavior (Manning, 2011). More specifically, confinement strategies involving restricting use have been conducted. Installation of campsite amenities (tables, fire grates, etc.) has been studied, and results show these strategies as effective ways to reduce impacts and concentrate use (Hammitt & Cole, 1998; Marion, 1995; Marion & Farrell, 2002). The implementation of rules and regulations to limit use have also been shown to have success in meeting management objectives (Cole, 2000b; Reid & Marion; 2004). Limiting group size has also been documented as a common practice to attempt to reduce impacts and crowding, however, it was not concluded to be any more effective than restricting individual use through other means (Monz, Roggenbuck, Cole, Brame, & Yonder, 2000). Park and colleagues (2008) also studied the use of constructed barriers to deter use and impacts in an area of off-trail use and concluded barriers as the best means of reducing impacts. Asher (2010) studied the effectiveness of various closures to dispersed sites along riparian areas, with lightweight fences and signing proving to be an effective closure technique until barrier rocks could be installed.

Despite the effectiveness of direct and indirect management in their own rights, several studies have also shown that a combination of the two techniques is often required to attain optimal outcomes (Manning, 2011). Cole and colleagues (1987) provided a fairly comprehensive review of impacts and management solutions for wilderness and backcountry settings. Several studies suggest management strategies that incorporate site closures, along with educational messages and restoration projects, can be successful in limiting user impacts to environmental factors (Cole & Ferguson, 2009;

Leung & Marion, 1999; Marion & Farrell, 2002; Park et al., 2008; Reid & Marion, 2004; Widman, 2010). Despite the amount of research surveying factors to limit impacts through direct management techniques and their combinations with indirect techniques, most literature surveyed had studies conducted in wilderness areas or national park areas where dispersed recreation is limited to more backcountry settings.

As this topic's research area is specifically tied to areas on the UWCNF, regulations involving dispersed recreation for this area will be addressed. Dispersed camping on the UWCNF is managed in a variety of ways. First, the "Designation of Trails, Roads and Areas for Motor Vehicle Use" portion of the Code of Federal Regulations (CFR 36, § 212.5b, 2005) allowed USFS managers to designate roads for dispersed use and management. Under this federal regulation, UWCNF districts have designated certain roads under a dispersed camping category that allows camping within 150 feet of the existing roads (USFS, n.d.-d). The Mountain View-Evanston Ranger District, however, allows dispersed camping within 300 feet of a designated route. Furthermore, dispersed camping is not allowed within 100 feet of a water source, such as a stream, lake or spring (USFS, n.d.-d). In addition to the regulations specifying distances from roads that one may camp and recreate, the UWCNF also encourages users to practice no-impact techniques such as using already impacted areas, limiting impacts to vegetation when starting fires and setting up camp, and using stoves instead of fires to reduce camp fire impacts (USFS, n.d.-d). This approach is typical of a synthesized direct and indirect management philosophy with hopes of limiting environmental impacts and preserving a desirable outdoor recreation experience. However, despite these management techniques, studies have shown a growth in resource impacts associated

from dispersed recreation activities (Evans, Haddock, Tibbets, & Topham, 1999; Monz, Reiter, & Vance, 2012; Wilson, 2008).

Temporal aspects of management. Dispersed recreation management involves temporal considerations. Temporal factors can be determined by managers and agency regulations, natural seasonal processions, or a combination of both factors which affect visitor use patterns. Hammitt and Cole (1998) classified one aspect of dispersed recreation management as dispersing use on a basis of time, such as seasonal limitations, or campsite rotations, to limit ecological impacts. Leung and Marion (2000a) outlined management involving temporal aspects, such as: seasonal closures to sensitive areas, variance in fees for seasons, limiting length of stay, and dispersing use to times of less use and visitor numbers. Closures are the most common managerial factor involving temporal aspects of recreation management. Marion and Cole (1996) discussed temporal closures and openings as being an important factor to managing impacts to soils and vegetation, with initial openings incurring the most impact on soil and vegetation, while long term closures have effects of allowing vegetation to recover. Other studies have shown how closures over periods of time allow the recovery of areas (Cole & Monz, 2004; Cole & Spildie, 2007). Other studies have demonstrated that over time dispersed campsites grow in number and size when not managed intensively (Cole, 2013; Hammitt and Cole, 1998; Leung & Marion, 2000a, 2000b).

Spatial aspects of dispersed management. Spatial aspects of dispersed recreation management have been documented on some level, although most research is focused on backcountry recreation. Hammitt and Cole (1998) described dispersed recreation management as trying to spatially control use through dispersing it through

limited areas, or dispersing it through a greater expanse of land. Leung and Marion (1999) have categorized the management of spatial factors into four categories: spatial segregation, spatial containment, spatial dispersal, and spatial configuration.

Spatial segregation is a strategy that seeks to define areas suitable for uses based on their compatibility with other uses or resources; examples include sensitivity buffers disallowing use near streams, or use-specific plans for motorized and non-motorized separation, and zoning (Leung & Marion, 1999). Spatial dispersal strategies are used to spread out use and therefore impacts over a larger area or timeframe, therefore minimalizing impacts by allowing time for resources to recover after disturbance. Spatial configuration strategy is a strategy that seeks to limit impacts to the landscape and user experience through arranging sites in a fashion that allows preferences and resources to maintain a preference or lack of disturbance. Lastly, spatial containment strategies seek to restrict the growth and expansion of sites by limiting the allotted area for an activity. An example would be fencing off a campsite's peripheral edge to keep it from expanding into the greater landscape.

These spatial strategies of involving the influence of recreation use are based off of early research by McEwen and Tocher (1976), which classified disturbance of sites in three zones: the core, the intersite, and the buffering zone. The McEwen and Tocher study has been validated by later work by Cole and Monz (2004) that demonstrated a pattern of a core area, an intermediate area, and a periphery area of impacts in experimental campsites. Other studies (Leung & Marion, 1999, 2000b; Marion, 1995; Marion & Farrell, 2002; Reid & Marion, 2004) have concluded that spatially containing use can benefit resources and recreation settings. A containment strategy has been put to

use on the UWCNF through a call for CUA development and monitoring throughout the Forest (USFS, 2003b), although study of the effectiveness of CUAs, along with management perceptions of containment strategies has not been studied on the UWCNF or in general. Lastly, most research involving spatial strategies has been conducted in a backcountry or wilderness setting.

CUAs as dispersed recreation management. Containment of use as a strategy has been documented to be an effective management strategy for reducing user and environmental impacts (Leung & Marion, 1999; Marion, 1995; Marion & Farrell, 2002; Reid & Marion, 2004). A containment strategy has also been identified on the UWCNF under the management of CUAs. The term CUAs refers to management areas involving USFS management and ownership. A CUA has been defined by the USFS (2011) as:

> an undeveloped site or area where management time or dollars is invested because recreation use in the location leaves evident impacts, such as litter; vandalism; or soil compaction such as dispersed campsite, or as large as a climbing area, or as complex as an all-terrain vehicle hill climb area. (p. 16)

However, despite this definition, CUAs have also been defined in Forest Plans for various National Forests. Another CUA definition provided by the USFS (2003b) comes from Revised Forest Plan for the Wasatch-Cache National Forest:

> [A] Concentrated Use Area (CUA) is where the Forest Service invest [sic] management time or dollars for the management of sites or areas of recreation activity that leave evident impacts, such as litter, vandalism, or soil

> compaction. Any constructed features or management activities are primarily for resource protection rather than user convenience. The primary management objective is to protect and stabilize natural resources. (p. GL-4)

While these definitions serve as general definitions of a CUA, they do little to define specific management strategies, or social and ecological factors that may influence these areas. Of particular interest to these definitions are terms involving management for the "resource" rather than the "user convenience" and issues of scale—how big are these areas typically? Also, not much information is given on setting classes derived from these spaces. Lastly, no reference to temporal aspects of these areas are described. While research has been conducted to show that concentrating use can be an effective management technique, little research actually addresses what CUAs generally are, especially outside of a backcountry setting.

Manager perceptions of dispersed recreation and CUAs. Managers have been managing dispersed recreation and CUAs for decades. Despite the history of this area of recreation management, relatively few studies have surveyed managers about dispersed recreation and its management. A pair of studies analyzed managers from various agencies on their attitudes towards the management of dispersed recreation in the northwestern United States (Downing & Moutsinas, 1978; Moutsinas, 1976). Overall, most managers favored dispersed recreation management along road systems. Furthermore, most managers stated their agencies have dispersed recreation management policies, although CUAs were not addressed. Downing and Clark (1979) identified issues of litter and garbage, vandalism and theft, danger of fire, danger of accidents with user

uses, conflict, and human waste as primary concerns involving dispersed recreation. Hart and DeByle (1979) also stated that managers view resource impacts related to dispersed recreation to vary with activity in a dispersed setting. Washburne and Cole (1983) surveyed a broad range of land managers throughout the United States, most of whom reported solitude and resource degradation as primary issues facing their management. While Washburn and Cole do not directly mention dispersed recreation, it appears that camping and trail impacts in their study are associated with areas managed in a dispersed manner, since most forests they surveyed had areas of dispersed use, although usually in a wilderness setting. Brooks and Champ (2005) surveyed "unmanaged recreation" on Colorado's Front Range to better understand the "wicked nature" of unmanaged recreation. Their study was qualitative and strove to address areas that fall under dispersed recreation definitions. The main recommendation from this study was that management of these areas needs to occur on a smaller scale, rather than regional scales, to ensure public participation and relationship building between land management agencies, local communities, and recreationists.

Research questions. Overall, very little literature was found that directly addressed CUAs and their management. This thesis will attempt to remedy these gaps in the literature by broadening the understanding of CUAs. The goal of this study is to answer two primary questions:

(1) What are CUAs?

(2) How are CUAs managed?

These two questions are intended to expand the definitions and management directives from forest plans and USFS documents into a broader knowledge of CUAs and current

practices involving their management. These USFS documents have thus far provided the greatest amount of literature-based insight into CUAs. Additional information in the literature review addressed general dispersed recreation topics, providing a greater context for understanding CUAs.

Literature was found that reviewed impacts to resources resulting from various recreational uses and settings. This literature displayed how recreation can affect vegetation, soils, wildlife, and hydrology. While the findings of the literature did at times relate to dispersed recreation, it did not directly reference CUAs.

Social aspects of recreation and its management were also surveyed in relation to dispersed recreation management. Recreational uses and use types have been found in some studies related to dispersed recreation settings, however no literature was found to relate these concepts concretely to CUAs. Some literature was also found that addressed issues of conflict, displacement, crowding and user preferences, but this literature did not show a strong link to CUAs and was only inferential toward CUAs in some cases involving dispersed recreation.

After surveying the management and design of features related to CUAs and dispersed recreation management, several studies revealed information that was informative regarding use and impact patterns in undeveloped settings, management options, and design tactics for sites. Several studies even directly addressed strategies for concentrating use through the installation of site features and the design of sites (Leung & Marion, 1999; Marion, 1995; Marion & Farrell, 2002; Reid & Marion, 2004). These studies will be compared to the overall findings of this study.

While the surveyed literature is informative toward the purpose of this study, the two broad questions (what are CUAs and how are they managed?) were further refined. This study sought to understand what frameworks, forest plans, and handbooks further define CUA management. This study aimed to examine managers' definitions, perceptions, management strategies, and design approaches involving CUAs. Furthermore, this study sought to understand where CUAs were generally located, what features were associated with CUA locations, and what CUA data were collected on the UWCNF. This study was not intended to be completely comprehensive regarding dispersed recreation management and CUAs; however, it was intended to serve as a starting point for an ongoing discussion of management and design practices involving outdoor recreation areas that may appear to the public as unmanaged and undeveloped.

CHAPTER III

METHODOLOGY

Description of Study Area

Part of Region Four or the Intermountain Region of the USFS forest system, the Uinta-Wasatch-Cache National Forest (UWCNF) is an area of public land encompassing slightly over 2.1 million acres across two states, which is managed by the United States Forest Service (USFS) and is administered by the U.S. Department of Agriculture. With its northern extent along the Utah-Idaho border, the UWCNF stretches south to the northern edge of the Colorado Plateau; western lands border the Great Basin while also encompassing a portion of southwestern Wyoming and part of the northern slope of the Uinta Mountain Range (Figure 1). The UWCNF is subdivided into seven ranger districts, each having a management approach of *multiple-use-sustained-yield* as determined by the 1960 Multiple-Use-Sustained Yield Act. The focus of this study involves recreation management.

The Logan Ranger District (LRD) is the northern most district of the Forest and consists of land across three counties, Cache, Rich, and Box Elder. The LRD also has two designated wilderness areas, the Wellsville Mountain and the Mount Naomi Wilderness Areas. Adjacent to the LRD, the Ogden Ranger District (ORD) includes land in Davis, Morgan, Weber, Rich and Box Elder counties. The Salt Lake Ranger District (SLRD) is located just directly south of the ORD and includes the Mount Olympus, Twin Peaks, Lone Peak, and Desert Peak Wilderness Areas. SLRD covers areas in Salt Lake, Davis

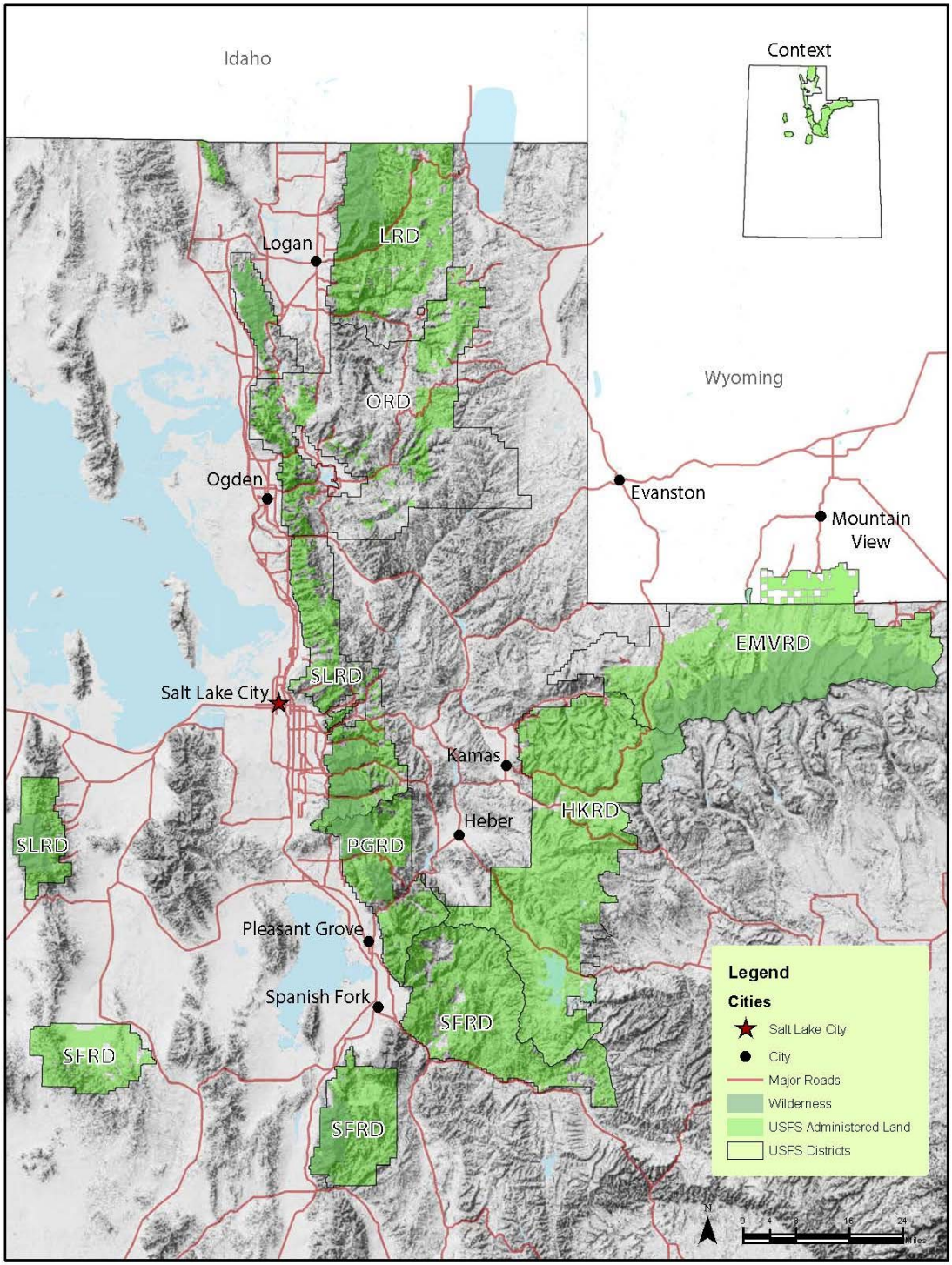

Figure 1. Map of study area.

and Tooele counties and supplies more than 60% of Salt Lake City's drinking water (USFS, n.d.-b). The Evanston-Mountain View Ranger District (EMVRD) is located in southwestern Wyoming and includes portions of the North Slope of the Uinta Mountains in Utah. Part of the EMVRD is the High Uinta Wilderness Area. Each of these districts was historically part of the Cache and Wasatch National Forests until these Forests were combined in 1973. The Heber-Kamas Ranger District (HKRD) is located 45 miles east of Salt Lake City as part of Summit, Wasatch, and Duchesne counties. The HKRD also contains part of the High Uinta Wilderness Area. The Kamas District was historically part of the Wasatch-Cache National Forest, while the Heber portion of the district was part of the Uinta National Forest. These forests and districts were combined in 2007. Pleasant Grove Ranger District (PGRD) is located south of the SLRD and includes parts of the Lone Peak and Mount Timpanogos Wilderness Areas. The Spanish Fork Ranger District is located south of the PGRD and includes the Mount Nebo Wilderness Area. The supervisor's office for the UWCNF is located in South Jordan, Utah.

Methods

The nature of this study is exploratory and descriptive research in the field of outdoor recreation management. This study has been conducted with a two-step approach. The first step was inventorying districts on the Uinta-Wasatch-Cache National Forest to identify previous CUA work, along with any work that is currently in progress. Inventorying included gathering existing GIS data, photographs, site maps, design drawings, and any previously documented strategies and regulations that are currently prescribed to CUAs on various districts. GIS data was quantitatively analyzed to reveal

landscape and development features associated with CUAs. Photographs, site maps, design drawings, and documented strategies and regulations were analyzed to contextualize CUAs and management actions. All inventory data sought was limited to documentation developed post the 2003 Wasatch-Cache Revised Forest Plan (RFP) and the 2003 Uinta National Forest Land and Resource Management Plan (LRMP), except GPS-based data (Table 1), which was found for 1999-2010. The post 2003 timeframe was selected based on the inventorying and monitoring protocol for CUAs from the 2003 RFP. These aspects were used to provide examples of what CUAs have been considered and how CUAs have been managed since the WCRFP. The second step of the study involved interviewing recreation and resource personnel of the UWCNF, and qualitatively analyzing interview data for themes involving CUA characteristics and management.

Table 1
Number of GPS-based Data Points for CUAs on the UWCNF

District	**Number of Sites**
Salt Lake	246
Heber-Kamas	5,617
Evanston-Mountain View	759
Pleasant Grove	342
Spanish Fork	389
Ogden	323
Logan	886
Uinta-Wasatch-Cache National Forest	8,562

GPS-based data analysis. Global positioning system (GPS)-based data exists for each district that showed CUA mapping on both the Wasatch-Cache National Forest and the Uinta National Forest. GIS point data exists with varying collection dates ranging

from 1999-2010 for all districts and was collected using Trimble and Garmin GPS units. Each point representing a CUA is the location of a fire ring at the mapped site.

Despite data existing for each district, some data lacked metadata describing collection techniques. Table 1 shows the final count of CUA data points by district and forest, which were used for this study. Data identified as not being collected using GPS unit was not included in the study. CUA data points were projected into ArcMap 10.2 using NAD 1983 UTM Zone 12N projected coordinate system, with Transverse Mercator projection, and GCS North American 1983 geographic coordinate system. The CUA data points were then clipped, using the ArcGIS Clip Tool, to the UWCNF administrative boundary. Each district's CUA data points were then overlaid with point, polyline, polygon landscape features and rasterized landscape characteristics in ArcGIS.

Landscape characteristics included: slope, elevation, vegetation cover, vegetation height, aspect. Landscape features included: streams, lakes, springs, roads, and developed recreation sites. The ArcGIS Proximity Toolbox tool "Near" was then used to find the proximity distance to features. These distances were exported into Microsoft Excel and categorized by distances identified in the Wasatch-Cache Revised Forest Plan, such as the 150/300' travel regulations and the 300' riparian conservation buffer zones, or general quarter-mile, half-mile, one mile, or two mile increments. CUA point data were then used to extract the other various landscape values to each point's data table, and categorized in general increments, or by categories defined by raster metadata (see Table 2). All data were then analyzed to understand the general characteristics of CUAs on each district and for all sites represented on the UWCNF.

Table 2
GIS Parameters of Mapped Features and Characteristics with Categorizations

Features	**Data Type**	**GIS Toolbox-Tool Used**	**Categorizations Used**
Springs	point	Proximity-Near	Distances of 150ft, 300ft, 1320ft, 2640ft, and >2640ft
Streams	polyline	Proximity-Near	
Lakes	polygon	Proximity-Near	
Roads	polyline	Proximity-Near	
Developed Recreation Sites	point	Proximity-Near	Distances of 1320ft, 2640ft, 5280ft, 10,560ft, and 10,560ft
Characteristics	**Data Type**	**GIS Toolbox-Tool Used**	**Categorizations Used**
Slope	Raster 10m x 10m cells	Extraction-Extract values to Points	Degrees of 0-4.9%, 5-9.9%, 10-14.9%, 15-19.9%, >20%
Elevation	Raster 10m x 10m cells	Extraction-Extract values to Points	4000-4999ft, 5000-5999ft, 6000-6999ft, 7000-7999ft, 8000-8999ft, 9000-9999ft, >10,000ft
Aspect	Raster 10m x 10m cells	Extraction-Extract values to Points	Values of Flat, North, Northeast, East, Southeast, South, Southwest, West, Northwest
Vegetation Height	Raster 30m x 30m cells	Extraction-Extract values to Points	LANDFIRE Existing Vegetation Cover data dictionary definitions
Vegetation Cover	Raster 30m x 30m cells	Extraction-Extract values to Points	LANDFIRE Existing Vegetation Height data dictionary definitions

Key-informant interviews and analysis. Further information on these districts was gathered through a qualitative approach of interviewing. This method was chosen because it has been shown to provide a deeper understanding of complex issues (Groat & Wang, 2002; Gall & Borg, 2007). Key-informant interviews were chosen because of the ability to gain access to managerial knowledge not available through other sources (Gall et al., 2007).

Twenty-one key-informant interviews were conducted either over the phone or in person with sixteen recreation managers and eight resource specialists for the UWCNF (Table 3). Recreation managers are defined as staff who are directly responsible for managing recreation activities and uses at a district or forest level, including: Recreation Staff Officers; Natural Resource Specialists-Recreation; Forestry Technicians with an emphasis in recreation, and Landscape Architects and Recreation Planners. Resource specialists are defined as Forest Service personnel whose primary job duties involve evaluating natural and cultural resource conditions for the purpose of ecosystem management, or cultural resource management. For the purpose of simplicity, those performing law enforcement duties are considered in this study to be resource specialists. Recreation managers and resource specialists were both interviewed in an attempt to present a holistic view of how CUAs are managed from a recreation and resource perspective, as both groups often collaborate on projects.

Four interviews were conducted as group interviews, with recreation managers and recreation technicians participating in the interviews. The remaining seventeen other interviews were conducted one-on-one. Prior to conducting interviews, the duration of interviews was estimated to be one hour in length. Overall, the longest interview lasted

Table 3
Job Titles and Number of USFS Personnel Interviewed

Recreation Managers	5 Recreation Staff Officers 7 Natural Resource Specialists-Recreation 2 Forestry Technicians 2 Landscape Architect/Recreation Planner
Resource Specialists	1 Fisheries Biologist 1 Botanist 1 Range/Weeds Resource Specialist 1 Hydrologist 1 Wildlife Biologist 1 Archaeologist 1 Soil Resource Specialist 1 Law Enforcement Officer

just over 2 hours and 3 minutes in length, while the shortest interview was just over 31 minutes in duration. The average interview time for all interviews conducted was just over 58 minutes.

Interviews were recorded using a handheld Sony Digital Flash Voice Recorder (ICD-PX312) to ensure the accuracy of data collection and transcription. Handwritten notes were taken during each interview to record important non-verbal indicators, which can add important meaning to interviewee responses (Hycner, 1985). A brief description of the interview was also captured directly following each interview. One interview was conducted with each key-informant to gain a breadth and depth of information on the

topic of CUAs for each specific district as well as at a broader forest level. No follow-up interviews were conducted. The interviews were semi-structured to add quantitative elements and some level of consistency to the data, yet questions were part of a qualitative "general interview guide approach" that allowed further probing and impromptu questions on specific sites and design principles (Gall et al., 2007). In this way, a baseline of data was collected for simple quantitative reporting (e.g. title of occupation, style of management, etc.); while qualitative insights into the management process also sought to add depth and further understanding (e.g. problems encountered while managing a site, management processes, site development, management tactics, etc.) to the process. Four questions were used to frame the interview guide:

(1) How are CUAs defined by recreation managers and resources specialists?

(2) Where do they commonly exist, and what primary recreation uses and landscape characteristics are associated with sites?

(3) How are CUAs prioritized and organized for management?

(4) What management/design solutions and problems exist for CUAs?

Using these questions, the interview guide was constructed in three parts. The first section was a basic introduction and asking of job title, positions held with the agency, and whether training involving CUAs had been provided by the Forest Service. The second section aimed at defining CUAs in a physical and social sense by asking managers to describe characteristics of landscape, use and conflict. Lastly, the managers were asked about the management and design of CUAs on the UWCNF.

Analysis of the interviews was derived from a qualitative analytical procedure. This procedure is formulated from the phenomenological approach used in qualitative

analysis. The phenomenological approach lends its process for sorting each individual interview (Hycner, 1985). These processes included: transcription, bracketing and phenomenological reduction, listening for a sense of whole, delineating units of general meaning, delineating units of meaning relating to the research questions, eliminating redundancies, clustering units of relevant meaning, determining themes from relevant meaning, and writing a summary of each review. This approach was used to analyze and sort data, while limiting analyst bias (Hycner, 1985). All interview data was analyzed under the assumption that patterns involving the definition of CUAs and management frameworks or design principles used to address CUAs would emerge.

In order to ensure the interview guide, process, and analysis were well designed and functioned according to the goals of the project, a pilot testing of the interview guide was conducted on the Logan Ranger District. The pilot interview process involved interviewing two resource specialists and three recreation resource managers. The guide provided answers to the main research questions of what is a CUA, how is it managed, and what design techniques are used. No changes were made to the general interview guide after the pilot interview process. Questions asked in later interviews were all based off of the interview guide and its structure. See Appendix A for interview guide and interview transcription examples.

All interviews were then followed by site visits on the district. Areas visited were recommended by managers as the more significant CUAs within their management areas. Survey guides relating to campsite inventories for sites visited were collected when meeting with managers (Appendix B). Due to time limitations and travel time, generally only one area was visited per district. Observations were noted during field visits and

photos were taken. In some cases, the researcher spent the night in campsites within areas described by management as CUAs. The observations from these visits are reported in the results section of this study and in Appendix C.

CHAPTER IV

RESULTS

Overview

Prior to each district being visited during the summer of 2013, GPS-based data for each district was attained from the UWCNF. In addition to the GPS-based data, some photographs accompanied survey data from the 2006 CUA surveys of districts on the Wasatch-Cache portion of the UWCNF. Other information and data was also sought during this initial inventory of the districts. Data searches included examining the 2003 Revised Forest Plan for the Wasatch-Cache National Forest (RFP), and the 2003 Land and Resource Management Plan (LRMP) for the Uinta National Forest (USFS, 2003a, 2003b). The 2003-2004 Forest Monitoring Plan (FMP) for the WCNF provided insight into CUA management and inventory (USFS, 2004). The USDA Forest Service Intranet and public internet sites were also searched to find national context for CUA management, such as national policy and directives. Overall, very little information on CUAs was discovered outside of the forest management plans and the GPS-based data for the UWCNF. Following this initial forest data search, each district was visited to conduct interviews and to visit CUA sites. Visits revealed further data such as additional photos, GPS-based data, and travel planning documentation. Interviews were then conducted to gather further data and insights into CUAs on the districts.

The results of these findings have been assembled and the results are reported in this chapter from a forest-wide perspective. First, a summary of district findings from the

inventory and site visits are presented from a forest-wide perspective; analyses of these results includes descriptions of photos, management plans, and other documentation obtained. A more detailed district breakdown of inventory and site visit results can be found in Appendix C. Secondly, GPS-based data have been analyzed using ArcGIS and descriptive results are provided from a forest-wide perspective in this chapter. A more detailed breakdown of GIS analysis of individual district results is provided in Appendix D and E. Lastly, results from the interview process are presented in an Interview Results section that further describes CUAs and their management by recreation managers and resource specialists.

Results of Forest-Wide Inventory, Site Visit, and Policy

Prior to interviewing managers and GIS analysis of CUAs on the UWCNF, a general inventory of districts was conducted in order to discover any data and policy relating to CUAs and their management. Overall, more information was found involving CUAs and their management on the Wasatch-Cache portion of the UWCNF than the Uinta portion. However, some data was found for all districts on the UWCNF. A summary of these findings for each district can be found in Appendix C. The information found in these plans often did not directly address CUAs, except in the FMP. Rather, most management plans identified dispersed recreation management strategies, which in many cases sought to concentrate use to specific areas. During visits to districts for interviews, site visits were conducted and photographs were collected at sites visited, along with general observations of site conditions.

Pre-visit inventory data and policy. Prior to visiting districts, a search was conducted to find management plans and policy that may inform how CUAs are managed on the UWCNF. This inventory resulted primarily in data relating to UWCNF documents, such as the 2003 Wasatch-Cache National Forest Revised Forest Plan (RFP), the 2003 Uinta National Forest Land and Resource Management Plan (LRMP), the Wasatch-Cache National Forest Monitoring Plan (FMP), and the UWCNF Recreation Strategy. Furthermore, some district specific documents and management plans were found, in addition to references to some rules and regulations related to dispersed recreation management. However, the majority management actions recommended to concentrate use were found in both forest management plans.

National level direction and definitions. A limited amount of data on national-level direction and definition of CUAs was found prior to site visits. A national-level definition of CUAs was found, with CUAs being defined as relatively undeveloped areas, managed to reduce impacts to natural resources rather for "user convenience"(USFS, n.d.-c). Overall, sites with a development scale of 0-2 appear to fit the national definition of CUAs, as these areas are managed for resource protection. These scales of development vary little, as level "0" sites are user-created, with no constructed improvements or designed circulation; while level "1" sites may contain signs, but are not developed or designed; and level "2" sites contain "rustic improvements" within a "defined site" with "circulation and parking contained and defined" (USFS, n.d.-d).

Meaningful Measures direction clarifies that recreation sites of all levels should be managed to National Quality Standards, including "health and cleanliness," "resource setting," "safety & security," "responsiveness," and "condition of facilities" (USFS,

2008). These standards included “critical standards” within five primary sections. Critical standards included insurance that: (1) visitors are not exposed to human waste; (2) recreation site meeting federal, state, and local water regulations; (3) sites do not conflict with environmental law; (4) sites do not have high-risk conditions involving safety; and (5) utilities are inspected to federal, state, and local requirements. No clarification is given on which recreation site development scale is tied to these standards; however, based on operations and maintenance tasks provided, it appears these standards are primarily intended for level 3-5 development level recreation sites. A national-level document produced for Fiscal Year 2013, provides some further clarification, calling for recreation sites with a development scale of 1-5 to be inventoried every five years; however, what they should be inventoried for, outside of constructed features, is not clarified (USFS, n.d.-e). No targets or metrics for management or its success were found relating to recreation sites and their management on a national level.

Forest management plans and strategies. Forest management plans and documents provided the greatest amount of information on how CUAs are to be managed on the UWCNF. Generally speaking, CUAs are addressed as areas for camping that result in heavy use and undesirable impacts (USFS, 2003b, p. 4-32). Actions proposed for these areas included inventorying districts for CUAs, developing management plans, and then conducting public outreach and education to explain management actions. The inventorying process appears to have been carried out to some extent, as the FMP details the beginnings of district inventories. The FMP describes a process of lumping individual sites together into a general geographic area that is given a name, such as “Left Hand Fork” of the Logan Ranger District (p. 24). The FMP process is then followed up by a

more in-depth inventorying process that resulted in GPS-based data being collected for all districts, although no report was found describing the findings of individual site inventories on a district or forest-wide level. Data describing the UWCNF show that the districts' CUAs are associated primarily with dispersed camping and motorized use along travel routes. This GPS-based data is used in the GIS analysis of this study to determine individual CUA site characteristics. Some areas identified in the RMP were found later in the UWCNF Recreation Strategy. While the Recreation Strategy did not specifically use the term CUA, it did prioritize some areas identified in the RMP for management within various recreation settings. The UWCNF Recreation Strategy does claim to fit within the frameworks of the RFP and LRMP; however its connection to forest management plans is tenuous and not clearly referenced throughout the document.

Overall, the RFP was found to detail CUAs and their management; while the LRMP was found to not reference CUAs; rather it addressed dispersed recreation management by placing emphasis on concentrating use to protect natural resource conditions (USFS, 2003a, 2003b). Other management actions proposed in both the RFP and the LRMP include hardening sites, defining sites with barriers like fencing, closing sites, moving sites near sensitive areas, signing areas, and designating sites and travel routes. Lastly, CUAs are closely associated with vehicular use and travel management. These areas seem to be predominantly managed to reduce use impacts on biophysical attributes found on the UWCNF, while allowing a variety of recreation opportunities. As the RFP states, these actions are proposed to "reduce or prevent unacceptable impacts" involving dispersed recreation on the UWCNF (USFS, 2003b, p. 4-136).

Site visits and observations. Each district was visited during the summer of 2013. Overall, CUAs observed on each district consisted of fairly similar characteristics, with three different CUA types observed and categorized by the researcher on the UWCNF. The first type of CUA, which was most commonly observed, was an individual dispersed camping site. These areas were located in flat spaces near roadways that were able to accommodate at least a car and a tent for camping; however it was more commonly noted that sites were in areas large enough to accommodate one to five camping trailers. These sites were identifiable because of the presence of a user-created fire ring, surrounded by denuded vegetation (Figure 2).

Figure 2. A typical dispersed camping site is a common CUA.

A second type of site observed during district visits was a more formal area designated for camping. These areas were usually large, flat, open areas that were surrounded by some kind of fencing or barrier rock to define a usable space (Figure 3, 4, & 5). Usually a main travel route was apparent in these areas, along with a series of user-created campfire rings located within the delineated space. These areas appeared to be used primarily for dispersed camping, or as a staging area for motorized trail use with OHVs.

Figure 3. A larger CUA defined with a boundary of rocks.

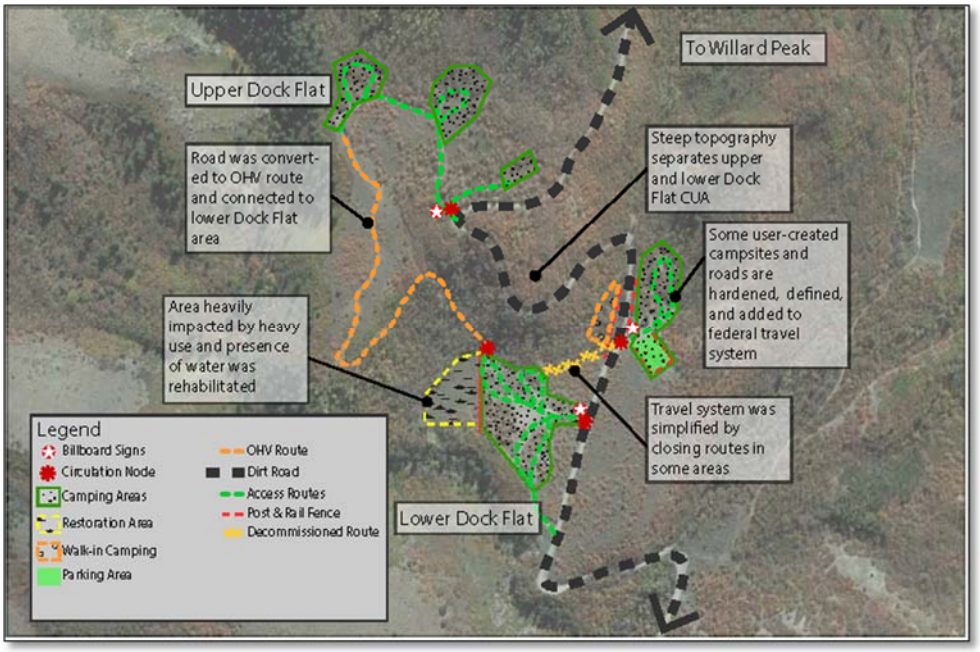

Figure 4. Aerial view and description of Dock Flat CUA.

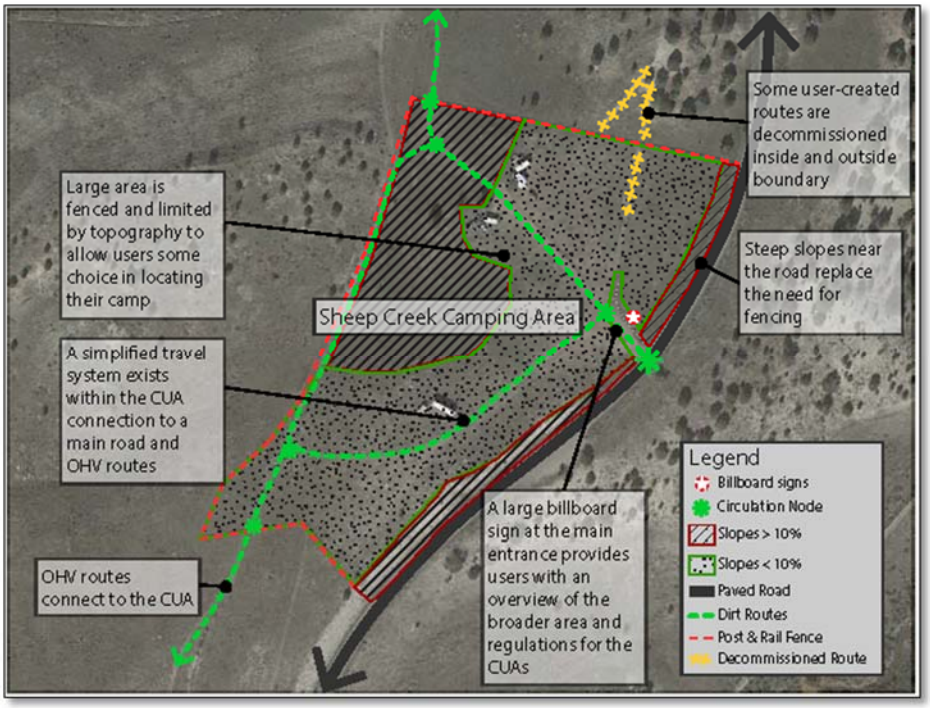

Figure 5. Aerial view and description of Sheep Creek Camping Area.

The last type of CUA observed on district visits were large open areas, usually part of a gravel pit, that were used as OHV play areas. These areas appeared previously impacted by the extraction of gravel and earthen materials, and appeared to allow OHV use within the impacted areas, although no signs were observed designating such use (Figure 6). Evidence of campfire rings were also observed in these areas as well, but no camping was observed in these areas.

In many cases, CUAs appeared to be influenced by uses other than recreation on the UWCNF, with particular influence observed in regards to timber harvesting and grazing activities. On the Heber-Kamas Ranger District (HKRD) and Evanston-

Figure 6. A gravel pit CUA.

Mountain View Ranger District (EMVRD), nearly all individual CUAs visited had signs of timber harvesting, as several low-cut stumps were observed in many areas. Furthermore, there were slash-piles observed on both districts, which were surrounded by areas often showing signs of vehicle travel and damage to vegetation, with some areas having campsites near the slash-piles. These piles appeared to be a major source of campfire wood for dispersed recreationists. In addition, individual sites visited on all districts generally showed some sign of livestock grazing. In some cases, such as on the Logan Ranger District, grazing impacts often made it difficult to discern the extents of human-created impacts versus grazing impacts.

Lastly, while the site visits, observations, and a review of forest management plans and policy describe somewhat consistent management actions and CUA conditions, it was observed that each district was responsible for defining its own CUAs and then determining how they should be managed. Management plans for CUAs were found on several districts, however their structure and descriptions varied to some degree. Furthermore, these plans appeared to be developed on a district by district basis, depending on the needs and perceptions of management within the district. This shows that definition and management CUAs, while given guidance through forest management plans and strategies, is still derived and carried out with a large degree of autonomy on a district level.

Results of Forest-Wide GIS Analysis of GPS-Based Data

GPS-based data was found for each district within the UWCNF. This data was collected from 1999-2010. The UNF was surveyed in 1999-2001, however the results of

such efforts appear incomplete, as it is not clear whether data was collected for entire districts or management areas and whether such data was collected in a consistent surveying method. For the WCNF, GPS-based data was collected from 1999-2010. Survey methods for data collected from 1999-2008 appears to be carried out in a fairly consistent matter using a campsite monitoring manual (see Appendix B) and a CUA surveying data dictionary and surveying methodology. A data dictionary is a document that standardizes data attributes prior to the inventorying process. Despite this development of a CUA and campsite surveying method by the WCNF, PGRD and HKRD later developed other surveying methods to collect data pertaining to their districts (see Appendix B). The methods of these two districts generally involved fewer inventory items than the original methodology developed on the WCNF. From meeting with managers it appears the reasons for these new methods being developed was either a lack of knowledge that a system had already been developed, or personnel had a need to develop a faster surveying method to complete surveys of more sites across a larger area in a shorter amount of time. With GIS technology now commonly being used as well, managers mentioned less of a need to survey distances to certain features, such as roads and streams, as these can be calculated in GIS more quickly than through onsite surveys.

Because of the variation in methods used to collect data, the following findings report quantitative GIS analysis of CUA data points in relation to eight different landscape features, and two constructed features that were not surveyed consistently during the initial process. These findings are intended to describe relationships between CUAs and general landscape and constructed features. These findings should be considered uncomprehensive, as some data used is over a decade old, while other data

sets were found to not survey the entirety of each district. A detailed district by district report of these findings is included in Appendices D and E.

Forest-wide results. All GPS-based data were analyzed on a forest-wide scale to determine if any larger forest trends could be seen. Generally, it was found that some landscape features corresponded to locations of CUAs, while roads also corresponded to CUA locations. Other factors, such as proximity to lakes, developed recreation sites, slope aspect, and proximity to springs did not appear to have forest-wide correspondence. Of landscape features analyzed on the UWCNF, slope, proximity to streams, vegetation cover, and vegetation height were found to most closely match CUA locations. Seventy-three percent of CUAs on the UWCNF were found within a quarter mile of a stream, and 35% of CUAs were located within 300 feet of a stream (Table 4). Areas with slopes of 0-10 percent corresponded with 85% of CUAs on the UWCNF, and 47% of CUAs were found in areas with slopes under 5 percent in grade (Table 5). Elevation analysis found that 67% of CUAs are located between 8,000-10,000 feet (Table 6). When looking at vegetation cover across all CUAs, 51% of all sites were found in areas with 20-60 percent tree cover, with the remaining CUAs distributed throughout a number of other categories of vegetation cover (Table 7). Vegetation height analysis revealed that 65% of CUAs on the UWCNF were located in forests with heights of 5-25 meters, and 55% of CUAs occurring in areas with a forest height of 10-25 meters (Table 8).

Other landscape features such as slope aspect, and proximity to lakes and springs, were found to not be in correspondence with CUAs. Seventy-one percent of CUAs on the UWCNF were located more than a quarter mile from a lake, with 45% of sites existing over a half mile from a lake (Table 9). Eighty-three percent of CUAs were located over a

half mile from a spring (Table 10). Slope aspects of CUAs on the UWCNF were found to be fairly evenly distributed with no aspect corresponding to more than 16% CUAs while the lowest corresponding slope aspect was found occurring in 9% of CUAs (Table 11).

Table 4
CUA Proximity to Streams

Distance to Streams	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
0-150ft	440	72	103	890	137	96	166	1904	22.2%
150-300ft	105	20	31	760	109	60	40	1125	13.1%
300-1320ft	181	95	131	2245	376	148	103	3279	38.3%
1320-2640ft	115	48	56	1143	111	34	60	1567	18.3%
>2640ft	45	11	2	579	26	4	20	687	8.0%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Table 5
CUA Relation to Slopes

Slope	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
0-5%	411	64	115	2691	528	67	118	3994	46.6%
5-10%	310	90	146	2230	195	135	169	3275	38.3%
10-15%	99	54	39	473	33	87	54	839	9.8%
15-20%	36	30	15	144	3	44	35	307	3.6%
>20%	30	8	8	79	0	9	13	147	1.7%
Total per District	886	246	323	5617	759	342	389	8562	100.0%

Table 6
CUA Relation to Elevation

Elevation	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
4,000-5,000ft	12	0	7	0	0	0	0	19	0.2%
5,000-6,000ft	346	13	63	0	0	3	64	489	5.7%
6,000-7,000ft	149	90	39	25	0	31	147	481	5.6%
7,000-8,000ft	222	64	42	872	0	203	80	1483	17.3%
8,000-9,000ft	157	74	165	1551	296	83	80	2406	28.1%
9,000-10,000ft	0	5	7	2804	462	14	18	3310	38.7%
10,000+ft	0	0	0	365	1	8	0	374	4.4%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Table 7
CUA Relation to Vegetation Cover

Vegetation Cover Categories	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
Open Water	2	2	0	22	3	0	0	29	0.3%
Developed Upland Deciduous	13	4	1	21	2	1	17	59	0.7%
Developed-Upland Evergreen Forest	3	3	0	39	0	0	0	45	0.5%
Developed -Upland Mixed Forest	6	0	0	12	0	1	8	27	0.3%
Developed- Upland Herbaceous	2	0	2	8	5	0	1	18	0.2%
Developed Upland Scrubland	1	0	0	18	0	0	5	24	0.3%
Developed Low Intensity	3	0	1	17	3	0	0	24	0.3%
Developed Medium Intensity	0	0	0	1	0	0	0	1	0.0%
Developed Roads	54	2	16	357	49	3	63	544	6.4%
NASS-Row Crop	0	0	0	0	0	0	1	1	0.0%
Barren	0	0	0	3	1	0	0	4	0.0%
Sparse Vegetation	3	1	1	91	10	2	0	108	1.3%
Tree Cover >= 10-20%	1	8	8	250	16	4	5	292	3.4%
Tree Cover >= 20-30%	43	38	22	711	67	20	25	926	10.8%
Tree Cover >=30-40%	130	52	66	1291	193	26	35	1793	20.9%

Tree Cover >=40-50%	224	26	85	1070	155	63	29	1652	19.3%
Tree Cover >=50-60%	124	36	46	417	78	127	31	859	10.0%
Tree Cover >=60-70%	11	2	2	81	42	15	4	157	1.8%
Tree Cover>=70-80%	2	0	3	6	1	5	2	19	0.2%
Tree Cover >=80-90%	0	1	0	0	0	0	0	1	0.0%
Shrub Cover >=10-20%	60	9	23	364	44	7	6	513	6.0%
Shrub Cover >=20-30%	52	22	20	224	10	15	50	393	4.6%
Shrub Cover >=30-40%	27	23	9	208	4	18	66	355	4.1%
Shrub Cover >= 40-50%	7	5	1	56	0	3	8	80	0.9%
Shrub Cover >=50-60%	0	0	0	1	0	0	0	1	0.0%
Herb Cover >= 10-20%	4	1	1	9	1	0	0	16	0.2%
Herb Cover >= 20-30%	13	3	2	68	9	0	2	97	1.1%
Herb Cover >= 30-40%	37	3	7	196	15	24	11	293	3.4%
Herb Cover >= 40-50%	37	1	3	59	33	0	7	140	1.6%
Herb Cover >= 50-60%	16	2	3	16	18	8	12	75	0.9%
Herb Cover >=60-70%	11	0	1	1	0	0	0	13	0.2%
Herb Cover >=90-100%	0	2	0	0	0	0	1	3	0.0%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Table 8

CUA Relation to Vegetation Height

Vegetation Height	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
Open Water	2	2	0	22	3	0	0	29	0.3%
Dev.-Upland Deciduous	13	4	1	21	2	1	17	59	0.7%
Dev.-Upland Evergreen Forest	3	0	0	39	0	0	0	42	0.5%
Developed-Upland Mixed Forest	6	3	0	12	0	1	8	30	0.4%
Developed- Upland Herbaceous	2	0	2	8	5	0	1	18	0.2%
Developed- Upland Scrubland	1	0	0	18	0	0	5	24	0.3%
Developed-Low Intensity	3	0	1	17	3	0	0	24	0.3%
Developed-Medium Intensity		0	0	1		0	0	1	0.0%
Developed-Roads	54	2	16	357	49	3	63	544	6.4%
Barren	0	0	0	3	1	0	0	4	0.0%
Sparse Vegetation	3	1	1	91	10	2	0	108	1.3%
NASS- Row Crop	0	0	0	0	0	0	1	1	0.0%
Herb 0-.5 meters	100	12	17	349	76	32	33	619	7.2%
Herb 0.5-1m	18	0	0	0	0	0	0	18	0.2%

shrub 0-0.5m	13	6	15	83	2	0	6	125	1.5%
shrub 0.5-1m	65	10	19	468	41	16	48	667	7.8%
Shrub 1-3m	40	41	15	301	15	26	72	510	6.0%
Shrub >3m	28	2	4	1	0	1	4	40	0.5%
Forest 0-5m	13	6	7	25	1	7	14	73	0.9%
Forest 5-10m	154	85	60	409	63	54	47	872	10.2%
Forest 10-25m	357	72	163	3353	477	197	70	4689	54.8%
Forest 25-50m	11	0	2	39	11	2	0	65	0.8%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Table 9
CUA Proximity to Lakes

Distances to Lakes	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
0-150ft	5	12	16	272	37	11	2	355	4.1%
150-300ft	13	5	15	281	32	3	0	349	4.1%
300-1320ft	66	10	61	1398	239	24	21	1819	21.2%
1360-2640ft	145	3	103	1703	208	42	20	2224	26.0%
>2640ft	657	216	128	1963	243	262	346	3815	44.6%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Table 10
CUA Proximity to Springs

Distance to Springs	Site by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
0-150ft	11	1	4	12	0	4	3	35	0.4%
150-300ft	25	10	7	27	2	3	4	78	0.9%
300-1320ft	117	35	73	244	20	31	30	550	6.4%
1320-2640ft	66	39	65	417	60	94	65	806	9.4%
>2640ft	667	161	174	4917	677	210	287	7093	82.8%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Table 11
CUA Relation to Slope Aspect

Slope Aspect	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
Flat (-1)	0	0	0	228	0	0	0	228	2.7%
North (337.5-360 & 0-22.5)	63	41	54	451	104	25	39	777	9.1%
Northeast (22.5-67.5)	75	36	48	560	122	17	45	903	10.5%
East (67.5-112.5)	114	32	46	619	215	28	59	1113	13.0%
Southeast (112.5-157.5)	125	33	42	960	77	43	44	1324	15.5%
South (157.5-202.5)	171	26	36	829	20	51	53	1186	13.9%
Southwest (202.5-247.5)	140	35	29	873	36	36	64	1213	14.2%
West (247.5-292.5)	115	21	28	549	95	65	57	930	10.9%
Northwest 292.5-337.5)	83	22	40	548	90	77	28	888	10.4%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Built environment features analyzed in this study resulted in mixed findings. Roads were found to correspond with CUAs on the UWCNF. Eighty-three percent of CUAs were located within 300 feet of a road, with 65% of sites occurring within 150 feet of a road (Table 12). Proximity to developed recreation sites showed a weaker correspondence. Fifty-three percent of CUAs where found beyond one mile from a developed recreation site on the UWCNF, and only 14% of CUAs were located within a quarter mile of a developed recreation site (Table 13).

Table 12
CUA Proximity to Roads

CUA Proximity to Roads									
Distance to Roads	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
0-150ft	614	154	218	3501	609	155	312	5563	65.0%
150-300ft	126	30	45	1109	110	77	47	1544	18.0%
300-1320ft	94	48	45	851	38	59	29	1164	13.6%
1320-2640ft	21	3	4	72	2	5	0	107	1.2%
>2640ft	31	11	11	84	0	46	1	184	2.1%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Table 13
CUA Proximity to Developed Recreation Sites

CUA Proximity to Developed Recreation Sites									
Distance to Recreation Sites	Sites by District and Forest								Percentage
	Logan	Salt Lake	Ogden	Heber-Kamas	Evanston-Mt. View	Pleasant Grove	Spanish Fork	Forest	
0-1320ft	153	46	48	667	72	146	97	1229	14.4%
1320-2640ft	66	39	37	788	106	65	66	1167	13.6%
2640-5280ft	137	53	23	1084	158	64	91	1610	18.8%
5280-10560ft	133	70	37	1556	270	56	73	2195	25.6%
>10560ft	397	38	178	1522	153	11	62	2361	27.6%
Totals	886	246	323	5617	759	342	389	8562	100.0%

Overall, this shows that while districts may have various factors corresponding more closely to the location of CUAs on their districts, some aspects can be used to evaluate CUA locations across the UWCNF as a whole. Roads in particular appear to be an influential factor in determining where CUAs may be found in relation to the built environment features, while proximity to streams (1/4 mile), and slopes of 0-10% appear to have a strong relation to where CUAs are found on the forest as a whole.

Interview Results

Interview results have been assembled into sections based on themes discovered during analysis of the interview data. Recreation managers and resource specialist results have been combined based on the low number of staff interviewed, and the fairly consistent answers provided by both groups. No district by district summary is given to add anonymity to the personnel surveyed. Rather, each set of results is structured around a basic structure of the general interview guide, which sought to address four questions:

(1) How are CUAs defined?

(2) Where do they commonly exist, and what primary recreation uses and landscape characteristics are associated with sites?

(3) How are CUAs prioritized and organized for management?

(4) What management/design solutions and problems exist for CUAs?

Analysis of twenty-one interviews with twenty-four UWCNF personnel (n=24) captured several themes related to defining, managing, and designing CUAs on the UWCNF. Themes corresponded to questions from the general interview guide; however, some clarity to answers was provided by follow-up questions about specific areas of management or through descriptions of certain sites on various districts. Three of the interviews conducted were group interviews. Themes were assumed in group interviews to be both participants' viewpoint, unless answered differently by each interviewee. In most cases, interviewees were in agreement with one another on themes discussed. All interviewees had held other positions within the agency than were currently possessed. In addition, twenty of twenty-four people interviewed had received no training involving

CUAs or their management. The four personnel who had received training reported the training as very limited, often only dealing with general definitions of sites for data collection and entry in USFS databases. Despite this lack of training, all personnel were able to provide information on defining, managing, and designing CUAs. This ability was found to result primarily from accumulated professional experience concerning the management of CUAs.

General defining characteristics of CUAs. Using the phenomenological approach to analyze interviews with twenty-four UWCNF personnel, eight topics emerged involving the definition of CUAs. Location factors, size/scale of sites, users and use types, use patterns, common impacts, conflict, site types, and influences on site types involving CUAs were found (Table 14). When these topics are considered as a whole, one can begin to see the overall themes and characteristics defining CUAs.

Scale/size and management. Scale and size of CUAs was addressed in interviews with UWCNF personnel, usually with size and scale closely related to the management of sites rather than as a descriptor of sites as a user may perceive them. For size of sites, main themes revealed that most CUAs were considered groups of sites, a corridor of use such as a canyon or roadway, a watershed or sub-watershed, and areas with more than one individual site. Groups of sites was the more common theme of CUAs from a management perspective. As one specialist described, “from a management perspective, that’s where you have to go. It has to be considered from some sort of grouping” (personal communication). Large scale views of CUAs, offered advantages for managers when seeking to identify recreation use patterns, recreation opportunities for users, and a more consistent and comprehensive approach to management. As one staff member

Table 14

Interview Themes Defining CUA Site Features and Characteristics

Topic	Primary Themes	Secondary Themes	Most Concerning
Location Factors	Water features (streams, lakes), Riparian areas, near hunting and fishing, fish/game habitat, easily accessible areas, flat/level ground, undeveloped, proximity to populations centers, meadows, near scenic views, accommodate multiple recreation opportunities, proximity to geologic feature	Crossroads/hubs, sensitive areas, cooler areas, elevation increases with season, shady/cooler areas, unmanaged areas, front canyons, dry sites, sensitive areas	Water & riparian areas
Size	Groups of sites, corridor (canyon, roadway, stream), watersheds, more than one individual site	Smaller/individual sites, variable in size (small, medium, large), whole district, large areas, large sites	High use, severe resource impacts, especially in riparian areas or near water, group areas
Users & Use Type	Multiple recreation uses, trailer campers, families/family reunions, groups, friends, repeated use, motorized use, ATVs, OHVs, off-road/unauthorized routes, historical, hunting/fishing, "the 10%" versus "the 90%", local use	Climbing, partying, tent camping, horses, cars and trucks, shooting guns, ranchers, day-use, location dependent	OHVs, situational to site/resources
Use Patterns	High use, continual use, user created, repeat visits, dependent on topography, “home base”	Unmanaged, seasonal variation (climate, hunting influence), generational, hubs/crossroads, influenced by built features	High use, increasing use
Impacts	Vegetation trampling, soil compaction Tree damage (scarring, cutting), soil erosion, wildlife disturbance, cumulative impacts from multiple recreation and/or other uses, human waste, motorize/off-road impacts	Bare ground, sedimentation, introduction of invasive species (vegetation, aquatics), tree cutting, ash, trash	Cumulative impacts from multiple uses, water impacts, soil compaction, impacts to wildlife, human waste
Conflict	Sites occupied on first come, first serve basis; overstay; conflicting uses (motorized/non-motorized), higher potential for conflict but unsure, overstay, unattended trailers	Localization, noise, blocking access, loss of solitude, safety	Conflicting uses
Site Types	Campsites, unauthorized trails, motorized trails, no fees, user-created, historical/long-term sites, riparian/water sites, motorized sites, group sites	Climbing areas, dry sites, tent sites, car camping sites, horse sites, parking areas	Campsites, unauthorized trails, motorized sites
Site Type Influences	Proximity to large population centers, historical use, no fees, unmanaged, large enough for groups, undeveloped setting, topography, local culture/history	Population growth, popular areas,	Proximity to population center, historical, accommodate groups

stated, "…[I]f you have several sites in one area it's really the cumulative effect of the individual sites that has more of an impact than just the one site itself" (personal communication).

However, it was also clear from the interviews that large-scale definitions were more appropriate for coordinated, holistic planning efforts that considered multiple uses and resources. These larger scale coordinated efforts would then lead to action at individual sites, with customized design and restoration actions being managed at a smaller scale. Large scale management, however, also posed issues for workers due to large areas increasing travel time and reducing site accessibility. Funding was found to be both a positive and negative aspect of large scale management of larger sites.

Secondary themes revealed that CUAs could also be individual sites, entire districts, or CUAs of variable size. Despite the great variation in CUA size, managers offered information on why these sizes varied. Variations in scale often resulted from varying managerial needs related to the scale of management. Smaller sites also were classified as a scale for CUAs. A smaller site might be an individual campsite, a climbing area, or a parking area. These areas were seen to have advantages for management that included allowing specific resource protection because smaller sites allowed flexibility in response, easier strategizing, quicker responses to issues, and faster implementation of design features than larger size and scale CUAs. However, they were also seen as time consuming and resource consuming during management implementation.

Site types. Types of sites were a common theme discussed during interviews. Site types were often closely associated with use types and user groups. Common site types included campsites, unauthorized trails, and fee-less areas, user-created sites,

historical/long-term use areas, group areas, motorized sites, and sites near water /riparian areas. On a larger scale, CUAs generally expanded to include user-created, or unauthorized walking and ATV trail networks that linked individual sites to one another.

Secondary themes included: rock climbing areas, dry/upland sites, tent sites, car camping sites, and horse sites. Of these sites, the most concerning for managers appeared to be large campsites, unauthorized routes, and motorized sites. Generally, the most concerning sites were related to high resource impacts, and/or areas of growth involving recreation use on the UWCNF, especially when involved with motorized use.

Use type and users. Common themes appeared when managers were asked whether certain uses or use types were associated with CUAs. Main features discovered from analysis included CUAs being places of multiple recreation uses, such as ATVing, camping, and hunting and fishing areas. Most often CUAs were associated with camping, especially trailer camping. Family reunions were reported as a common use of CUAs, as perceptions of these sites often described CUAs as being family friendly areas. Motorized use was also a common use associated with CUAs. ATV and OHV use were often the primary modes of travel mentioned by managers. Users participating in these activities were often recreating in groups. During the fall, use in CUAs was commonly reported as being influenced by groups of hunters camping in areas for several days. Hunting season was also associated with the proliferation of CUAs from season to season. As one UWCNF staff member described, CUAs often occur as:

> …several families, or extended families use an area, so they might bring up three or four trailers, and then there's the other [use type], which is usually during the deer and elk hunt where you have several individuals or

> even families that'll set up a camp in a certain area where they know each other and they want to have their experience together. (Personal communication)

Other primary use types and users were mentioned as well. Ranchers may set up camps to manage livestock on a range allotment, or a timber company may establish an area to stage equipment during a timber harvest. As one interviewee stated, "it's from the recreationalist to the hunter to the permitee side, the range side; so you know as far as I'm concerned, there's impacts that I see on all levels. You know, from all different users." ATV use was seen as a more concerning use, as it was often perceived as having a greater potential to create impacts because of its ability to quickly create unauthorized routes.

There was also a notion of some users causing greater impacts involving CUAs. These users are termed here as the 10% versus the 90%, because, as one manager described, the 10% often do as they wish, disregarding rules and regulations while pioneering trails and sites in an unauthorized and illegal manner. The behavior of the 10% was mentioned as often leading to confusion for the other 90% of users because unauthorized trails sometimes looked like they were established and authorized by UWCNF management.

Secondary features of CUAs relating to manager perceptions of use and user types revealed other uses occurring in CUAs. Climbing, partying, tent camping, car and truck presence, and target shooting were reported as uses occurring in CUAs. These uses and use types were mentioned with less frequency by managers, and so seemed of less significance to the management of CUAs from a forest-wide perspective. With both primary and secondary features, uses were often seen as varying in importance depending

on situational factors and site resources. In particular, the frequency and intensity of use in relation to natural resources' capabilities to withstand or rebound from impacts was seen as an important aspect to consider.

Use patterns. With various uses identified, managers often described use patterns associated with use. Use patterns in these areas were generally described as continual use, high use, and user-created patterns resulting in repeated use patterns. This repeated use pattern was described as a "home base" style of use, where people use CUAs as an area to explore a greater expanse of a district or forest. For instance, personnel described how a group might bring up trailers and ATVs to the forest and then ride their ATVs from CUAs to other places, only to return later to their camps and stay overnight. These patterns were also commonly described as dependent on an area's topography, with flat areas being more accommodating to most uses.

Secondary features of use patterns were identified during analysis as patterns of unmanaged recreation; seasonally correlated patterns, such as increased trailer camping and ATV riding during hunting season; and generational use patterns, such as patterns of use that have been established by a grandparent and then passed down to a grandchild. Furthermore, CUAs were sometimes described as areas located at hubs or crossroads in a road or trail system. Although, it was unclear whether CUAs created these intersections in the landscape. A secondary feature influencing CUA patterns was identified as the proximity of CUAs to built recreation facilities, such as roads and trails.

Location factors. Many factors involving location were stated by managers as having correspondence to CUAs on the UWCNF. Primary themes corresponding to CUA locations included: easily accessible areas, areas with flat/level ground, areas in

proximity to water and riparian zones, areas providing access to hunting and fishing opportunities and habitat, undeveloped areas, areas near population centers, areas with scenic views or proximity to unique geological features, meadows, and areas capable of accommodating multiple recreation uses. The most common site features influencing CUA locations appeared to be flat topography, areas easily accessible by road, and locations close to some source of water, whether a stream, lake, or spring. Locations with proximity to water and riparian areas were often stated as areas most concerning for management of CUAs. Lastly, another major component influencing site locations was the presence of some kind of human created feature such as a travel route or a fire ring.

Secondary themes were also identified as relating to location factors corresponding to CUAs. Areas near a crossroads/hub in the road/trails network were identified as common CUA locations, along with dry sites, ridgelines, dry meadows, sensitive areas, cooler areas, areas providing shade, areas selected for their elevation (high elevation being a greater draw in the hot months, lower elevation being a draw in the cooler and wetter seasons), areas appearing unmanaged, and front canyons.

Impacts. Managers also often identified CUAs as having common impacts. Primary impacts mentioned by managers included damage to trees, vegetation trampling, soil compaction, soil erosion, wildlife disturbance, human waste, motorized use impacts, and cumulative impacts resulting from multiple recreation uses. Of these impacts, the cumulative impacts of recreation, water impacts, soil compaction, impacts to wildlife, the cumulative impacts of multiple uses, and human waste appeared as the most concerning to managers; however, these concerns were not always consistent across districts. For instance, some districts saw impacts to municipal watersheds as most concerning, while

other districts expressed more concern about the overall cumulative impacts of recreation on ecological factors and management's ability to address such impacts.

Less often reported impacts included several common resource impacts. Stream sedimentation, the introduction of invasive species, presence of trash, ash, and bare ground, were all impacts mentioned less often than primary impacts. However, when looking at overall results, it appears that any impacts resulting in the degradation of water quality, such as sedimentation, are significantly more important to UWCNF personnel.

Conflict. When UWCNF personnel were asked about recreation conflict resulting from CUAs, many themes were identified as issues involving conflict. Primary aspects of conflict were stated as conflicting uses (i.e. motorized use vs non-motorized use), sites being occupied on a first-come-first-served basis, and unattended trailers being left to reserve dispersed campsite. While these were the primary themes identified by UWCNF personnel, it was also perceived that conflict was fairly low in CUAs. However, when interviewees were asked if CUAs held a higher potential for conflict, most readily stated that CUAs had a higher potential for conflict due to the amount of high use occurring in these areas. It was also noted that resource specialists appeared to have less knowledge of CUA conflict than recreation managers, as they were less likely to being involved in CUA management. The most concerning of these themes for UWCNF staff was conflict resulting from conflicting uses. Since many sites appear to accommodate various recreation uses, this type of conflict was related as difficult to manage without more direct management techniques.

Lesser mentioned themes involving conflict included overstay at sites, noise, recreationists blocking access to sites, a loss of solitude, safety issues involving users,

and “localization” of sites. Localization of sites was described as users taking strong ownership of a site, and therefore considering it a local spot, for local use. When multiple users adopt a spot as their local recreation site, then there may be conflict resulting from conflicting ownership perceptions.

General influences resulting in CUAs. During the course of interviewing managers, a theme evolved describing general influences resulting in CUAs. Main influences on the creation of sites were their proximity to large population centers, sites having historical significance for the user, a lack of fees being charged for use of sites, the unmanaged nature of CUAs, sites being large enough to accommodate groups of recreationists, undeveloped settings, local culture’s connection to outdoor recreation, and topography limiting or accommodating use. Overall, it appeared that sites’ proximity to population centers, users’ historical connections to sites, and the ability of areas to accommodate groups were the primary factors concerning management of CUAs.

Secondary themes were identified as well, such as population growth and CUAs being relatively popular areas because of their recreation opportunities. Both appear to influence the location and creation of CUAs on the UWCNF. With public lands in high demand, it was described by specialists that CUAs will continue to grow in size and number until designation and regulation of sites is enforced through management.

Themes of management involving CUAs. Several topics involving the management of CUAs were identified during the analysis of interviews with managers and specialists from the UWCNF. These topics involved the scale of management, direct and indirect management techniques, trigger points for management, management priorities, issues involving CUA management, frameworks used to assist management,

tools used by management, general approaches to management, needs for management, trends in management, and general management considerations involving CUAs (see Table 15, 16, & 17). These results captured the management process across the various districts, which is generally a process that seeks to balance recreation use and its impacts with various natural resource settings and values.

CUA management process and general management considerations. Interviewees were asked to describe how they manage CUAs within their management areas. From this question, a few general patterns were identified that describe a general process for managing CUAs. Generally, an idyllic approach to the management of CUAs consisted of a process of inventorying resources and impacts, evaluating impacts and uses in the context of resources existing on site, planning for how to balance use and its impacts on the resource, implementing a plan through field work, and then monitoring user responses to management actions.

There were some differences between recreation managers and resource specialists. Resource specialists generally described a much more interdisciplinary approach being taken during the idyllic approach of systematically inventorying resources and impacts. Furthermore, resource specialists appeared to look at CUA impacts from a larger scale and smaller scale during the same process. The idyllic process described by resource specialists was also generally mentioned as being a process closely tied to NEPA analysis, and was generally more focused on resource protection, with secondary consideration given to allowing recreation use.

The resource specialist approach was in contrast to many recreation managers'

Table 15
Interview Themes Involving the Management of CUAs

Topic	Primary Themes	Secondary Themes	Effective/Pros	Ineffective/Cons
Management Scale	Large scale, groups of sites, roadway/corridors, both large and small scale often involved in projects, site specific (implementation of management actions), watersheds	Forest-wide, small to large, situational, resource scale, patrolled/cleaned in a day, "working circle"	Large scale better for identifying patterns; larger easier to manage; larger better to identify opportunities; small scale allows tangible results for site, protection of specific resources; doing both allows required flexibility	Small scale is time and funding intensive; large scale can be difficult with personnel, funding, and time constraints
Direct Management Techniques	Closing and defining sites, moving sites, patrols & enforcement, 150' rule, defining site boundaries, creating buffers	Showing management, travel planning, concentrating use	Boundaries, showing management, patrols & enforcement constructing barriers to define use	Some closures when public does not want
Indirect Management Techniques	Education, improving sites, cleaning sites, designing sites, signing	Project explanation and outreach, ROS categories	Carsonite signs attached to post, employees educating public, multiple-use design,	Carsonite signs
Trigger Points for Active Management	Soil displacement/erosion, impacts to stream/riparian area, vegetation impacts (bare ground/loss of vegetation type), trail proliferation, management deciding to take action, funding available, trash, human waste, growing sites, public complaint, user safety	Tree cutting, resource specialists taking action, wildlife affected, sites lack a buffer, invasive species moving in, crowding occurring, homesteading, can't maintain site, unorganized use, administrative support, incised trails, stream widening, stream depth decreasing, disproportionate impacts to site, fish populations decreasing		
Prioritization of CUA Management	Water/riparian areas, areas in UWCNF Recreation Strategy, areas with increasing resource impacts, high use areas/culturally significant areas	Broken infrastructure, safety, invasive species, unauthorized routes, safety, municipal watershed, growth areas, motorized areas, areas of poor sanitation, poor draining soils, stream class (1, 2), sensitive species impacted		

Table 16
Interview Themes Involving the Management of CUAs (cont.)

Topic	Primary Themes	Secondary Themes
Issues Associated with CUA Management	Funding, lack of personnel, lack of targets and goals for CUA management, the "10%" of users, lack of interdisciplinary planning	Hiring, consistency of management, earlier ID collaboration, increased pressure from use, limited number of workers, coordinating funding cycles, consistency of management, sustainability of management or use, lack of signage, lack of enforcement, scale of enforcement, not holistic management, lack empirical evidence to make decisions, Forest Plan outdated/not matching conditions, keeping up with changing technology, communication of objectives, adjacent land use
Frameworks Used to Manage CUAs	Forest plans, UWCNF Recreation Strategy, NEPA, professional judgment, forest manuals/handbooks, ID management teams, not much guidance	State water quality standards, INFRA/meaningful measures, Recreation Opportunity Spectrum (ROS), Environmental Impact Statements (EIS)
CUA Management Process	Inventory, assess, plan, implement, monitor; no clearly defined process, NEPA	React to issues, adaptive, operations and maintenance
Management considerations for CUAs	Resource values, amount of use, collaboration, balancing use and resource, budgets, safety, vegetation type/impact/cover, multiple use perspective, management setting/ROS setting, primary uses, user type, social aspects of use, proximity of CUA to water, will improvements increase use, vegetation type/impact/cover	Coordination of management with adjacent Forests, resource ability, topography match to use, sanitation, magnitude of impacts, plan to control use, concentration of use, amount of use, group size, CFRs, enforcement, duration of use, wildlife, invasive species, safety
Needs for CUA Management	More money, more people on the ground, , more information sharing on managing techniques, earlier ID team collaboration, more ID team collaboration	Inventory of CUAs, knowledge on implementation of strategies, more documentation of CUA management, indicators for management action, inventories of CUAs, better signage, better information on regulations, more management with on-the-ground- experience, trigger points, better informing of the public, recreation retreats to share information, more/better resource training

Table 17
Interview Themes Involving the Management of CUAs (cont.)

Topic	Primary Themes	Secondary Themes
Trends in CUA Management	Less funding available for projects, more NEPA, more group sites, more partnerships, increasing number of sites, more managers seeking grant funding, specialists not familiar with CUA management, more ID management needed and starting to occur	Lack of respect for agency from pubic, more motorized CUAs, more environmental assessments, more volunteers, more use, more closures, changes with technology, need for multiple use campgrounds, more street legal OHVs, fewer employees, not enough early ID collaboration, more noxious and invasive species, CUA a relatively new term
Proactive Approaches to CUA Management	Majority recreation managers thought management was reactive mixed with proactive, usually involves planning of long-term, preemptive measures, closures	Minority of managers thought management was proactive
Reactive Approaches to CUA Management	Minority of recreation managers felt agency was reactive to issues with CUA management, resource specialists usually thought management actions were reactive	Some related that reactive management is a result of agency systems and/or lacking funding
Focus of CUA manage	Protecting the resource, balancing use and resource, multiple-use effects (recreation and other uses)	Following agency mission, depends on case-by-case differences, use, water most important to focus on
Factors of Successful CUA Management	Collaboration, persistent management	Having administrative support, having adequate budget, having right personnel
Tools Used (or have potential use) in CUA Management	Forest service manuals and design guides, NEPA processes	Travel management process, ROS, rangeland guidelines of bare ground less potential & loss of vegetation type guidelines (potential), watershed assessments, fish surveys, habitat surveys

descriptions. Recreation managers often mentioned times when the more idyllic, comprehensive management model was replaced by a more site-specific reactive process of surveying impacts to an individual site, such as a campsite, and then reacting to issues resulting from use and resource impacts with the individual site. This more reactive

process generally occurred within the context of an individual site, whereas the more comprehensive management model focused on a larger scale issues, such as multiple sites having a cumulative impact on water quality within a stream corridor. The individual site response was generally described as more reactive; however it should be clarified that all processes described by recreation managers and resource specialists appeared reactive to undesirable recreation impacts.

UWCNF staff were also asked whether they considered their approach to managing CUAs as more proactive or reactive in nature. Overall, most managers responded that their management approaches were a mixture of proactive and reactive actions to manage CUAs. A large part of this continual back and forth was seen by managers as a result of having to find a balance between allowing uses and protecting resources. Many described this dichotomy as a result of the USFS mission of "Caring for the Land and Serving People." An outcome of this mission is that managers often described taking proactive implementation steps from an area's plan or a design, but then becoming reactive in management actions as maintenance of infrastructure and user impacts to natural resources are monitored. Resource specialists often perceived management actions as reactive, however, as they often saw management action as a response to an already existing impact to natural resources. Management responses to issues discovered during monitoring stages of the planning process were described as reactive.

Many items are considered by UWCNF personnel when making management decisions involving CUAs. The most mentioned items included resource values such as proximity to water and vegetation characteristics, along with amount of use, primary

uses, user types, and social aspects of use. These themes were often considered during a process of weighing the resource and recreation use values. Large-scale management usually considered use patterns and recreation opportunities, as well as disseminating information through signing. Small-scale management often considered resource capabilities and impacts on a micro-scale. Lastly, management often considered how budgets would affect use, whether management or lack of management would result in unsafe conditions, and whether improving a site would increase use and create greater maintenance issues in the long term.

Other items were also considered, but less frequently. These less mentioned items included coordination of management actions with other districts and forests, topography and its relation to use, sanitation issues, magnitude of impacts, previous plans to control use, concentrating use through management, Codes of Federal Regulations (CFRs), group sizes for areas, wildlife impacts, and the risk or presence of noxious and invasive weeds. More weight appeared to be given to issues involving sanitation of sites, as several managers mentioned this several times as an important issue in their high use areas.

Management scale. Most recreation managers stated that management of CUAs occurred from a large scale perspective, as CUAs generally are composed of a grouping of individual sites in various areas throughout a district. Large scale management views were generally seen as the management of CUAs along a larger corridor, such as a river or road corridor. However, this large scale management was often described as merely one step in management's assessment of CUAs. These larger scale management views were seen as advantageous because management could more easily identify use patterns, cumulative impacts, and overall recreation opportunities. Large scales were also viewed

as a more cost effective way to approach CUAs, as management actions could accomplish more for less. However, large scale management was also seen as disadvantageous because it can be difficult to implement due to limited personnel, funding, and seasonal work seasons.

As initial planning efforts transitioned to implementation stages, managers often mentioned managing smaller individual sites (e.g., campsites) when taking direct action to influence or regulate recreation use and its impacts. Advantages to managing CUAs on an individual site scale were mentioned as sites allow easy to see, tangible results, and small sites are more accommodating to time and funding restraints. Despite these advantages, smaller individual sites were also perceived as being very time consuming and work intensive compared to other large scale recreation areas.

Secondary themes involving management scale were also discovered during interviews. Some managers viewed CUAs as their entire district and took a very large-scale view of how these areas needed to be managed. Others described using "working circles," which were described as areas accessible and maintainable during a day's work. Resource specialists mentioned working from various scales such as small scales to a large scales, resource scales, or in scales related to operations and maintenance field work, such as areas patrolled daily. For instance, a specialist of invasive weeds may choose to view CUAs within the broader scale of a weeds project. Whereas, if the same specialist was working with a recreation specialist, they may then look at CUAs at an individual site level of a project with the scale defined by a recreation resource specialist. Botanists, archeologists, and pedologists may view a project on a small scale first, as they generally have to look at the specifics of an individual site to determine its make-up and

then work outwards to a larger scale. However, a range specialist, a hydrologist, or a wildlife biologist may begin looking at CUAs on broad scales such as allotment scales or watershed scales, and then work down to smaller scales involving individual campsites.

Direct management techniques. UWCNF personnel described several direct management strategies while explaining their approach to managing CUAs. The primary strategies described most often by recreation managers and resource specialists included: closing areas through the installation of barriers, moving sites from sensitive areas, patrolling areas, enforcing rules and regulations, especially in regards to the 150/300' travel rule and unauthorized routes, creating buffers between CUAs and sensitive resources, and defining site boundaries through the installation of fencing and barrier rock. Other strategies were also mentioned by some personnel, but less frequently. These strategies included showing a management presence, such as improving or cleaning an area, travel planning, and concentrating use though the installation of features such as a fire ring or some fencing.

Of the direct management strategies identified, personnel considered some more effective than others. Overall, managing through the use of boundaries and the construction of barriers was seen as effective, especially when barrier rock was used. Showing such management initiative was also described by most UWCNF staff as resulting in positive public feedback. Enforcement through patrols were described as an effective strategy as well, as it allowed employees to contact the public and share information on projects, USFS rules and regulations, educational materials, and overall management objectives. In addition, patrols allowed for management to clean and perform maintenance on sites being heavily used. Lastly, management strategies defining

recreation site boundaries were seen as effective in concentrating use and protecting resources. In some cases, however, closures were not always effective, especially when the area closed was in high demand by visitors, or had a great historical or cultural attachment with its user groups. In these cases, personnel described continual problems with users removing barriers to reopen user-valued recreation areas.

Indirect management techniques. UWCNF personnel also described the use of indirect management techniques when dealing with CUAs. Most often interviewees described using education, site improvements, site cleaning and maintenance, site design, and sign installation as the primary indirect management strategies used for CUAs. These indirect management strategies were also described often as an element of management strategies, which also relied on more direct management techniques. To a lesser degree, managers also described using the ROS categories to inform management decisions, while also using employees to perform project outreach and explanation during the implementation of management objectives.

Indirect strategies were described as successful and unsuccessful by personnel. Effective aspects of indirect management included the use of Carsonite signs attached to wooden posts to allow managers to change signs and their meaning through removable stickers, while providing a more stable sign than a Carsonite sign alone. Carsonite signs used without a wooden post were seen as ineffective. Public education was also seen by managers as an effective strategy for getting the public to choose appropriate behaviors while recreating in CUAs. Lastly, designing sites well and for multiple uses was also seen as a more effective indirect strategy, as it allowed more flexible use at a more resilient site. Perhaps even more interesting was design that is termed by the author as “adaptive

recreation design" or "user-created design" which occurred when managers took existing user-created sites and improved them through hardening, and then simplified travel routes to make them more sustainable to use. In these cases, managers described sites as retaining a sense of ownership from the users who had created the sites, while also benefitting the resource by reducing unmanaged and unauthorized routes causing resource impacts. Design was not always viewed as successful however, as personnel were skeptical of design that failed to realize the needs of users in a dispersed recreation setting. These criticisms were often directed towards the large CUA sites that were overly defined by barriers. These sites were seen as leading to the displacement of recreationists desiring a group recreation experience.

Frameworks and tools used for management. Managers and resource specialists were asked during the interview process to identify management frameworks used to manage CUAs. Overall, the most commonly identified frameworks used for CUA management included forest plans, the UWCNF Recreation Strategy, the Forest Service Manual/Handbook, and the NEPA process. Despite the use of these frameworks, personnel did not commonly speak of them as comprehensive or giving specific direction for CUA management. Furthermore, UWCNF staff often described frameworks for CUA management and direction as limited or not providing much guidance. Because of this lack of guidance from frameworks, interviewees generally described relying heavily on professional experience when making decisions involving CUAs. In the case of using the NEPA process, professional experience was also relied upon in the form of recommendations from resource specialists and recreation managers. This lack of a common framework providing guidance was not from a lack of wanting from personnel,

as many expressed a need for more and better information sharing and examples of management regarding CUAs.

Other frameworks were also mentioned by some managers and resource specialists less frequently. State water quality guidelines, Infra/Meaningful Measures guidelines, the ROS, and Environmental Impacts Statements (EIS) were also mentioned as frameworks some UWCNF staff use when making management decisions involving CUAs. These frameworks were not mentioned very often during the interview process and seemed less recognizable to the decision making process of CUA management. This is not to say these frameworks are less important to CUA management, as many are key parts of policy, such as the ROS, EISs, and Infra protocol for data collection. However, these frameworks were not emphasized by many managers.

Some tools for management were also identified during the interview process. The NEPA process and forest service manuals were described as effective tools to use for the management of CUAs. Manuals were described as giving good advice on how to construct features such as trails and facilities, as well as how to manage site features. The NEPA process was described as a tool for producing defensible decisions based on resources, resource specialist input, and public input. Some specific tools were mentioned by resource specialists as tools that could benefit CUA management, even though they apply to other forest uses. Rangeland guidelines for "bare-ground-less-potential," — which essentially sets a limit for how much bare ground can become exposed in grazing areas when compared to the baseline expectations for undisturbed vegetation types— could be used in conjunction with "loss of vegetation type" surveys. Watershed assessments have been used to identify areas needing more management. Fish and

wildlife habitat surveys have also been used as tools to describe how CUAs could be managed, as they set baselines for monitoring impacts. In some cases, water quality standards, wildlife conservation strategies, the ROS, the USFS Forest Manual, Codes of Federal Regulations (CFRs), the forest weed plan, and the Migratory Bird Treaty Act provided additional direction for making decisions. In addition, the majority of resource specialists also stated that a lot of their actions are based on professional experience derived from years of experience and managing multiple projects.

Trigger-points and prioritization of CUAs for management. UWCNF personnel were also asked during the interview process to identify any trigger-points for active management and to describe how they prioritize CUAs for management. Several trigger-points were identified during the analysis of interviews. Primary themes involving trigger-points included: resource impacts, including soil displacement/erosion, vegetation impacts (bare ground, loss of vegetation cover), and impacts to water and riparian areas. However, primary themes were not limited to resource impacts, as unauthorized trail proliferation, evidence of trash and human waste, site growth, user safety, public complaints, acquiring funding, and management deciding to act were all described as trigger points for more active management. Trigger points are defined for this study as indicators of various types (ecological, social, managerial) that imply the need for action. They are important because they signify the moment when an observation transitions to stages of action. Of these trigger points, excessive resource impacts and the presence of human waste and trash were the most mentioned trigger-points determining action was needed. Lesser mentioned trigger-points included: tree cutting, wildlife being impacted, invasive species becoming present in sites, sites lacking a buffer between use area and

water source, crowding, homesteading, unorganized use patterns, resource specialists determining action is needed, administrative support, and field personnel being unable to keep up with regular maintenance tasks.

Interviewees were also able to describe several themes involving the prioritization of sites for management. Areas near water, or within riparian areas were commonly described as being priorities for management. If a CUA fell within priority areas identified in the UWCNF Recreation Strategy, it was also considered a priority for management action and project budgeting. Other primary priority factors included: areas experiencing high use, or areas of a high cultural significance, poor draining soils, stream class (1 & 2), areas with safety issues, municipal watersheds, and sensitive habitat areas and areas experiencing increasing resource pressure and impacts. Secondary themes for prioritization included: areas with broken infrastructure, areas with safety issues, areas with invasive species, the creation of unauthorized routes, municipal watersheds, motorized areas, areas with poor sanitation, and recreation areas of growth or increased popularity.

Issues and needs of CUA management. Several issues and needs related to CUA management were spoken of by recreation managers and resource specialists during the interview process. Primary themes were typically related to organizational issues, such as lack of funding for CUA management, and lack of personnel to manage areas. These two issues were often related as issues resulting from CUAs not being a priority for recreation management on the UWCNF. This point was further discussed when personnel described that there are no targets and goals specifically associated with CUAs and how to measure successful management. Rather, management often described how they will use leftover

resources to deal with CUAs in a piecemeal style of management. A main issue was also identified by resource specialists. Specialists often stated that a lack of early interdisciplinary planning involving CUAs existed. Most specialists either stated that they had not been contacted to deal with the management of CUAs in the past, or that they were usually contacted in the "eleventh hour" when many decisions may have already been made.

Several other secondary themes were identified during interview analysis. A lack of being able to communicate clear management objectives, adjacent land use issues, being able to hire seasonal employees, coordinating state and federal fiscal years, consistency of management, sustainability of management actions, a lack of signage, lack of enforcement, the "10%" of users who generally disobey management regulations and actions, and the overall scope of enforcement across vast swaths of land, are all challenges facing the management of CUAs across the UWCNF. The general scope of issues involving CUAs management shows that management of CUAs is complex, multifaceted, and often difficult under current management conditions.

Interviewees identified needs for the management of CUAs during the interview process. Like many of the issues identified for CUA management, primary themes involving needs related to organizational issues. More funding, more personnel, and more information sharing from management across the UWCNF were the primary areas of need mentioned by UWCNF staff. Resource specialists also saw more interdisciplinary (ID) team CUA management as a primary need of the UWCNF. Furthermore, there was also a need for earlier ID team collaboration on CUA projects.

Many secondary themes involving the needs of management associated with CUAs were also discussed. These themes often involved needs to better document CUAs, their management, and then share that information with others. There was also a need to better sign areas, and to better inform the public and management of CUA policies and regulations. There was also a desire from managers to have more clearly identified trigger points for CUAs management. Lastly, some personnel mentioned a need to have more decision makers with on-the-ground experience managing CUAs, as they mentioned there were discrepancies at times with managers who have a lot of administrative experience, but little field experience.

Trends in CUA management. Several themes involving management trends and CUAs were identified during the analysis of interviews with UWCNF personnel. One primary theme was that funding for management activities has been decreasing over the years. As a result, more UWCNF staff believed there will be a need to seek out alternative grant funding and partnerships to get projects implemented. Many specialists stated that the increased participation of resource specialists and recreation managers on the same projects is a result of a shrinking budget. In addition, more NEPA analysis is seen as a trend for CUA management as there is more of a need to justify management actions and get public input on the process of developing CUA management plans.

These trends involving funding and more analysis of management actions through the NEPA process are based on another primary theme involving CUAs. Generally, interviewees mentioned that CUAs are increasing in number on the UWCNF. In particular, more group sites are being established and used in areas allowing dispersed recreation. This greater demand has created greater impacts on resources, and therefore

puts more pressure on managers to take management action. Action will require more funding and analysis of recreation impacts on natural resources. Lastly, one of the most common trends from interviews was that many resource specialists were unfamiliar with the term CUA and what it meant for management. This has been interpreted by the researcher as meaning that CUA management is a fairly new concept, or at the very least new terminology describing a dispersed recreation management technique.

Secondary themes from the analysis of interviews resulted in a much broader portrait of trends affecting CUA management. More ID team management was seen as a trend, in conjunction with the need to do more environmental assessments of CUAs and their impacts. Overall, there were indications that more motorized-focused management of CUAs would be needed in the future, especially involving OHVs and the street legal modifications allowing motorized use to reach a wider swath of CUA opportunities. These modifications were often seen as technological advances that managers will need to address and keep up with over the coming years as more OHV use occurs on forest land. Managers also discussed a concerning trend of more users showing a lack of respect for the Forest Service agency and its management decisions. This lack of respect has resulted in managers being more aware of their need to justify their actions through evidence based management, increased collaboration, and adherence to NEPA policy. In addition, more managers have begun to reach out to volunteers to get projects completed, while building partnerships that support management. Lastly, some managers thought that increased use, coupled with unauthorized use would result in more closures of sensitive sites, especially as management funding and personnel decrease and are unable to closely monitor conditions which may have allowed areas to remain open.

Themes of design involving CUAs. The last portion of the interview guide sought to identify design themes involving CUAs on the UWCNF. Analysis of interviews resulted in the identification of several topics involving CUA design. These themes resulted in a picture of design intervention involving CUAs and some information on successful and unsuccessful elements of design to mitigate undesirable CUA impacts to natural resources. Overall, general topics of CUA design elements discussed included: CUA implementation materials, elements influencing CUA design, successful and unsuccessful elements of CUA design, aspects of CUAs needing consideration during the design process, and the topic of sustainability in the context of CUAs (Table 18). Collaboration was viewed by resource specialists as an area needing more effort to produce more successful outcomes.

General design considerations. When asking managers about the management and design of CUAs, many UWCNF staff offered examples of design considerations they incorporate into the management CUAs. Most design considerations for sites were discussed for individual sites, rather than the larger scale CUAs and their management. General design considerations often dealt with the siting of CUAs, such as moving sites away from water in the landscape, defining boundaries of sites and uses, creating a buffer of ideally 200-300 feet (50 foot minimum) when altering sites or installing new sites near sensitive areas, and using topography to help define individual sites. Design consideration was given to existing natural resources involving sites, such as hardening areas to protect resources, closing sites because of resource damage, scarifying areas that had received significant impacts, and then restoring areas with native plants and materials to match existing landscape conditions. Removing sites close to water could also be

Table 18
Interview Themes for the Design and Implementation of CUAs

Topics	Primary Themes	Secondary Themes
General Design Elements	Roads, trails, site accesses, campsites, group areas, restoration areas, motorized sites, restrooms, user-created elements, fire rings, level areas	Climbing areas, equine areas, fishing areas/water access sites
Implementation Materials	Barrier rocks, fencing (buck-and-rail, post-and-rail), signs	Buildings (bathrooms), logs, gravel, native seeds and vegetation, kiosks, wooden fencing wrapped in wire, wood chips
Elements Influencing Design	Location of sites (sensitive resources, topography, vegetation, etc.), type of use, type of impact, unintended consequences, policy, timing	History of site, user-created patterns
Successful Elements	Barrier rocks defining linear barrier, fencing (buck-and-rail, post-and-rail) with anchor points, presence of management (signs, changes in site), employees informing public of reasons for action, persistent and adaptive management	Forethought, improvement to point of getting used, signing what's open, Carsonites with wooden posts, holistic approach, harvesting materials on site, proper siting of elements, metal posts, presence of management, multiple use design, employees explaining management action
Ineffective elements	Carsonite signs, single rock placements, closing significant sites, engineering alone, signs too close to campsites	
Mixed successes	Using trees for closures	
Need to Consider	Unintended consequences, forethought, Long-term maintenance and funding, three Es (engineering, education, enforcement), fitting design to site and use, removing elements after success, relocation rather than closure, social aspects of CUAs, move sites away from streams/water, install barriers, define boundary of site/use, hardening sites, educating the public, scarifying/ripping (6 inch depth) areas with compacted soil, reseed/revegetate areas ripped (use native vegetation), restoration, multiple uses (recreation, grazing, etc.), resources, maintenance, signing areas, closing sites, incorporate user-created elements, defining sites using topography	Circulation, ROS setting, support slopes, designation of sites, use rocks to concentrate use near streams, location of access (sensitive areas), direct users to features with objects, site relocation (across road), grading, loop system of trails, providing parking, use motivation, low-level development
Sustainability	Balancing use with resource	Protecting the land and allowing the use, stop proliferation of sites, no sustainability for CUAs, finding passionate management to manage forest, finances to manage, establishing a baseline for use, instilling responsible use in public, no heavy impacts, able to maintain sites with normal O&M procedures

considered a resource based decision in the design process. Users were also a general design consideration, as multiple recreation uses and multiple forest uses both are elements that were considered during the design of areas. Lastly, primary themes involving design elements included making sure to design areas that included educational aspects, such as signing areas and installing kiosks. In addition, the long-term and sort-term maintenance of sites was a general design element considered, as managers need to clean sites and maintain sanitary conditions if use left behind a large amount of trash and/or human waste.

Many other secondary themes were also mentioned during the interview process. Secondary themes included: defining circulation, using ROS settings to inform design, supporting steep slopes, using rocks to concentrate use near streams, determining locations of access when near sensitive areas, directing use with design elements and installed objects, relocation of sites across roads from water resources, signing sites, long-term consideration of use and maintenance, grading, and understanding user motivations for choosing and using sites

General design elements. Analysis of interview data revealed there are several primary and secondary themes that describe general design elements. Some specific elements were mentioned as design elements, such as trails and road access to sites. Within sites there were more specific elements, such as restrooms, fire rings, and level areas. Other general design elements mentioned by interviewed personnel included: campsites, group areas, restoration areas, motorized sites, and user-created elements/sites. User-created elements/sites were described as areas created by users that are retained during the design process and incorporated into site plans. Travel planning allows

UWCNF personnel to adopt user-created trails and roads into the forest inventory system that are primarily user-created sites/elements. Secondary elements mentioned by those interviewed included: rock climbing areas, equine areas, and fishing and water access sites. These elements usually included an access trail or road to a site and then a general use area where people could station themselves and recreate.

Elements influencing design. Elements influencing the design of CUAs are closely related to general design elements. Primary themes identified during the analysis of interview data revealed that the location of sites, the type of use evidenced at the sites, existing use patterns, the type of impacts observed at sites, and previously observed unintended consequences resulting from professional experience all influence design. Location features included: site features such as topography, sensitive ecological areas, and resource elements, such as vegetation, water, soils, wildlife, etc. Timing was discussed briefly by a few specialists as something to consider with the design and management of CUAs, especially with regard to site restoration. When planting native seed and vegetation, many specialists expressed a need to do so in the spring or the fall. Specialists expressed that the reason for spreading seed and planting vegetation during these times (e.g. late season sowing, or early season sowing) provided seeds and vegetation with a better opportunity to establish themselves with the increased rainfall and moisture at these times of year.

Secondary themes identified included site history involving use, and user-created patterns. Specialists thought considering the historical background of how users came to use a site may help a project's implementation be successful. This included incorporating user-created use patterns into the design of a site, or mimicking them elsewhere in newly

created features, such as routing trails in a similar pattern. These elements, both primary and secondary themes, were usually all considered together to inform designs.

Implementation materials. Many materials used for the implementation of site designs were discussed by UWCNF personnel during the interview process. The most common materials mentioned included large barrier rocks, wooden fencing (buck-and-rail, post-and-rail), and signs. Barrier rocks were mentioned as the most effective material to use for defining sites and restricting use to areas deemed appropriate. Secondary elements mentioned included buildings, such as pit toilets, trees/logs, gravel for hardening sites, native seeds and vegetation for restoration, kiosks for educational and regulatory information, wooden fencing wrapped in fencing wire (barbed and smooth wire), and wood chips. Logs were generally mentioned as a means to close unauthorized, user-created trails and sites; however logs were seen as a material with mixed results for success. The use of materials generally varied to some degree across districts on the UWCNF. Therefore, it was found that many managers were experimenting with various materials, and there was some inconsistency in the use of materials on a forest level.

Sustainability and successful elements of design. Many themes were identified by interviewees as being successful elements of design. These primary management and design strategies for CUAs also were discussed in the context of sustainability. Overall, many elements and materials involving the design and management of CUAs were considered successful. Primary themes reveal that using barrier rock and fencing to define linear boundaries was an effective management tool and design element when such features were anchored to features in the landscape, such as topography (rock outcroppings, ravines, steep slopes), and vegetation (trees and shrubs). Other successful

themes identified included management actions that showed a presence of active management at a site (installation of signs and site improvements). It was also important for management to have employees informing the public of what they were doing to areas and have justification for management actions. The last major theme to report is successful designs and management required persistent, adaptive management and design. Many managers expressed the management and the design of CUAs is an ongoing process that responds to user actions. Secondary themes identified with successful management and design included a wide variety of themes from materials used to holistic management and design approaches.

There were also themes of mixed and unsuccessful elements. Mixed results were commonly expressed when management used trees and downed logs to close sites. Users commonly will move such obstacles. Unsuccessful elements included the use of Carsonite signs, single rock placements, closing significant sites, engineering sites but not educating and enforcing management and design elements, and placing signs too close to campsites, as they would often be vandalized or shot.

When managers were asked about what sustainability in the context of CUAs meant, one main theme emerged in most interviews. Sustainability for CUAs hinges on the management and design of CUAs being able to balance recreation use with resource impacts. This theme was often related to the Forest Service Mission of "Caring for the Land and Serving People." Resource specialists responded that the most important aspect of sustainability involving CUA management and design involved balancing the use with the capabilities of the resource to accommodate use. Secondary themes clarified this notion further, as the use of best management practices (such as creating buffers near

water), sustaining/increasing wildlife populations, clearly identifying limits of acceptable change, and reducing site proliferation could all be seen as indicators that management and design were successful in balancing use and resource characteristics. In the case of built features, one specialist even provided the time frame of 25-30 years as the life expectancy of materials used for site construction and definition. Based in these findings it appears that managers may have an informal set of metrics they can use to measure the long-term success of management involving CUAs.

Other secondary themes were also mentioned that related to sustainability. Stopping the proliferation of sites, having no heavy impacts to sites, having funding to manage areas, having the ability to maintain sites with normal operations and maintenance procedures, having passionate managers managing the forest, instilling responsible use from the public, and establishing baselines for use were all themes involving sustainability expressed by interviewees. Lastly, there was some indication from UWCNF staff that there is no context for sustainability involving CUAs, as budgets and personnel are not available to sustain sites at the rate they currently exist and continue to grow. Because of the limited amount of resources, some personnel expressed the importance of designing and implementing projects well the first time, so that management and maintenance can be reduced over the long-term.

CHAPTER V

DISCUSSION

This study sought to answer two primary questions from its beginning. First, it sought to understand: What are CUAs? Current definitions provided by USFS documents are general and did not provide details about what CUAS are, where CUAs are located, and what impacts and uses are associated with the areas. This study extrapolated USFS definitions to create a more detailed definition of CUAs based on data collected for this study. Secondly, this study sought to understand: How are CUAs managed? The findings of this study result primarily from interviews with managers and GIS analysis of GPS-based data. The results of this study identify several characteristics of CUAs and their management. These results speak to previous research in the field of dispersed recreation, broadening the understanding of ecological, social, and managerial elements and their relation to CUAs in a dispersed setting. This study also suggests some previous literature written about dispersed recreation has implications for CUAs and their management. The findings of this study result primarily from qualitative interviews with managers and quantitative GIS analysis of GPS-based data.

Defining CUAs

This study provided greater insight into defining CUAs than previous literature. Previous definitions of CUAs were found in the United States Forest Service Manual (USFS, 2011) and the Wasatch-Cache Revised Forest Plan (USFS, 2003b). CUAs were defined therein as:

> An undeveloped site or area where management time or dollars is invested because recreation use in the location leaves evident impacts, such as litter; vandalism; or soil compaction such as dispersed campsite, or as large as a climbing area, or as complex as an all-terrain vehicle hill climb area. (USFS, 2011, p. 16)

And as:

> …where the Forest Service invest [sic] management time or dollars for the management of sites or areas of recreation activity that leave evident impacts, such as litter, vandalism, or soil compaction. Any constructed features or management activities are primarily for resource protection rather than user convenience. The primary management objective is to protect and stabilize natural resources. (USFS, 2003b, p. GL-4).

Based on interviews with UWCNF recreation managers and resource specialists, along with GIS analysis of GPS-based data, these definitions can be further clarified.

Managers, when asked to define CUAs, typically provided information on landscape features, use characteristics, use types, and management techniques involving CUAs. Generally speaking, undeveloped sites or areas involving CUAs would primarily be areas and sites that are relatively flat and near a road, making them easy to access by motor vehicle. This perception of managers correlated to findings of the GIS analysis of CUAs inventoried on the UWCNF. Forest-wide nearly 47% of CUAs surveyed were found in areas with slopes of 0-5% grade. Nearly 85% of CUAs inventoried were located in areas of 0-10% grade. Eighty-three percent of CUAs inventoried were within 300 feet of a road. Managers also

perceived that CUAs result from their proximity to population centers, such as urban areas adjacent to the UWCNF. The proximity of sites to roads and population centers suggests that CUAs are not backcountry sites. This categorization is appropriate as well, based on USFS personnel describing these sites as highly accessible areas near roads that are often associated with motorized travel. Backcountry sites appears to be a more appropriate descriptive term for sites removed from road access and motorized travel.

CUAs were noted by UWCNF personnel as often occurring in close proximity to areas with water features and riparian vegetation, or some geological feature that is desirable, such as a scenic vista. There was some strong correlation found between manager and specialist perceptions and GIS analysis of CUA data. Seventy-three percent of CUAs inventoried on the UWCNF were located within one-quarter of a mile of a stream, while nearly 30% of CUAs were found within one-quarter of a mile from a lake. The lower number of sites near lakes could be a result of the Utah's dry climate, topography, and the lack of lakes within various districts on the UWCNF, especially lakes located near roads. This finding implies that dispersed recreation visitors on the UWCNF generally seek areas near water. This finding varies from a study by Whitcomb and colleagues (2002), which discovered that people preferred dispersed camping sites that were closer to lakes.

Managers also noted that CUAs were often found in areas with some degree of shade present from vegetation. This perception can be inferred from GIS analysis, as CUAs were generally located in forested areas with vegetation cover of 20-60%, and trees usually over 5 meters in height. Whitcomb and

colleagues (2002) also found that most dispersed recreation users preferred sites within forested areas, which suggests a similar finding to this study.

Management time and dollars are invested in CUAs because they are high-use areas that have high impacts to natural resources or "evident impacts" (USFS, 2003b, p. GL-4; USFS, 2011, p. 16). Impacts noted by recreation and resource specialists included more than just "litter, vandalism, or soil compaction" (USFS, 2003b, p. GL-4; USFS, 2011, p. 16). Impacts can be expanded to include issues such as vandalized trees and denuded vegetation, wildlife disturbance, unauthorized trail proliferation, multiple-use impacts (grazing, timber harvesting, etc.), soil erosion, human waste, trash, and motorized use impacts. Managers perceiving impacts to vegetation and soil is consistent with Hart and Debyle's (1979) study of dispersed recreation managers. Curiously, water quality impacts were not a primary theme mentioned by USFS personnel during this study. However, previous research suggests that these areas are at higher risk of contamination from their high use (Varness et al., 1978). UWCNF management perceptions of CUAs not having significant water impacts may result from the difficulty involved in quantifying impacts to water resources in a dispersed setting (Cole, 2000a; Hadwen et al., 2008).

Vegetation impacts described during this study are consistent with descriptions of impacts, such as trampling, and development of a barren core around the center of a site, from previous studies involving dispersed recreation (Cole & Monz, 2003; 2004; Cole & Spildie, 2007; Hammitt & Cole, 1997; Manning, 2011; Marion, 1998; Marion & Cole, 1996). The commonality of CUAs

having vegetative impacts coincided closely with soil impacts as well. Interviewee perceptions that soil compaction, erosion, and loss of organic compounds are common to CUAs suggests that previous research can be applied to better understand soil impacts within CUA recreation settings (Barros et al., 2013; Marion, 1998; Olive & Marion, 2009; Zhevelev et al., 2013). There was also general concern involving invasive vegetative species and their introduction into CUA settings, which is consistent with previous literature findings about the likelihood of human activity in areas resulting in invasive species being introduced (Barros et al., 2013; Wimpey & Marion, 2011).

"Recreation use" and "activity" causing ecological impacts predominantly includes multiple recreation uses, including group activities, trailer camping, family reunions, ATV and OHV use, motorized use, hunting, fishing, and unauthorized use resulting in user-created routes. This varies from previous studies that identified dispersed recreation as having a greater variety of uses (Brooks & Champ, 2006; Hammitt & Cole, 1998; Moutsinas, 1976; USFS, 2003a, 2003b). In particular, UWCNF managers and specialists identified CUAs predominantly as group areas on the Forest that accommodate family groups, hunting groups, and groups of friends who gather to recreate in a natural, undeveloped setting. Dispersed recreation in previous studies did not mention group recreation as a use in their findings. This finding may signal a new trend in dispersed recreation use, with group recreation activities being more common. It may also signal that group settings in traditional developed settings are not meeting the needs of current users and uses, and therefore, these uses and users

are using dispersed recreation areas to accommodate their recreation needs. Moreover, UWCNF management also identified ATV and OHV use as closely associated with CUAs and their establishment. This finding may indicate ATV and OHV use as being primary uses in CUAs and dispersed recreation areas. It may also speak to the nature of motorized use, signaling that it has a tendency to concentrate in certain areas, such as CUAs.

These uses and activities often have historical precedence, and are carried out by people who generally follow the rules, although there is often a user type who will disregard rules and create unauthorized routes and unacceptable impacts. Use of areas is generally not illegal, because of the 150/300 foot designated dispersed use area, but increased use generally will result in an eventual unauthorized use in areas not restricted by topography, natural barriers, or constructed barriers. From a management perspective, these areas have been identified by managers as having a higher potential for social conflicts. This study also identified that management does report conflict occurring within these areas, especially in regards to conflicting motorized and non-motorized uses, and extended stays of recreationists during camping trips.

The size of CUAs is dependent on management perspectives. Individual CUA sites generally are dispersed camping sites, which is what was captured by management during GPS-based inventory of sites on the UWCNF. However, for management purposes CUAs are managed at larger scales than individual sites. Scales used for management include watershed scales, road corridor scales, stream corridor scales, canyon scales, working circles, and scales that focus on

groups of sites in a general geographic area. These scales can include features, such as individual campsites, parking areas, climbing areas, roads, and trails. These larger scale management scales are used to evaluate cumulative impacts and overall trends across larger areas within a district. Features identified by management as parts of CUAs (i.e., fire rings, camping areas, and climbing areas) are generally not initially created by management, but are user-created features in an undeveloped area.

Lastly, it should be noted that the term CUA appears to be primarily a termed used by management. A review of literature during this study did not return any publications discussing CUAs or their management. This finding could result from CUA being a relatively new term that has not been studied until now. Another possible conclusion is that the term CUA is highly specialized and has yet to receive attention in a broader spectrum of outdoor recreation.

Based on these findings, the author proposes the following definition to describe CUAs:

> *Concentrated Use Area (CUA):* a management term use to describe a high-use, relatively undeveloped area varying in size from individual recreation sites to larger-scale management areas, including watersheds, travel corridors, canyons, or large complexes used for dispersed recreation such as camping and motorized travel; site landscape features generally include areas of relatively flat ground, accessible areas near roads with desirable landscape

> features, such as adjacency to water, vegetative cover, or scenic views. High use in CUAs generally results in undesirable impacts to biophysical attributes of sites and result in management action. Management actions are generally reactive and involve a process of adaptively designing, restoring, closing, or maintaining user-created dispersed sites.

Overall, this study of the UWCNF has been able to add more specificity to defining CUAs on the Forest. This expansion of CUAs' definitions, however, should not be considered definitive for all sites. It is apparent from this study that definitions involving CUAs on the UWCNF will continue to change and evolve over time, as a result of changing visitor use and demographics. Moreover, CUAs appear to be a management response to user-created sites. Therefore, CUA management may be unique to the UWCNF and its visitor use. This implies that other USFS forests, and other agencies managing dispersed recreation, may find CUAs to have varying characteristics and management needs that coincide with visitor use within varying areas. In any case, future studies of other areas outside the UWCNF may well reveal patterns not mentioned here. Definitions and management techniques may need to be adapted and changed as they are employed and adopted on other forests and management areas in the realm of dispersed outdoor recreation.

Designing CUAs

Despite CUAs being considered undeveloped, this does not mean they are not designed areas. Rather, the design of CUAs is often a process of adaptive design, where user-created features in areas are improved to allow areas to be more resistant to impacts. Despite improvements— such as improving grading and drainage, hardening surfaces, and strategically placing restrooms within a general area— these sites remain undeveloped because they typically lack amenities one might find in a developed site. This is a more bottom-up approach to managing dispersed recreation in CUAs, as management is not always choosing sites to develop, but rather adapting user-created sites to management objectives. UWCNF management may have more influence on the final layout of a site, but a site's initial location is typically determined by forest visitors and their interpretation of the 150/300' dispersed recreation travel rule. Management generally becomes involved in designing the site during a process of limiting access of certain uses and protecting sensitive resources in particular areas. To illustrate the process of design, two figures (Figure 7 & 8) have been included below.

Figure 7 shows a prototypical user-created CUA near a travel route and a water feature. It is comprised of several user-established dispersed camping areas located in relatively flat area, and areas near streams, along with unauthorized, user-created travel routes deriving from the main travel route. Key user-created features in such areas include dispersed camping sites with fire rings, unauthorized access routes, and in some cases there may be minor features, such as user-created seating areas (seats made by placing large stones or cut logs around a fire ring). Depending on use levels, the impacts from the dispersed camping sites and the travel routes could be light to heavy with some

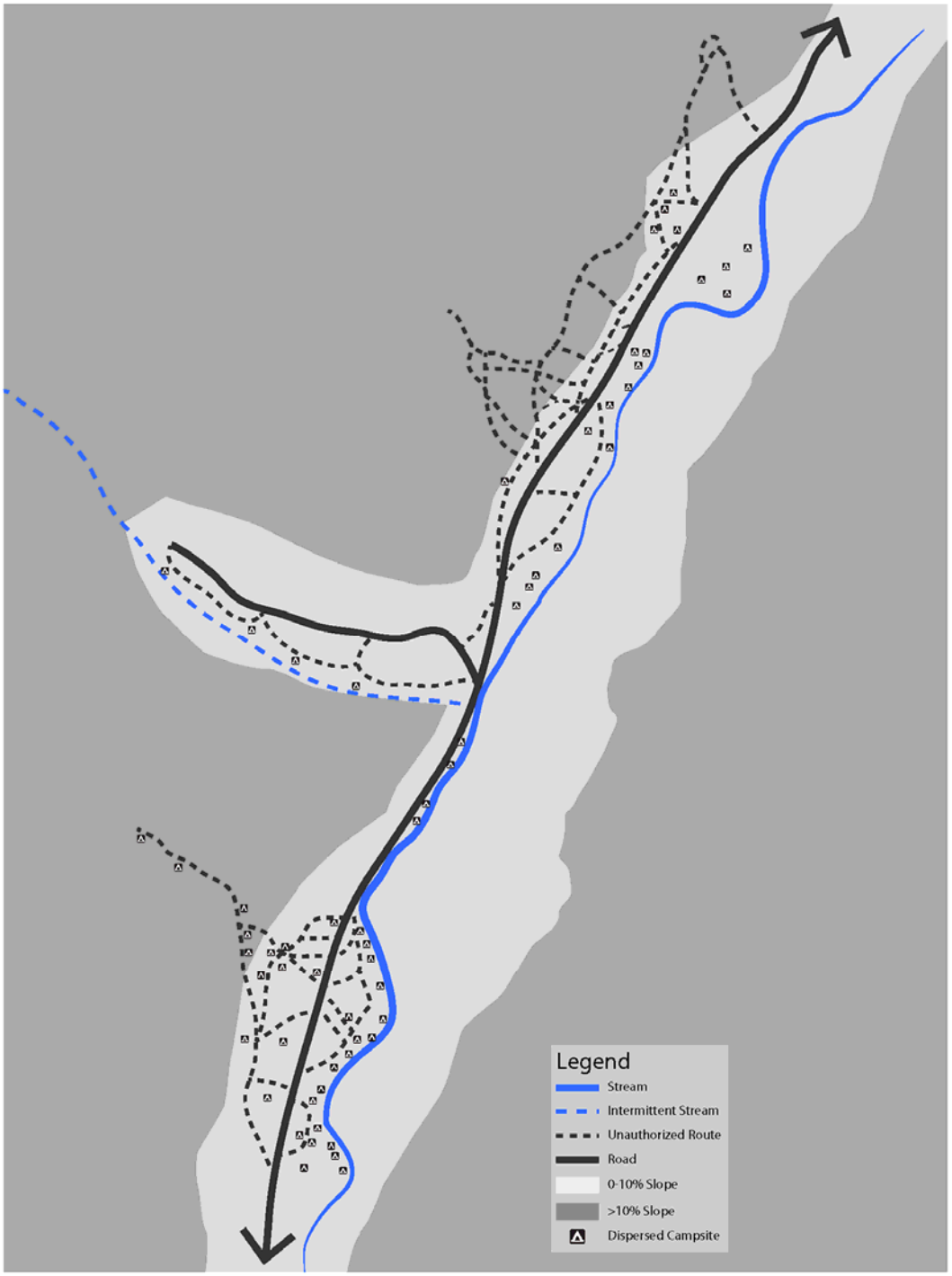

Figure 7. User-created dispersed recreation patterns resulting in a CUA.

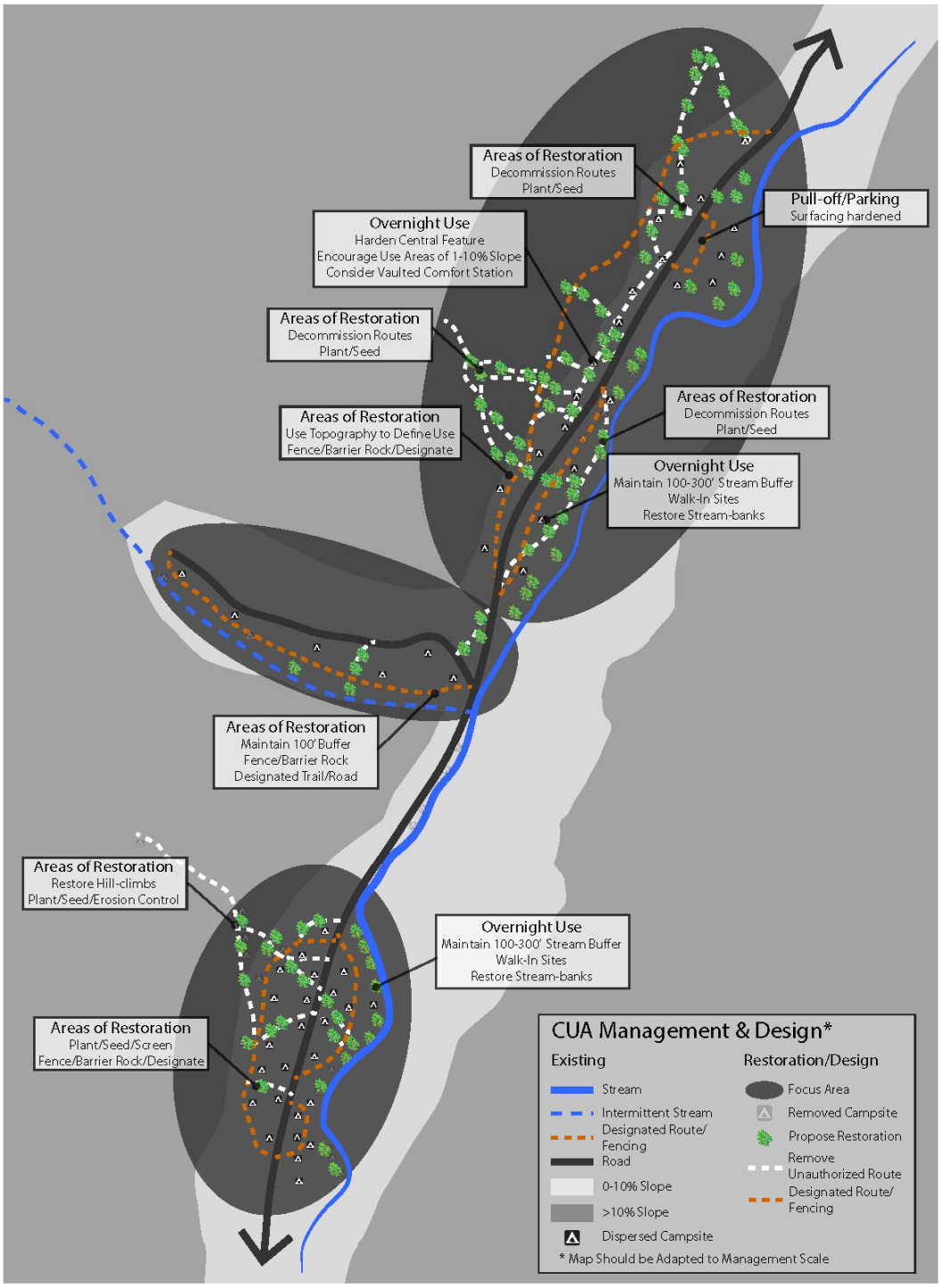

Figure 8. CUA management, design, and restoration elements in a corridor.

areas devoid of vegetation from trampling, while other areas may only have minimal vegetation loss. In areas with heavy vegetation loss, soil erosion would be apparent. In heavily impacted sites near the stream, vegetation loss would result in lost riparian habitat and soil erosion might result in stream sedimentation depending on its proximity to the stream bank. These impacts would be deemed undesirable based on the RFP and LRMP and management would seek take action to bring more balance to user patterns in the area and their impacts on the natural resources.

In Figure 8 the design elements of adapting use-created sites to management objectives is represented. The overarching design principle of most solutions described by USFS personnel involved balancing existing uses with natural resource conditions. In order to successfully accomplish this, areas impacted by user-created recreation sites were generally categorized as areas that would remain open to use and improved, or areas that would be restricted and restored. In order to represent these two areas at the site level, barriers area used. Depending on funding levels, these barriers would be either a linear installation of barrier rocks or some type of wooden fencing. These barriers would ideally limit motorized use from continuing to impact areas with steep slopes, sensitive resources, or riparian zones within 100 feet of a stream. Walk-in camping access would remain open, except areas being revegetated, areas closer than 100 feet of a stream, areas of extreme slope, or areas containing a safety hazard. Areas closed for restoration would be ripped to relieve soil compaction, and then reseeded. In areas with stream bank erosion, riparian vegetation would be reestablished to stabilize stream banks. In some cases, floodplains may be reintroduced if channelization has occurred due to use. In areas left open to use, user established travel routes would be simplified through

decommissioning non-essential access routes. These decommissioned route would be temporarily closed using fencing until vegetation could be reestablished. Routes left open would be assigned a designated route number, and be improved using standardized aggregate road construction techniques. Campsites would be left open in fenced in areas, and barren core areas would be hardened using a crushed aggregate surfacing material. When walk-in sites were left open to camping or other nonmotorized recreation, parking would be provided at key access points.

The descriptions for Figure 7 and Figure 8 area based on an ideal design process focused on balancing the use and the impact. This ideal design process would be a part of a larger management process (Figure 9) that may be used at various scales, depending on project scope. However, a variety of responses may exist based in site specific characteristics and needs. Processes surrounding the design of these CUAs appeared to vary from one manager to the next. Several factors appeared to influence this variation.

Figure 9. The ideal process involving management of CUAs.

design and layout of larger areas within a district. On smaller scales, such as the individual site scale, interviews appeared to reveal that a more ad hoc approach was taken, where a quick survey of impacts would be taken, and then key considerations involving site access and site layout would be considered, with undesirable aspects being limited, while acceptably impacted areas would be left unchanged. The idea of site layout and the placement of access points being important is consistent with a study by Orr (1971), which indicated that these factors are important to reducing impacts. Yet, within all instances, it seemed that there was still some variation in the how areas were designed and managed. This appeared to derive from UWCNF staff having different levels of professional experience and a variety of management preferences.

Complete closures of CUAs did not appear to be common. Rather, management would design areas to encourage different use patterns. For instance, in an area near a stream, management would remove camping that might impact the stream by moving a fire ring away from the stream and encouraging use to be walk-in rather than allowing any motorized use. This technique was intended to change user behavior, while still allowing some previously used areas to be used for recreation. This design strategy appears to hinge on the idea of site accessibility influencing rate, severity, and manageability of impacts; by limiting access to foot travel, it appears that sites receive less impacts and become more manageable.

The previously described approaches appeared effective, however managers were skeptical of containment strategies as these would also limit groups wishing to use designed CUA sites. Therefore, it appears important for managers to consider use types and patterns before installing site features, as limiting uses through design may push

users to pioneer new sites that will allow their preferred uses and use patterns, such as group recreation. The mixed results of installing features and limiting groups on the UWCNF is consistent with literature by Monz and colleagues (2000) and their conclusion that limiting individual use characteristics may be as effective as controlling for group size.

By adapting design to user-created recreation sites, management also appears to strive to reinforce some sense of ownership for the forest visitor, as management validates use through codification, rather than simply closing it off and restricting it. The downfall of designing sites in this way is the lack of amenities and the sites' undeveloped characteristics appear to encourage some level of irresponsible use and continued impacts to resources outside of designated areas. In these cases, managers were keen to mention the importance of designing areas' features, such as fences and barrier rock lines, with anchor points in mind. Anchor points mentioned by management included a thick area of vegetation, such as a grove of trees, or a steep area of topography that limits travel. Moreover, managers mentioned the importance of persistence in managing areas and maintaining designed features, such as fences and signs. It was commonly acknowledged by UWCNF personnel that recreational use inevitably will impact designed features, especially in areas experiencing high use. Because of the impact of use on designed features, management actions must be directed at maintaining site features and showing a management presence after implementing designed features in CUAs. This persistence of management action appears important, as even a small amount of improvement to sites, can increase the use of an area. In some cases it may be inappropriate to develop areas to even a modest degree, if these areas are sensitive and not resilient to increased use.

Lastly, interviews with UWCNF managers correlated a finding from Spildie and colleagues (2000), who found that providing a designed site can reduce impacts from forest visitors and their uses, even if this design is minimal. The design of CUAs is, generally speaking, reactive, minimalist design, which often shows signs of being adaptive to existing use patterns. In most cases, observed CUAs and management descriptions of sites involved merely defining areas for use through the installation of barriers (e. g., barrier rocks or wooden fencing), the definition of circulation and site access, and then perhaps installing a metal fire ring and a hardened area to concentrate use. Despite CUAs being designed, this study revealed there is very little information involving design guidelines for CUAs. Regulations have defined an area of within 150/300 feet of designated travel route as appropriate for dispersed recreation. However, this guideline does not address design solutions for high-use situations that result in undesirable impacts. CFR 36, 212.51(b) gives USFS personnel the authority to designate user-created routes into the forest system of roads and trails, but no design criteria for CUAs within the context of designating new routes or new areas for other use is provided. Although these rules and regulations provide tools to manage dispersed recreation through the creation of CUAs, no training or guidelines were discovered that capture design guidelines and best practices involving the concentration of use and the creation CUAs. Personnel at times showed frustration that appeared to derive from the lack of CUA guidelines for the design and monitoring of sites. The lack of guidance has resulted in various techniques being developed by past decision makers, some of which were perceived as being ineffectual or causing more harm than good. This suggests a

need to better understand CUAs, their impacts, their management needs, their challenges involving design, and recreationist preferences and patterns of use.

Managing CUAs

Defining management. "Management activities" generally include indirect and direct management actions (USFS, 2003b, 2011). Closing sites, defining site boundaries, installing barrier rocks and fencing, and enforcing rules and regulations are direct management strategies employed during the management of CUAs on the UWCNF. Interviews with UWCNF staff suggest that the installation of barriers was often the most successful means of reducing impacts while still permitting use. This finding from the UWCNF appears to be consistent with findings from other studies, which found that barriers were the best means of reducing impacts (Asher, 2010; Park et al., 2008). Reduction of impacts through the use of barriers was carried out with two different objectives on the UWCNF: reducing impacts to natural resources, and allowing use. This strategy of containing use to reduce impacts also suggests that resource and recreation settings can benefit from such management, which appears to be consistent with several other studies (Leung & Marion, 1999, 2000b; Marion, 1995; Marion & Farrell, 2002; Reid & Marion, 2004). Moreover, barriers were installed either to close sites, or to simply define areas deemed acceptable for use. Despite these findings, overall, managers still found these containment strategies to have mixed results, as sometimes barriers were removed or vandalized by forest visitors.

Another aspect of direct management mentioned during the study of UWCNF CUAs was the use of patrols and the enforcement of rules and regulations on the Forest. CFR 36, 212.51(b) was a travel management regulation identified prior to interviewing managers, which allows management to designate roads for dispersed camping access. This rule was found to be effective on the ORD with its designation of the Dock Flat and Dry Bread CUAs. Despite this success, no other districts were found to have used this authority for the management of CUAs. This may be due to the need to perform NEPA analysis of areas, including EIS reports of areas, which managers at times may be reluctant to do, since these processes can take years to complete. The NEPA process may be especially difficult to carry out when staff levels and budgets have been reduced over the past several decades; this has resulted in a commonly mentioned issue of managers having less time to invest in new projects. The lack of plans may also be a result of the UWCNF simply having no existing targets, metrics, or funding to allow these plans to be developed. Lastly, no training is provided on CUAs and their design and implementation, which may signal that UWCNF personnel have not been provided with the skills and expertise necessary to carry out CUA projects in a consistent manner across the Forest.

Another rule, the dispersed camping rule that allows camping within 150’/300’ of a designated travel route, was a regulation noted by UWCNF staff. This regulation appears to have seen mixed results. Currently, 65% of CUAs on the UWCNF are located within the 150’ buffer of roads on the UWCNF, according to analysis of CUA inventory data. With 83% of CUAs found within 300’ of roads, it appears that this may be a more appropriate buffer to allow use, as a 300’ buffer more closely aligns with current use patterns, and shows greater adherence on the EMVRD. For instance, the 300’ buffer is

currently allowed on the EMVRD, with 95% of CUAs occurring within the allowed buffer. Despite the success of this regulation on the EMVRD, if this rule was adopted across the Forest, 17% of CUAs would still need active management to reach compliance with the 300' buffer on roads experiencing CUAs. If management decided to expand the buffer, thereby allowing dispersed use along travel corridors, they would still need to determine whether the trend of increased sites, as reported in previous studies (Evans et al., 1999; Monz et al., 2012; Wilson, 2008) is acceptable.

Moving sites, signing areas, creating buffers, designing sites, hardening sites, cleaning and maintaining sites, patrolling sites, providing public education at sites, and improving areas (i.e., adding restrooms, fire rings, picnic tables; leveling areas; improving drainage, etc.) are common indirect techniques used by management on the UWCNF. These indirect activities appear to be consistent with effective indirect management techniques described in other studies and literature (Hammitt & Cole, 1998; Manning, 2011; Marion, 1995; Marion & Farrell, 2002; Spildie et al., 2000). However, these techniques were found to have mixed success on the UWCNF, which coincides with findings from Park and colleagues (2008). Despite management perceiving mixed results from indirect efforts, UWCNF recreation managers still had a common view that low-impact recreation education (i.e., Leave No Trace) is an effective means to change user behavior, which is consistent with findings from Marion and Reid (2007).

"Constructed features" generally included in the design of CUAs were hardened areas, buck-and-rail and post-and-rail fencing, installed barrier rocks, signs and kiosks, restoration areas that have been ripped and reseeded. These

features are intended to address the "primary management objective… to protect and stabilize natural resources" (USFS, 2003b, 2011). The design and placement of these features were based off of user-created sites and patterns of use. Interviewed personnel did not signal that the UWCNF took initiative to design new areas that were previously not impacted.

While direct and indirect management techniques on the UWCNF were often deemed somewhat successful, many of the people interviewed also believed that efforts to combine indirect and direct management techniques were most successful. For instance, many managers stressed that when direct management techniques, such as site closures, were implemented, these actions needed to be accompanied by indirect techniques such as educational programs on low-impact use. These management perceptions on the UWCNF are consistent with literature that describes a combination of direct and indirect management techniques as most successful (Cole, 1993c; Cole & Ferguson, 2009; Leung & Marion, 1999; Marion, 1995; Marion & Farrell, 2002; Park et al., 2008; Reid & Marion, 2004; Widman, 2010). Based on the findings from this study, CUAs appear to be an ideal area on public lands to further study the effectiveness of direct and indirect management techniques involving wildland recreation, especially in a heavily used, undeveloped setting.

Recreation managers and resource specialists. The interview process consisted of asking both recreation managers and resource specialists their approaches to managing CUAs. Overall, there were many similarities in the answers of both recreation and non-recreation specialists. Both groups described using direct and indirect management techniques when dealing with CUAs. Furthermore, both groups mentioned using

ecological factors as trigger-points to signal a need for management in areas on the UWCNF. Recreation management personnel also mentioned some social factors, but usually after mentioning a resource issue. The two different groups were also both familiar with techniques for managing CUAs, and focused their management actions on protecting the resource first but also providing for use. These commonalities in management may derive from both groups working together on projects. This suggests that management of CUAs on the UWCNF is consistent with the primary objective stated in USFS definitions of CUAs: protecting and stabilizing natural resources (USFS, 2003a, 2003b, 2011).

When mentioning successful elements of management, both recreation managers and resource specialists were keen to describe collaboration as a key component of successful management. Despite collaboration being mentioned as a successful element, it appears that the UWCNF could still use more collaboration and at an earlier stage. Resource specialists specifically mentioned a need for earlier collaboration, as often times they described only being consulted once a project is already going through the NEPA process. Furthermore, this lack of collaboration may result from both sides not being provided training for the skills involved with CUAs development, designation, site design, and management. Considering that in 1994 there were six landscape architects on the UWCNF combined (personal communication), and today only one landscape architect remains, it may be a beneficial investment for the UWCNF and the USFS as a whole to hire more landscape architects who can provide a holistic approach to outdoor recreation policy, planning, ecology, and design involving CUA management. The lack of collaboration may also be symptomatic of the trend of decreasing personnel budget

levels. It was common to hear interviewees describe the busy nature of their work now, as they spend more time in offices doing administrative paperwork, such as hiring, timesheets, and reports, and less time in the field working on projects. Overall, it appeared that it was difficult for interviewees to find time to come together and develop plans and designs to address CUAs. It was mentioned that the UWCNF Recreation Strategy was intended as an attempt to prioritize areas within districts to allow for more field evaluation and work. The Recreation Strategy was viewed skeptically by many interviewees, however, as it too was seen to lack collaboration, especially during the development stages.

There were also several differences in the management of CUAs between recreation and non-recreation personnel. Overall, interviews with recreation managers resulted in a greater amount of information. Interview analysis suggests that they are more familiar with CUAs and their management. Specifically, recreation managers appeared more in tune with the social aspects of recreation management, along with aspects of designing sites. This appears to result primarily from professional experience that is accumulated over years of working and interacting with recreationists, as managers mentioned that little guidance exists for managing CUAs. Recreation managers were also more likely to mention their management styles towards CUAs as a mix of proactive and reactive management. This appears to result in their participation in all stages of planning and managing for the use and impacts associated with CUAs. Lastly, recreation managers described the management scale and size of CUAs usually as large scale, with a group of sites making up a CUA. This larger scale was then used to add

consistency to management actions before looking at sites on an individual level and making design specific decisions involving unique site conditions.

Resource specialists appear to have a stronger understanding of managing for multiple forest uses. They often evaluate areas not just on impacts resulting from recreation, but also evaluate impacts from permitted multiple forest uses, like grazing and timber harvesting. Resource specialists were also less knowledgeable of CUAs and their management. In a few cases, specialists asked for a definition of CUAs, rather than being able to offer a definition; or they stated they did not directly manage CUAs since they were not recreation managers. However, once understanding the context of CUAs and dispersed recreation management, they offered valuable insight on characteristics, management, and design of sites. Resource managers also perceived USFS management of CUAs as being more reactive than proactive to issues involving resource impacts. This could be a result of resource specialists being consulted later in the management process, as many specialists mentioned they were only consulted when it was required for the NEPA process, which was indicated as later than preferred. Resource managers tended to look at CUAs and their management from more of a small, individual site level, as this scale generally corresponded more to their role of evaluating resources within a specific area that has been proposed for active management, design, and ultimately altercation through implementation of management action and site design. The varying scales employed by resource specialists could be seen as complementary to the more large scale management views of recreation managers, as the smaller scale perspectives of resource specialists could help define issues not noticeable in a larger scale view of impacts and use. This would especially be the case in situations where small scale issues had

disproportionately adverse effects on larger scale systems. The complementary prospect of these findings between large and small scale views may be what leads to successful collaboration and project success.

Need for targets, success metrics, and funding. One main point that came from interviews was that CUAs currently lack emphasis as a forest priority, despite interviewees indicating that CUAS are of great concern due to the high level of impacts associated with CUAs and their continued proliferation on the UWCNF. A large part of CUAs lacking prioritization may be a result of there currently being no targets or metrics to determine how goals and outcomes of projects are evaluated in regards to successful CUA management. This may, to some degree, stem from the lack of a clearly defined definition of what a CUA is. The lack of a simple, efficient, and consistent inventorying process appears to compound the issue, as trends of growth or recession are difficult to establish and link with common site characteristics and impacts. Without such baseline data, it is difficult for management to establish metrics to determine management successes and struggles. Furthermore, the prioritizing of sites will be left up to professional judgment in many cases, rather than a systematic evaluation process that looks at key indicators involving resource impacts and use trends. Without a more refined system for inventorying and evaluating CUAs, funding will continue to be an issue as there will be no way to weigh the importance of projects focusing on CUA management.

Interview Results and GIS Analysis of GPS-Based Data

Interview results and GIS analysis results were compared to define characteristics of CUAs. Overall, there was correlation between interview themes and results from GIS

analysis of GPS-based data. Managers commonly described CUAs as occurring in areas that were relatively flat, easily accessible, and near a water feature. GIS analysis of GPS-based data correlated to managers' perceptions of CUA locations. Generally, GIS analysis showed that the majority of CUAs were in flat areas of 10% grade or less, in close proximity to a road allowing easy access, and often close to a water feature, such as a lake or stream. This correlation between manager perceptions and GIS analysis demonstrates that GPS-based data may be an effective quantitative tool used in defining characteristics of CUAs and recreation sites, which heretofore have been defined using more qualitative measures. With further refinement, the characteristics identified through GIS analysis and the interview process with management could be used as a predictive tool to identify areas that may develop into CUAs in the future. Preliminary attempts by the author to quantify such characteristics into a predictive mapping tool, not reported in this document, have had some success. Using a quantitative approach could help reduce professional bias when planning and managing CUA recreation sites and potential areas of high use.

Study Limitations and Areas of Future Research

During the course of this study several limitations became apparent, along with issues that deserve future research. One of the greatest limitations to this study derives from its scope. This study was focused on CUAs on the Uinta-Wasatch-Cache National Forest. Other public land management agencies were not considered in this study, nor was dispersed recreation outside the USFS administered lands, except in the context of some previously published literature. Moreover, this study was directed specifically at

USFS management of CUAs on the UWCNF and did not take into account other management agencies nor other USFS regions and forests.

Future research should expand this study to understand where CUAs exist on other lands, and what other agencies have done to manage recreation in contexts similar to CUAs. This would include research involving other agencies, but also studies of other forests under USFS management would be useful for understanding the broader context of dispersed recreation and CUA management within the agency. Some information provided during this study related to literature outside the strict realm of USFS CUA management, such as the social aspects of CUAs; however this information's link to CUA management requires further study, as it is somewhat tenuous as only USFS personnel participated in this process.

Another limitation of this study comes in the form of the GPS-based data involving CUA inventorying. Data used in this study were collected over several years using various methods. Because of the variation in methods and lack of comprehensive data collected over several years, analysis of trends involving CUAs was limited to information gained from interviews. This could be remedied by future studies that strive to test the effectiveness of various inventorying techniques and their effectiveness as tools for managers and resource specialists.

Other limitations of this study come from its focus on the management of CUAs and its timeframe. Data collected during this study was focused generally on management policy, management actions, and manager perceptions. Some of this was tempered with site observations, GIS analysis of GPS-based data, and interviews with natural resource specialists outside the focus of recreation. However, as Manning (2011) detailed, studies

in outdoor recreation are composed generally of three categories: the resource environment, the social environment, and the management environment. While this study has addressed some aspects of these three environments, it has been primarily through the lens of the management environment. Therefore, future studies should strive to understand CUAs in their respective resource and social contexts. In particular, future studies could study resource impacts in CUA contexts in various environments, with research that better defines the cumulative impacts of CUAs on wildlife, soils, vegetation, and water quality. Future studies could also strive to better understand the social environment of CUAs from the recreationist's perspective using user-intercept surveying techniques. Interviewing users could help understand why sites are selected, what factors are considered when returning sites previously visited, what deterants employed by management are effective, and so forth.Future studies could also look further into trends involving CUAs over a greater period of time. Such studies could look at long-term trends, but could also analyze CUA trends as they relate to spring, summer, fall and winter conditions and use. These studies could give a more well-rounded description and analysis of CUAs, their use, and their environmental impacts.

Lastly, this study's findings involving the design of CUAs requires further exploration. Future studies could seek to define design guidelines for CUAs. Studies could explore various uses and settings to categorize dispersed settings, and attempt to define a systematic approach for designing CUAs in various settings. The trigger-points and themes associated with this study could be used as a starting point for deriving a set of best practices and design criteria on the UWCNF. The themes identified in this study during the interview process, could be coupled with future studies involving the

ecological and social aspects of CUAs to determine a holistic approach to designing and managing CUAs. The aspects of CUAs and their management identified in this study could be used to define a series of targets and metrics for management on the UWCNF.

Conclusion

This qualitative and quantitative study examined aspects of dispersed recreation management in the limited context of CUAs. The study focused on inventorying CUA data, interviewing recreation managers and natural resource specialists, and conducting a site visits. Overall, this process identified factors in order to define CUAs and their management on the UWCNF during the non-winter portions of the recreation season.

During the course of studying CUAs on the UWCNF many connections to previous outdoor recreation research were identified. Specifically, this study broadens the understanding, definition, management, and design of CUAs within the context of dispersed recreation management carried out by USFS personnel on the UWCNF. The definition of CUAs has been expanded and can be traced to earlier understandings of dispersed recreation. In addition, this study speaks to previous research within three broad fields of wildland recreation identified by Manning (2011). CUAs appear to have aspects related to ecological factors including vegetation, soils, hydrology, and wildlife. Social factors of CUAs have been discovered during this study, and can be related to previous studies involving conflict, and use types and preferences. Many findings from this study were found to be consistent with previous studies involving outdoor recreation in a dispersed setting; however, many areas involving CUA definition, management, and

design still need to be studied further to provide greater depth to the subject than this study's focus of CUAs on the UWCNF.

This study also identified differences and commonalities involving management perceptions of recreation managers and resource specialists. Recreation managers had an overall greater knowledge of CUAs and their management. However, successful management of CUAs appears to result from a collaborative approach that incorporates the specialized knowledge of recreation management and natural resource management. These management types should collaborate with one another in the early stages of planning and management involving CUAs. To assist this process, a system of targets and metrics needs to be developed to assist the success of collaborative management. These measures will likely need to be tied to resource and recreational use goals.

Another key finding of this study is that CUAs are managed sites, but also designed sites in many cases. Design of CUAs is different from some forms of design, in that it looks at user-established patterns and determines how these patterns can be adapted and improved to meet management goals of reducing recreation impacts on natural resources. Design can be characterized as minimalist, adaptive design that uses low-impact modifications consisting of defining boundaries for certain use types, defining circulation routes, and then hardening sites to make them more resilient to high use. Despite CUAs being designed, this study revealed there is very little information involving design guidelines for CUAs. Codes and regulations have given UWCNF personnel tools to help manage and designate CUAs on USFS lands. The Wasatch-Cache RFP provided some inventory guidelines and objectives to "develop and implement" and provide public education on agency actions involving CUAs (USFS, 2003b, p. 4–33).

Despite these rules and regulations, no training or guidelines were discovered that capture design guidelines and best practices involving the concentration of use and the creation of CUAs. Given the unique characteristics of CUAs being undeveloped areas that accommodate high levels of use, this study's finding would suggest guidelines based on both recreation and resource perspectives. Design guidelines for these sites could help provide indirect management tools for UWCNF personnel and other USFS Forests, especially when dealing with the multiple uses that arise in these areas.

This research is considered preliminary in regards to defining, managing, and ultimately designing CUAs. Future research in areas involving the social and ecological characteristics of CUAs is needed to further refine the findings of this study, and to inform the design and designation of CUAs in the future. Further studies involving the management and design of CUAs could be used to evaluate the effectiveness of various methods of management and design, such as the installation of barriers, and the designation of new travel routes. Future research could then clarify what design guidelines and best practices would be appropriate for various recreational uses and settings. Developing guidelines focused on management and design best practices will allow decision-makers who oversee areas of established, emergent, and potential future sites to maintain a balanced approach of promoting the ecological health of the land while providing for and valuing appropriate, established use. Using such guidelines, management may be able to better articulate to users that their recreation sites are valuable, and the experience of recreating in CUAs can be preserved through an adaptive process directed at sustaining undeveloped areas that provide a diverse range of quality dispersed recreation opportunities.

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APPENDICES

Appendix A. General Interview Guides and Sample Transcription

General Interview Guide
Concentrated Use Areas: Management and Design Strategies For the Uinta-Wasatch-Cache National Forest

Date:
Place:
Duration:

Baseline Questions (5min.)

What is your official job title?

What positions have you held within the agency or your field?

Does the Forest Service provide you training involving Concentrated Use Areas (CUAs)?

Concentrated Use Areas Questions (25 min.)

Could you describe what you consider a concentrated use area?

- Where do you find CUAs within your management area?
- Why do you think people continually use these areas?
- Why do you consider these areas CUAs? Do specific areas lend themselves to CUAs and their impacts?
- Why do you think people tend to impact these areas more than others?

How does scale factor into your definition of a CUA?

- Are they site-specific or do you consider them on a larger scale, say a canyon, a watershed, or a campground and trails?
- Do you lump a complex of CUAs together or is the individual site more important? Are there types of uses that create more CUAs than other uses?
- Do any issues such as user preferences, crowding, use displacement, user conflict, etc. create unique conditions that result in CUAs?
- Do you believe that CUAs are areas of use conflict? Or have a higher potential than developed sites?

When looking at a CUA, do you usually value the resource or the use occurring in the area as more valuable? Or how do you assign value to use and resources in a CUA?

Date: Place: Duration:

Management and Design Involving CUAs (30 min.)

Could you describe your approach to managing a CUA? Do you have more than one approach?

- What ecological, social and managerial factors do you consider when managing a CUA?

Do you use any existing management frameworks to assist in your decision making and evaluation process involving CUAs?

- If yes, what are the frameworks?
- If no, what do you rely on instead of a framework?

On a scale of 1-5 (1= reactive 5=proactive), how would you describe your approach to managing CUAs?

- Why do you believe your approach is this way?

What factors do you feel one must consider when making decisions involving CUAs?

When is design or improvement of a site considered? OR should it be considered?

Are there certain trigger points that you use to identify an area as in need of more management or the implementation of site designing/improvement?

- How do you prioritize different areas and their needs?

What do you find to be the biggest obstacles to managing CUAs?

What impact mitigation techniques and design criteria are incorporated into the management of CUAs?

- Are there times when you choose to develop or improve a CUA?
    - If yes:
    - Do you have criteria to determine when a site needs improvement? Are there trigger points?
    - Do improvements change a site from undeveloped to developed? Are there cases when it does not change site categorization?
    - Do you use specific materials for design construction?
    - What features do you often change in an area, (i.e. topography, boundaries, site features, etc.)?
- Do you ever design to prevent potential future impacts to an area (preemptive measure), or do you usually design to mitigate impacts to an already existing CUA?
- Do different impacts require different designs?
- What designs materials, or approaches have been effective and ineffective in managing these areas?

What would sustainability within the context of CUAs mean from your perspective?

Do you think there are resources or information that could help you in your management of CUAs?

Date: Place: Duration:

Transcription	Units of General Meaning	Units of Relevant Meaning to Research Questions
Z: Okay, so basically today's the 20th of June, we're at the [district 01], this will be pilot interview for Concentrated Use Areas: Management and design Strategies for the Uinta-Wasatch-Cache National Forest, so um I'll just start off with some real basic questions	**Z:The date is the 20th of June** **We are at the Logan Ranger District** **This is a pilot interview for CUA strategy & design** **Starts with basic questions**	
01: You probably want to have my name right? **Z: um no actually, I'm not going to record any names, I'm going to keep that confidential,** **01:** Perfect.	**01:** He asked if his name was needed **Z: No names will be needed, keeping confidentiality**	
Z: I just want to know like first off like, what's your title?	01: He understands **Z: I asked his title**	**What is your title?**
01: I'm a soil and water program manager	01: He says a soil and water program manager.	A soil and water program manager
Z: Okay, and um, like have you held any other positions within the forest?	**Z: I ask what other positions he's held in the Forest**	
01: yes, ah, I've been a firefighter, as a seasonal, and as a Forest technician doing slash and burn, things like that. I worked as hydrologist	01: he says a seasonal firefighter, Forest technician, and worked as a hydrologist	**Other relevant positions** Hydrologist
Z: Okay	**Z: I say okay**	
01: yep	01: he says yes	
Z: cool, and um last kind of baseline question, Have you had nay training with Concentrated Use Areas which the Forest has provided?	**Z: I ask if training has been provided by the forest on CUAs.**	**Have you had any training involving CUAs?**
01: ah not training but I've worked with [name] on going out and on putting together inventory,		No. Has experience with soil and water issues involving CUAs

portions of the inventory, dealing with soil and water issues	01:he says no training was provided He says he has worked with others on inventory He says Inventory dealing with soil and water issues	
Z: okay, so um, the next section will kind be about Concentrated use areas in general. How would you, how do you kind, how would you describe or what do you consider a concentrated use area?	**Z: next section is about CUAs in general** **I ask how he would describe or consider a CUA**	**What does he consider a CUA?**
01: yeah, a concentrated use area is, um, an area in which, um, you have uses such as dispersed recreation, maybe areas used for range land, or if you have a permittee that's set up a place where they have... are going to stay. Ah, but it's an area in which the use, usually um impacts the vegetation and the soils, and maybe indirectly the water or even directly, and usually, um an area where there's um some place, um someone sets up a trailer, a place where they have like a home, I don't know if you want to call it a home base, but it's a place where the set up a camp of some sort.	01: A CUA is an area Dispersed recreation is a use Maybe in areas used for range A Permittee's place they will stay An area where use usually impacts vegetation and soils Indirectly or directly impacts water Usually an area where there is some place Someone sets up a trailer A place where they have a kind of home A home base A place where they can set up a camp	An area Dispersed recreation is use Maybe involved with range Permittee's camp Area with vegetation and soil impacts Direct and indirect impacts to water Place for trailer camping Some kind of home A home base A place to set up camp
Z: Okay. Um, let's see, are there areas, specific areas you think, that these, that usually lend themselves to these concentrated use areas, are there specific areas within the forest that might call upon people to visit these areas or something like that?	**Z: I ask if certain areas lend themselves to CUAs**	**What areas lend themselves to CUAs?**
01: ah, yes, and they're usually associated with some type of water body like along streams, and	**I ask if these forest areas specifically call upon people to visit them.** 01: he says they are usually associated with some	Areas with water Streams

they're usually located in relatively level areas, um and usually they are related to, usually recreation use. Most of them are recreation use.	type of water The water could be a stream They are usually located on level areas They are usually related to recreation use Most of them are recreation use	Level areas Area of recreation use Most are recreation use areas
Z: okay, do you have any ideas as to why people might continually use these areas?	**Z: I ask if he knows why people might continually use the areas.**	**Why might people continually use these areas?**
01: yeah, I think a lot of areas are easily accessible to vehicles, they are being relatively level, it's easy to bring in trailers, usually the place where they will set up are areas where there's some type of activity they can do, they can either play in the water, they can fish, or maybe a hunting camp of some sort where they can go out and usually the areas have places where you can set up several trailers in one area where you can have a family and extended family camping. Or several hunters. That sort of thing.	01: He says he may know why The areas are easily accessible The areas are level The areas are easy for trailer The areas are in places where there's some activity to do Places where people can play in the water Place people can fish Places people can set up a hunting camp Places where people can have several trailers in one area Places for family or extended family camping Places for several hunters	Areas are accessible Areas are level Area easy for trailers to access Areas have activities to do Water play opportunities Fishing opportunities Hunting camp opportunities Several trailers allowed in one area Family events Hunting events
Z: Okay. There's usually within a CUA like impacts usually occur. Do you think there are any reasons why these areas are impacted more than other areas on the forest, than through say range or something like that?	**Z: I agree.** **I state that there's usually impacts within a CUA** **I ask if he knows why some of these areas are impacted more than other areas, like rangeland.**	**Why are these areas impacted more than others?**
01: so the impacts are usually, are in concentrated use areas are a lot higher in vegetation because the areas has a lot more concentrated use. You have got people walking the same paths, using the same are to set where they're camping or where	01: he says impacts are a lot higher in vegetation He says Impacts on vegetation are from concentration of use He says people use the same paths	Vegetation impacted more Us is concentrated People use same paths People camp in same area

they have campfires. Trails to the stream are used over and over again.	He says using the same area to set camp He says using the same area for campfires He says trails to streams are used again and again	People use same area for campfires Trails to streams used again and again
Z: And with these areas being closer to water, like you mentioned earlier, does that impact, does that create more problems with impacts, or?	**Z: I ask if these areas being closer to water create more problems with impacts.**	**Do areas near water create more problems?**
01: yes, impacts can be from sediment eroding from the site into the water. Also from uses like, going to the bathroom next to the river. You know all that stuff where you can cause water quality problems with that.	01: He says they do. He says sediment from erosion can go into the water He says going to the bathroom next to water is an issue Issues involving water quality are increased.	Yes Sediment goes into water Bathroom use is problem for water quality Issues are increase with water quality
Z: okay	**Z: I say okay**	
01: impacts, you're looking at impacts, other impacts would be soil compaction, areas of which would norm... would be areas of extended compaction compared to say a single site. It's has a lot to do with there's not a lot of distribution of impacts over a large area of land. It's all in one area, and that can cause problems in the immediate area, especially, along streams and that.	01: he says I'm looking for impacts He says an impact would be soil compaction He says there are areas of extended compaction These areas are not a single site He says it has to do with impacts not distributed over a large area of land Impacts are in one area The impacts can cause problem in the immediate area Especially along streams and area's like that	Soil compaction is an impact Extended compaction occurs Not single sites impacts are not distributed over large area one area impacted impact problem in immediate area especially with streams and water
Z: okay, So the next thing I want to ask you about kind of has to do with scale. And defining CUAs. When you look at these areas, do you generally, consider them on a site specific scale, or on a larger scale, say a canyon, or a watershed or a campground, or like a corridor or something like	**Z: I want to ask about a scale thing** **And defining CUAs** **When he looks are these areas** **Does he generally consider them on a site specific**	**How does scale factor into you definition of CUAs?**

that? 01: yeah, that's ah, it actually, depends, well the way I actually look at concentrated use areas, they are usually areas where there is more than one unit in a certain area. And that certain area I look at as a more site specific area. **Z: like an individual campground, or an individual campsite.** 01: Not so much an individual campsite, but a group of campsites in an area, so it'd be like, for instance it would be something that could be 1000 feet in length, or along a stream and it would be several campsites within that one areas, as opposed to having just an individual site every thousand feet. **Z: Okay** 01: yeah **Z: so usually you would lump, kind of lump some together into like a complex. Is that kind of what you are saying?** 01: yes **Z: Okay. Do you think that there's an advantage to looking at it that way as opposed to an individual site?** 01: Yes, and the reason is that because if you have several sites in one area it's really the cumulative	**scale or on a larger scale like canyon, watershed, or a campground or a corridor or the like?** 01: He says yes. He says it depends He says he usually looks at concentrated use areas He says they are areas usually of more than one unit He looks at this area as more site specific **Z: I ask if he means an individual campground or individual campsite** 01: he says not so much with individual campsite He means a group of campsite in an area His example is several campsite along a 1000 feet of length or stream He does not mean an individual site every 1000 feet **Z: I say okay** 01: he says yeah **Z: I ask that the lumping of sites into a complex is what he is saying.** 01: he says yes **Z: I ask if he thinks there is an advantage to looking at sites this way rather than individually.**	Its depends Usually more than one unit Looks at area as site specific No so much the individual site A group of campsite in an area A group of site in a 1000' stretch Not a site every 1000' **Is there an advantage to your method?**

Appendix B. Campsite Survey Guides

Campsite survey guides used for the Uinta-Wasatch-Cache National Forest CUA inventory (USFS, 2006b).

Wasatch-Cache NF Concentrated Use Area Oct. 25, 2006

Data Dictionary version CUA v1.0_beta

Inventory definition sheet

Identifying the Site:

Begin by finding an existing fire ring. All GPS measurements need to be taken from the center (or as close as possible) of the fire ring. If there are multiple fire rings, locate the centermost fire ring: anything greater than 25 feet away may represent another site if other fire rings are present and parking impacts are visible. *Note: All feature measurements should extent from the center fire ring GPS point.*

My walking pace: _____ feet per single step. (To calculate this, measure 100 feet on the ground and count the number of paces within this distance. Divide 100 by this number to get your feet per single step.)

Getting started with the GPS:

1. Open the GPS function of the Trimble GoeXM by tapping the **GPS** button located in the lower right of the screen.
2. In the upper left pull-down menu, select **Data.**
3. In the *Create New Data File* screen, make sure that **File Type** is "Rover," **Location** is "Default," the **File Name** is generated by the system and can be left as is, and **Dictionary Name** is "CUA v1.0_beta."
4. Tap the **Create** button in the upper right.
5. In the *Confirm Antenna Height* screen, fill in the **Height** by measuring from the bottom of the antenna, either of the GPS unit itself or the external antenna. Make sure that **Measure To** is "Bottom of antenna mount." Tap **OK**.
6. In the *Choose Feature* screen, make sure that "cua_point" is highlighted and then tap **Create** in the upper right.

Site Inventory:

ATTRIBUTE	PULL-DOWN CHOICES	DEFINITION
SITE_ID_CODE:	(Type in appropriate info)	Indicate District, site abbreviation, and site number (ie. D3MLHCUA001 – Kamas RD, Mirror Lake Highway CUA – car camping)
SURVEYOR_ID:	(Type in Last Name)	

Wasatch-Cache NF Concentrated Use Area Oct. 25, 2006

Data Dictionary version CUA v1.0_beta

Inventory definition sheet

ATTRIBUTE	PULL-DOWN CHOICES	DEFINITION
USGS_QUADRANGLE:	(Type in corresponding name of Quad map if known)	
TOTAL_CAMPSITE_AREA:	0-500sqft 501-1000sqft 1001-1500sqft 501-2000sqft 2001-2500sqft 2501-3000sqft 3001-4000sqft 4001-5000sqft 5001-6000sqft >6000sqft N/A	The area that has noticeably been used including tent site. Usually distinguished by visible human trampling of vegetation. Pace the area off and calculate a square footage. (This measurement is length times width and can be done using the fire ring as the center point of a cross. For the calculation, tap the Microsoft "flag" in the uppermost right corner, tap **Programs**, and tap **Calculator**.)
TOTAL_BARREN_CORE:	0-100sqft 101-250sqft 251-500sqft **500**-750sqft 751-1000sqft 1001-1500sqft 1501-2000sqft 2001-2500sqft 2501-3000sqft >3000sqft N/A	The barren core is within the area and is distinguishable by bare soil caused by heavy use in the area. Pace off the area and give a square footage.
LITTER_TRASH:	None Light Moderate Heavy	Within view of the campsite: ° No trash visible ° Fire ring litter or less than ½ of a 5-gallon bucket ° Less than two 5-gallon buckets ° Large items or in excess of two 5-gallon buckets
TREE_DAMAGE:	0 1-5 6-10 11-15 >15	Count the number of trees that have human caused damage within the campsite area or within clear visibility of the site. Include trees with scars, nails, ax marks, carvings, broken limbs, and tree stumps.

ATTRIBUTE	PULL-DOWN CHOICES	DEFINITION
TREE_DAMAGE_EXTENT:	Slight Moderate Severe None	Of the trees that have visible damage: ° Few trees damaged by nails, graffiti, or limbed ° Several damaged trees, some cut down ° Many damaged trees, graffiti/carvings, more than 4 trees cut down ° No visible human caused damage
VEG_COVER_ONSITE:	**0-10%** **11-50%** **51-90%** **91-100%** **(needs more categories)**	Percentage of vegetative ground cover within campsite area. (To do this, pace off a 10 ft X 10 ft section of the campsite area. Look to see what percentage is barren compared to covered with vegetation.)
VEG_COVER_OFF_SITE:	**0-10%** **11-50%** **51-90%** **91-100%** **(needs more categories)**	Percentage of vegetative ground cover in adjacent, undisturbed areas. (To do this, find an undisturbed area outside the campsite area. Pace off a 10 ft X 10 ft section and look to see what percentage is barren compared to covered with vegetation.)
CANOPY_COVER	Light Moderate Dense None	Looking up within the campsite area: ° Some tree branch cover over campsite area, can still see most of the sky ° Canopy cover over more than half the campsite area, sky still clearly visible ° Closed canopy over campsite area, sky visibility minimal ° No tree branches over campsite area
NUMBER_OF_FIRE_RINGS:	1 2 3 4 >4	Number of distinguishable fire rings in a given campsite area. If fire rings are more than 25 feet from the centermost fire ring, then this constitutes two separate campsites.
HUMAN_WASTE_EVIDENCE:	None Light Moderate Heavy N/A	Do a quick search of likely "toilet" areas in the vicinity of the campsite area, up to 300 ft: ° No visible sign of "toilets" or toilet paper ° One "toilet" site visible, little toilet paper present ° 2-3 "toilet" sites visible, moderate amounts of toilet paper present ° 4 or more "toilet" sites visible, heavy amounts of toilet paper visible

ATTRIBUTE	PULL-DOWN CHOICES	DEFINITION
CUA_CONDITION_CLASS:		Select the condition class that most closely represents the campsite. Condition class is determined by soil exposure and vegetation coverage. It is **NOT** determined by size, amount of trash, or tree damage other than root exposure.
	1	° Campsite barely distinguishable; soil surface only slightly disturbed; vegetation cover and organic litter barely altered. Often a campsite that has not seen recent use.
	2	° Campsite apparent, effects confined; soil surface cleared of large stones and branches where primary activities occurred; vegetation and organic litter lost or trampled. Obvious effects concentrated and tapered towards boundary.
	3	° Campsite obvious, effects throughout site; distinct boundary between campsite and undisturbed adjacent areas; vegetation cover and organic litter lost on much of the site; primary area of activity is clear of stones and gravel. Most gravel or stones are outside primary activity area.
	4	° Campsite obvious, effects widespread; distinct boundary exists between campsite and undisturbed area. Nearly complete or total loss of vegetation cover and organic litter; bare soil widespread with little gravel or few stones present anywhere within boundaries.
	5	° Campsite obvious, effects widespread, and condition greatly different from adjacent areas. Roots exposed, vegetation absent, and soil compressed.
DIST_TO_ROAD_SYS:	0-50 ft 51-150 ft >150 ft N/A	Pace the distance from the center fire ring GPS point to the nearest roadway. The road should be identified on FS Travel Map.
DIST_TO_SYS_TRAIL:	0-50 ft 51-150 ft >150 ft N/A	Pace the distance from the center fire ring GPS point to the nearest system trail, either motorized or non-motorized. The trail should be either on the quad map or identified on FS Travel Map or Visitor Map.

ATTRIBUTE	PULL-DOWN CHOICES	DEFINITION
SCREENING:	Complete Partial None	Calculate the screening between the campsite and the travel path to the site (this does not include the path that leads solely to the individual site). ° Campsite is well hidden from others traveling by, site may not even be noticeable ° Campsite can be seen from the travel path id you are specifically looking for it ° Campsite is out in the open, clearly visible from the travel path
DISTANCE_TO_WATER:	0-10 ft 11-25 ft 26-50 ft 51-100 ft 101-300 ft >300 ft	Pace the distance to the nearest water source from the center fire ring GPS point.
TYPE_OF_WATER_SOURCE:	Lake/Pond Spring Developed Spring None Perennial Spring Intermittent Spring Man made Other	Pick the category that best describes the water source.
COMMUNITY_TYPE:	Mixed C and D **C-SpruceFirPine** **C-PinyonJuniper** **D** - Deciduous Meadow Riparian Shrub and forbs Shrub and grass Grass Bare Other	Select the category that best describes the major plant community in and adjacent to the campsite.
SURFACE_SUBSTRATE:	Duff Sand Gravel Topsoil Rocky Soil Bed Rock Other	Select the category that best describes the surface of the campsite.

ATTRIBUTE	PULL-DOWN CHOICES	DEFINITION
OVERLAND_FLOW:	None **Slight** Moderate Severe	Amount of water damage: ° No visible evidence of damage ° **Use either Moderate or Severe** ° Evidence of gullies not towards water source ° Evidence of gullies going towards water source
CORRAL:	Present Absent	Determine if there is evidence of a stock animal corral
GFA:		Skip this one unless it does not say "Populated in GIS"
COMPLEX:		Skip this one unless it does not say "Populated in GIS"
The following are amenities and need to be present within the campsite area to be marked present		
HARDEN_SPUR:	Present Absent N/A	Graveled or other manmade material
BARRIER_ROCK:	Present Absent N/A	Mechanically placed rock
FENCE:	Present Absent N/A	Mechanically placed fencing
HORSE_USE:	Present Absent N/A	Signs of horse use, including trammeled vegetation and corral structures
ACCESS_ROUTE_MOTOR:	Present Absent N/A	***This outside of the campsite area, but is how to get to the campsite area itself.***
ACCESS_ROUTE_NON_MOT:	Present Absent N/A	***This outside of the campsite area, but is how to get to the campsite area itself.***
CONNECTOR_MOTORIZED	Present Absent N/A	System motorized route. ***This outside of the campsite area, but is how to get to the campsite area itself.***
CONNECTOR_NON_MOTOR:	Present Absent N/A	System non-motorized route. ***This outside of the campsite area, but is how to get to the campsite area itself.***
CONNECT_TO_WATER_MOT:	Present Absent N/A	***This outside of the campsite area, but is how to get to the campsite area itself.***

ATTRIBUTE	PULL-DOWN CHOICES	DEFINITION
CONNECT_WATER_NONMOT:	Present Absent N/A	***This outside of the campsite area, but is how to get to the campsite area itself.***
ATV_USE:	Present Absent N/A	
CORRAL:	Present Absent N/A	
HARDEN_PICNIC_AREA	Present Absent N/A	Graveled or other manmade surface
FS_INSTALL_FIRE_RING	Present Absent N/A	Manmade material, culvert end, or manufactured ring
RETAINING_WALL	Present Absent N/A	
FS_INSTALLED_SIGN	Present Absent N/A	
FS_TABLE	Present Absent N/A	
COMMENTS:	(Type in appropriate info)	Any additional information about the campsite that is not in the pull down menus that is important to its management.

Campsite survey guide for the Pleasant Grove Ranger District methodology (USFS, n.d.-f).

Dispersed Campsite Inventory

Date:

Site Number:

Site Name:

Person(s) completing inventory:

Road and milepost:

Verbal Description:

GPS Coordinates (UTM) Easting: Northing:
Elevation:

# of parking places for full size vehicles:

# of fire rings:

Approximate size (length and width):

Structures present Bathroom Kiosk Fence Rock Barrier Other None

Type of camping primarily utilized: RV Tent Walk in Other
# of sites:

Other types of camping possible: RV Tent Walk in
# of sites:

Distance to water:

Type of water: River Lake Stream None Other

Proximity to parking:

Proximity to other sites:

Use: Heavy Medium Light

Recommendations: Kiosk Harden surface Rock Barrier Fence
Encourage use Discourage Use Expand Eliminate

Problems with site:

Associated pictures: (Looking) N: E: S: W:
Structure(s): Problems:

Comments:

Campsite survey guide for the Heber-Kamas Ranger District methodology (USFS, n.d.-g).

CAMPSITE LOCATION (Road Number/Name):

CAMPSITE NUMBER:

DATE:

GPS COORDINATES:

PHOTOS TAKEN:

Part A. **Disturbance to Groundcover Rating**

1- Groundcover vegetation flattened, not permanently damaged, minimal Change except for rock fireplace.
2 - Ground vegetation worn away around fireplace or center of activity.
3 - Ground vegetation lost on most of site, most humus and litter still present.
4 - Bare mineral spoil widespread over most of site.

Part B. **Distance From Road**

0 - 0-150ft
1 – 150-300ft
2 - More than 300 ft

Part C. **Disturbed Area Rating**

0 - 0-2500 ft^2
1 - 2501-5000 ft^2
2- More than 5000 ft^2

Part D. **Total Length of User Created Roads**

0 - 0-250 ft
1 - 250-500ft
2 - More than 500 ft of Road

Part E. **Overall Impact Rating**

____ Sum of index ratings for Part A + Part B + Part C + Part D

COMMENTS:

Appendix C. Inventory and Site Visit Results by District

Evanston-Mountain View Ranger District Inventory and District Visit Results

General data searches involving the Evanston-Mountain View Ranger District (EMVRD) resulted in a very limited amount of data for use in the study. Only inventory data from ArcGIS shapefiles, the 2003 RFP, and the 2003-2004 FMP was found. Other data and observations come primarily from photos and observations collected during the district visit.

Pre-visit inventory data and policy. Prior to site visits on the district, very little data was obtained. Some GPS-based inventory data of CUAs was obtained in the form of ArcGIS vector shapefiles. All other data was limited to sections of the 2003 RFP and the Recreation Strategy (USFS, 2012) for the UWCNF.

EMVRD is identified in the RFP as management areas in the Western Uinta Management Area and the Eastern Uinta Management Area. The 2003 RFP specifically states for the Western Uinta Management Area that the Whitney Reservoir Area's "adverse resource effects from concentrated use areas…will be reduced by actively managing where vehicles are allowed to drive and park" (USFS, 2003b, p. 4-179). In the Bear River Management Area, the RFP states that, "dispersed areas will be defined or designated to better integrate developed and dispersed opportunities, while reducing resource impacts" (p. 4-188). Other parts of the RFP for the Bear River Management Area call on managers to monitor, sign, limit, define, and harden dispersed recreation areas of high use to limit impacts to vegetation, water quality, and wildlife habitat. The Eastern Uinta Management Area does not call on specific areas to be managed to a desired future condition, however it does state:

> Designation of sites for dispersed camping will be employed to restrict or mitigate recreation impacts in riparian areas and to aquatic systems, while continuing to provide opportunities in and near these attractive areas. Hardening of sites and use of barriers will be employed where needed to reduce or prevent unacceptable impacts." (p. 4-199-200)

The RFP was followed up by the RMP which described several General Forest Areas on the EMVRD as having CUAs (USFS, 2004). These areas include the Whitney Area, Bear River Area, Mill Creek Area, Blacks Fork Area, Hoop Lake-Henry's Fork Area, and the Bridger Area. Sites included in the RMP CUA inventory consist mostly of dispersed campsites. One area is a gravel pit, which also serves as a dispersed camping area. Maps associated with such use areas were not obtained, so it has been difficult to understand the scale or size of these areas. No follow up monitoring plans were found for the EMVRD. GPS-based data was later collected by EMVRF staff to further inventory the locations of CUAs on the EMVRD and converted to ArcGIS shapefiles. GPS-based data was not found to be linked to the initial CUAs described in the FMP.

Further policy for the EMVRD comes from the UWCNF Recreation Strategy (USFS, 2012). Management calls for the evaluation of management of the Mirror Lake Highway for dispersed camping. The Recreation Strategy also identifies the Whitney Area as a priority for dispersed recreation management on the EMVRD. As part of this prioritization, installation of a trailhead is identified as a project of "medium" importance for the UWCNF as a whole.

District site visits and photos. Photos for EMVRD are limited to those obtained during the district visit. Being directed by the recreation managers on the district, Henry's Fork, Whitey Reservoir, and Mirror Lake Highway (Utah Highway 150). Areas observed were mostly dispersed camping areas in relatively flat areas. In some cases, water was observed adjacent to sites, such as at Whitney Reservoir and along Henry's Fork River. Some areas were located within the 300' riparian conservation area zone identified in the RFP (USFS, 2003b). There was obvious damage to vegetation seen in each CUA, with a fire ring usually being surrounded by a barren core of exposed mineral soil (Figure 10), along with evidence of small trees having been cut by forest users and hatchet/ax scarring on trees. Many sites also had some form of amenity, some of which appeared to be provided by management, such as equestrian hitching posts; while others had user created amenities, such log benches and fire rings (Figures 10 & 11). In some cases, management had also installed barriers to restrict use, such as buck-and-rail fencing (Figure 10). Signing was provided at some sites and displayed guidelines for use, such as stay limits and recommended times of use based on resource conditions (Figure 12). Signing was also observed that incorporated Carsonite signs attached to 4x4 treated posts (Figure 13).

Figure 10. Typical dispersed site with fire ring and log bench (2013).

Figure 11. Hitching rail installed near a dispersed use area (2013).

Figure 12. Carsonite sign communicating use limitations of a dispersed site (2013).

Figure 13. Carsonite sign attached to a 4x4 treated post (2013).

Another observation on travel routes supporting CUAs and dispersed use was the apparent coincidence of multiple uses on the forest influencing the development of user created sites. In the case of EMVRD, logging operations appear to have an influence on CUAs. In many instances, sites were observed in areas with evidence of previous logging activity, such as stumps from harvested trees (Figure 14 & 15). Current sites with existing slash piles may form into future concentrated use and dispersed recreation sites.

However, considering that photos were taken on a limited number of sites on EMVRD, it is unclear how many multiple-use sites exist on the entire district.

Figure 14. Stumps can be seen in an area impacted by dispersed use (2013).

Figure 15. A route to a slash pile from logging on the Evanston-Mountain View Ranger District has developed into route used for ATVing and dispersed camping (2013).

Heber-Kamas Ranger District inventory and district visit results. Initial data inventorying of the Heber-Kamas Ranger District (HKRD) resulted in a limited amount of data found. This data consisted primarily of some incomplete GPS-based data from a 2001 Uinta National Forest (UNF) survey, as well as a draft version of a Concentrated Use Area Plan for Teapot Lake along the Mirror Highway corridor. Other data was collected during a district visit from July 25-26. The district visit consisted of an interview and district tour with two recreation personnel on July 25, along with an overnight stay and subsequent visit to sites identified by managers as CUAs. During the visit GPS-based data was obtained from a comprehensive 2010-2012 survey of dispersed sites on the district. This data will be discussed as in the GPS-Based Data Results portion of this chapter. Photos of various areas on the HKRD were also taken during this the

district visit. These photos captured sites at Soapstone Basin, Murdock Basin, Mirror Lake Highway (HWY 150), and routes near Bald Mountain.

Pre-visit inventory data and policy. During the pre-visit inventory of the HKRD an ArcGIS vector data shapefile for portions of the Heber district was obtained, in addition to a draft planning document for Teapot Lake area. The draft Teapot Lake Concentrated Use Area Plan (USFS, 2005), provides goals, objectives, desired future conditions, and monitoring protocol for how to manage fishing, camping, and hiking activities within the riparian areas surrounding the lake. However, before describing the specifics of the Teapot Lake Concentrated Use Area Plan, the general policy relating to the district will be described.

The Heber-Kamas Ranger District consists of districts from both the Uinta National Forest (UNF) and the Wasatch-Cache National Forest (WCFN). Heber Ranger District (HRD) was part of the UNF, while the Kamas Ranger District (KRD) was part of the WCNF. Because of this, direction for the combined districts comes from both the 2003 LRMP for the UNF and the 2003 RFP for the WCNF (USFS, 2003a, 2003b). Additional information on the management and monitoring of CUAs on the HKRD is provided in the FMP (USFS, 2004) and the UWC Recreation Strategy (USFS, 2012).

The RFP contains management direction and desired future conditions for the Kamas portion of the district within Western Uintas Management Area. Dispersed recreation is to be managed to reduce impacts to resources such as watersheds, vegetation, wildlife, and soils (USFS, 2003b). The Mirror Lake Highway corridor "will be monitored to determine tree health, vigor and condition" (p. 4-180). Safety concerns along the corridor, such as hazard trees, is to be managed to ensure safety. Areas

accessing water will be hardened to where appropriate to provide recreationists access, while also protecting the watershed. Other designated dispersed areas within the management area "will be hardened and additional designated sites may be added to protect resources and provide for increasing demand" (p. 4-187).

The LRMP contains management direction for the Heber portion of the District, which includes the Currant Creek Management Area, the Upper Provo Management Area, the West Fork Duchesne Management Area, the Deer Creek Reservoir Management Area, the Strawberry Reservoir Management Area, and the Willow Creek Management Area. The Willow Creek Management Area does not comprise any dispersed recreation management settings (USFS, 2003a). All management areas in the Heber portion of the HKRD contain descriptions of current conditions and desired future conditions for dispersed recreation, including the concentration of use. Overall, management is to attempt to actively manage dispersed recreation in a way to minimize resource impacts while providing for increased use and diversified use (USFS, 2003a).

Currant Creek Management Area is managed for 4,630 acres of dispersed recreation settings, which comprises about eleven percent of the management area. Dispersed use within this areas is described as "moderate" with camping, fishing hunting, and OHV use making up the primary uses (USFS, 2003a, p. 5-31). Desired future conditions are described as management efforts focusing on travel corridors along the Trout Creek Road and Co-op Creek Road. Management of sites is described as hardening dispersed campsites to reduce impacts to areas adjacent to sites and reducing travel to designated routes.

The Upper Provo Management Area consists of 3,570 acres of dispersed recreation settings or roughly seven percent of the management area (USFs, 2003a, p. 5-145). The area hosts a variety of dispersed activities including hunting, fishing and camping. However, no desired future conditions involved with dispersed site management or priority areas are described from the area.

The West Fork Duchesne Management Area is comprised of 1,980 acres of land, which make up about five percent of the management area. This area is described as an area where "dispersed recreation activities are emphasized to address anticipated increases in activities associated with access through the forest" (USFS, 2003a, p. 5-185). Without building any developed facilities, this area will be managed primarily for dispersed use. Areas along Forest Road 054 and the western edge of the management area will be actively managed. The description of this area provided by the LRMP describes the area as experiencing a trend of increased dispersed use that will continue into the foreseeable future.

The Deer Creek Reservoir Management Area provides a smaller portion of land available for dispersed recreation, but these areas are prescribed active management. Only 210 acres of land are dispersed recreation management areas. This small amount of land comprises only 0.005 percent of the management area. Despite this small amount of dispersed recreation settings, dispersed recreation is to be "available throughout the management area" while "active management of these activities is focused on road corridors" (p. 5-42). In some cases campsites will be managed through hardening sites and protecting nearby resources. This recreation is also to be "limited to incidental dispersed use" (p.5-42).

The Strawberry Reservoir Management Area contains the largest amount of area managed for dispersed recreation settings. Approximately 27,460 acres are considered dispersed recreation settings, which comprises nearly twenty-two percent of the management area. Dispersed recreation is described as causing resource impacts from "extensive use," which has resulted in some sites being hardened to limit impacts to resources (p. 5-126). Future conditions of dispersed recreation sites in the area consist of hardening high-use areas along road systems and installing signage to encourage concentrated use and the reduction of impacts. In some cases, development of more recreational facilities may be acceptable. This description implies that this area has been managed in the past to concentrate use to specific areas. However, no details of specific areas and or management plans are provided.

Following up on the RFP, the WCNF Forest Monitoring Plan (FMP) listed CUAs on the Kamas Ranger District (USFS, 2004). Preliminary CUA inventory of the district reported five General Forest Areas containing twenty-eight different CUAs. Areas consisted of a variety of sites, including campsites, river corridors, road corridors, and areas surrounding lakes. These areas are not well described in terms of amount of use or the primary uses creating impacts. The inventory was very preliminary in nature. No follow-up reports further clarified these areas with any substantial meaning in context of CUAs besides the *Teapot Lake Concentrated Use Area Plan (Draft)*. The Teapot Lake CUA was not reported as a CUA in preliminary inventorying from 2004.

The *Teapot Lake Concentrated Use Area Plan (Draft)* describes the CUA location as the network of trails, campsites, and fishing areas around Teapot Lake located near Mirror Lake Highway, Bald Mountain, and Reid's Peak. National goals listed in the plan

include, “provide outdoor recreation activities” and “improve watershed conditions” (USFS, 2005, p. 1). National goals are then followed by forest-wide desired future conditions, including functioning watersheds and unimpaired riparian vegetation, recreation resources that provide a broad range of opportunities for users with limited impacts to the environment, and minimal recreation conflict. Forest-wide desired conditions are then linked to the desired future conditions of the Western Uintas Management Area.

The Teapot Lake CUA Plan then goes on to describe the forest-wide goals and objectives relating to the site. Forest-wide goals include improving watershed health, managing road and trail access, travel management, recreation education, undeveloped recreation, and CUA management objectives. This overview is followed briefly by describing the management prescription for the area, Scenic Byways; the ROS category, Roaded-Natural; and the Scenery Management System (SMS) category, Developed Natural Appearing. These contextual descriptions are then followed by Teapot Lake CUA issues, goals and objectives.

There is a section for the desired future conditions of Teapot Lake CUA, however, this section is open-ended in that it is left to be “developed by District Staff and Forest Resource People” (p. 5). Despite this, key resource issues are described as vegetation impacts, undefined trail system, fire rings close to lake, no defined access point for angling, impacts to riparian and wetland areas, impacts from canoe launching, soil compaction from anglers using the lake, and self-management implementation (p. 5). From these issues a goal to “ comply with National Quality Standards for General Forest Areas” is stated, and key measures and indicators are identified to help assess progress

on attain the national goal. These key measures include identifying and monitoring resource settings, health and cleanliness, safety and security, and responsiveness. Based on this goal and the subsequent measures, goal and monitoring protocol specific to the Teapot Lake CUA are provided.

Goals for the lake included constructing infrastructure to address recreation and its impacts, while also informing the public of impacts and management. Proposed construction projects included, constructing buck-and-rail fencing to direct use around the lake, installing boardwalks in wetland areas, creating fishing piers of rock, constructing a small boat launch of natural materials, and defining primary and secondary trails around the lake by using rocks and logs.

Monitoring these actions was written into the plan, as well. Areas where fence would be constructed are to be monitored for human impacts. Use patterns near the boardwalks would be monitored to determine if boardwalks are being used. The boat launch, fishing piers, and trails would be monitored for vegetation impacts and regeneration. The monitoring process was suggested to consist of photographing areas from designated areas every five years by USFS staff and volunteers. No documentation was found to report monitoring results.

Areas on the HKRD have also been prioritized recently in the UWC Recreation Strategy. The Mirror Lake Highway has been prioritized as a “Scenic Travelway” setting which calls for resource protection through limited development for facilities. The Soapstone and Greater Strawberry areas are identified as “Dispersed Play” areas, which provide a range of recreation opportunities, while limiting infrastructure and facilities to areas needing resource protection because of high use. Education will also be provided in

each of these settings to help influence user behavior and decision making. Areas not identified as priorities are not addressed, nor is a timeline for reevaluating these areas' successes and drawbacks provided.

Site visit observations and photos. Areas visited and photographed were adjacent to roads, relatively flat, accessible, and showing use of OHVs and camping by various means (RV, tent, car, etc.). Some CUAs along the Mirror Lake Highway were hardened and provided some amenities, such as equestrian facilities, improved access routes, picnic tables, and restrooms (Figure 16 & 17). While some areas near the Mirror Lake Highway appeared in Riparian Conservation Zones, which are defined as vegetation corridor of 300 feet on either side of a waterway (Figure 18) or vegetation within 300 hundred feet of the edge of a body of water. The areas in Murdock Basin, Soapstone Basin, and Bald Mountain consisted of mostly dry sites with good access to a forest road (Figure 19). Some sites appeared to be within 150' of travel routes designated for dispersed camping, others appeared to be beyond the 150' travel rule. Overall conditions of sites visited showed impacts to vegetation, with a barren core area usually surrounding a camp fire ring. There was evidence of young to mature trees being impacted by cutting tools such as axes and saws, although it was difficult to determine from observation whether this was authorized firewood harvesting or dispersed recreation impacts (Figure 20).

Figure 16. Improved travel route leading to hardened camping sites along the Mirror Lake Highway (2013).

Figure 17. CUA area along the Mirror Lake Highway. Area has equestrian facilities, hardened travel routes, and trailer sites (2013).

Figure 18. CUA near a stream with fire ring and vegetation impacts (2013).

Figure 19. Flat, dry dispersed camping spot in the Bald Mountain area (2013).

Figure 20. Vegetation damage to a site, and stumps from firewood harvesting (2013).

Some sites had collections of garbage or firewood (Figure 21). The primary use characteristics seen with sites visited showed uses such as camping (tent, trailer, and car), OHV use, and the presence of large group areas as most common (Figure 22). These large group sites are usually indicated to forest visitors by the group through erecting signs attached to fence posts (Figure 23). These signs were handwritten and generally gave some direction for group members seeking a site in an otherwise undirected space. Common materials for these signs were paper plates, cardstock paper, and in some cases painted, wooden signs. Often times, these signs were giving direction to camps not clearly visible from forest roads.

Figure 21. Trash and firewood left at a dispersed campsite (2013).

Figure 22. A large group CUA. Area accommodates trailers, cars, and OHVs paralleling a road are common on the HKRD (2013).

Figure 23. Signs attached to fence posts along travel routes direct users to group camps (2013).

Other areas on the HKRD were observed as CUAs with primary uses other than camping. In Murdock Basin, a large flat area, devoid of vegetation was being used as an OHV play area (Figure 24). In this location, OHVs were observed driving around and kicking up dust, in an area without a clearly defined trail network or driving course. Users were free to choose their route in a large open space. Once enough free play had taken place, users could then access a nearby route open to OHV use and explore a wider area of the district. In another location, a large gravel pit was being used as an OHV play area (Figure 25). In this location, users had created a series of short trail systems with varying elevation to drive around. The nature of this recreation seemed more free and undefined, challenging the users to test their skills and creativity in choosing routes in a way that a more defined system of trail may not allow.

Figure 24. A large, barren area is used by OHVs as a play area (2013).

Figure 25. A gravel pit is used by OHVs as a larger play area (2013).

Management actions to counter impactful use were also observed on the HKRD. Some areas that had been previously impacted were closed off from use by constructing buck-and-rail fencing (Figure 26). In some cases, fences and barrier rocks closed areas, while also defining areas still available for use. Some fences had been knocked over and had pieces missing, while others had bucks and rails wrapped in barbed wire to prevent tampering from users. In other cases, areas had been signed. A variety of signs were observed. Simple Carsonite signs conveyed areas were open to uses, while other signs communicated areas being closed (Figure 27). There were also billboard signs in areas serving as major nodes in the travel network (Figure 28), while in other cases Carsonite signs had been screwed to eight inch diameter treated wooden posts to show users route numbers. Overall, managers stated during the visit that these large posts with Carsonites were a way to recycle old Carsonite signs while also installing a more robust and permanent signing regime.

Figure 26. Buck-and-rail fencing near Soapstone Basin. Fencing defines an area, but is also having issues staying in place (2013).

Figure 27. A Carsonite sign placed in an open meadow to deter use (2013).

Figure 28. A large billboard showing a map of travel routes. Signs are for OHV use in Murdock Basin (2013).

Logan Ranger District inventory and site visit results. The inventory and site visits on the Logan Ranger District (LRD) produced the greatest amount CUA documentation. The amount of documentation found is likely a direct cause of the LRD being the district where the researcher was most familiar. In addition, most preliminary research for the study was based out of Logan with more time spent in the LRD office. Therefore, more time was allotted to finding documentation of the LRD, along with more access to managers and data. Furthermore, the relationship of the LRD and Utah State University (USU) appears to have influenced the amount of documentation of CUAs on the district. Of the three documents found involving CUAs on the LRD, each document

was associated with research or course work involving USU. GPS-based data was also found for the district for 1999 and 2006. This data was also analyzed in a dispersed campsite study by Monz, Reiter, and Vance (2012). GPS-based data collected in 2006 was also accompanied by photos for many of the sites surveyed.

Pre-site visit inventory data and policy review. Policy involving CUA management for the LRD consists mainly of direction and guidance in the 2003 Revised Forest Plan. The LRD is covered in the Bear Management Area and the Cache Box Elder Management Area (USFS, 2003b). While CUA management is not specifically addressed, dispersed recreation management and future conditions for these management areas are described. Policy for the management of CUAs is also addressed in the 2012 UWCNF Recreation Strategy through descriptions of priority areas previously described in the 2003-2004 Forest Monitoring Plan (USFS, 2005; USFS, 2012).

For the Bear Management Area of the RFP, dispersed recreation activities will be managed to "keep vehicles and camping impacts within marked areas" (USFS, 2003b, p. 4-124). The impacts of dispersed recreation will also be monitored, and where threats to riparian areas exist, sites will be hardened and barriers will be constructed to "prevent unacceptable impacts" to vegetation and water quality (p. 4-124). In some areas with sensitive resources, sites may be closed to prevent impacts. Lastly, "some upland areas will be identified and hardened to accommodate increased dispersed recreation use," while other areas that are sensitive will be closed (pp. 4-125).

Desired future conditions for the Cache Box Elder Management Areas are very similar to the Bear Management Area. Dispersed recreation management on the Cache Box Elder Management Area is directed to provide "a variety of recreation opportunities

and settings" (p.4-135). In areas where "dispersed recreation is heavy or expected to become heavy" management is expected to "restore vegetation to trampled areas" near streams (p. 4-130). Other areas, such as the Sinks are identified as areas to examine "for accommodating increased dispersed recreation" (p. 4-136). Use will be monitored and managed more intensively in areas sensitive to impacts, such as riparian zones and important watershed and resource areas. Some areas may see the construction of barriers and the hardening of sites to "reduce of prevent unacceptable impacts" (p. 4-136). In some cases, upland areas will be "hardened to accommodate increased dispersed recreation" such as the Sinks area (p. 4-136). Lastly, some areas experiencing high levels of use that are sensitive will be closed. Overall enforcement will be emphasized through the management area to educate users and protect resources.

The Forest Monitoring Plan (FMP) followed up on the RFP monitoring protocol. The LRD was reported as having several areas qualifying as CUAs. CUAs were reported on six different areas of the district, with a total of 57 sites identified as groups of campsites in a general geographic location, or as parking areas and pull-offs. Heavy use is identified as occurring in CUAs named the Sinks area, Providence Canyon, Millville Canyon, Left Hand Fork of Blacksmith Fork Canyon, White Pine Lake, Green Canyon, Smithfield Canyon, and High Creek Canyon. No information on whether these areas are being managed to "provide for recreational amenities while meeting standards and guidelines for resource protection" is provided (USFS, 2004, p. 24).

Some areas identified as CUAs in the 2004 Forest Monitoring Report were later identified as priority areas for management in the UWCNF Recreation Strategy (USFS, 2012). These areas fall under two categories, "Dispersed Play" and "Neighborhood

Influence." Dispersed play areas identified as priorities include Left Hand Fork of Blacksmith Fork Canyon, and the Sinks areas, with Franklin Basin also identified as an area of concern. Dispersed play areas are to be managed for a visitor recreation experience that is "unstructured… in a defined system of roads and trails, camp locations, and portals," with infrastructure provided for "resource protection rather than user convenience." While these areas of dispersed play are not directly defined as CUAs, their descriptions for opportunities and infrastructure align with definitions of CUAs, however it is unclear how much use some of these areas are experiencing. It should be noted that these areas are heavily managed towards a motorized recreation experience as well, based on the list of objectives.

Neighborhood Influence areas include a priority area of Green Canyon to Millville Front, which includes Green Canyon, the lower portion of Logan Canyon, Logan Dry Canyon, Providence Canyon, and Millville Canyon. These areas are described as giving residents "quick access to National Forest" and are "proactively" designed with "trail systems and amenities for residents." Infrastructure for these areas is well signed and provides "easy access portals" to trails systems. A wide variety of uses are provided for in these areas, and "intensively managed for high use." Based on the more intensive management with more focus on high intensity management and infrastructure design, these areas appear to be transitioning away from the traditional sense of CUAs being undeveloped and providing resource protection rather than user convenience.

Overall, little documentation of CUA management was discovered for the LRD, but there were reports that addressed heavy dispersed use on the district. A report by Wilson (2008), describes heavy use in Providence Canyon involving a variety of uses. Target

shooting and OHV use within the Canyon are identified as uses likely impacting the canyon in a way that could be detrimental to natural resources and use experiences. Based on the impacts occurring from a variety of uses, the report recommends that active management is taken to evaluate areas for concentrated use and dispersed use. A subsequent report by Wilson (n.d) provides a management plan for Providence Canyon. The *Providence Canyon, Concentrated Use Plan*, recommends that use in the canyon be concentrated to designated travel routes through the use of fencing, and the closure of areas of high impacts to resources (Wilson, n.d.).

Another report by Monz, Reiter, and Vance (2012), uses data collected in dispersed campsite surveys from 1997 and 2006 to analyze use and impact trends on dispersed campsites on the LRD. While it is not clear if the areas surveyed in 1997 and 2006 were comprehensive, overall it appears that the number of sites in many areas increased, along with impacts including the presence of trash, human waste, damage to trees, and growth of a barren core around a centrally located fire ring. Overall these results show that continued or increased use on 237 areas of the LRD have witnessed increased impacts during the decade between data collection, especially in areas of coniferous forest and riparian zones. This implies these areas should be considered for concentrated use management strategies to help reduce resource impacts.

Another management plan was acquired detailing future plans to concentrate use on the LRD. This plan was an in-house document detailing plans to actively manage dispersed recreation in Franklin Basin. This plan generally followed a process of identifying sites that were negatively impacting the Logan River, a critical habitat for Bonneville Cutthroat Trout in northern Utah. The plan details identifying sites within the

100 feet of the riparian corridor and over 150 feet from designated dispersed use routes, and then decommissioning sites. In cases where sites are within 100 feet of the riparian corridor and 150 feet of a designated route, sites would be hardened and a boundary of barrier rock would define areas of use to provide a buffer between recreation use and the river. Barrier rock would also be placed in strategic locations to prevent trail bifurcation and the development of new campsites beyond 150 feet of routes. In some cases of cultural significance, sites would also remain open, even if beyond 150 feet of designated roads. Overall, the management plan for Franklin Basin presents management options that try to balance recreation use with the maintenance of natural resources including wildlife, vegetation, and watershed health.

Site visit observations and photos. Site visits on the LRD were limited to areas of priority on the district. An ongoing project in Left Hand Fork of Blacksmith Fork Canyon was visited to observe restoration efforts involving dispersed recreation and concentrated use. Campsites along the Left Hand Fork road had recently been moved back from stream edges and in places closed to motorized access. These areas were generally flat areas, adjacent to the Left Hand Fork stream, in areas providing some degree of overhead canopy and shade (Figure 29).

Figure 29. Left Hand Fork dispersed recreation area. Site is managed to concentrate use through using newly installed barrier rocks to limit encroachment of use on the adjacent stream (2013).

The Left Hand Fork area also sought to improve watershed conditions through site restoration. In order to limit use in the area, buck-and-rail-fence was installed in areas that may entice users to encroach on flat, riparian areas (Figure 30). In many of these cases, unauthorized motorized routes were also closed and some camp sites were pulled back from the stream's edge and only walk-in access was allowed to the stream. Sites on the opposite side of the road from the stream were left open to camping; however, impacts to trees and vegetation were evident in these areas (Figure 31). When areas were closed, they were often accompanied by a Carsonite sign displaying regulations imposed on the site (Figure 32).

Figure 30. Buck-and-rail fencing in Left Hand Fork. Fencing creates a boundary to use in a relatively flat area creating a buffer between use and the stream (2013).

Figure 31. Campsite across the road from stream. Site shows signs of tree damage and vegetation loss (2013).

Figure 32. Typical Carsonite sign showing regulation for an area (2013).

Along the lower boundary of Forest land, a trailhead had been created to allow a parking area for OHV use and cars (Figure 33). This area was later fenced with post-and-rail fencing to define a useable area away from the stream. Unauthorized OHV routes were closed using fencing and barrier rocks, and had been ripped and re-seeded (Figure 33). A prior flood plain adjacent to the stream was also restored by closing the area to use with fencing and barrier rocks, removing a berm channelizing the stream, and then ripping and reseeding the previously impacted area (Figure 34).

Figure 33. An unauthorized route. Area has been closed, ripped, and reseeded; in the background a newly developed trailhead provides areas for parking and staging (2013).

Figure 34. A previously disturbed flood plain. The area has been ripped and reseeded after restricting access to the site through the use of barrier rocks (2013).

While Left Hand Fork constitutes only one area of the LRD, use patterns for all front canyons, such as Providence and Green Canyon were observed as having very similar patterns of use. Use generally occurred in flat areas allowing relatively easy access to adjacent roads and water features when available, and were nearly always in an area providing some degree of shade. In areas where management was evident, use had usually been concentrated to an areas defined by barrier rock or wooden fencing. No sites visited, besides Gus Lind Flat in Logan Canyon, showed signs of sites being hardened through the use of crushed aggregate road base or gravel.

In some cases, evidence of vandalism to fences and signs was evident. Vandalism and damage usually consisted of fences being cut or broken by force, or damage resulting from being shot at with firearms. Most areas also showed signs for OHV use and impacts resulting from unauthorized routes. Despite some evidence of impacts from users disregarding management actions, most managed areas with boundaries to restrict use appeared to effectively limit use impacts from expanding beyond constructed barriers.

Ogden Ranger District. Ogden Ranger District (ORD) had a limited amount of data available involving CUAs and their management on the district. GPS-based collection systems were used to collect data for a 1999 survey of CUAs on the ORD. This data was collected in coordination with methods used for similar data collection on the Logan, Salt Lake, and Evanston-Mountain View ranger districts. This data is primarily concerned with dispersed campsites. In addition, desired future conditions and management of dispersed recreation was defined in the RFP (USFS, 2003b). CUAs were also identified on the district in the Forest Monitoring Plan (USFS, 2004). Some of these areas were later identified in the UWC Recreation Strategy (USFS, 2012).

Documentation was also found in the Ogden Ranger District Travel Plan Revision defining management actions for designating the Dock Flat and Dry Bread CUAs (USFS, 2006a). A site visit was conducted to observe the Dock Flat CUA.

Pre-site visit inventory data and policy review. Policy for the management of dispersed recreation and CUAs is primarily addressed in the RFP for the Wasatch-Cache National Forest, although further guidance is provided through the UWC Recreation Strategy and sites are named in the Forest Monitoring Plan. CUAs identified in GPS-based data collection show CUAs existing in two management areas of the RFP, the Cache Box Elder Management Area and the North Wasatch Ogden Valley Management Area.

Similar to the LRD, the Cache Box Elder Management Area defines desired future conditions and management for the Curtis Creek and Monte Cristo areas of the ORD. In Curtis Creek, the RFP calls for the area to "be explored for accommodating increased dispersed recreation" (USFS, 2003b, p. 4-136). However, any current or future management will "keep vehicles and camping impacts within marked areas, outside of sensitive areas, to ensure watershed and other resource protection" (p. 4-136). Barriers and hardening sites will be management techniques used to lessen "unacceptable impacts." However, opportunities for dispersed recreation will be increased through the hardening of sites in upland areas of Curtis Creek. Enforcement will also be a focus of management to ensure resource protection, while "trail opportunities, hardened sites, or other amenities will make new areas more attractive to uses, while reducing impacts" (p. 4-136).

In the North Wasatch Ogden Valley Management Areas of the ORD dispersed recreation and CUA management are described as the Monte Cristo Hinterlands, including Dry Bread area, and the Willard area, including the Dock Flat area. The Dry Bread area of the Monte Cristo Hinterlands is describe as an area of "designated dispersed overnight settings" that are managed so that "users will understand concerns for resource protection" (p. 4-148). Dock Flat is described as an area affording dispersed recreation camping. Overall, dispersed recreation within the North Wasatch Ogden Valley Management Area "will be managed to protect resources" and "opportunities for dispersed camping and parking will be clearly defined" (p. 4-147) Lastly, where dispersed recreation impacts create unsustainable resource conditions, areas "will be restored to production of vegetation and watershed protection" (p. 4-147).

The Forest Monitoring Plan reported after the first year of RFP implementation that CUAs were located on the ORD (USFS, 2004). In General Forest Areas on the district, nine general areas were identified as having 19 different CUAs consisting of campsites, pull-outs, parking areas and an "additional use" area adjacent to a river corridor (USFS, 2004). Of these areas, Dock Flat and Dry Bread are now considered priority areas for Dispersed Play in the UWC Recreation Strategy (USFS, 2012).

Dock Flat and Dry Bread areas have also been developed as designated CUAs in the Ogden Ranger District Travel Plan Revision (USFS, 2006a). The designation of Dock Flat as a CUA was a result of sustained and increased use creating degraded resource conditions, user conflict, and issues of safety (USFS, 2006a). The high amount of use in the Dock Flat Area had created a "proliferation of OHV user trails, hill climbing, and cutting of switchbacks" on the site (p. C-2). Water from a nearby stream had become

redirected onto a main travel route causing significant erosion, along with potential impacts to a nearby culinary water supply. Lastly, “a sanitation problem” was occurring in the area with excess trash and human waste often existing on site (p. C-2). To correct the issues existing at Dock Flat, USFS management implemented a plan to mitigate natural resource impacts to vegetation and watersheds, while also improving user safety and experiences. To reduce impacts, managers reworked sections of road along the Dock Flat corridor to provide a better and safer user experience, while also closing unauthorized routes and better defining authorized routes. This included the construction of new OHV trails connecting the upper portion of Dock Flat with the lower portion of Dock Flat. Toilets were also proposed at both the upper and lower Dock Flat areas. The impacted Box Elder Creek was restored to its original channel. Areas of dispersed camping were hardened with gravel, a parking area was graded and hardened, and several kiosk signs were installed at various intersections involving the CUA. Areas that were deemed unauthorized for use, were closed off with fencing, and vegetation was rehabilitated.

The CUA planning effort for Dry Bread in the Monte Cristo area was similar to Dock Flat. Suffering from overuse and the proliferation of unauthorized routes, active management was proposed to limit impacts and restore areas. Unlike Dock Flat, Dry Bread had a history of firewood cutting permitted in the area. Previous management actions had also been undertaken in 1993 to improve signage and define some areas through barrier logs. The 2006 project description called for road maintenance to improve travel ways, including both roads and ATV trails. Other unauthorized routes were closed and rehabilitated. Despite some closures to user-created routes, other routes were

constructed or authorized for ATV use in the area. Twenty-two dispersed campsites were hardened and barrier rock and fences closed off other sites. In total seven sites were closed and restored. These efforts were also signed and communicated to the public.

Overall these management actions focused on sites identified as appropriate for high use and resource impacts. Managers analyzed areas to determine what areas could remain open and what other areas needed to be closed within a defined geographic area. These decisions were based on resource impacts, established use patterns, and previous management of the areas. In cases where use was deemed acceptable in relation to its resource impact, user-created sites were incorporated into travel management plans, thereby making them authorized despite their initial creation by users rather than USFS personnel and management.

Site visit observations and photos. The site visit was conducted at Dock Flat CUA on the ORD with a manager. The site consisted of two different areas, an upper area and a lower area. These areas are connected via a forest road and an ATV trail. The purpose of developing the ATV trail was to try to lessen congestion and safety issues from ATV users solely riding on the forest road (personal communication). Use of the ATV trail had been limited to vehicles with a 50 inch wheelbase (Figure 35). This limitation has led to the deterrence of some use, including the recently introduced and popular side-by-side OHVs. Therefore, the effectiveness of designating a new travel route has been a mixed success in terms of lessening the pressure of users on the main forest road.

Figure 35. The trailhead of the Lower Dock Flat ATV trail. Metal posts were installed to restrict access to vehicles with wheelbases greater than 50 inches (2013).

Other user created routes were observed on the site, both in the upper and lower sections of Dock Flat. Some of these user created routes had been incorporated into the travel plan and were regraded and then hardened with road-base. Lower Dock Flat Road and Upper Dock Flat Road are both examples of user created routes that have been transformed into designated travel routes. Both of these routes showed evidence of extensive use. Some issues were still evident in areas, as user-created, unauthorized routes had developed since implementation of the Dock Flat travel planning effort (Figure 36). Some user-created routes were being actively managed by the recent construction of buck-and-rail fencing. Buck-and-rail fencing appeared to be deterring use

and allowing for vegetation to regrow. This was especially apparent on the lower portion of a large flat camping area (Figure 37). Some other unauthorized routes were being managed through eight inch wooden posts placed in the ground with a road closed Carsonite attached to the post. These signs were not effective in deterring use, as users appeared to be simply going around the sign (Figure 38).

Figure 36. User-created routes. These routes are still an issue in the Dock Flat CUA and require continued management (2013).

Figure 37. Buck-and-rail fencing on the lower portion of Dock Flat. Fencing has effectively deterred use from entering onto the meadow in the background (2013).

Figure 38. A Carsonite sign attached to a wooden post. Such signs are somewhat ineffective in deterring unauthorized use and impacts (2013).

Several camping areas were observed that had been hardened by placing a gravel base on top of native soils. Management conveyed that, prior to hardening, these areas had experienced significant erosion and rutting. These areas were then graded and graveled to encourage use (Figure 39). These sites appeared to be used regularly. Other user-created campsites in the Dock Flat area had been rehabilitated or left open but only with walk-in access provided beyond fencing. These walk-in sites showed limited impacts, with only a central barren core around a rock fire ring showing significant vegetation loss (Figure 40). It was also observed that there was no evidence of continued campsite proliferation. Therefore, it appears defining boundaries, hardening sites, and allowing some sites to be accessed via motor vehicles and others only by foot travel, are successful ways to manage this area for dispersed camping use.

Figure 39. A hardened campsite. This site at Dock Flat appears fairly naturalized despite the use of gravel (2013).

Figure 40. A walk-in dispersed campsite. These sites in Dock Flat CUA provide a different recreation opportunity, while also eliminating motorized impacts (2013).

Signs were installed in various parts of Dock Flat. The main camping areas had bulletin boards installed with notices to the public and educational messages (Figure 41). Meanwhile, near the large parking area, a kiosk had been installed as a main information hub of the entire site (Figure 42). The kiosk did not provide any maps for users to reference. Other signs observed were Carsonite signs attached to eight inch treated wooden posts. No visitors were observed reading the signs during the site visit, but each large bulletin board was visible from the main roadway. The Carsonite signs appeared somewhat ineffective for closing areas to motorized use.

Figure 41. A bulletin board. Placed adjacent to a road, these signs convey regulations and educational messages to the public (2013).

Figure 42. A kiosk near the main parking areas at Dock Flat (2013).

Lastly, no vaulted, pit toilets were installed on the site or trash collection bins. A crew of seasonal employees were observed removing trash from the site during the visit. This type of continued maintenance has been used on the site; however, no restroom exists on site. Management opted out of installing a restroom on site, due to long-term costs and maintenance considerations.

Overall, the Dock Flat CUA seemed to have some success in reducing impacts and providing for a wide variety of recreation opportunities. Hardened sites appeared to provide a resilient area for use, and fencing appeared to work well for defining areas appropriate for use. Despite the successes of the site, there appeared to still be a need to actively manage the areas and provide for maintenance of the site. Maintenance costs include both enforcement, clean-up and trash removal, and upkeep involving signs installed to educate the public and deter inappropriate use, respectively. The site was also in need of a map to allow users to orient themselves to the ORD and its open travel routes and camping areas.

Pleasant Grove Ranger District. The Pleasant Grove Ranger District (PGRD) had a very limited amount of data involving CUAs available prior to the district visit to interview managers. Some GPS-based data was found from 2001 that detailed some dispersed camping inventories done on the district. As PGRD was a part of the Uinta National Forest (UNF) prior to its merging with the Wasatch-Cache National Forest (WCNF) in 2007, it is managed under a different forest management plan than the Logan, Ogden, Salt Lake, Evanston-Mountain View ranger districts and Kamas portion of the Heber-Kamas Ranger District. The management plan governing the PGRD is the 2003 Land and Resource Management Plan (LRMP) for the UNF (USFS, 2003a). PGRD is

also included in the UWC Recreation Strategy. Upon visiting the district, an inventory sheet for the collection of GPS-based data was provided. A site visit up American Fork Canyon was conducted in the brief time on the district. Salamander Flat was observed as a large CUA. No other data was collected outside of the interview.

Pre-site visit inventory data and policy review. Prior to visiting PGRD, no data was obtained from a search of documents for the district; however, policy regarding the management of dispersed recreation on the district was found in the LRMP. PGRD is covered in the LRMP under management area descriptions for American Fork Management Area and Lower Provo Management Area (USFS, 2003a). In the American Fork Management Area, dispersed recreation was prescribed for 6,790 acres of land within a management area of slightly more than 58,000 acres, or 12 percent of the management area. Dispersed recreation opportunities are spread throughout the management area. Dispersed recreation use is intended to be managed actively along travel corridors in American Fork Canyon and a portion of the Alpine Scenic Loop in an attempt to reduce use conflict between motorized and non-motorized users (p. 5-19). Overall, very little information on dispersed recreation and concentrated use management is provided in the LMRP for this American Fork Management Area.

The Lower Provo Management Area provides guidance on a busy portion of the PGRD. Access to the area is provided primarily through the use of U.S. Highway 189, which runs adjacent to the Provo River. Approximately 9,980 acres or about 16 percent of the Management Area are managed under a prescription for dispersed recreation out of 63,491 total acres (USFS, 2003a). Many dispersed areas in the Lower Provo Management Area occur on side roads. Desired future conditions for the Lower Provo Management

Area are described as “active management of dispersed recreation…focused along corridors of the Alpine Loop and Cascade Scenic Backway” with some sites hardened to reduce “resource impacts from high levels of human use,” which can include “intensive vegetation management” (p. 5-82). These recreation opportunities are balanced with developed recreation and motorized, non-motorized, and backcountry opportunities.

Site visit observations and photos. The site visit on the district involved visiting Salamander Flat, a designated dispersed camping area in American Fork Canyon. Overall, the area was a large flat space with barrier rocks serving as a boundary (Figure 43). A gate was located at the entrance to the area to allow for closures when necessary. There was vault pit toilet near the entrance to the area, along with signs displaying some educational messages (Figure 44). Several trails appeared to enter the site from various points. The ground was hardened with gravel and road base in several areas. Fire rings consisted of user created rock rings. There was some evidence of fire rings within the boundary area that had been dispersed; while many fire rings where located outside of the area defined by barrier rock. Only walk-in access was allowed to these sites (Figure 45). These areas usually included some trees and shade. The trees and shade outside the boundary rocks appeared a draw for users, despite the large open areas available for use. Areas adjacent to boundary rocks showed vegetation impacts and soils compaction. Arid conditions on the site and intense use had led to soils being pulverized to the point of fine dust. Roads were fairly visible despite overall hardening efforts within the area, which had left large areas fairly void of vegetation.

Figure 43. Salamander Flat. A large, flat area provided for dispersed camping and recreation (2013).

Figure 44. A vaulted pit toilet at Salamander Flat. Feature is provided to help manage sanitation conditions (2013).

Figure 45. A shady area beyond barrier rocks. This area provides walk-in opportunities for users at Salamander Flat (2013).

Overall, Salamander Flat appears to function as a designated area for dispersed recreation. The barrier rocks provided a boundary to limit motorized travel, while the flat areas allowed space for trailers and groups for recreationists to gather and enjoy scenic views. While not much use was observed during the visit, the area appeared heavily used and well maintained. Because of the amount of use occurring in walk-in areas, the designated trails entering the area were difficult to discern, which could lead to some issues involving the legibility of the site, user satisfaction, and navigation of trails. Better signing and a map of the area at key nodes within the site could resolve this issue.

Salt Lake Ranger District. Pre-site visit inventory and data collection for the Salt Lake Ranger District (SLRD) revealed very little data in terms of management plans for the district. GPS-based data was found for CUAs as part of inventory effort from 2006 and 2008. Policy information and management guidance was found in the 2003 RFP for the WCNF (USFS, 2003b). Along with follow-up information coming from the FMP (USFS, 2004), and the UWCNF Recreation Strategy (USFS, 2012). No management plans specific to CUAs were obtained prior to or during the site visit. A one day site visit was conducted during July 2013, and included visiting sites along Skyline Drive. The Skyline Drive observations were conducted with seasonal dispersed recreation staff.

Pre-site visit inventory data and policy review. Most guidance on policy implementation comes from the RFP. SLRD is part of three management areas within the RFP, the North Wasatch Ogden Valley Management Area, the Central Wasatch Management Area and the Stansbury Management Area (USFS, 2003b). The descriptions for desired future conditions of use and management on the Central Wasatch Management Area provide little guidance involving dispersed recreation, thereby giving the impression that dispersed recreation is not a management or use-type on this portion of the UWCNF. This lack of guidance may be due to the area's topography and high use not allowing a dispersed recreation experience. Furthermore, the area is primarily managed to preserve watershed quality for the surrounding population centers, and therefore, uses that are somewhat unmanaged in nature are not encouraged.

The North Wasatch Ogden Valley Management Area contains opportunities for dispersed recreation and CUA management. Skyline Drive from Ward Canyon to

Farmington Canyon is "managed for dispersed recreation anticipating increased demands while protecting resource values" (USFS, 2003b, p. 4-147). In addition, particular attention will be directed toward preserving the area's scenic values while still allowing dispersed recreation uses. As with other dispersed recreation areas and CUAs in the Management Area, use will be managed to protect resources through defining areas for parking and dispersed camping. No specifics on materials or design standards are given besides resource protection through defining areas to concentrate use.

The Stansbury Management Area is the other part of the district that is managed specifically for dispersed recreation opportunities. The RFP provides the most direction on how this area will be managed. Three areas, Davenport, North Willow, and South Willow will all be managed for dispersed recreation.

In Davenport unauthorized routes will be closed and signed to keep use concentrated on main travelways (USFS, 2003b). Dispersed camping "will be primarily designated dispersed where camping is allowed just off the road," while areas considered riparian "will be managed to allow recreation access to hardened points" to keep vegetation from being overly impacted (p. 171). Growth in this area will be "least accommodated" (p. 171).

North Willow Creek will be managed to close and restore sites along the creek. Dispersed camping management in North Willow will "provide designated dispersed sites" (p. 4-172). North Willow is also deemed the most compatible area for "future dispersed growth." To manage the impacts associated with dispersed use and growth, "increased management presence and hardening of sites" will be undertaken and users

will be educated on designated areas and how use impacts can be reduced through their "actions" (p. 4-172).

South Willow Creek will have camping in "designated sites only," and dispersed camping will no longer be allowed (p. 4-172). There will be a trailhead developed as a fee area, which will accommodate horses and ATV parking. As with North Willow and Davenport, protection of riparian areas will be provided by hardening locations and keeping use from impacting vegetation. The rest of the Stansbury Management Area will have some dispersed opportunities for recreation, and will be managed reduce impacts "through modification and delineation of travel routes and trailhead improvement" (p. 4-172).

The FMP (USFS, 2004) describes SLRD as having six General Forest Areas with CUAs present. In all, fifty-one CUAs are reported as existing within the district. These areas include parking areas, dispersed campsites, climbing areas, and various lakes and scenic overlook areas. One noticeable feature of this data is that it shows CUAs in areas within the Central Wasatch Management Area, although dispersed recreation management is not included in the RFP for this management area. This suggests that CUAs also exist in areas perhaps not considered for dispersed recreation management.

The UWC Recreation Strategy provides guidance on which areas containing CUAs should be prioritized for management. Within a Dispersed Play setting, areas along the Davis County Front, along with areas along the Skyline Drive road, are considered priorities. Within a Neighborhood Influence setting, the Davis County Front and the Salt Lake County Wasatch Front are described as areas of priority. There is no mention for recreation on the Stansbury Management Area being a priority for management on the

UWCNF. No clarification for this reasoning is given, despite the attention paid to the area in the RFP.

Site visit observations and photos. The Davis County Front and the Skyline Drive road were visited in July 2013, with a dispersed recreation crew from the SLRD. Management of this area generally consists of a weekend patrol by seasonal employees, who pick up trash, survey and repair buck-and-rail fence and signs, and communicate to the public federal regulations and Leave No Trace principals. CUAs on the Skyline Drive portion of SLRD consisted mostly of dispersed campsites in flat, accessible, high elevation, and shady areas off of main travel routes (Figure 46). Some routes also provided views of Salt Lake Valley in the distance. In addition, some unauthorized routes adjacent to travel routes were closed. The primary methods used were barrier rocks and buck-and-rail fencing. Buck-and-rail fencing was usually wrapped on smooth, tri-band fencing wire to deter forest visitors from cutting and removing the fencing (Figure 47). This was clarified by crew members as being a fairly successful deterrent of vandalism.

Figure 46. A dispersed campsite. Such sites are common CUAs along Skyline Drive on the SLRD (2013).

Figure 47. A buck-and-rail fence wrapped with smooth, two-wire, twisted fencing wire. Wire is wrapped around bucks and rails to deter vandalism (2013).

The Davis Front area was somewhat different from the higher elevation areas. These areas appeared drier and were often bordering neighborhoods. While no camping was observed in these areas, there was substantial trash visible in addition to green waste that had been dumped. Most use occurring in the Davis Front area consisted of a variety of braided trails created by users. In some areas ATV and motorcycle use has created hill climb areas on steep slopes (Figure 48). These motorized user-created trails showed the most impacts to vegetation and soils, with bare and eroded areas existing in many places (Figure 49). In some areas, these impacts were quite extreme.

Figure 48. A hill climb area on the SLRD shows vegetation impacts and soil erosion (2013).

Figure 49. Loss of vegetation in an off-road area. Off-road use has led to substantial erosion of soils on the SLRD (2013).

Spanish Fork Ranger District. Relatively little data was found for the Spanish Fork Ranger District (SFRD) prior to the site visit and interview with managers. GPS-based data was found from two surveys in 1998 and 2001. This data represented dispersed campsites found on various parts of the district, but appeared to be non-comprehensive. Policy information and management guidance was found in the UNF LRMP (USFS, 2003a). Additional information was gathered from the UWCNF Recreation Strategy (USFS, 2012). No additional data or site management plans were obtained during the site visit and interview process.

Pre-site visit inventory data and policy review. No management plans for CUAs or dispersed recreation were obtained prior to the site visit to SFRD. SFRD dispersed recreation desired future conditions and management are defined in the LRMP (USFS, 2003a) with some additional prioritization of areas provided in the UWC Recreation Strategy (USFS, 2012).

The LRMP provides the majority of guidance involving dispersed recreation on the SFRD. There are nine management areas with reference to dispersed recreation management. Diamond Fork Management Area, Hobble Creek Management Area, Nephi Management Area, Payson Management Area, Thistle Management Area, and the Upper Spanish Fork Canyon Management Area are areas with the largest opportunity for dispersed recreation on the district (USFS, 2003a). Vernon Management Area, White River Management Area, and the Mona Management Area allow dispersed recreation, but have little direction on management of dispersed recreation within these areas.

Diamond Fork Management Area contains 8,760 acres of land managed for dispersed recreation opportunities, or about nine percent of the management area.

Dispersed recreation areas in adjacent to the Diamond Fork/Halls Fork Road and Wanrhodes drainage are "managed intensively" for dispersed recreation (p.5-56). Campsites in these areas are to be "hardened and designated for use as necessary" to recreation opportunities while also deterring resource damage to riparian areas (p. 5-56). Motorized and non-motorized trails are also provided for public use.

Hobble Creek Management Area provides 2,320 acres of land managed for dispersed recreation opportunities, or about three percent of the management area. Management of the Right Fork Hobble Creek corridor "is actively managed," although dispersed recreation occurs elsewhere on the management area (USFS, 2003a, p. 5-68). There is no direction calling for the modification of sites within this management area. However, management of the Right Fork Hobble Creek area is intended to be managed in coordination with the Diamond Fork Management Area, as these two areas create a loop system of motorized and non-motorized roads and trails.

Nephi Management Area provides 6,390 acres of dispersed recreation settings, or about twenty percent of the Management Area. Within this area of dispersed recreation opportunities, there exists only one "highly-used dispersed camping site and a variety of trails for hiking, mountain biking, and horseback riding" (p. 5-102). No management direction is provided for how dispersed areas will be managed.

The Payson Management Area offers 5,990 acres, or about seventeen percent of the management area, of dispersed recreation opportunities for the SFRD. One area south of the Bennie Creek trailhead is identified as an area for dispersed camping within the management area. Despite the existence of the dispersed camping area, no site

modifications for the management area are provided in the LRMP, and concentration of use is not discussed.

The Thistle Management Area provides 5,370 acres of dispersed recreation opportunities within the Management Area. Dispersed recreation accounts for about fifteen percent of the management area. Desired future conditions call for dispersed campsites occurring adjacent to the Mount Nebo National Scenic Byway to be "hardened and signed to concentrated use and reduce impacts to other resources" (p. 5-139). Furthermore, trails "may be constructed to accommodate appropriate use consistent with resource needs and public demand." These management actions can also be coupled with increased "recreational facilities" (p. 5-140). Increased demand and resource needs will determine the extent that designed facilities or improved areas will be implemented. Based on the fact this area borders the Mona, Nephi and Payson management areas, it seems increase of management directives indicates that the Thistle Management Area may sustain higher use, and be of more importance to managers.

The Upper Spanish Fork Canyon Management Area offers 4,350 acres of dispersed recreation opportunities. The dispersed recreation acreage is equivalent to about ten percent of the management area's total acreage. This area is generally used by "local residents" for "general dispersed recreation including fishing, hiking, driving for pleasure, and general wildlife viewing" and hunting (p. 5-161). Desired future conditions for the area includes hardening sites to defend vegetation and soil from impacts "along road corridors" with areas outside corridors still providing opportunities (p. 5-162). The greater amount of description for this management area compared to others could possible denote this area as one of greater importance to management and recreationists.

In the remaining Vernon, White River, West Sheeprock, and Mona management areas, dispersed recreation is a recreation opportunity for the areas. However, there is no direction for managing these areas intensively. This may denote that despite use occurring in these areas, it is not being managed or is not substantial enough to require management.

Recreation Strategy provides little insight into the prioritization and management of CUAs and dispersed recreation on the SFRD. Only three areas associated with the SFRD area identified for priority management. The Mount Nebo Scenic Byway is described as a "Scenic Travelway," which calls for management to prioritize areas for management to protect resources through providing appropriate infrastructure, opportunities, and education. The Vernon area is defined as Dispersed Play priority area for the months of March-May. In addition, the Springville to Mapleton Front is defined as a Neighborhood Influence priority area. Despite designating these areas as priorities, no action items for the management of these areas are identified within the Recreation strategy.

Site visit observations and photos. The site visit to SFRD consisted of camping overnight at a designated CUA, Sheep Creek Camping Area. Another day was spent driving along forest roads to observe various dispersed recreation areas and CUAs, including the Unicorn Ridge designated dispersed camping area. This Sheep Creek area was recommended by recreation staff on the district as an example of CUA management.

The Sheep Creek Camping Area is located off Sheep Creek Road, near U.S. Highway 6 up Spanish Fork Canyon. This area is a large dispersed area nearly eight acres in size that is defined by steep topography near the road, and then a large, flat area that is

fenced around the remaining perimeter with post-and-rail fencing (Figure 50). Main access route to the area ran on an x-y axis running southwest to northeast. These access roads had been hardened with a crushed aggregate road base to provide a more durable surface. Topography was relatively flat and suitable in many places for camping with a trailer or a tent. Very few trees existed on the site, so little shade was available. Access to ATV trails was identified on the site, with main access to the trails existing in the southwest and northwest corners of the site. The ATV trails used a separate trail running along the western edge of the fence (Figure 51). The camping area also included signage in the form of Carsonite signs denoting appropriate trail uses, and a three paneled bulletin board provides a map of the area and some educational messages from the Forest Service (Figure 52). In front of the bulletin board, barrier rocks had been placed to prevent motorized vehicles from hitting into the sign. Another observation of the site was a trailer located on the site. No one occupied the trailer during the night spent in the camping area. It is speculated by the researcher that the trailer was reserving a camp spot for the upcoming weekend.

Figure 50. The Sheep Creek Camping Area on SFRD. This area provides a relatively large and flat area for dispersed camping (2013).

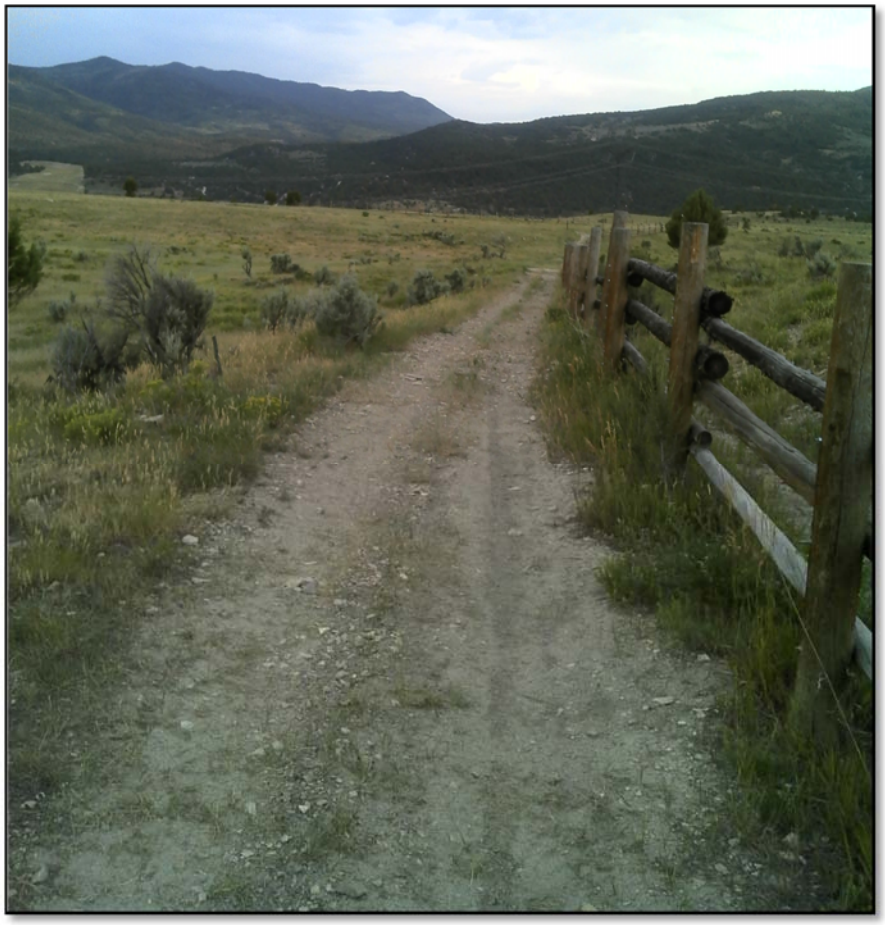


Figure 51. An ATV trail connects to a CUA. This trail runs along the inside of a post-and-rail fence bordering the Sheep Creek Camping Area (2013).

Figure 52. A three-paneled bulletin board. This sign at Sheep Creek Camping Area provides users information, including maps and some educational materials on forest regulations (2013).

Appendix D. GIS Analysis of GPS-Based Data by District

Evanston-Mountain View Ranger District. GPS-based data for the EMVRD was collected during 2008 using methods in the CUA Data Dictionary (see Appendix B) for the WCNF and a Trimble GPS unit. The GPS unit model type was unclear. A total number of 759 CUAs (n=759) were documented on the district. These CUAs were generally dispersed campsites, although primary use characteristics were not captured in the data dictionary.

Several landscape features, such as lakes, streams, slope, vegetation height, vegetation cover, slope aspect, and elevation appeared to correspond with the location of CUAs on the EMVRD. The majority, or 68%, of CUAs were located within a half mile of a lake on the district, with 41% of CUAs occurring within a quarter mile of a lake. CUAs within a quarter mile of a stream accounted for 82% of the total number of sites, while 32% of CUAs were within 300 feet of a stream. Slope was a significant factor describing CUA locations, with areas under ten percent in slope, containing 95% of all CUAs on the EMRD. 70% of all CUAs existed in areas with slopes under five percent. Slope aspect was found to be influential for CUA locations, with the majority of sites (58%) occurring in areas experiencing partial afternoon shade, such as north, northeast, and east facing aspects. However, vegetation with potential to provide shade was even a more correlative factor with 70% of CUAs occurring in areas with tree cover between 20-70% and vegetation heights of 5-50 meters. The majority of CUAs (60%) were found at higher elevations of 9000-10,000 feet. Proximity to springs did not appear a significant factor in the location of CUAs, as 89% of sites were over a half mile from a spring.

Built environment features also influenced location of CUAs on the EMRD. Nearly 95% of all CUAs were found within 300 feet of a road on the district, while 80%

of CUAs occurred in areas within 150 feet of a road. These findings indicate that access to these areas by road is a very influential component of their establishment. However, location of developed recreation sites did not seem to result in CUAs occurring close to developed recreation sites. Nearly 77% of all CUAs on the EMVRD were found over a mile away from any developed recreation site. This implies that users seeking these areas are not choosing areas close to recreation facilities, such as campgrounds and bathrooms, or that suitable dispersed recreation areas do not exist near developed recreation facilities. Charts of these findings can be found in Appendix C.

Heber-Kamas Ranger District. GPS-based data for the HKRD was collected using from 2009-2010 using a Garmin GPS unit. The GPS unit model type was not discernable from collected GPS data. A total number of 5617 CUAs (n=5617) were surveyed on the district using the HKRD dispersed campsite survey (see Appendix B). These CUAs generally consisted of dispersed campsites, although differentiation of camping type (trailer, car, tent, etc.) was not found.

CUAs on the HKRD corresponded with proximity to natural landscape features and settings. Streams appeared within a quarter mile of 69% of CUAs on the district, with slightly over 29% of CUAs within 300 feet of a stream. Lakes also showed correspondence to CUA locations; 65% of CUA were located within a half mile of a lake, however only about 10% CUAs were within 300 feet of a lake. Slope also corresponded with the locations of CUAs, with 87% of CUAs located in areas with slopes under ten percent grade and 48% of CUAs in locations with under five percent grade. CUAs, when considered within the context of slope aspect on the district, showed 47% of sites in locations facing the southeast, south and southwest. This may be a preference of campers,

or it could be a result of most sites being located on the south slope of the Uinta Mountains. Elevation also appeared to influence location of CUAs with nearly 50% of CUAs located at an elevation of 9,000-10,000 feet. 78% of sites were located at elevations of 8,000-10,000 feet. There was a strong correspondence between sites and vegetation height and cover. 68% of all CUAs on the district were located in areas with forest heights of 5-50 meters. Vegetation cover consisting of 20-60 percent tree cover corresponded with 62% of CUAs on the district.

When looking at built features on the HKRD, 82% of all sites were found within 300 feet of a road, with 62% of CUAs within 150 feet of a road. This result shows that access is an influential factor in site establishment. Proximity to developed recreation facilities, such as restrooms and campgrounds, was less of a factor when determining locations of CUAs since nearly 55% of all CUA were over one mile from a developed recreation site. This shows that proximity to recreation facilities could be more important on this district than on others, or that the HKRD has a higher concentration of developed recreation sites on their district. Charts showing more detailed results can be found in Appendix C.

Logan Ranger District. GPS-based data for the LRD was found for years 1999 and 2006. Both 1999 and 2006 data was collected using methods in the CUA Data Dictionary for the WCNF and Trimble GeoExplorer 3 and a Trimble Geo-XM GPS units, respectively. The sites surveyed were generally dispersed campsites. To reduce the likelihood of double counting data from multiple years, ArcMap 10.2 GIS software was used to remove sites suspected of being counted twice. This was accomplished using the "select by location" tool to select and remove all 1999 CUA data points within a 3 meter

distance of 2006 CUA data points. This process resulted in 886 CUAs (n=886) being identified on the LRD.

Several landscape features were found to correspond with locations of CUAs on the LRD. Slope, vegetation cover, vegetation height, elevation, slope aspect and proximity to streams were features that corresponded with a greater percentage of CUAs on the district. Sixty-two percent of CUAs on the LRD were located within 300 feet of streams on the district, with 50% occurring within 150 feet of streams. Areas with slope grades of 0-10 percent contained 81% of CUAs, with 46% of sites occurring in areas with grades under five percent. Elevations of 5,000-7,000 feet contained 56% of CUAs; however elevations from 5,000-6,000 contained 39% of all CUAs on the LRD. Slope aspect revealed a more dispersed pattern of CUA distribution throughout the LRD, with east, southeast, south, southwest, and west facing aspects containing 75% of sites. Fifty-eight percent of CUAs were located in areas with 20-60 percent tree cover. Areas with forest vegetation heights of 5-50 meters contained 59% of CUAs on the district. However, unlike some other districts proximity to lakes did not show strong correspondence to CUA locations, with 74% of CUAs located more than a half mile from a lake. Analysis of CUA proximity to springs also showed that 75% of CUAs were located more than a half mile from a spring.

Built environment features also corresponded with the location of CUAs on the LRD. Eighty-three percent of CUAs on the LRD were within 300 feet of a road, while 63% were within 150 feet of a road. This indicates that access has some influence on were CUAs occur. Proximity of CUAs to developed recreation sites did not appear to be

a draw with 60% of CUAs being over one mile from a developed recreation site, such as campgrounds and toilets. Further details of these findings can be found in Appendix C.

Ogden Ranger District. GPS-based data for the ORD was collected during 1999, using methods in the CUA Data Dictionary for the WCNF and Trimble GeoExplorer 3. A total number of 323 CUAs (n=323) were inventoried on the ORD. These CUAs are primarily composed of dispersed campsites, although type of camping (trailer, car, tent, etc.) is not described.

Several landscape features, such as slope, vegetation cover, vegetation height, elevation, and proximity to streams correspond to CUA locations on the ORD. Eighty-two percent of CUAs are located within a quarter mile of a stream, with 32 % of CUAs located within 150 feet of a stream. Areas with slope grades of 0-10 percent contained 81% of CUAs, with 36% of CUAs located on slopes under five percent in grade. The majority of CUAs (51%) were located at an elevation of 8,000-9,000 feet. Sixty-eight percent of CUAs were located in areas with 20-60 percent tree cover. Seventy percent of CUAs were located in areas with forest vegetation at heights of 5-50 meters. Some characteristics, such as slope aspect, proximity to lakes and springs, did not seem to be factors closely associated with CUA locations on the ORD. CUAs were fairly evenly distributed through all slope aspects, with west and southwest facing aspects seeing the least amount of CUAs. Seventy-four percent and 71% of CUAs were more than a quarter mile from a spring or a lake, respectively.

Built environment features also correspond to CUA locations on the ORD. Eighty-one percent of CUAs were within 300 feet of a road, with 67% being within 150 feet. However, proximity to developed recreation sites was not a characteristic of most

CUAs, with 67% of CUAs located more than one mile from developed recreation areas. Further details regarding CUAs can be found in charts in Appendix C.

Pleasant Grove Ranger District. GPS-based data for PGRD was collected over several different years. One group of data found was from 2001, 2002, and 2004. Other data was from a group of data from 2011-2012. These data points were merged and redundancies removed using an ArcGIS selection by location process as describe in the Logan Ranger District section above. Types of GPS units used for the collection of data was unclear for the 2001-2004 data, while 2011-2012 data was collected using a Garmin GPS unit, although the model type was not provided. Approximately 342 CUAs (n=342) had been surveyed on the PGRD as of 2012. Generally, these sites were considered dispersed campsites, with a mixture of RV and tent camping occurring.

Several landscape features investigated corresponded to the location of CUAs on PGRD. Proximity to streams, slope aspect, slope, elevation, vegetation cover, and vegetation height all appeared to be factors influencing location of CUAs. Eighty-nine percent of CUAs were found to be within a quarter mile of a stream, while 45% of CUAs were within 300 feet of a stream. Slope aspects of northwest, west, south and southeast corresponded to 23%, 19%, 15% and 13% of sites on the district, respectively; or about 70% of CUAs. Fifty-nine percent of CUAs were found in locations with slope grades between 0-10 percent, with 39% of sites occurring in areas of 5-10% grade. Elevation of 7,000-9,000 feet contained 84% of CUAs on the district, with 59% of those sites occurring at elevations of 7,000-8,000 feet. Areas with tree cover of 20-60 percent contained 69% of CUAs on the PGRD, with 37% of sites occurring in areas with 50-60 percent tree cover. Forest vegetation heights of 5-25 meters corresponded to 73% of

CUAs, with 58% of sites occurring in areas with 10-25 meter forest heights. Proximity to lakes and springs did not appear to be a factor in the location of CUAs on the PGRD, with 77% and 61% of CUAs occurring in areas more than a half mile from these features, respectively.

Built environment features appeared to be an influencing factor in determining the locations of CUAs on the PGRD. Sixty-eight percent of CUAs were located with 300 feet of a road, with 45% of sites occurring within 150 feet of a road. Unlike other districts, proximity to developed recreation sites corresponded to CUAs' locations. Eighty percent of CUAs were located within one mile of a developed recreation site, with 43% of CUAs occurring in areas less than a quarter mile from a developed recreation site. Further details of these finding can be found in Appendix C.

Salt Lake Ranger District. GPS-based data for the SLRD was collected in 2006 and 2008 using CUA Data Dictionary for the WCNF. A Trimble GeoXM GPS unit was used to collect data. Data was collected for 246 CUAs (n=246), with sites composed primarily of dispersed campsites. Primary mode of camping (trailer, car, tent, etc.) was not reported.

Several landscape features were found to correspond with locations of CUAs. Slope, elevation, vegetation cover, vegetation height, and proximity to streams all had correspondence with CUA locations. Seventy-six percent of CUAs were found to within a quarter mile of a stream, with 37% of sites located within 300 feet of stream. Areas with slopes of 0-10 percent contained 63% of all CUAs surveyed on the SLRD. Elevations of 6,000-9,000 were found to contain 93% of all CUAs, with a fairly equal distribution of sites occurring at intervals of 1000 feet, i.e. 6,000-7,000. Areas with tree

cover of 20-60 percent accounted for 62% of CUAs, while areas with vegetation heights for forests of 5-25 meters contained 64% of all sites. Proximity to lakes and springs did not seem a factors for the majority of CUAs, with 88% and 65% of CUAs existing over a half a mile from these features, respectively. CUAs were found to be distributed fairly evenly between various slope aspects on the SLRD as well.

Built environment features appeared to also correspond with the location of CUAs on the SLRD. Seventy-five percent of CUAs were located within 300 feet of a road, with 63% occurring with 150 feet of road. Fifty-six percent of CUAs were also found to be within a mile of a developed recreation site on the district, such as a toilet, trailhead, to campground. Nineteen percent of CUAs occurred within a quarter mile of developed recreation facilities. Further details of these findings can be found in Appendix C.

Spanish Fork Ranger District. GPS-based data for the SFRD was collected in 1998 and 2001, although methods and the type of GPS unit used for data collection were not found. A total of 389 CUAs (n=389) were surveyed on the district; although, metadata from ArcGIS layers revealed that this survey was incomplete and varied in methods. CUAs surveyed consisted of dispersed campsites.

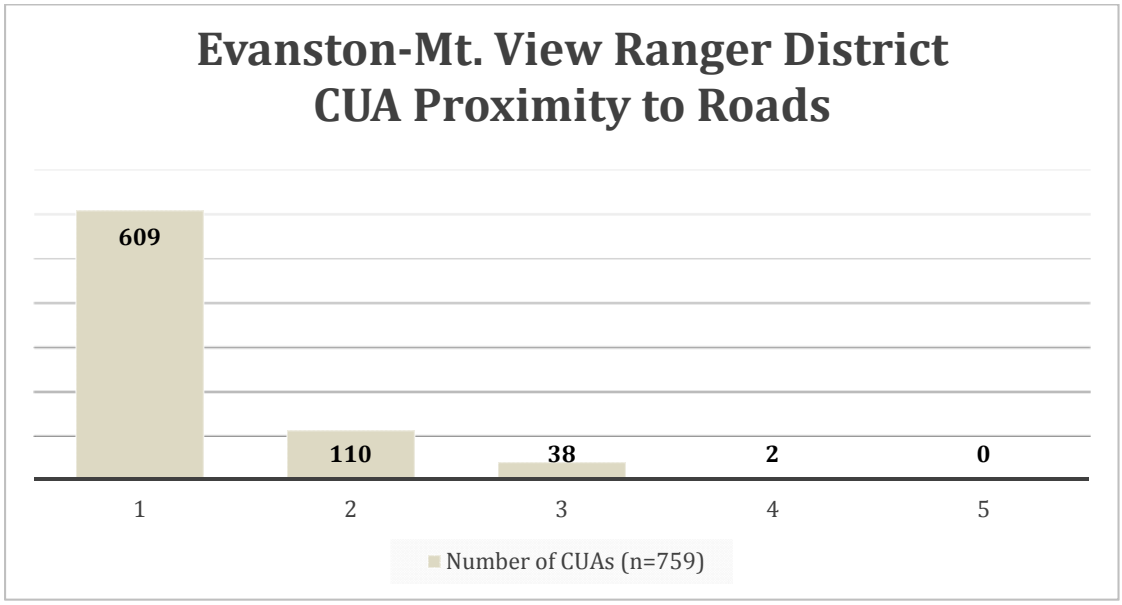
Several landscape features were found in correspondence with CUA locations. Slope, proximity to streams, elevation, and vegetation cover and height attributes showed some connection to CUA locations. Seventy-nine percent of all CUAs on the SFRD were found within a quarter mile of a stream, with 43% of CUAs located within 150 feet of a stream. Slopes of 0-10 percent grades accounted for 74% of all sites, with 30% of CUAs found in areas under five percent in grade. Elevations of 5,000-7,000 feet contained 54% of all CUAs, while 38% of CUAs were found at 6,000-7,000 feet in elevation. Two

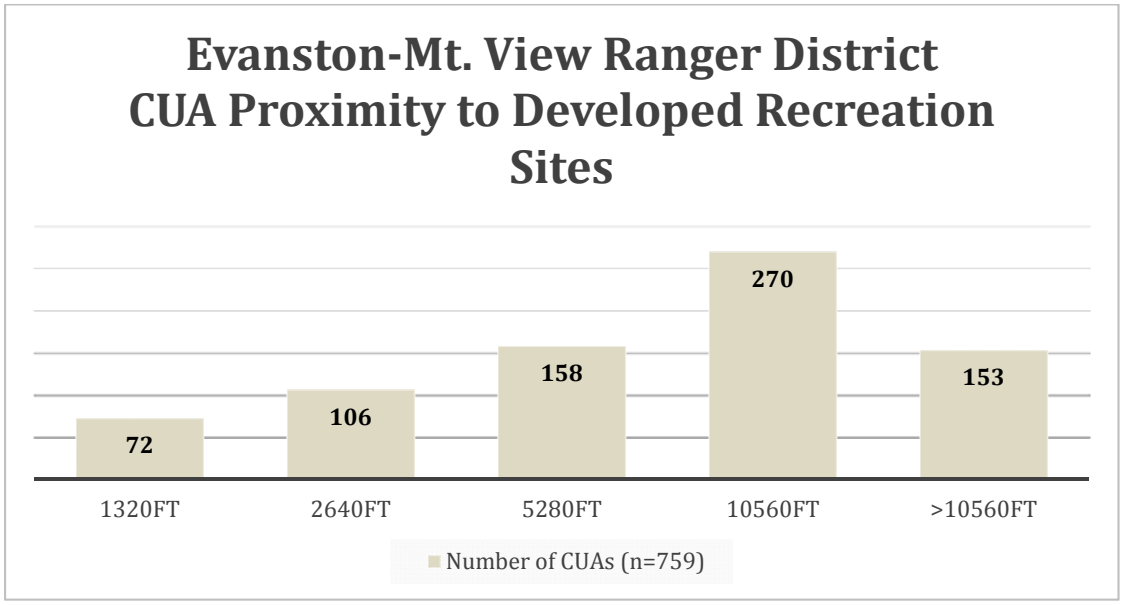
categories of vegetation cover were found to correspond with CUA locations, as 31% of sites were located in areas with 20-60 percent tree cover, while 30% of CUAs were located in area of 20-40 percent shrub cover. Vegetation height also has two major corresponding characteristics, with areas of 5-25 meter forests accounting for 30% of CUAs, and areas with shrub heights of 0.05-3 meters consisting of 31% of sites. Proximity to lakes and spring were not found to correspond to CUA locations, as 89% and 74% of CUAs were located over a half mile from each feature, respectively. Slope aspect was also found to not be a factor, as CUAs were distributed fairly evenly across all aspects within the SFRD.

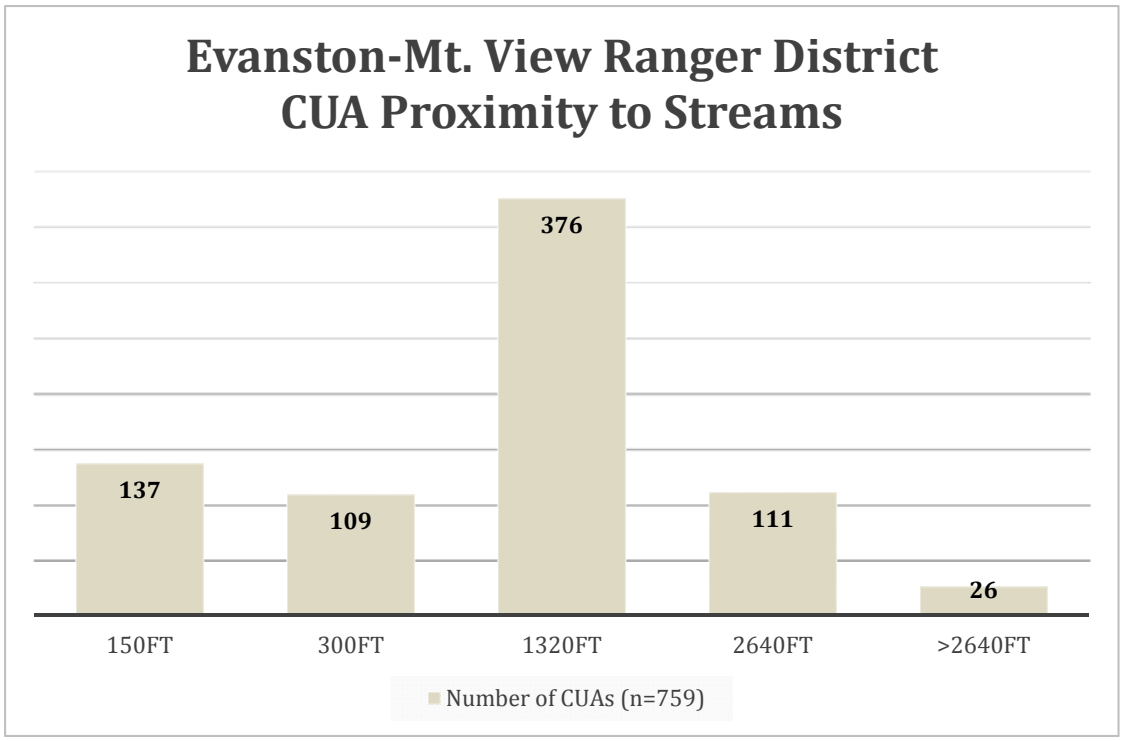
Built environment features also corresponded with CUA locations. Ninety-two percent of CUAs were located within a 300 feet of a road, with 80% of CUAs found within 150 feet of a road. Developed recreation facilities also showed some relation to CUAs with 65% of sites found within a one mile of a developed recreation areas, and 25% of CUAs were located within a quarter mile of a developed recreation area. More details of these results can be found as charts in Appendix E.

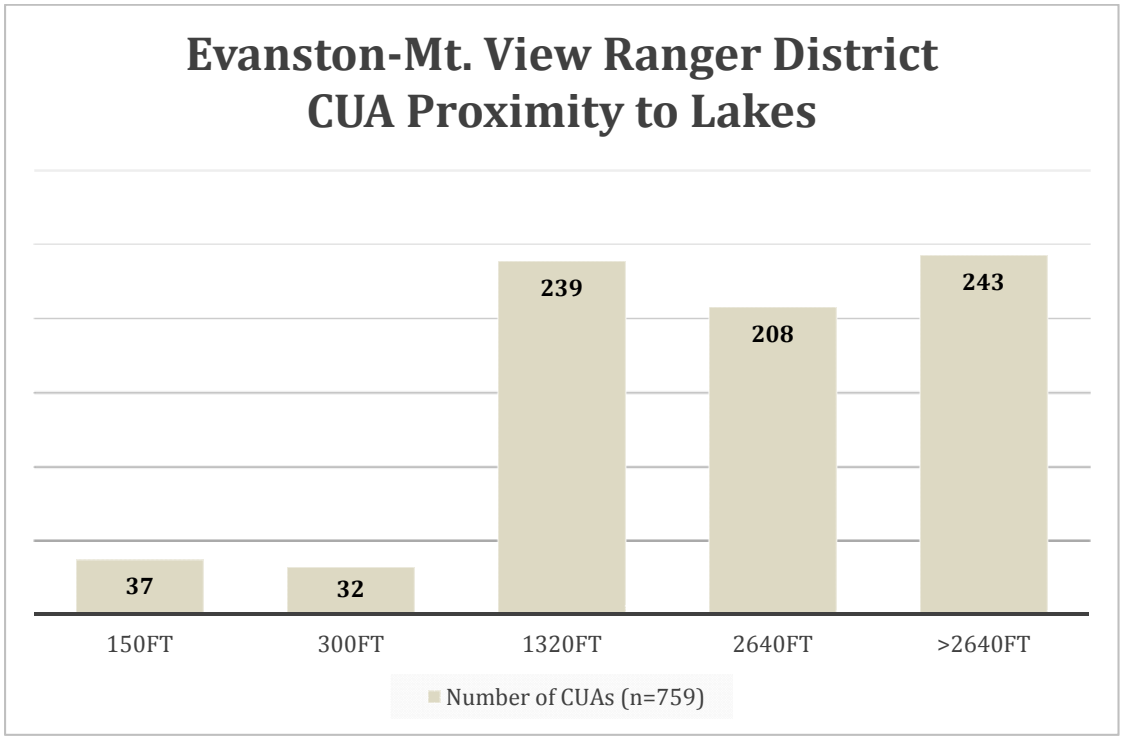
Appendix E. Charts of CUA locations in relation to landscape and built environment features.

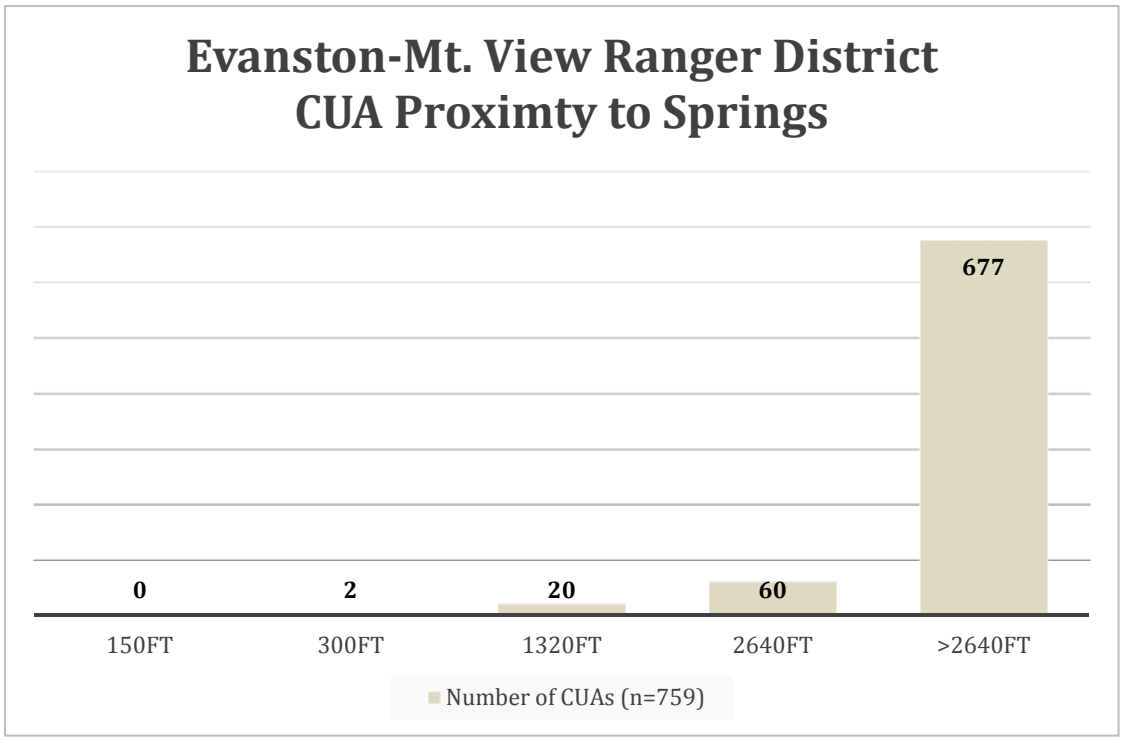
Evanston-Mountain View Ranger District.

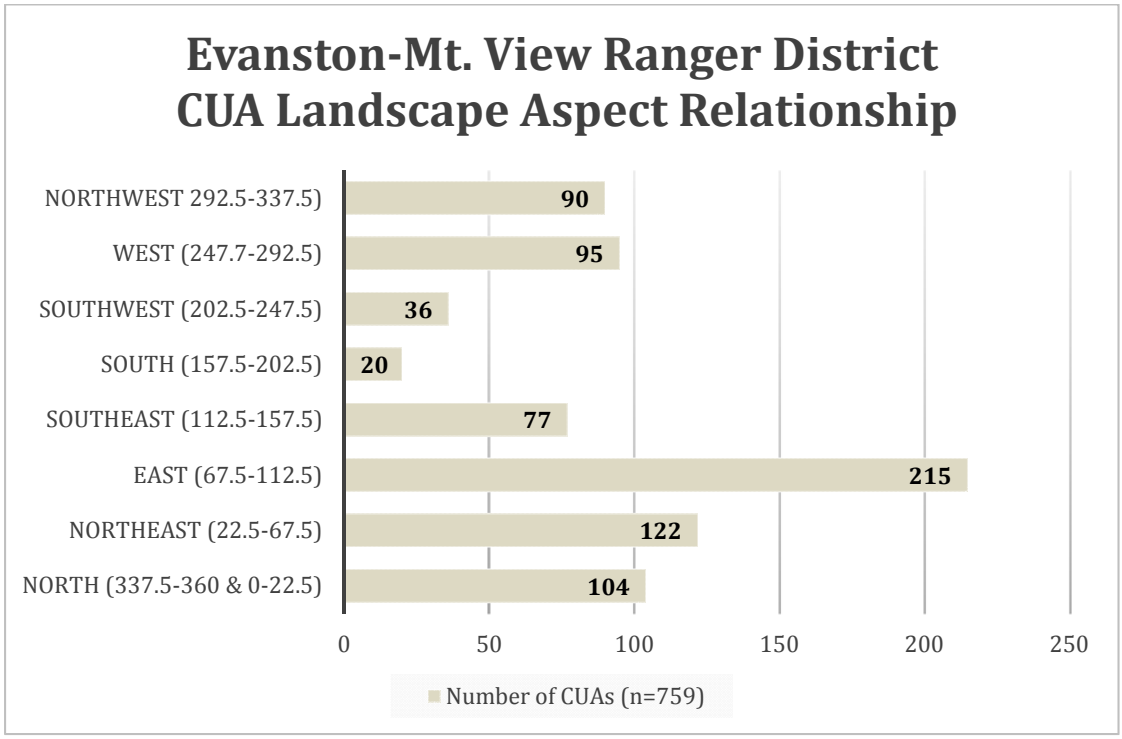


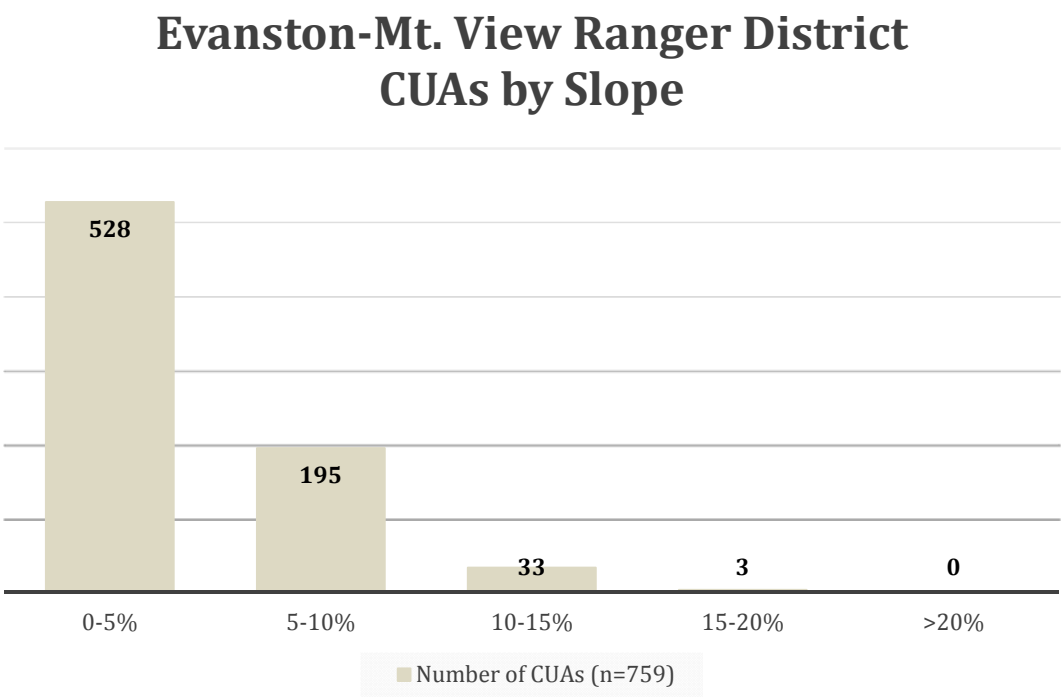


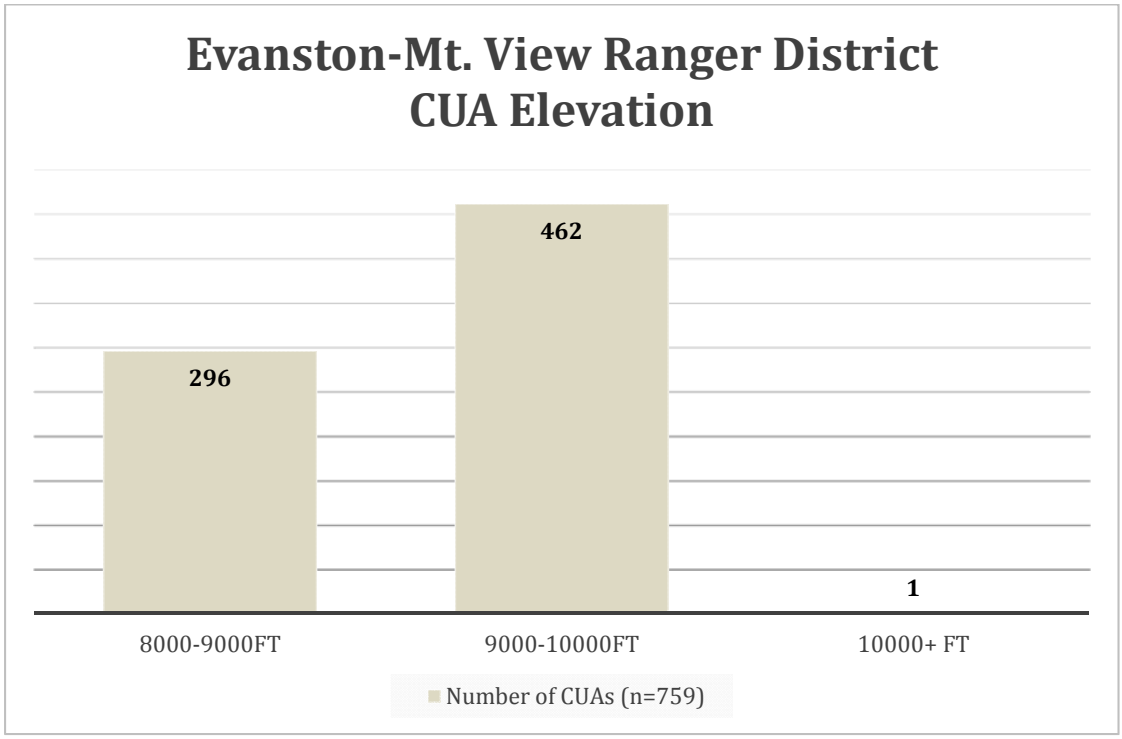

Evanston-Mt. View Ranger District
CUA Proximity to Streams
137
109
376
111
26
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=759)

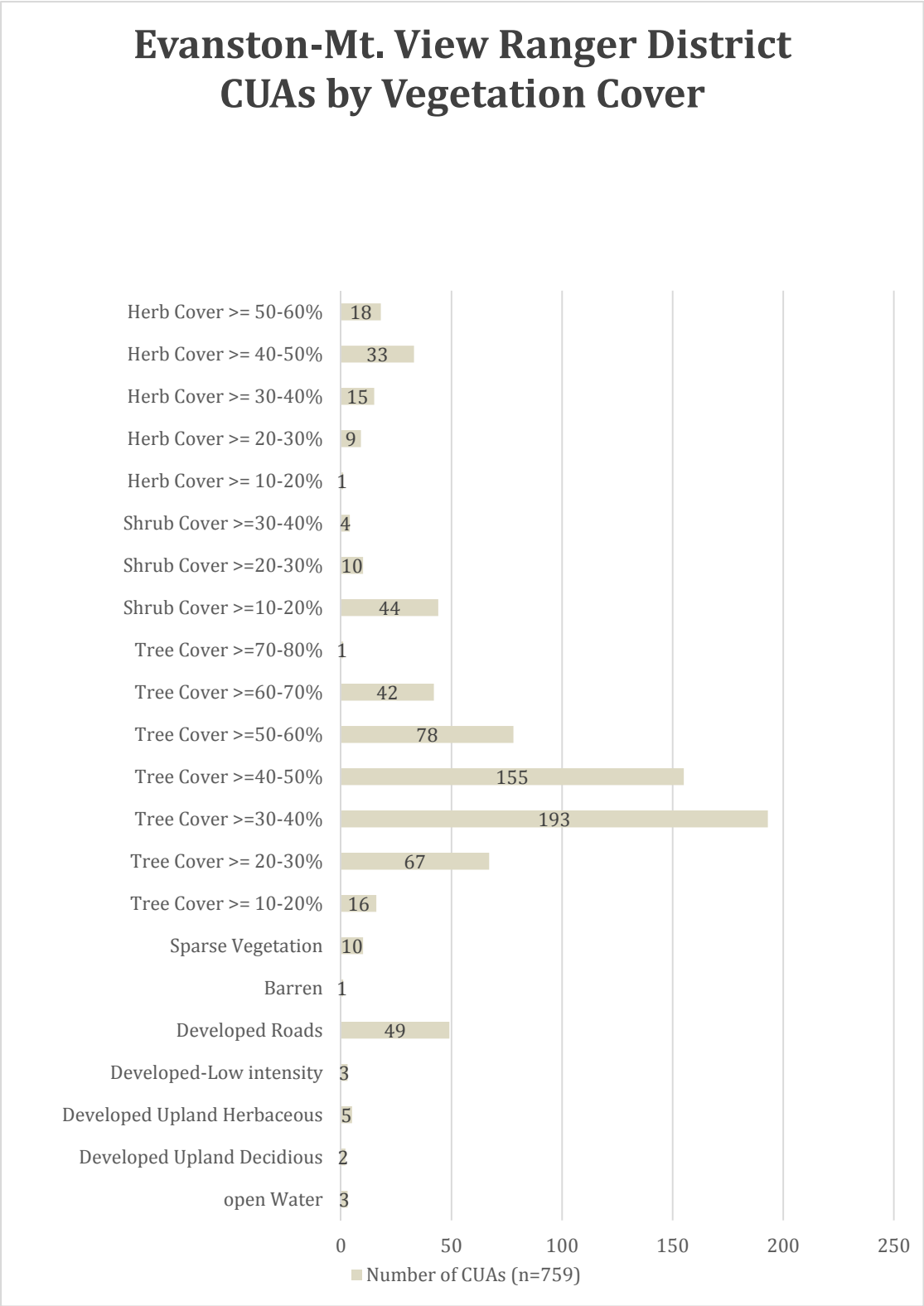

Evanston-Mt. View Ranger District
CUA Proximity to Lakes
37
32
239
208
243
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=759)

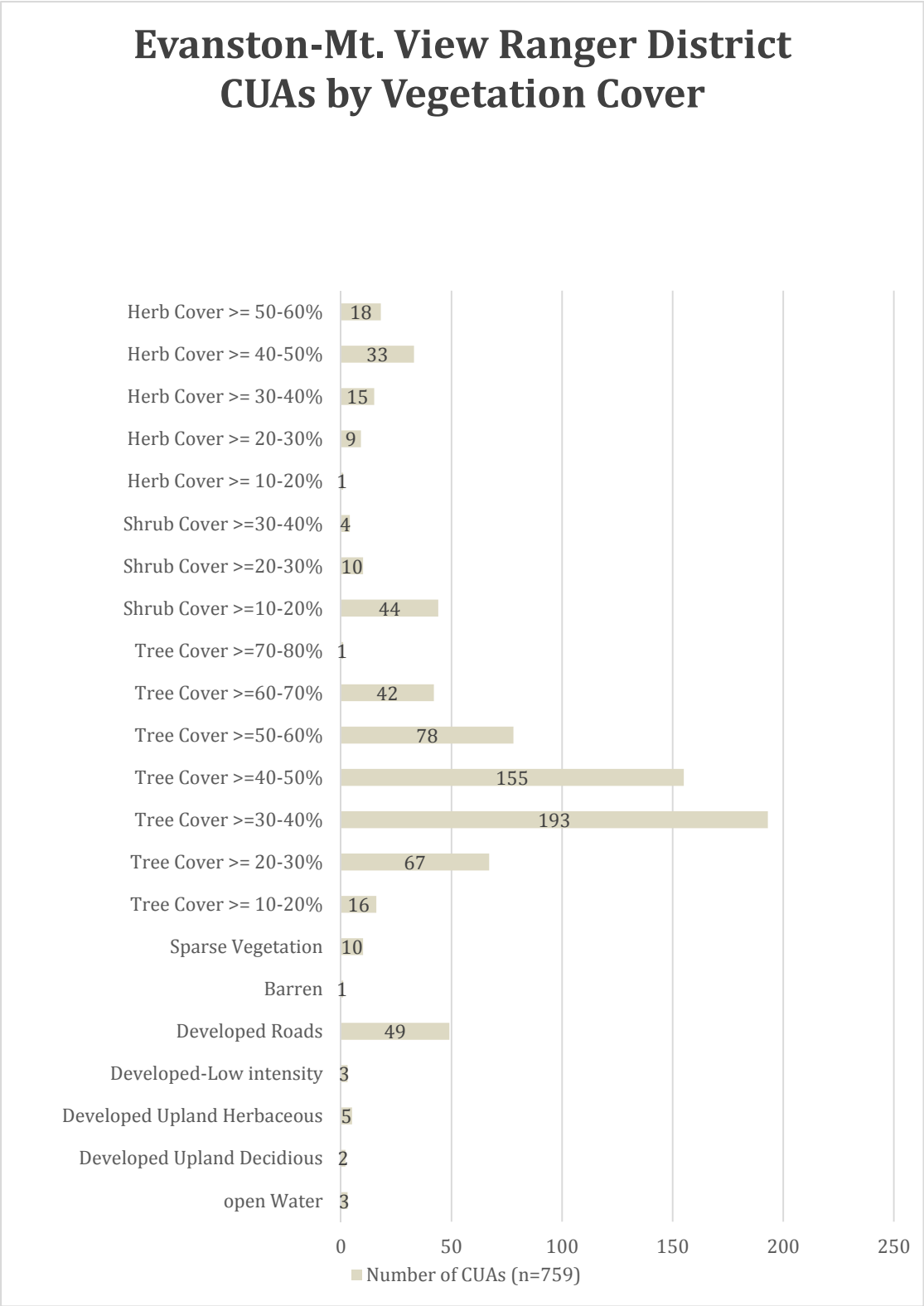

Evanston-Mt. View Ranger District
CUA Proximty to Springs
677
0
2
20
60
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=759)


Evanston-Mt. View Ranger District
CUA Landscape Aspect Relationship
NORTHWEST 292.5-337.5)
WEST (247.7-292.5)
SOUTHWEST (202.5-247.5)
SOUTH (157.5-202.5)
SOUTHEAST (112.5-157.5)
EAST (67.5-112.5)
NORTHEAST (22.5-67.5)
NORTH (337.5-360 & 0-22.5)
90
95
36
20
77
215
122
104
0
50
100
150
200
250
Number of CUAs (n=759)

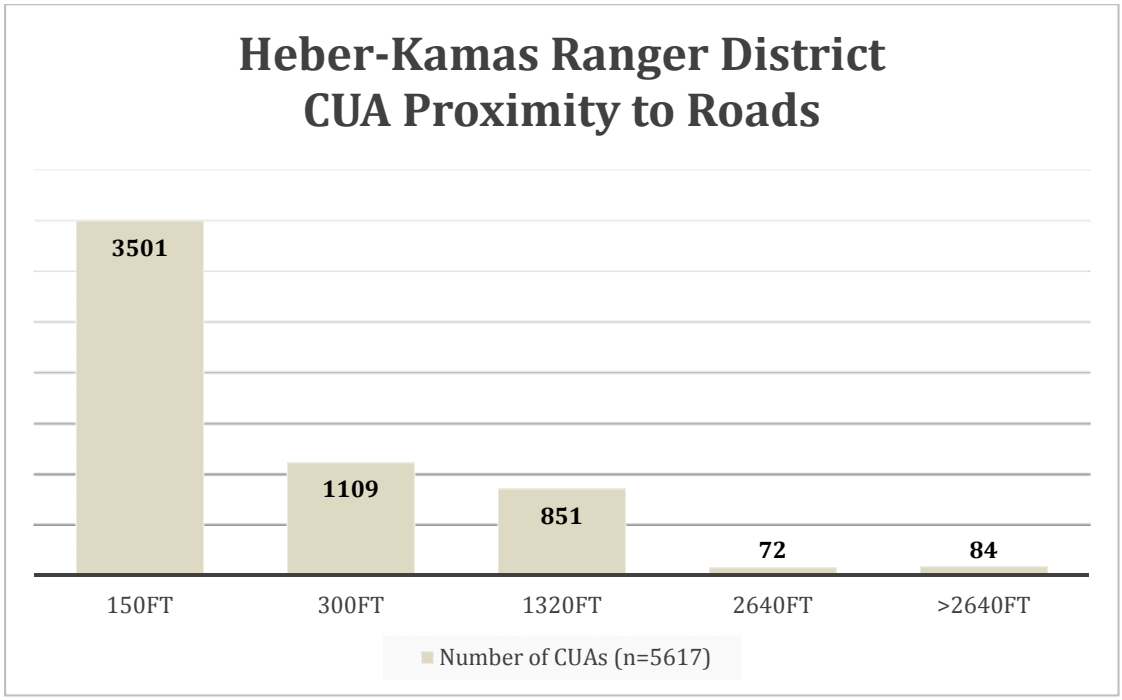

Evanston-Mt. View Ranger District
CUAs by Slope
528
195
33
3
0
0-5%
5-10%
10-15%
15-20%
>20%
Number of CUAs (n=759)

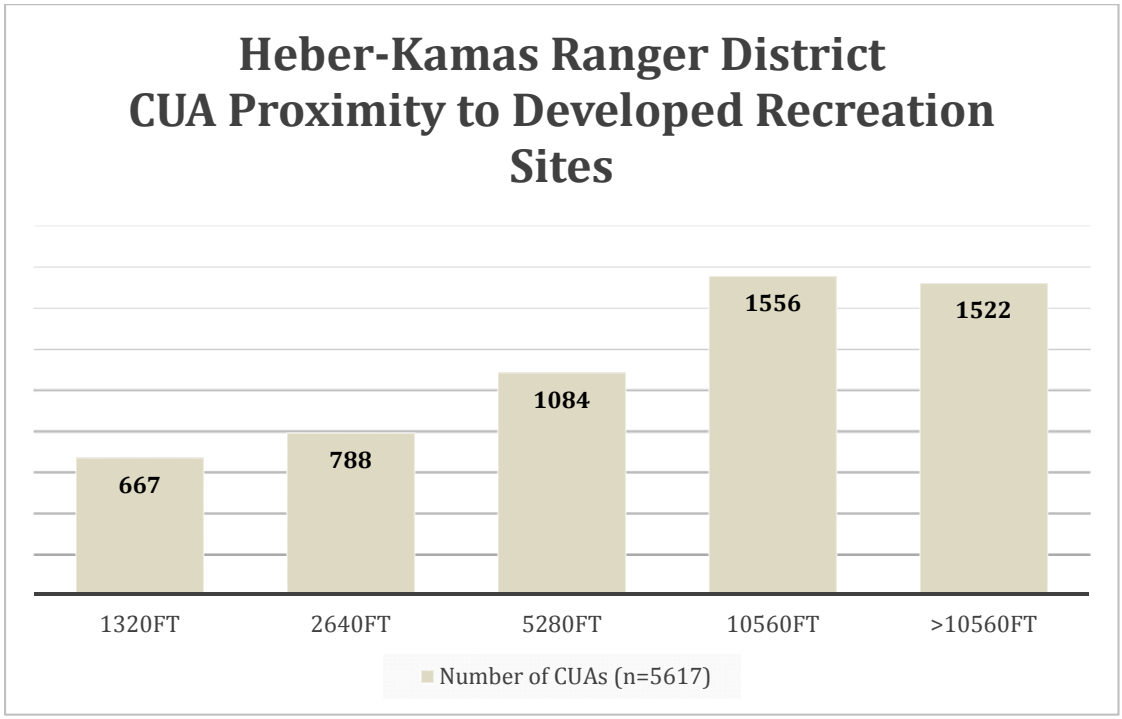

Evanston-Mt. View Ranger District
CUA Elevation
296
462
1
8000-9000FT
9000-10000FT
10000+ FT
Number of CUAs (n=759)

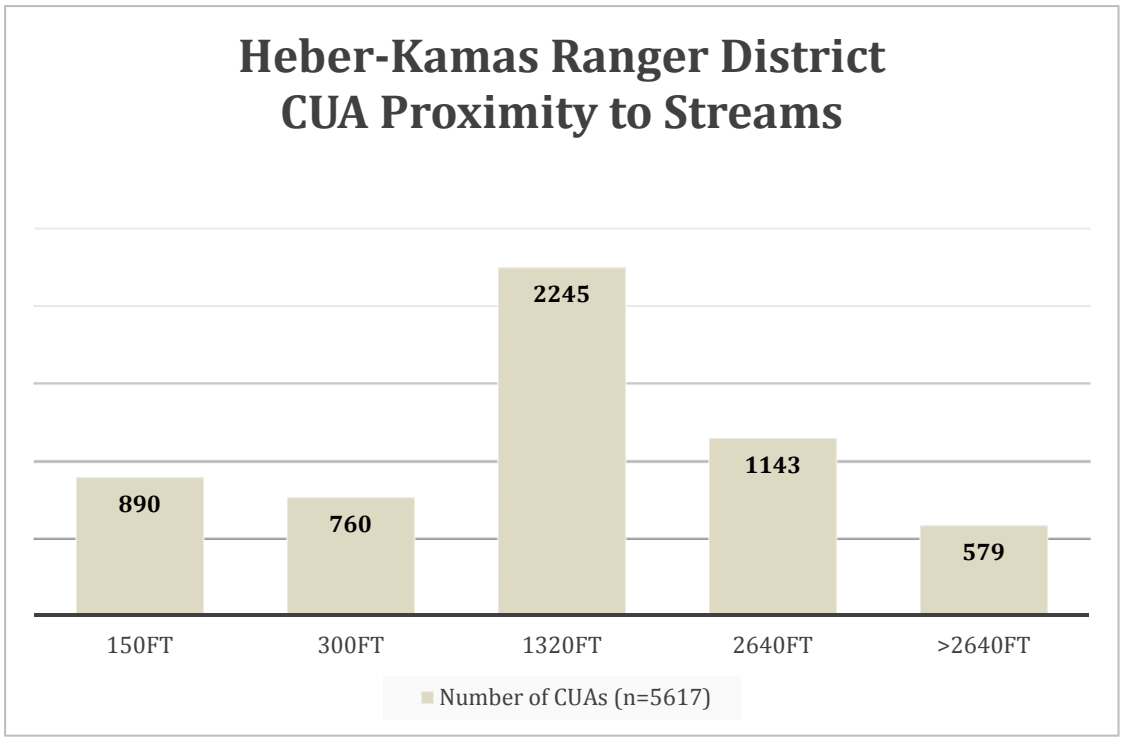

Evanston-Mt. View Ranger District
CUAs by Vegetation Cover
Herb Cover >= 50-60%
18
Herb Cover >= 40-50%
33
Herb Cover >= 30-40%
15
Herb Cover >= 20-30%
9
Herb Cover >= 10-20%
1
Shrub Cover >=30-40%
4
Shrub Cover >=20-30%
10
Shrub Cover >=10-20%
44
Tree Cover >=70-80%
1
Tree Cover >=60-70%
42
Tree Cover >=50-60%
78
Tree Cover >=40-50%
155
Tree Cover >=30-40%
193
Tree Cover >= 20-30%
67
Tree Cover >= 10-20%
16
Sparse Vegetation
10
Barren
1
Developed Roads
49
Developed-Low intensity
3
Developed Upland Herbaceous
5
Developed Upland Decidious
2
open Water
3
0
50
100
150
200
250
Number of CUAs (n=759)

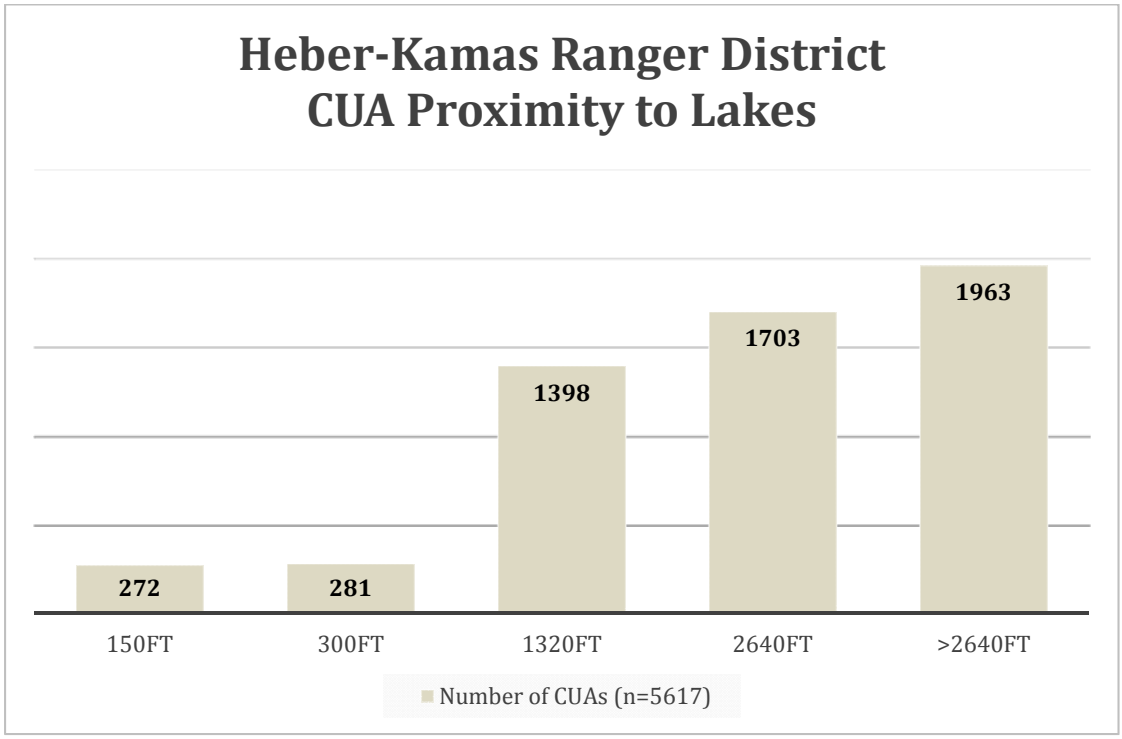

Evanston-Mt. View Ranger District
CUAs by Vegetation Cover
Herb Cover >= 50-60%
18
Herb Cover >= 40-50%
33
Herb Cover >= 30-40%
15
Herb Cover >= 20-30%
9
Herb Cover >= 10-20%
1
Shrub Cover >=30-40%
4
Shrub Cover >=20-30%
10
Shrub Cover >=10-20%
44
Tree Cover >=70-80%
1
Tree Cover >=60-70%
42
Tree Cover >=50-60%
78
Tree Cover >=40-50%
155
Tree Cover >=30-40%
193
Tree Cover >= 20-30%
67
Tree Cover >= 10-20%
16
Sparse Vegetation
10
Barren
1
Developed Roads
49
Developed-Low intensity
3
Developed Upland Herbaceous
5
Developed Upland Decidious
2
open Water
3
0
50
100
150
200
250
Number of CUAs (n=759)

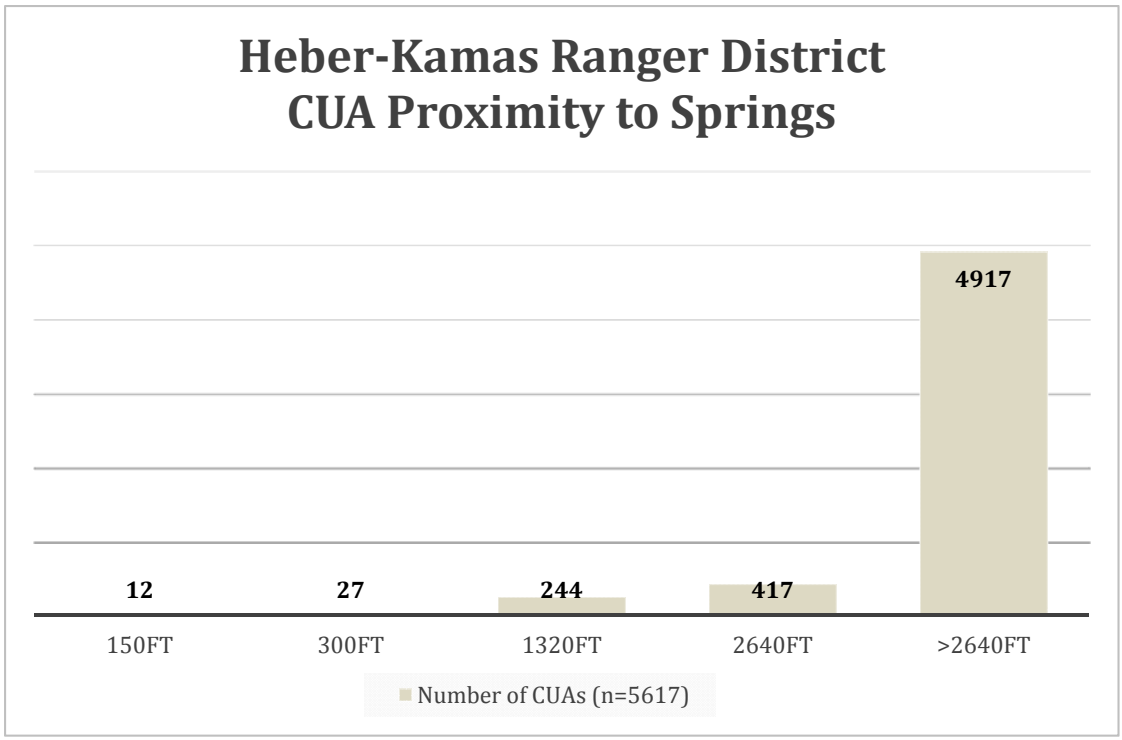
Heber-Kamas Ranger District.

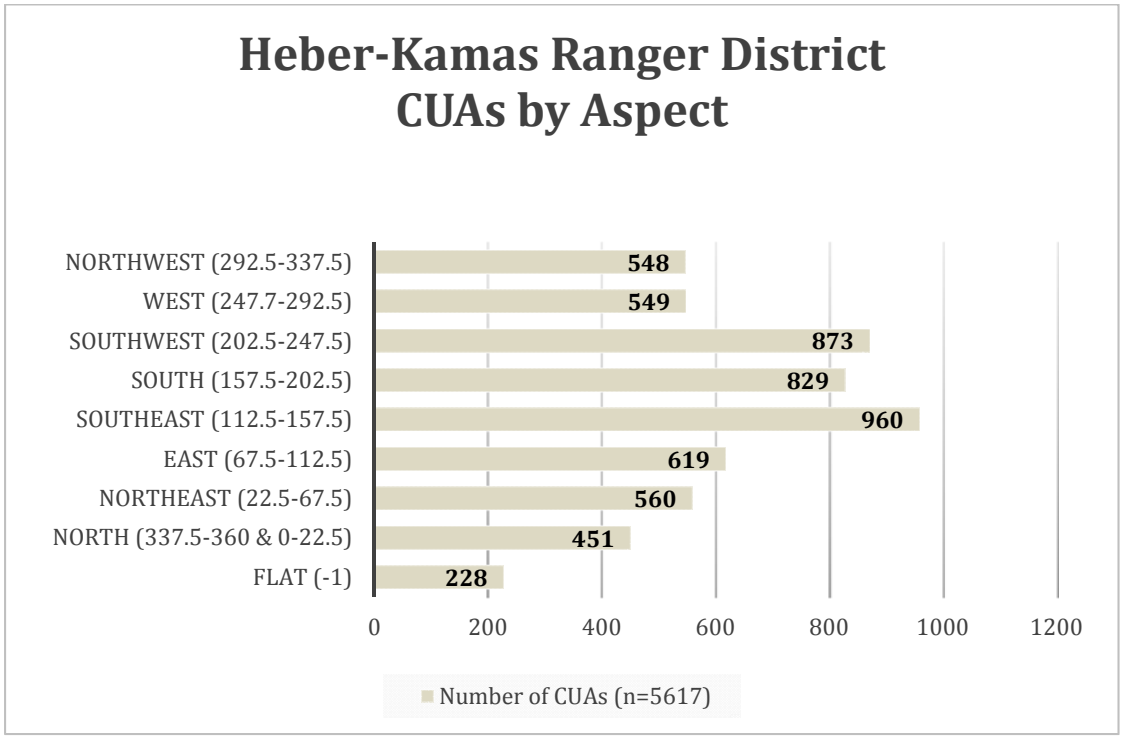


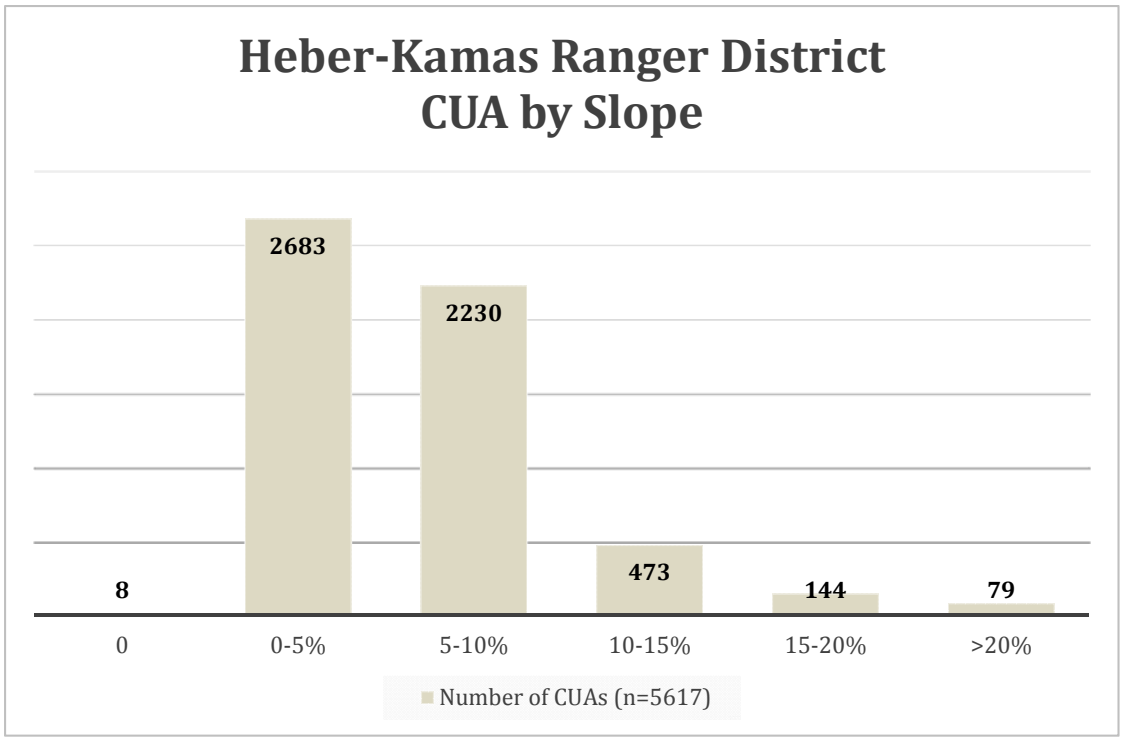


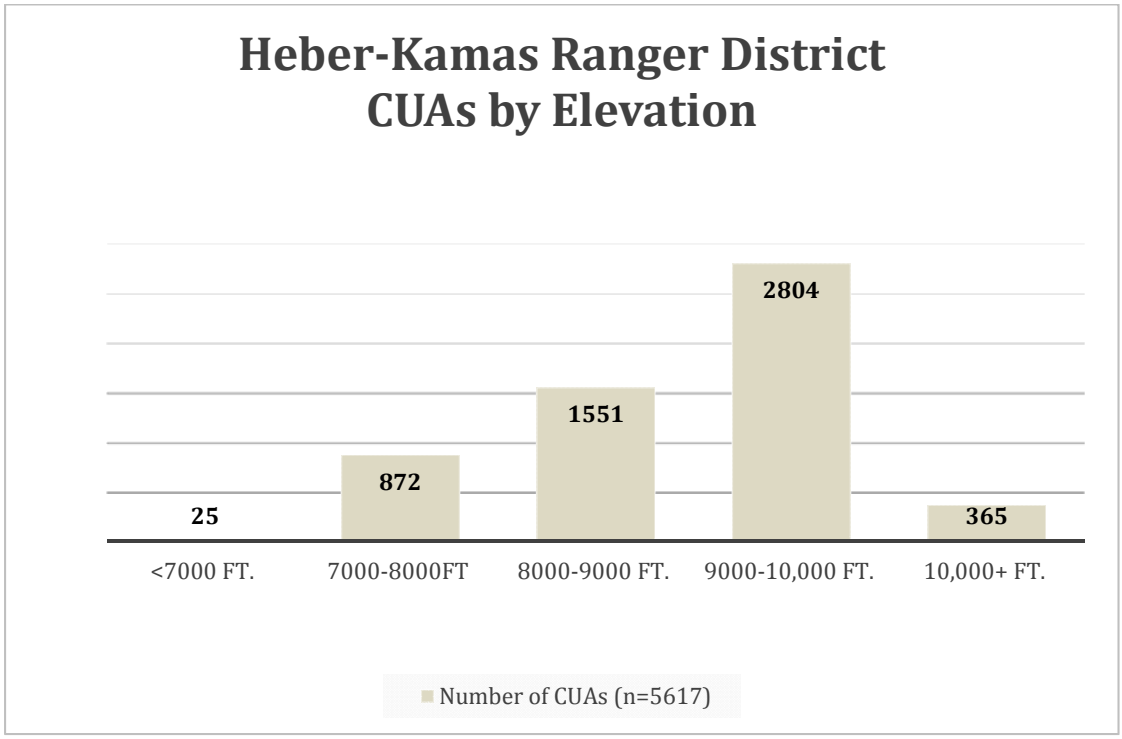

Heber-Kamas Ranger District
CUA Proximity to Streams
890
760
2245
1143
579
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=5617)

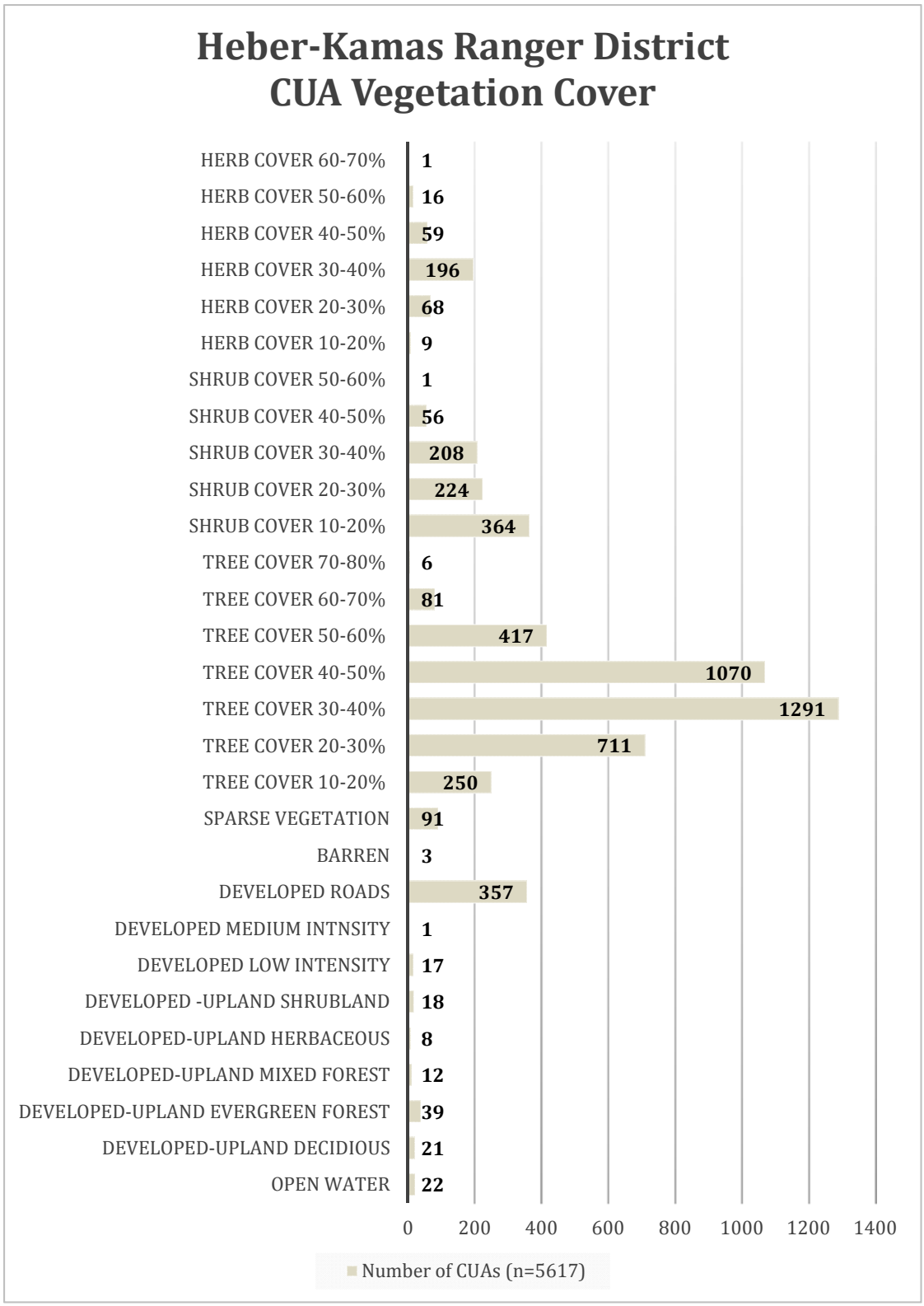

Heber-Kamas Ranger District
CUA Proximity to Lakes
272
281
1398
1703
1963
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=5617)


Heber-Kamas Ranger District
CUA Proximity to Springs
12
27
244
417
4917
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=5617)


Heber-Kamas Ranger District
CUAs by Aspect
NORTHWEST (292.5-337.5)
WEST (247.7-292.5)
SOUTHWEST (202.5-247.5)
SOUTH (157.5-202.5)
SOUTHEAST (112.5-157.5)
EAST (67.5-112.5)
NORTHEAST (22.5-67.5)
NORTH (337.5-360 & 0-22.5)
FLAT (-1)
548
549
873
829
960
619
560
451
228
0
200
400
600
800
1000
1200
Number of CUAs (n=5617)

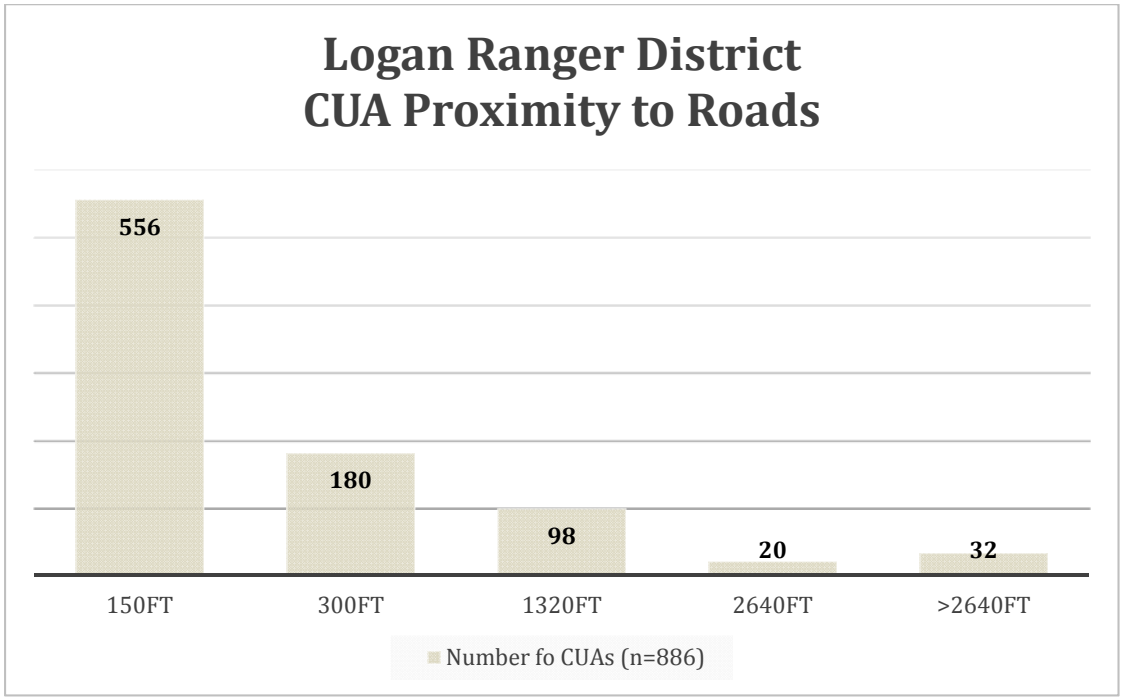

Heber-Kamas Ranger District
CUA by Slope
8
2683
2230
473
144
79
0
0-5%
5-10%
10-15%
15-20%
>20%
Number of CUAs (n=5617)

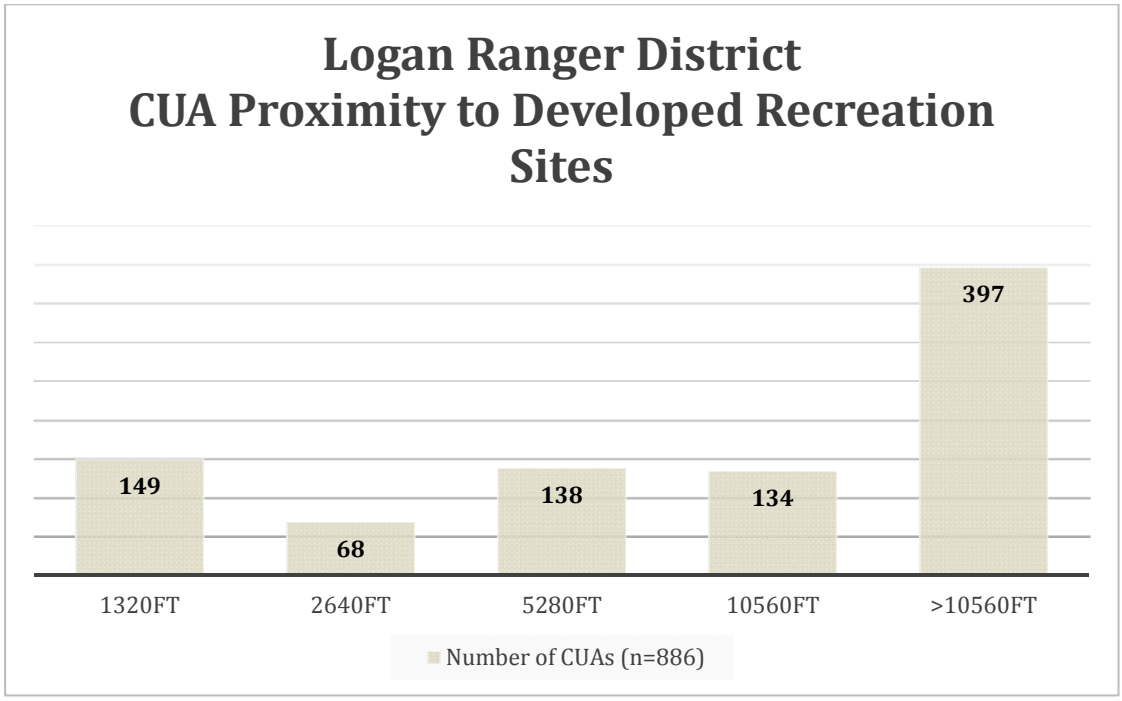

Heber-Kamas Ranger District
CUAs by Elevation
25
872
1551
2804
365
<7000 FT.
7000-8000FT
8000-9000 FT.
9000-10,000 FT.
10,000+ FT.
Number of CUAs (n=5617)

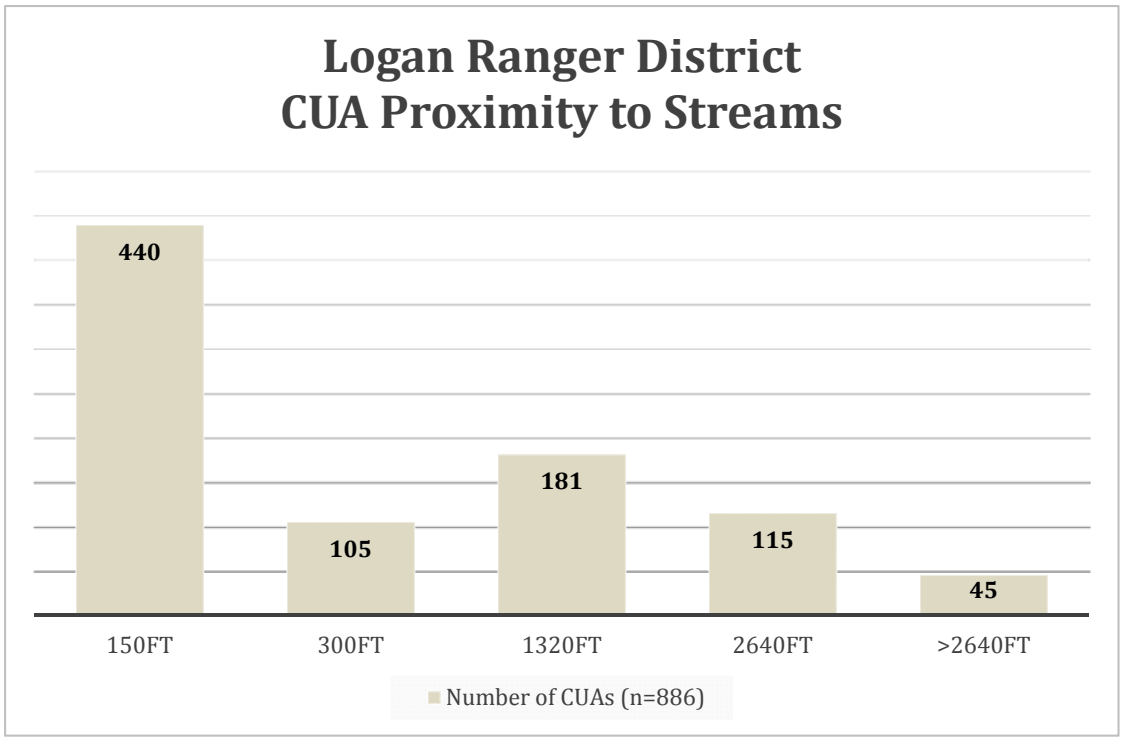

Heber-Kamas Ranger District
CUA Vegetation Cover
HERB COVER 60-70%
1
HERB COVER 50-60%
16
HERB COVER 40-50%
59
HERB COVER 30-40%
196
HERB COVER 20-30%
68
HERB COVER 10-20%
9
SHRUB COVER 50-60%
1
SHRUB COVER 40-50%
56
SHRUB COVER 30-40%
208
SHRUB COVER 20-30%
224
SHRUB COVER 10-20%
364
TREE COVER 70-80%
6
TREE COVER 60-70%
81
TREE COVER 50-60%
417
TREE COVER 40-50%
1070
TREE COVER 30-40%
1291
TREE COVER 20-30%
711
TREE COVER 10-20%
250
SPARSE VEGETATION
91
BARREN
3
DEVELOPED ROADS
357
DEVELOPED MEDIUM INTNSITY
1
DEVELOPED LOW INTENSITY
17
DEVELOPED -UPLAND SHRUBLAND
18
DEVELOPED-UPLAND HERBACEOUS
8
DEVELOPED-UPLAND MIXED FOREST
12
DEVELOPED-UPLAND EVERGREEN FOREST
39
DEVELOPED-UPLAND DECIDIOUS
21
OPEN WATER
22
0
200
400
600
800
1000
1200
1400
Number of CUAs (n=5617)

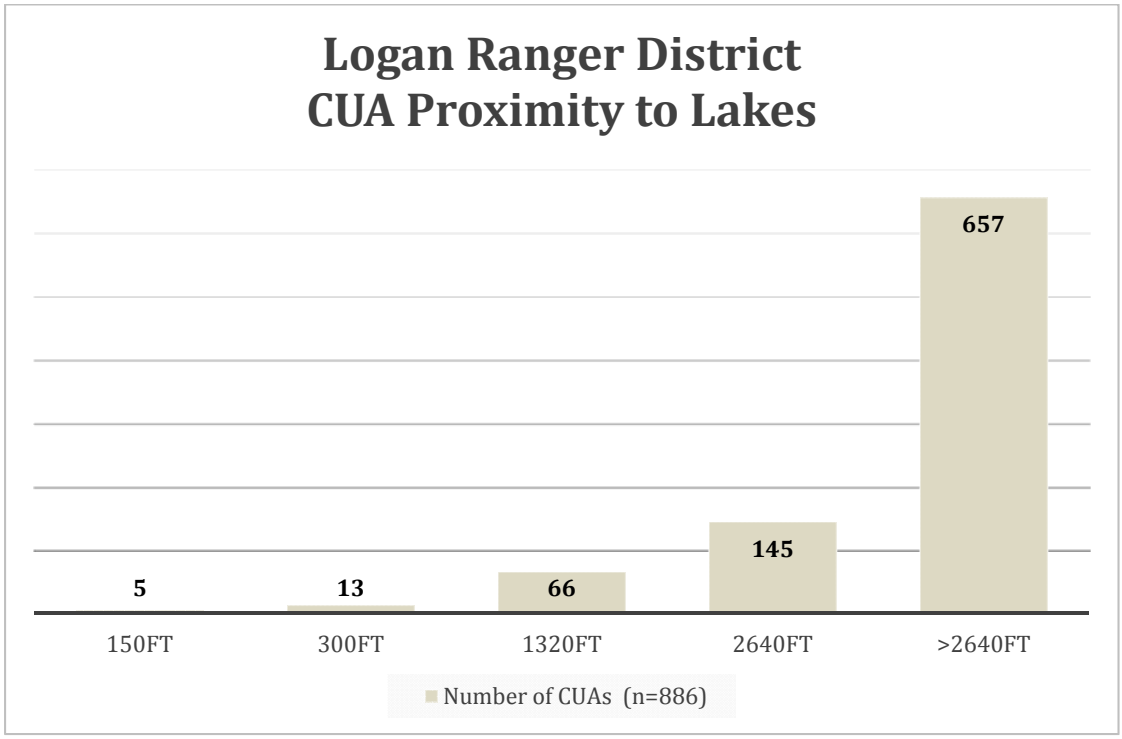
Heber-Kamas Ranger District
CUA Vegetation Height
Forest 25-50m
39
Forest 10-25m
3353
Forest 5-10m
409
Forest 0-5m
25
Shrub >3m
1
Shrub 1-3m
301
Shrub 0.5-1m
468
Shrub 0-.05m
83
Herb 0-.05m
349
Sparse Vegetation
91
Barren
3
Developed Roads
357
Developed Medium Intensity
1
Developed-Low Intensity
17
Developed-Urban Shrubland
18
Developed-Upland Herbacous
8
Developed-Upland Mixed Forest
12
Developed-Upland Evergreen Forest
39
Developed-Upland Decidious Forest
21
Open Water
22
0
500
1000
1500
2000
2500
3000
3500
4000
Number of CUAs (n=5617)

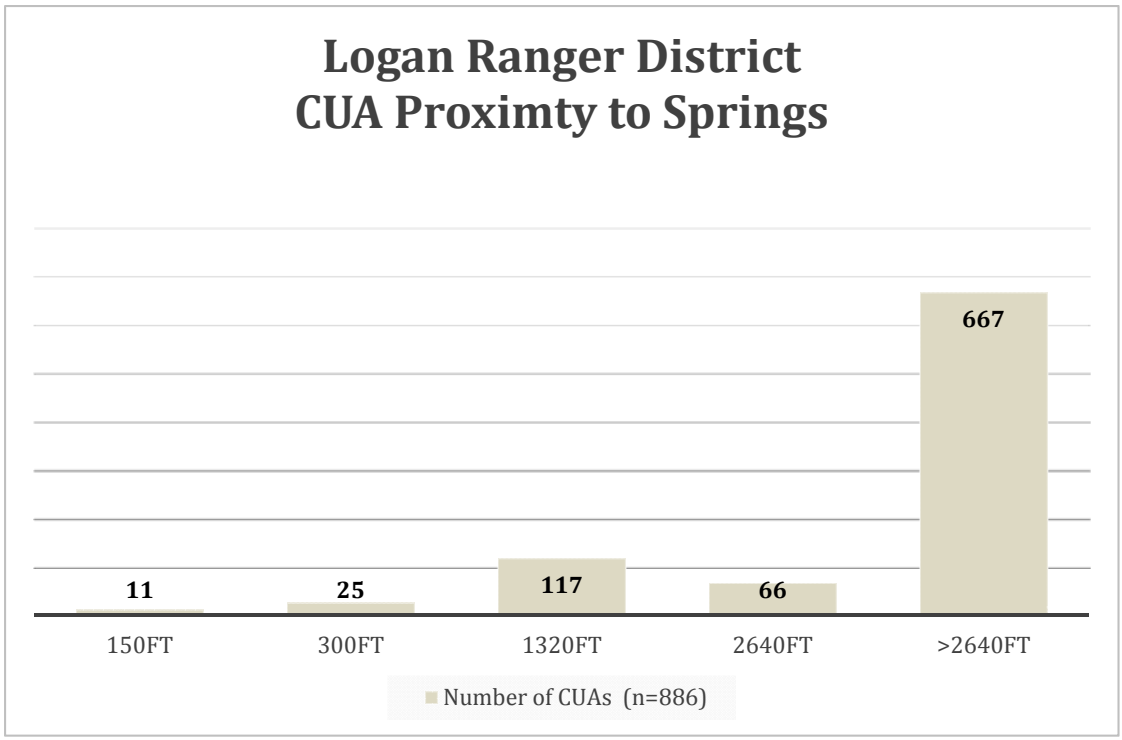
Logan Ranger District.

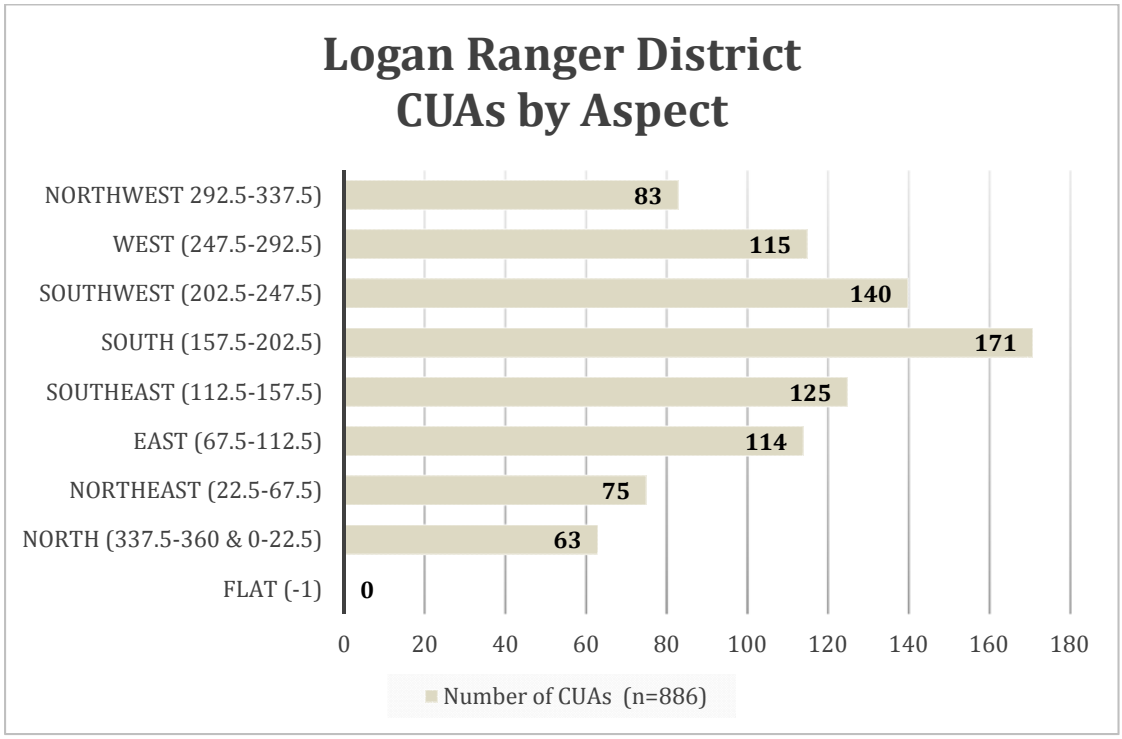


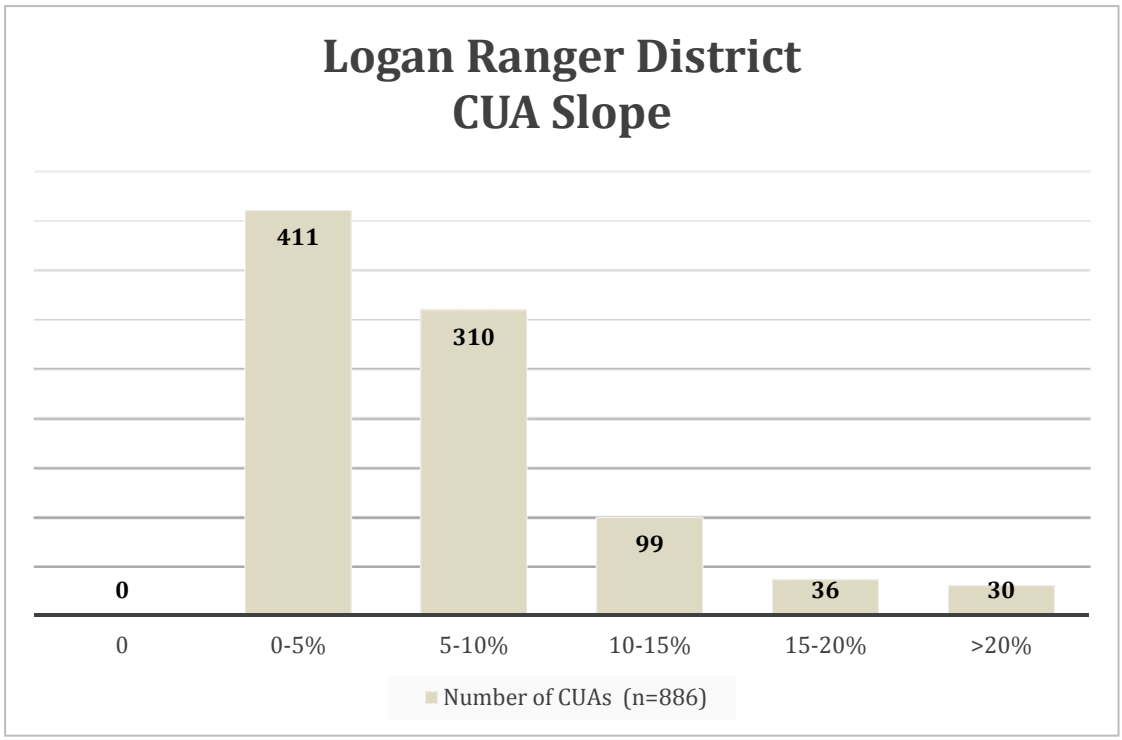


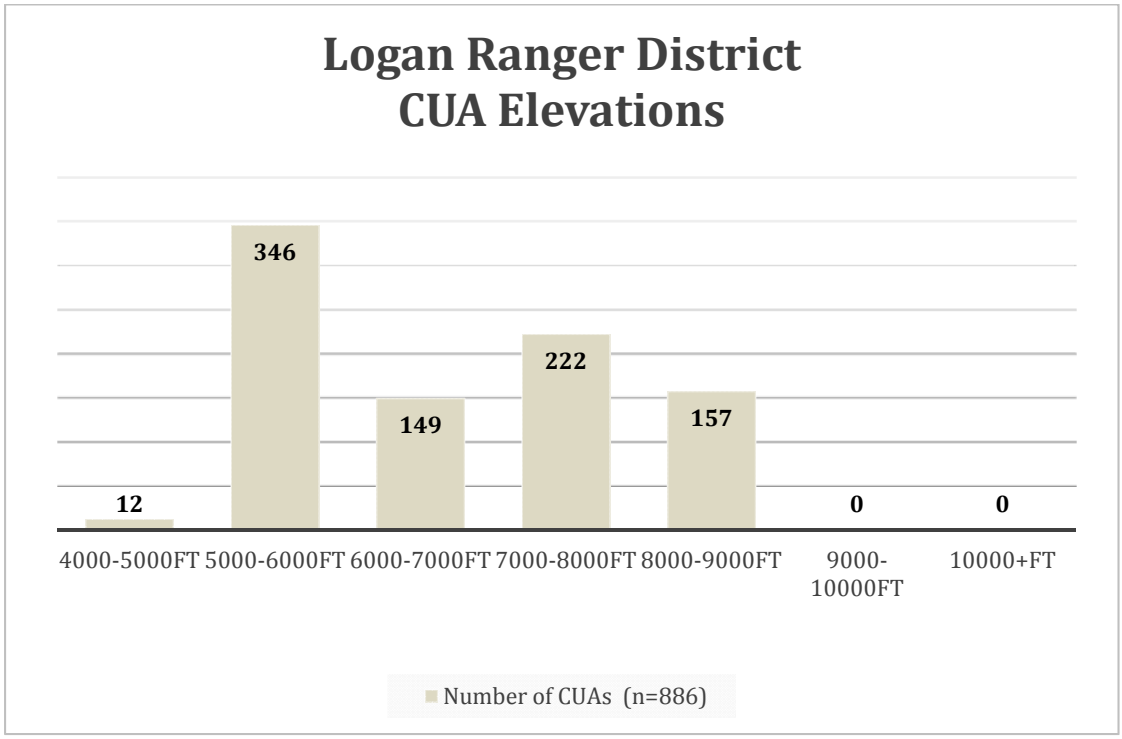

Logan Ranger District
CUA Proximity to Streams
440
105
181
115
45
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=886)

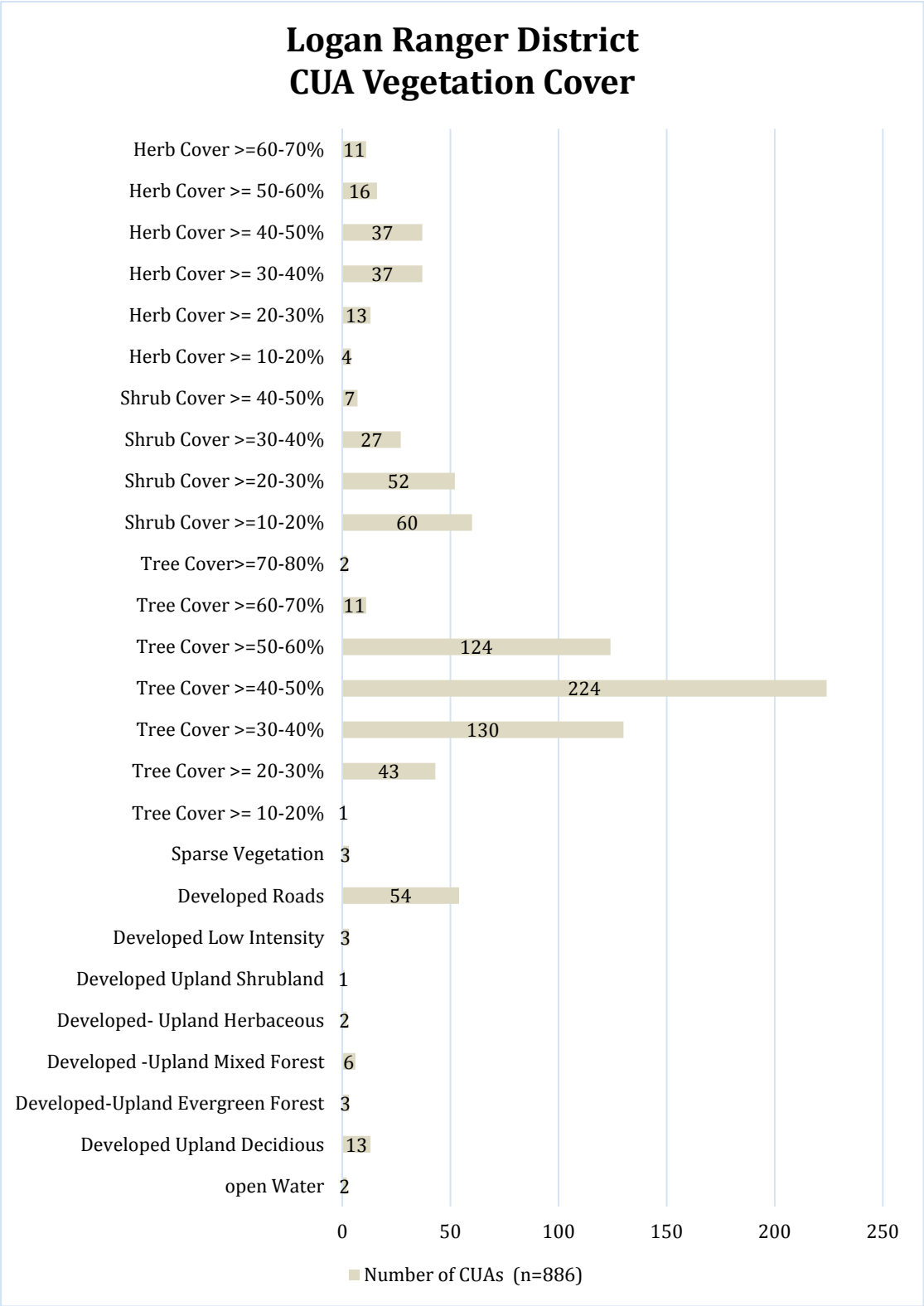

Logan Ranger District
CUA Proximity to Lakes
5
13
66
145
657
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=886)

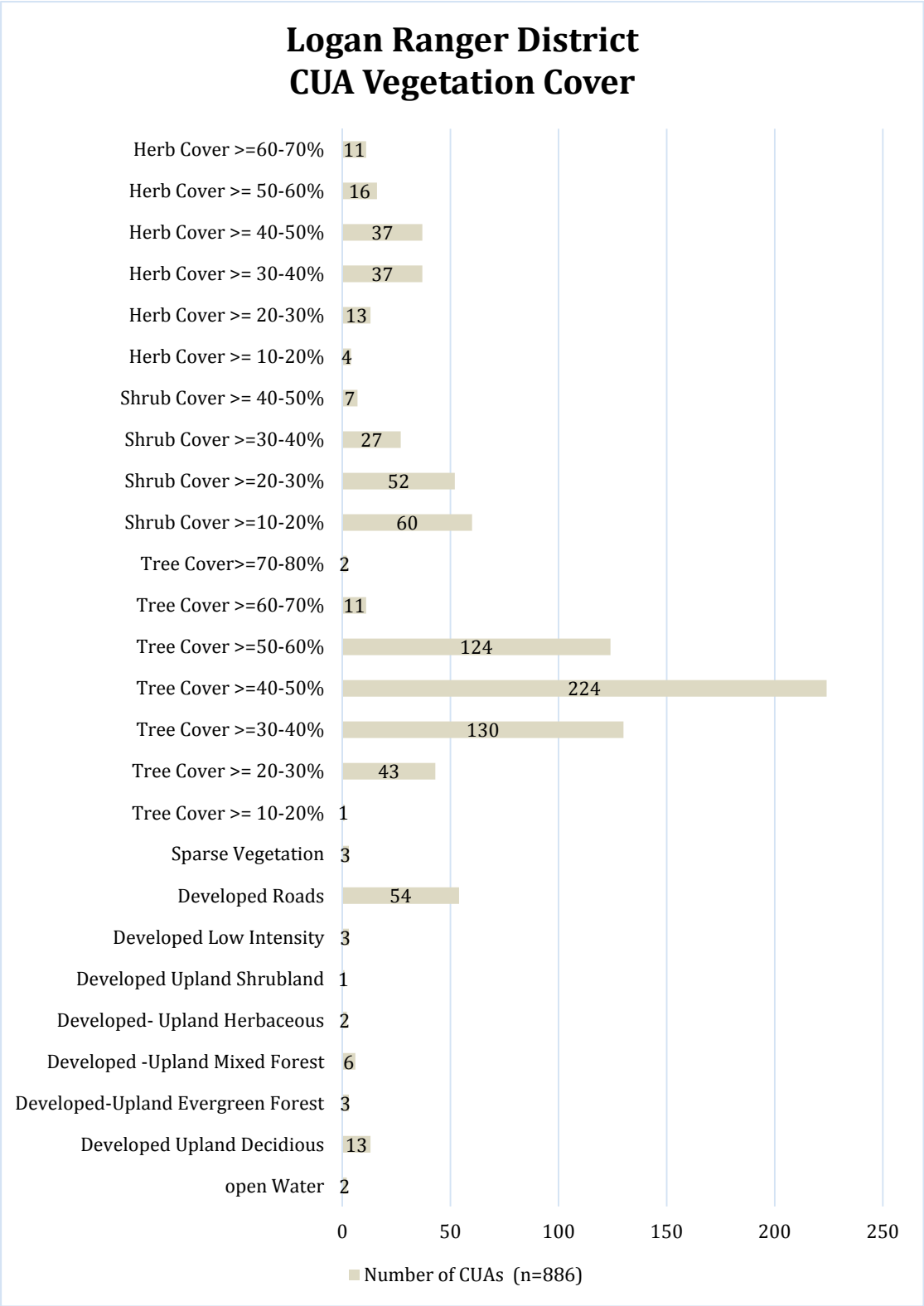

Logan Ranger District
CUA Proximty to Springs
11
25
117
66
667
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=886)


Logan Ranger District
CUAs by Aspect
NORTHWEST 292.5-337.5)
WEST (247.5-292.5)
SOUTHWEST (202.5-247.5)
SOUTH (157.5-202.5)
SOUTHEAST (112.5-157.5)
EAST (67.5-112.5)
NORTHEAST (22.5-67.5)
NORTH (337.5-360 & 0-22.5)
FLAT (-1)
83
115
140
171
125
114
75
63
0
0
20
40
60
80
100
120
140
160
180
Number of CUAs (n=886)

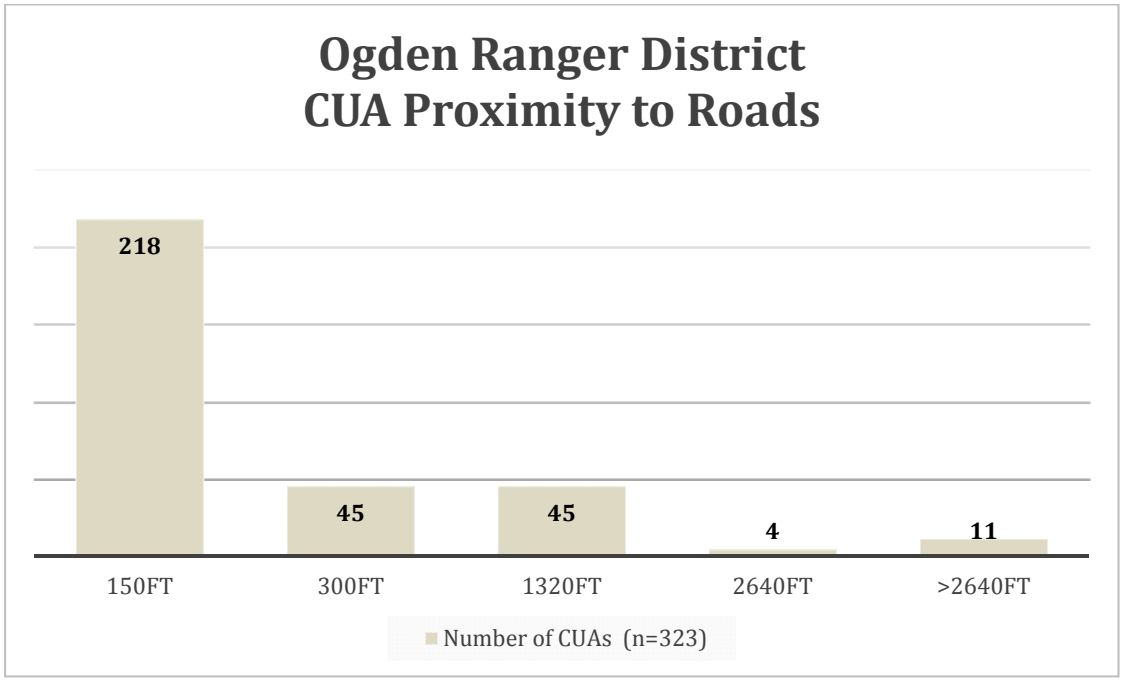

Logan Ranger District
CUA Slope
411
310
99
0
36
30
0
0-5%
5-10%
10-15%
15-20%
>20%
Number of CUAs (n=886)

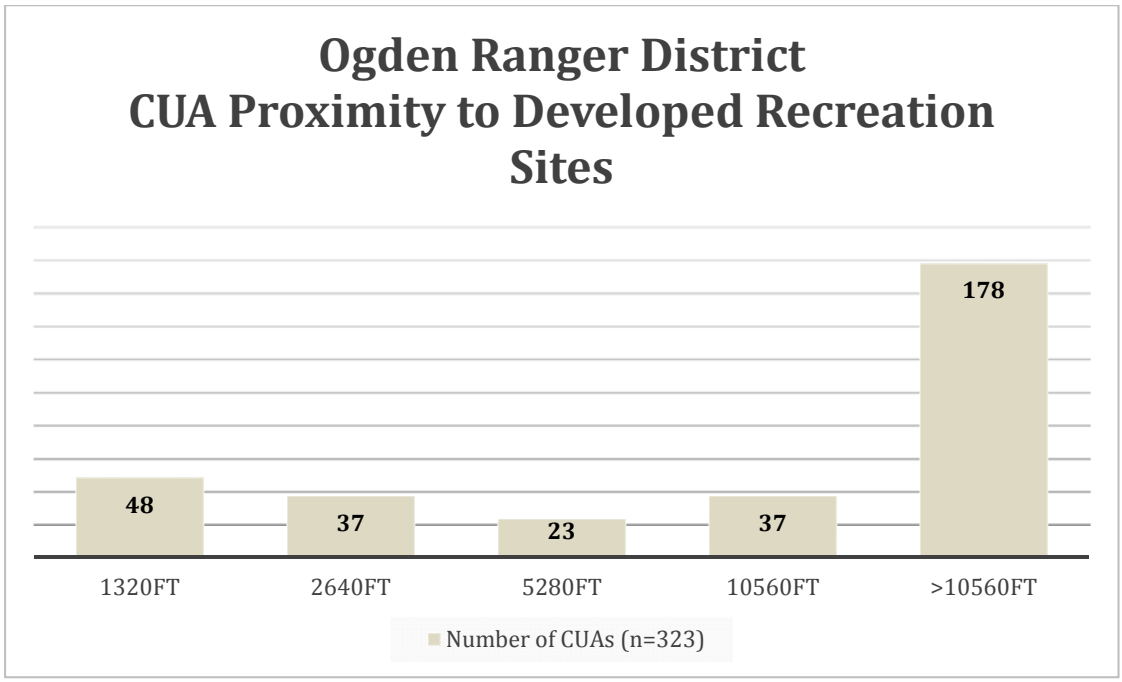

Logan Ranger District
CUA Elevations
346
222
149
157
12
0
0
4000-5000FT
5000-6000FT
6000-7000FT
7000-8000FT
8000-9000FT
9000-10000FT
10000+FT
Number of CUAs (n=886)

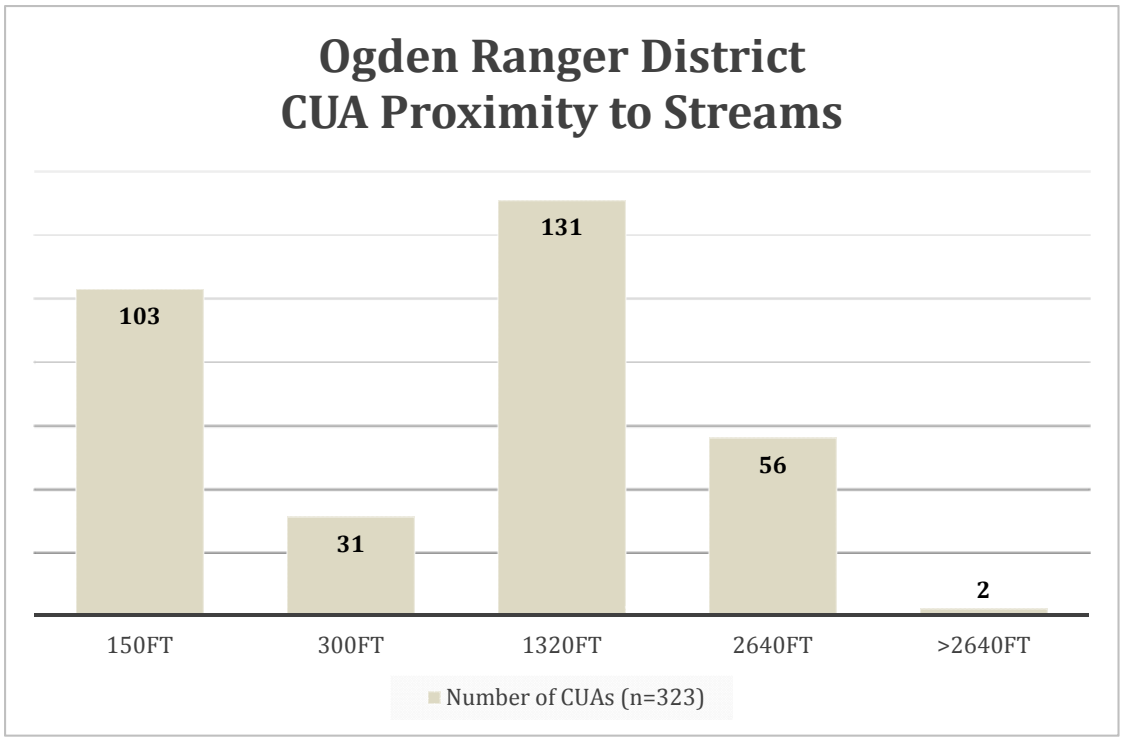

Logan Ranger District
CUA Vegetation Cover
Herb Cover >=60-70%
11
Herb Cover >= 50-60%
16
Herb Cover >= 40-50%
37
Herb Cover >= 30-40%
37
Herb Cover >= 20-30%
13
Herb Cover >= 10-20%
4
Shrub Cover >= 40-50%
7
Shrub Cover >=30-40%
27
Shrub Cover >=20-30%
52
Shrub Cover >=10-20%
60
Tree Cover>=70-80%
2
Tree Cover >=60-70%
11
Tree Cover >=50-60%
124
Tree Cover >=40-50%
224
Tree Cover >=30-40%
130
Tree Cover >= 20-30%
43
Tree Cover >= 10-20%
1
Sparse Vegetation
3
Developed Roads
54
Developed Low Intensity
3
Developed Upland Shrubland
1
Developed- Upland Herbaceous
2
Developed -Upland Mixed Forest
6
Developed-Upland Evergreen Forest
3
Developed Upland Decidious
13
open Water
2
0
50
100
150
200
250
Number of CUAs (n=886)

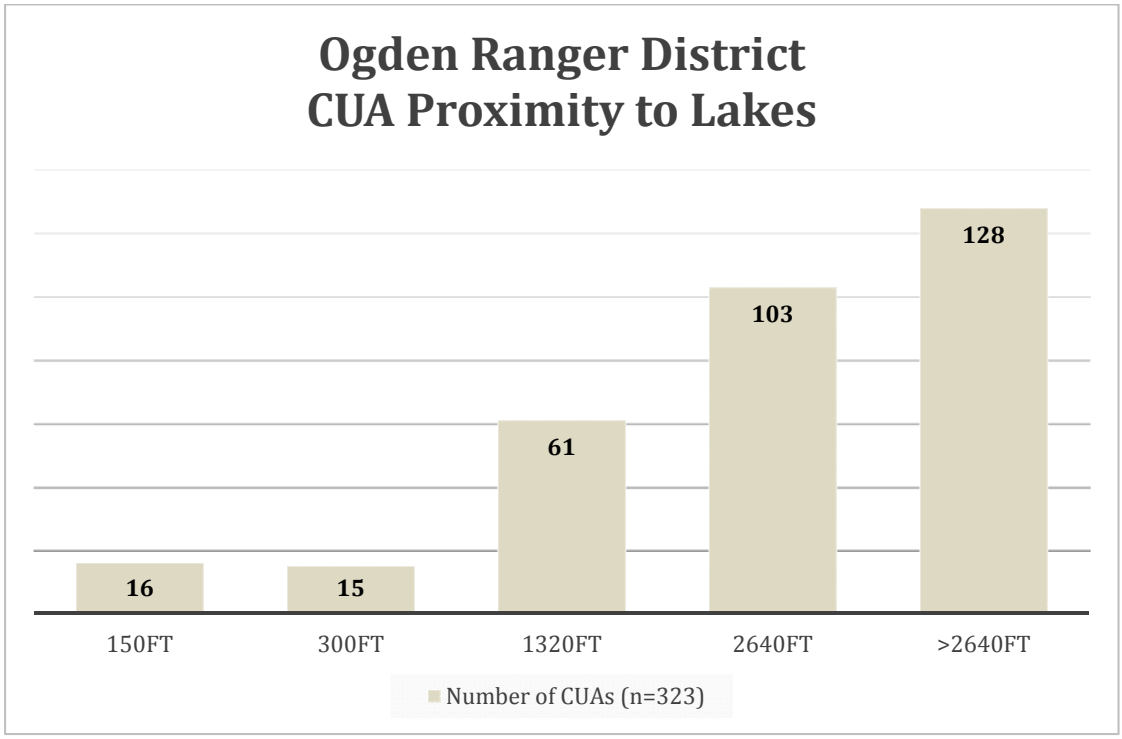

Logan Ranger District
CUA Vegetation Cover
Herb Cover >=60-70%
11
Herb Cover >= 50-60%
16
Herb Cover >= 40-50%
37
Herb Cover >= 30-40%
37
Herb Cover >= 20-30%
13
Herb Cover >= 10-20%
4
Shrub Cover >= 40-50%
7
Shrub Cover >=30-40%
27
Shrub Cover >=20-30%
52
Shrub Cover >=10-20%
60
Tree Cover>=70-80%
2
Tree Cover >=60-70%
11
Tree Cover >=50-60%
124
Tree Cover >=40-50%
224
Tree Cover >=30-40%
130
Tree Cover >= 20-30%
43
Tree Cover >= 10-20%
1
Sparse Vegetation
3
Developed Roads
54
Developed Low Intensity
3
Developed Upland Shrubland
1
Developed- Upland Herbaceous
2
Developed -Upland Mixed Forest
6
Developed-Upland Evergreen Forest
3
Developed Upland Decidious
13
open Water
2
0
50
100
150
200
250
Number of CUAs (n=886)

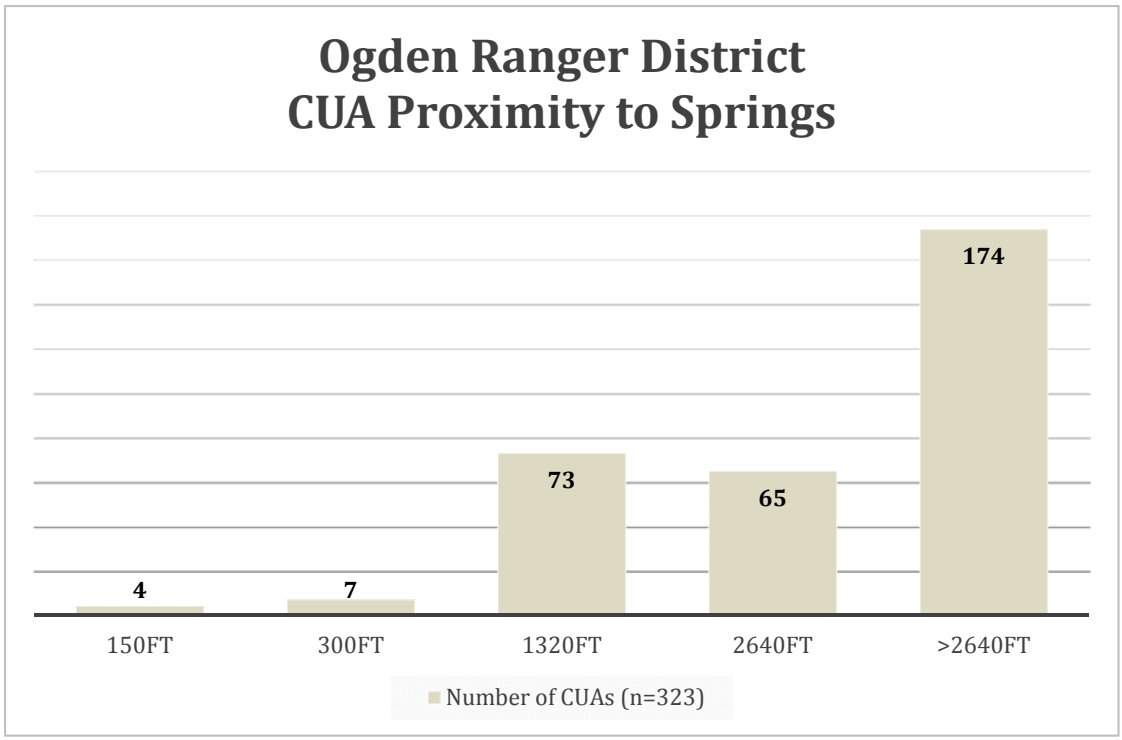
Ogden Ranger District.

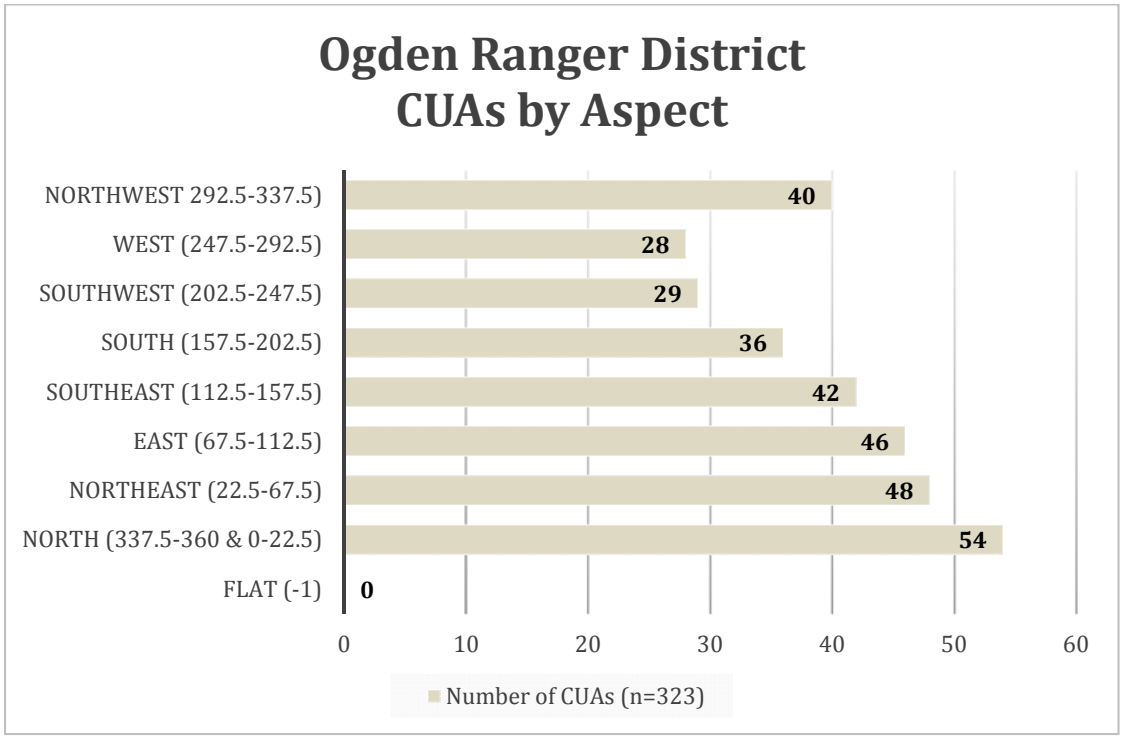


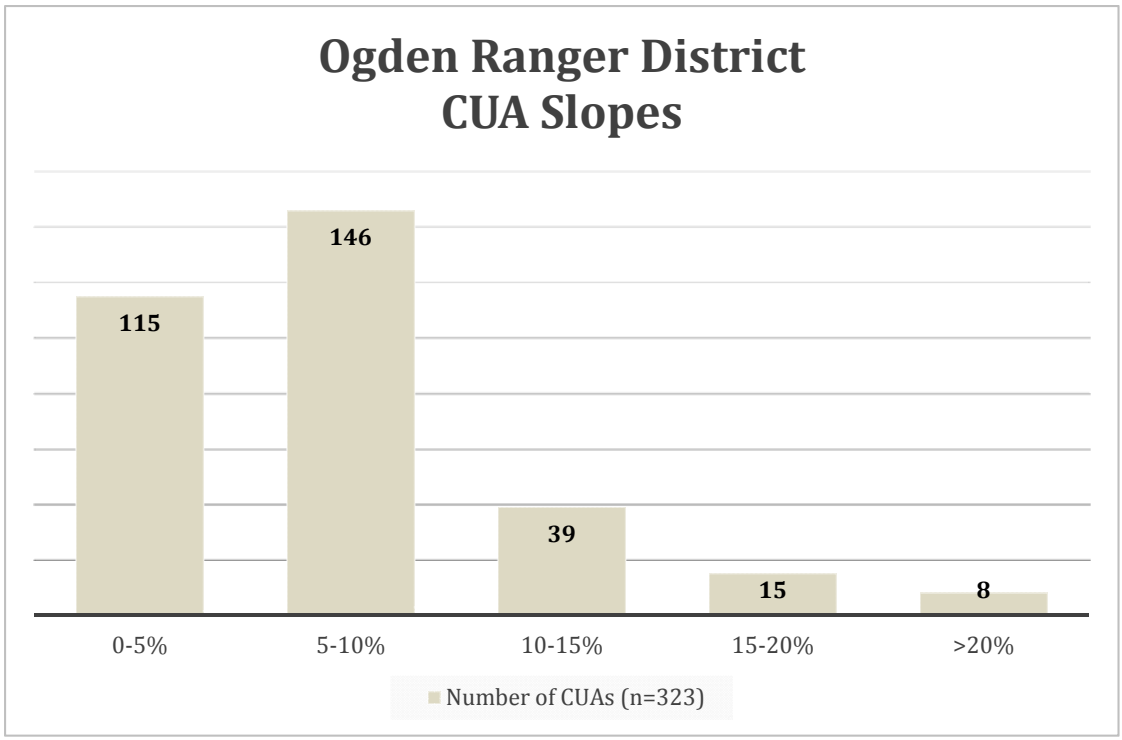


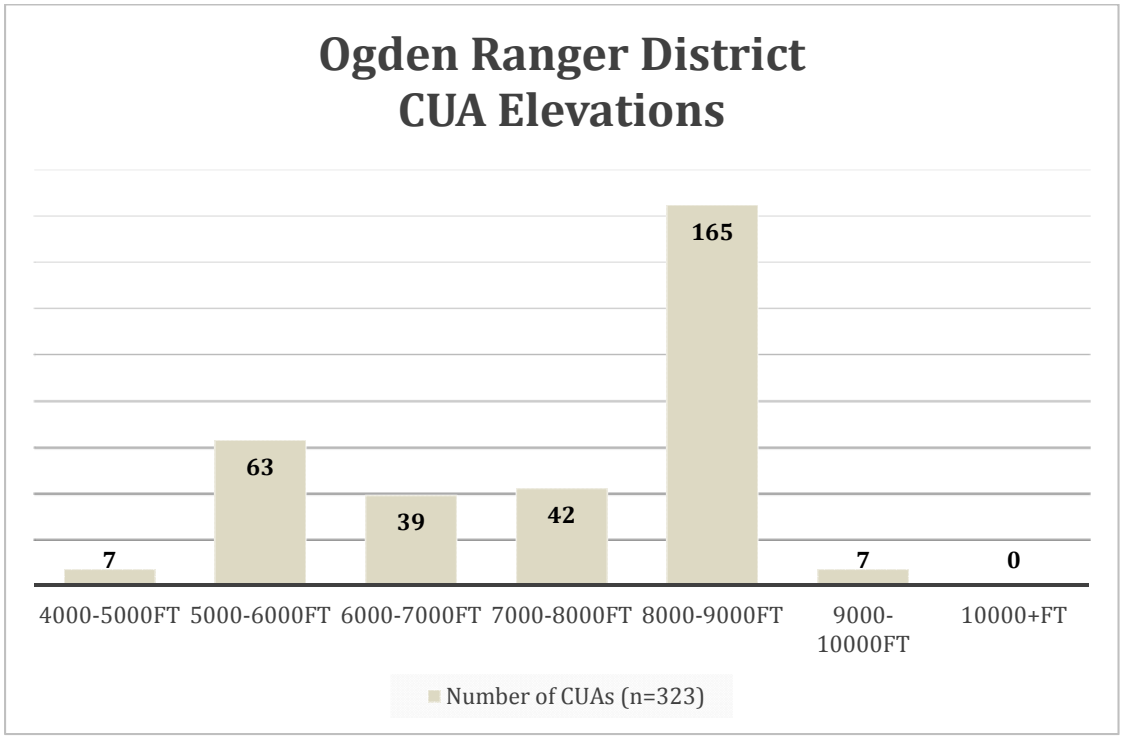

Ogden Ranger District
CUA Proximity to Streams
103
31
131
56
2
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=323)

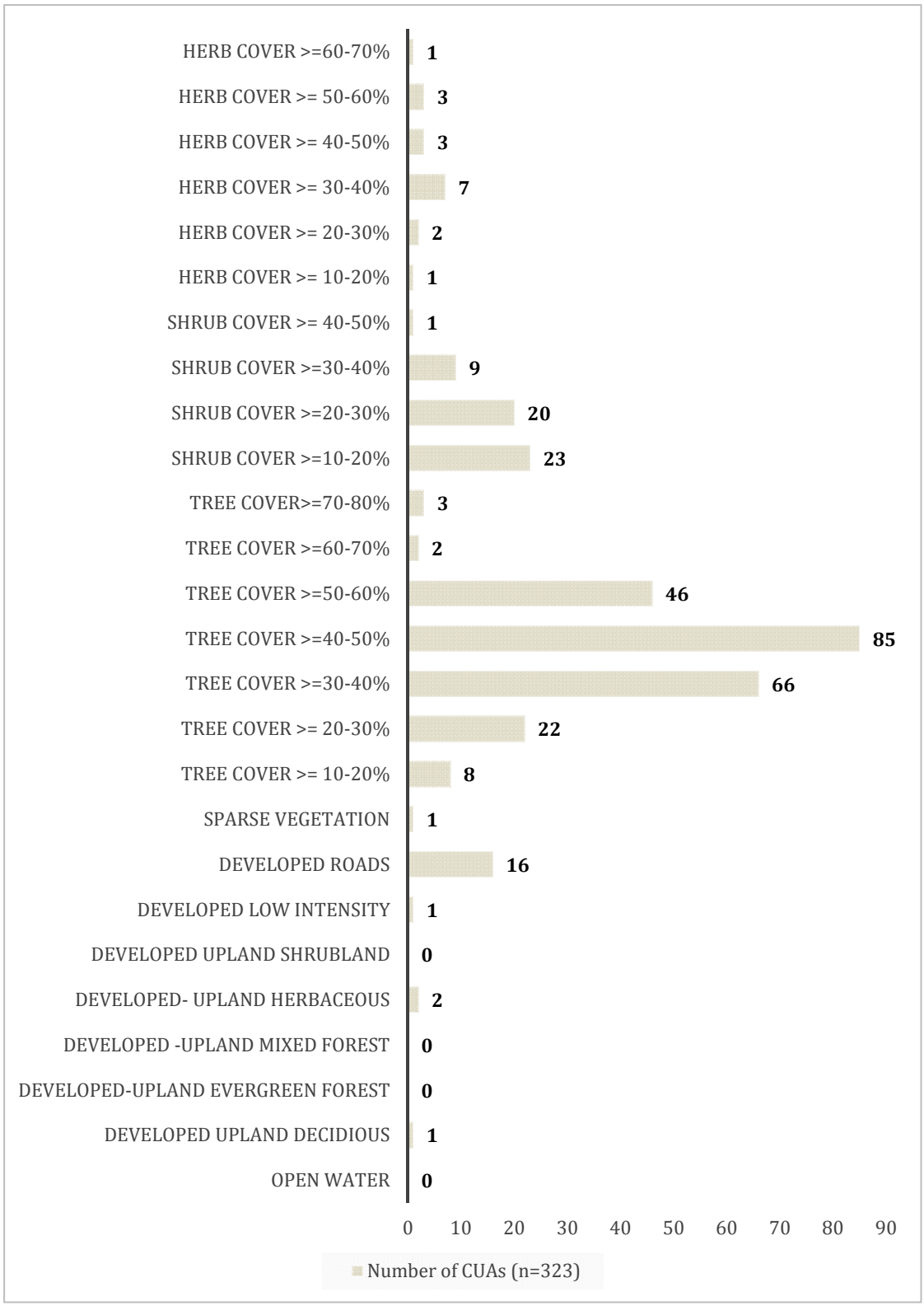

Ogden Ranger District
CUA Proximity to Lakes
16
15
61
103
128
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=323)

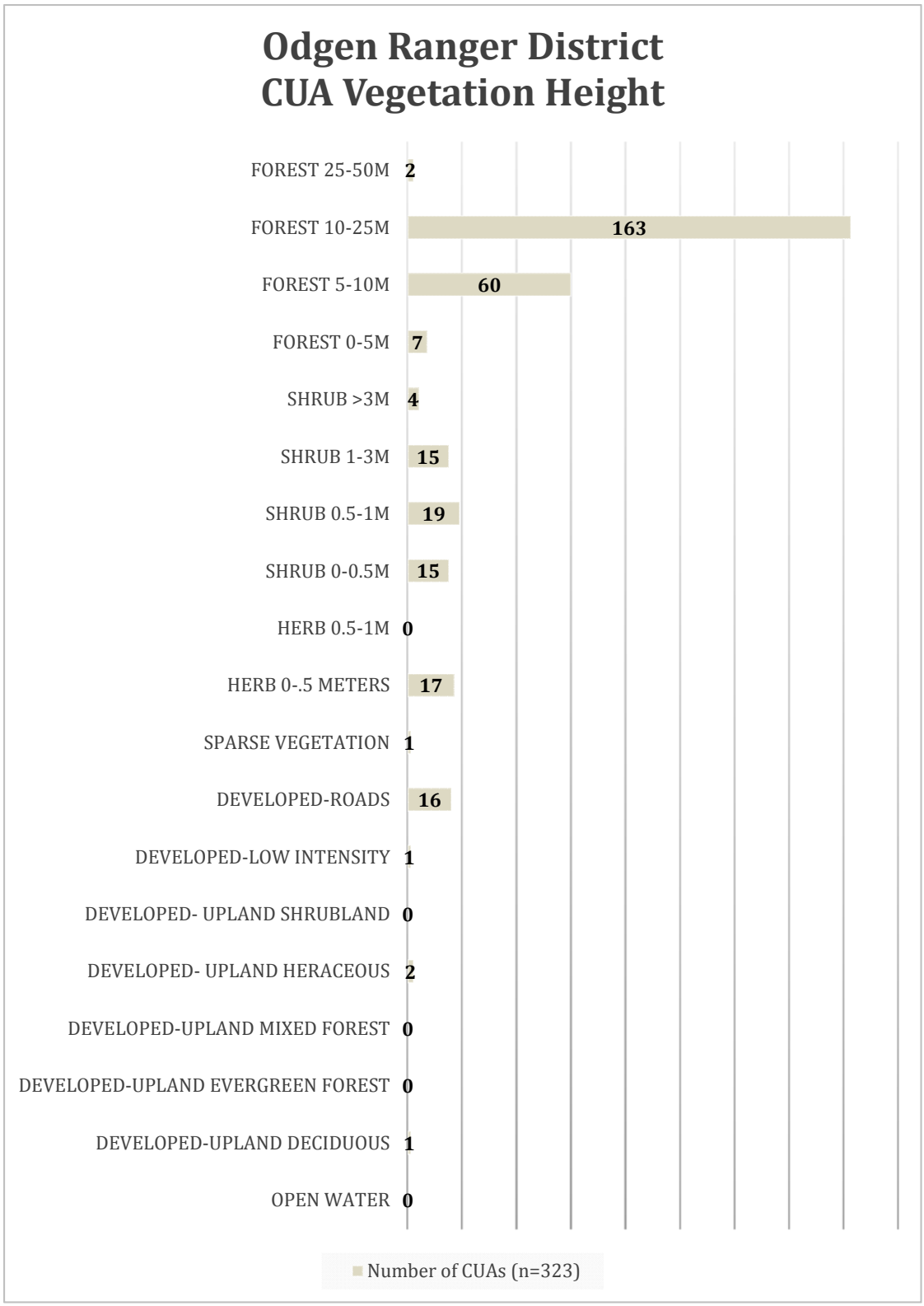

Ogden Ranger District
CUA Proximity to Springs
4
7
73
65
174
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=323)


Ogden Ranger District
CUAs by Aspect
NORTHWEST 292.5-337.5)
WEST (247.5-292.5)
SOUTHWEST (202.5-247.5)
SOUTH (157.5-202.5)
SOUTHEAST (112.5-157.5)
EAST (67.5-112.5)
NORTHEAST (22.5-67.5)
NORTH (337.5-360 & 0-22.5)
FLAT (-1)
40
28
29
36
42
46
48
54
0
0
10
20
30
40
50
60
Number of CUAs (n=323)

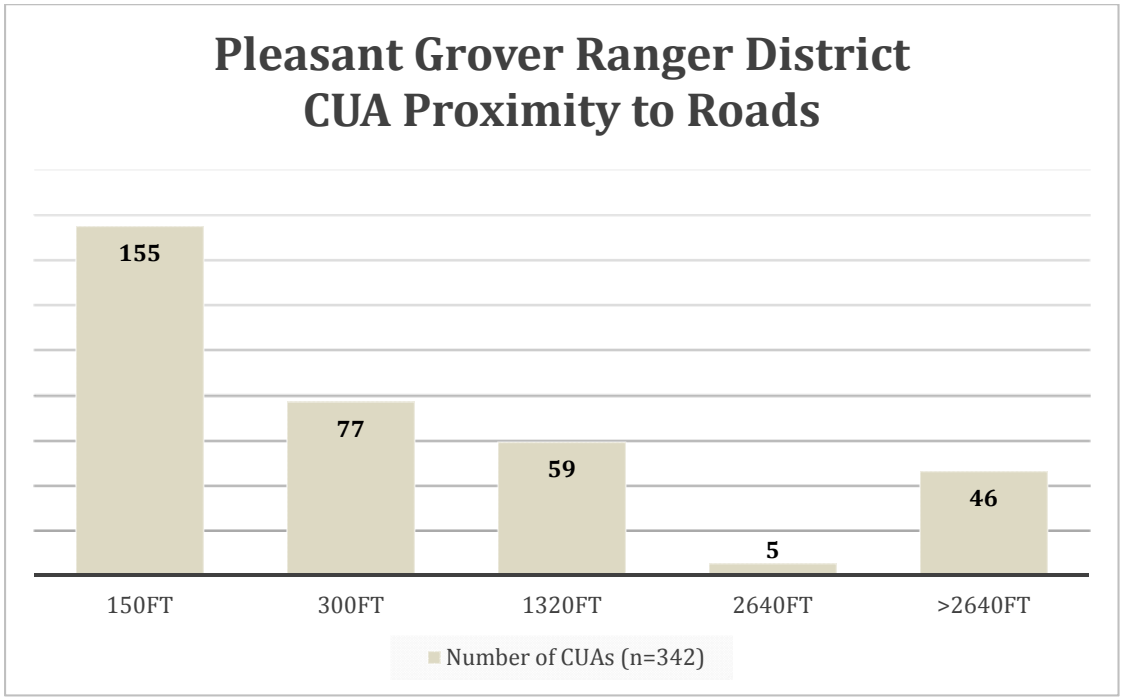

Ogden Ranger District
CUA Slopes
115
146
39
15
8
0-5%
5-10%
10-15%
15-20%
>20%
Number of CUAs (n=323)

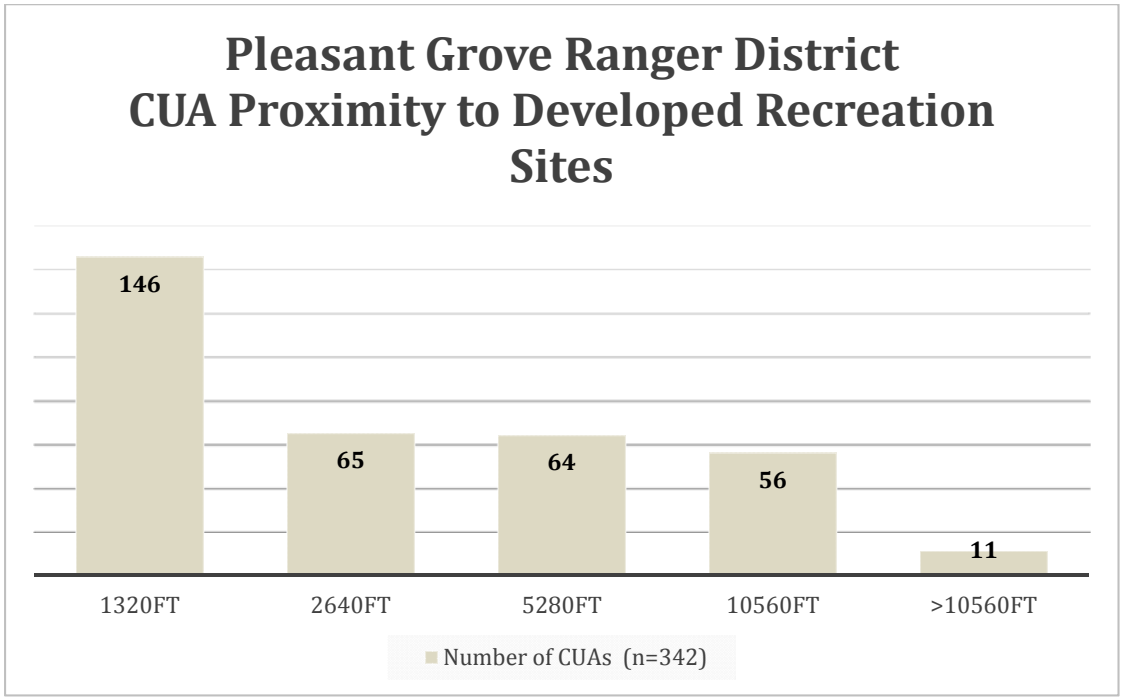

Ogden Ranger District
CUA Elevations
7
63
39
42
165
7
0
4000-5000FT
5000-6000FT
6000-7000FT
7000-8000FT
8000-9000FT
9000-10000FT
10000+FT
Number of CUAs (n=323)

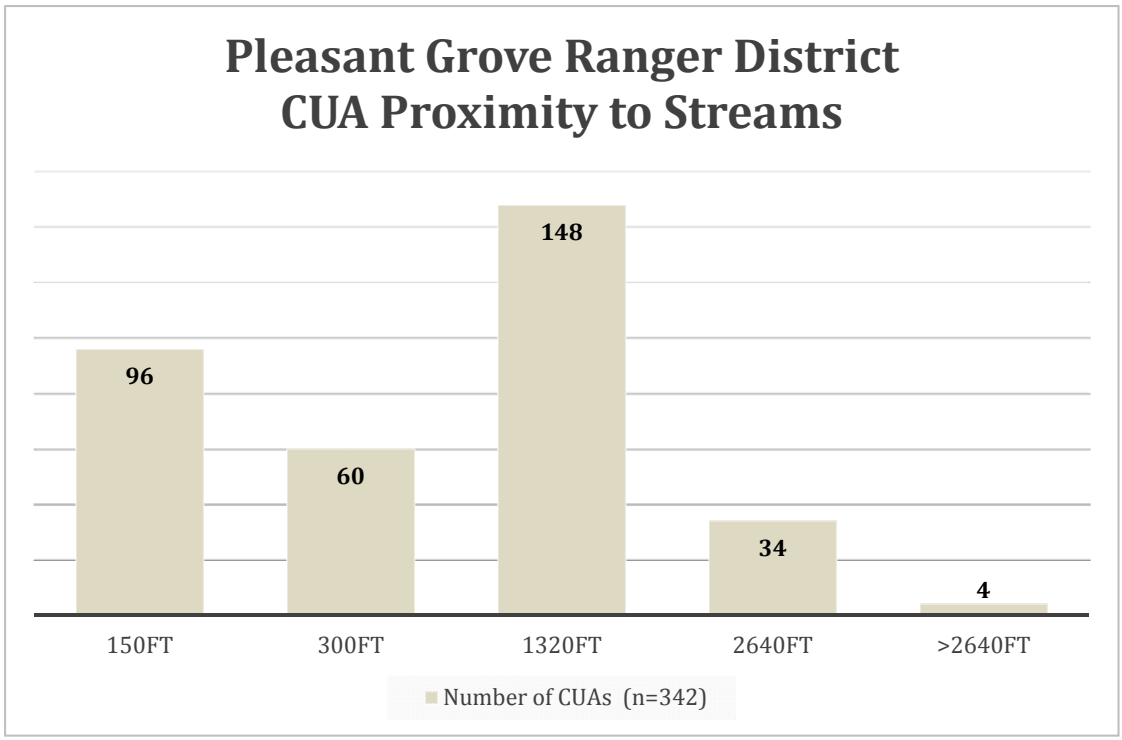

HERB COVER >=60-70%
1
HERB COVER >= 50-60%
3
HERB COVER >= 40-50%
3
HERB COVER >= 30-40%
7
HERB COVER >= 20-30%
2
HERB COVER >= 10-20%
1
SHRUB COVER >= 40-50%
1
SHRUB COVER >=30-40%
9
SHRUB COVER >=20-30%
20
SHRUB COVER >=10-20%
23
TREE COVER>=70-80%
3
TREE COVER >=60-70%
2
TREE COVER >=50-60%
46
TREE COVER >=40-50%
85
TREE COVER >=30-40%
66
TREE COVER >= 20-30%
22
TREE COVER >= 10-20%
8
SPARSE VEGETATION
1
DEVELOPED ROADS
16
DEVELOPED LOW INTENSITY
1
DEVELOPED UPLAND SHRUBLAND
0
DEVELOPED- UPLAND HERBACEOUS
2
DEVELOPED -UPLAND MIXED FOREST
0
DEVELOPED-UPLAND EVERGREEN FOREST
0
DEVELOPED UPLAND DECIDIOUS
1
OPEN WATER
0
0 10 20 30 40 50 60 70 80 90
Number of CUAs (n=323)

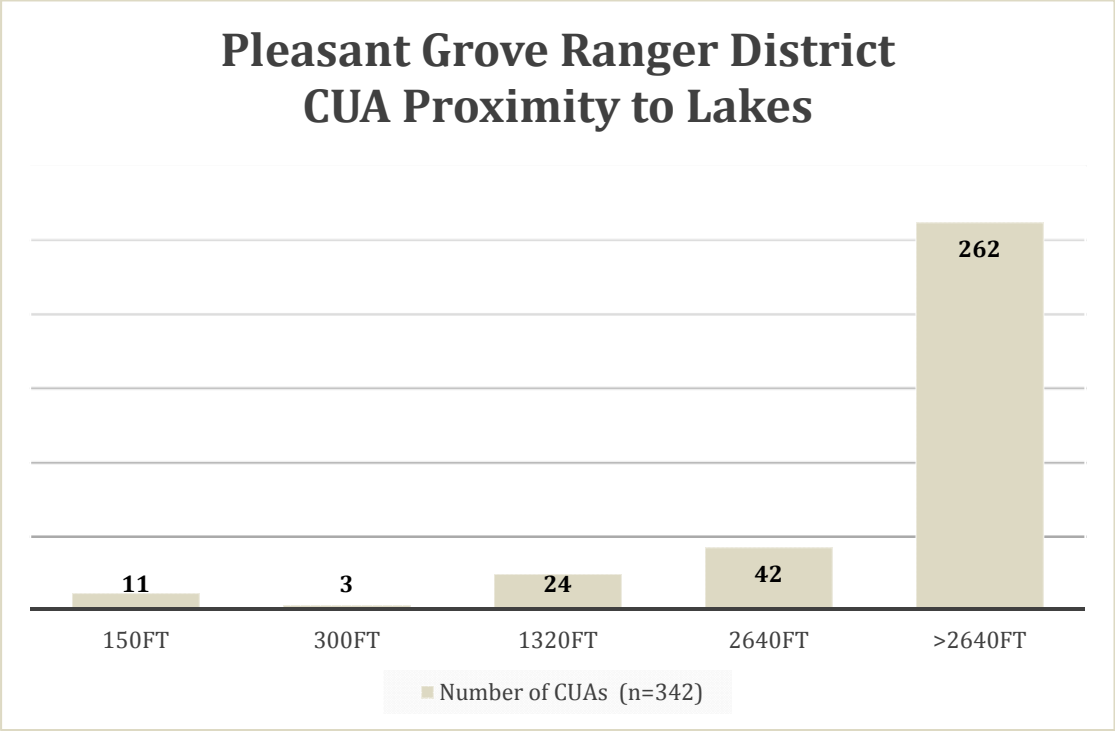

Odgen Ranger District
CUA Vegetation Height
FOREST 25-50M 2
FOREST 10-25M 163
FOREST 5-10M 60
FOREST 0-5M 7
SHRUB >3M 4
SHRUB 1-3M 15
SHRUB 0.5-1M 19
SHRUB 0-0.5M 15
HERB 0.5-1M 0
HERB 0-.5 METERS 17
SPARSE VEGETATION 1
DEVELOPED-ROADS 16
DEVELOPED-LOW INTENSITY 1
DEVELOPED- UPLAND SHRUBLAND 0
DEVELOPED- UPLAND HERACEOUS 2
DEVELOPED-UPLAND MIXED FOREST 0
DEVELOPED-UPLAND EVERGREEN FOREST 0
DEVELOPED-UPLAND DECIDUOUS 1
OPEN WATER 0
Number of CUAs (n=323)

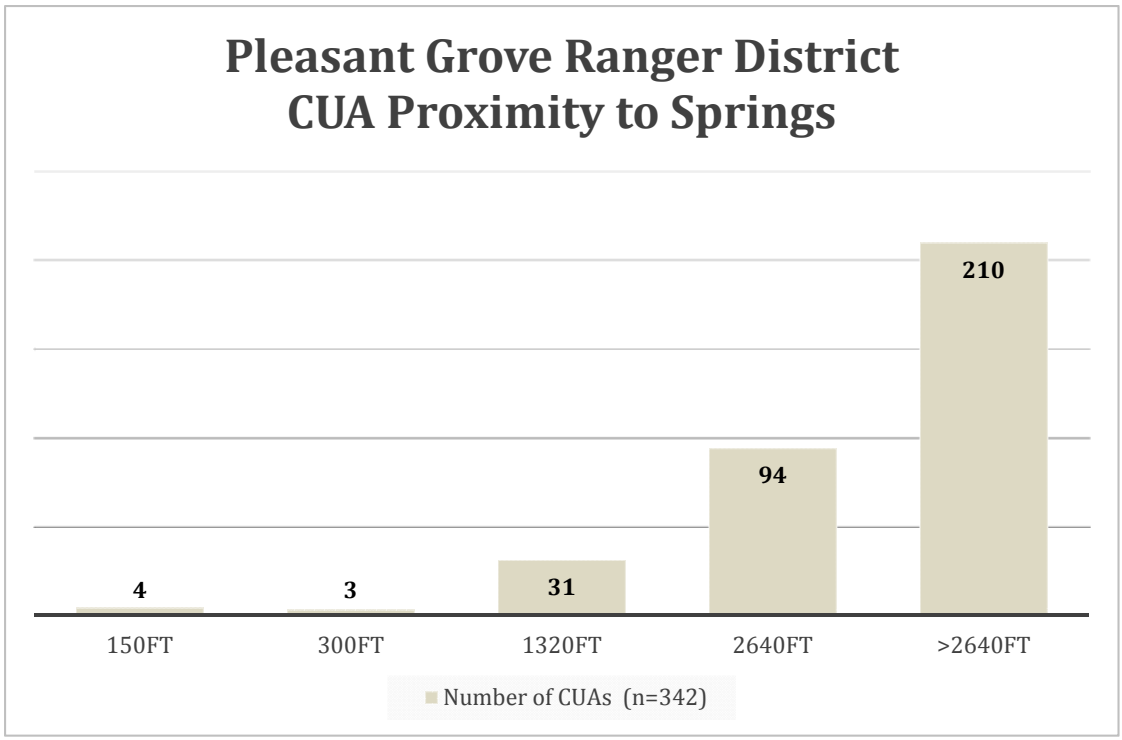
Pleasant Grove Ranger District.

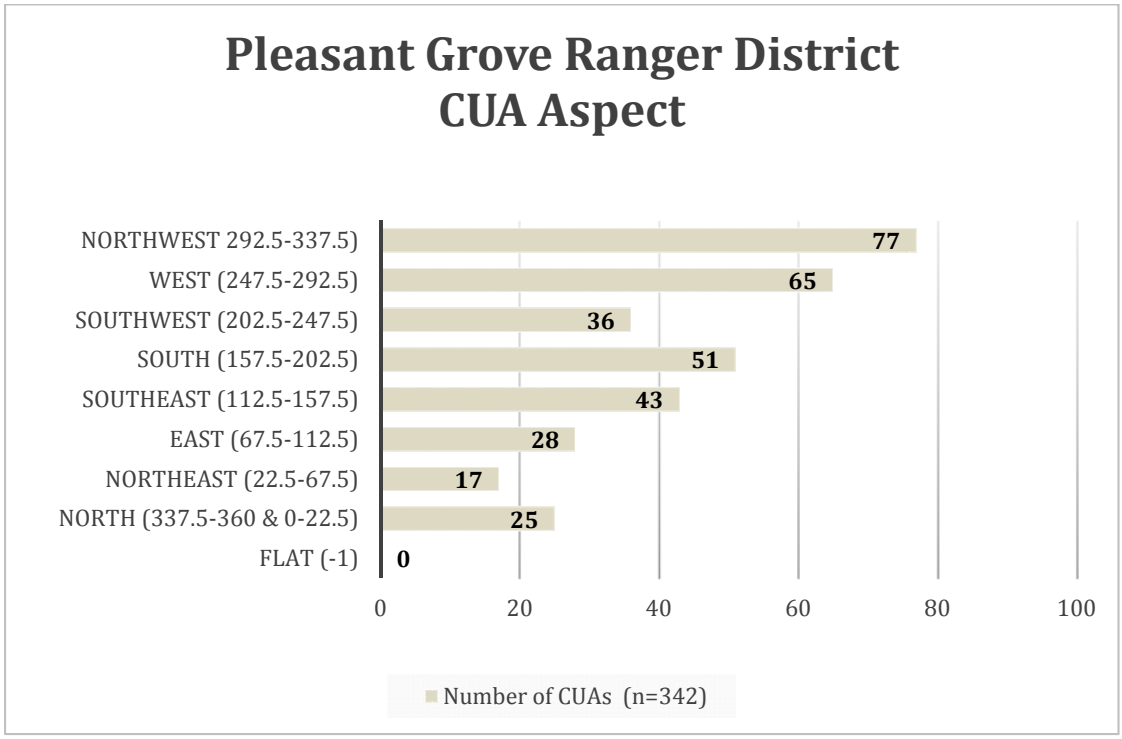


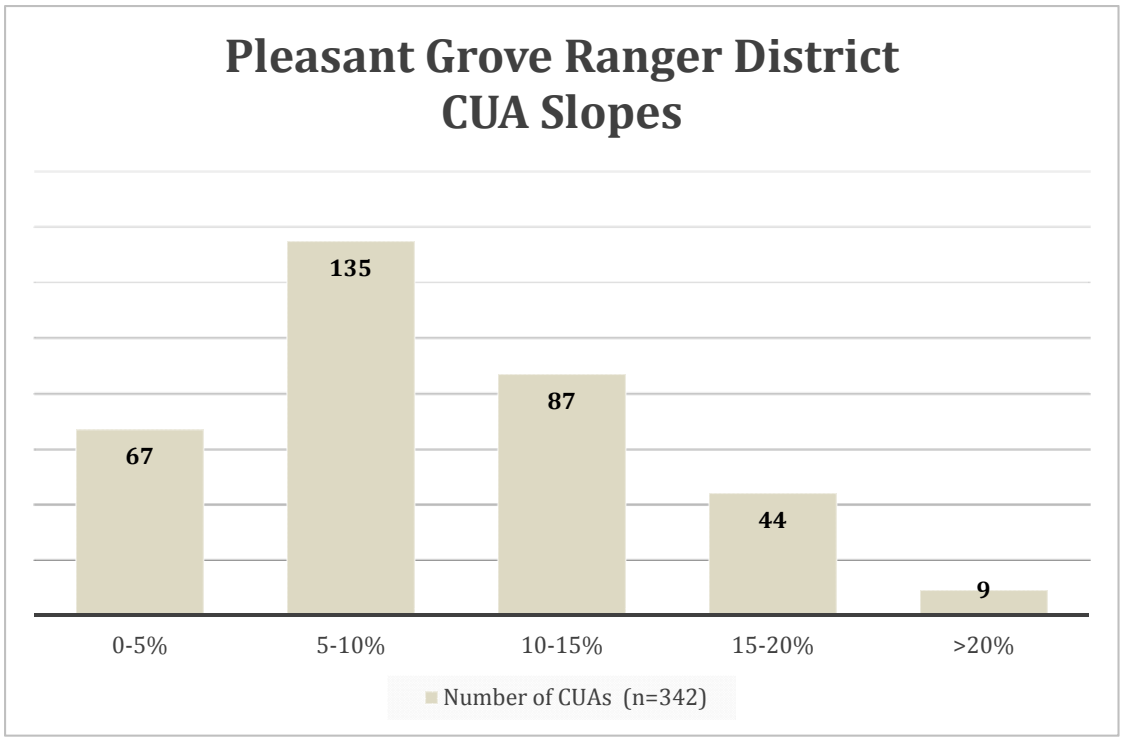


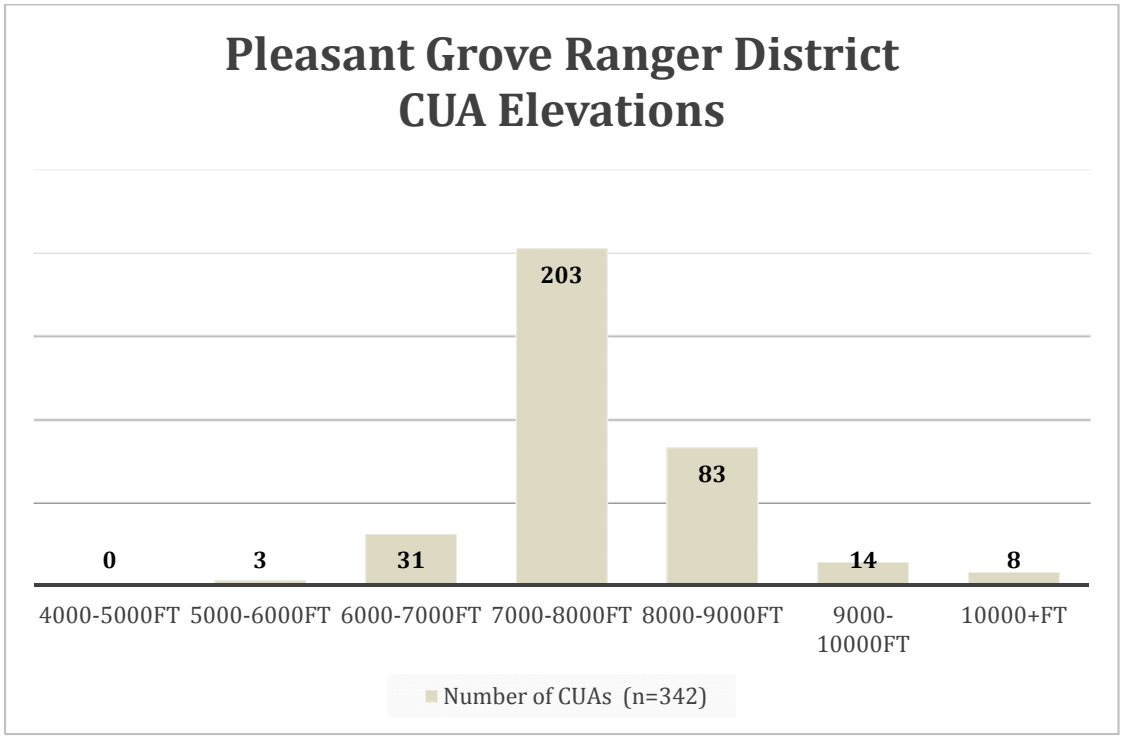

Pleasant Grove Ranger District
CUA Proximity to Streams
96
60
148
34
4
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=342)

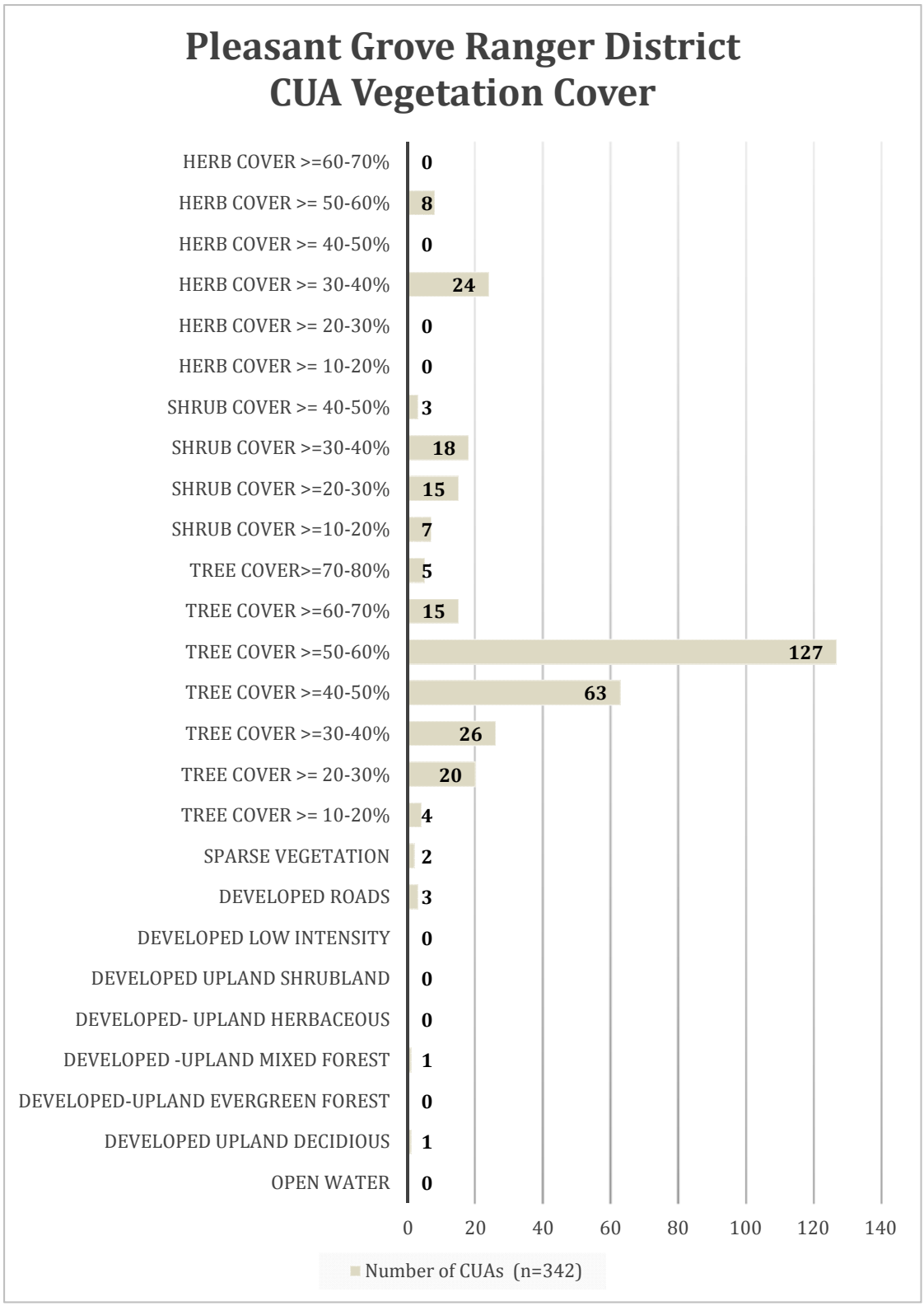

Pleasant Grove Ranger District
CUA Proximity to Lakes
11
3
24
42
262
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=342)

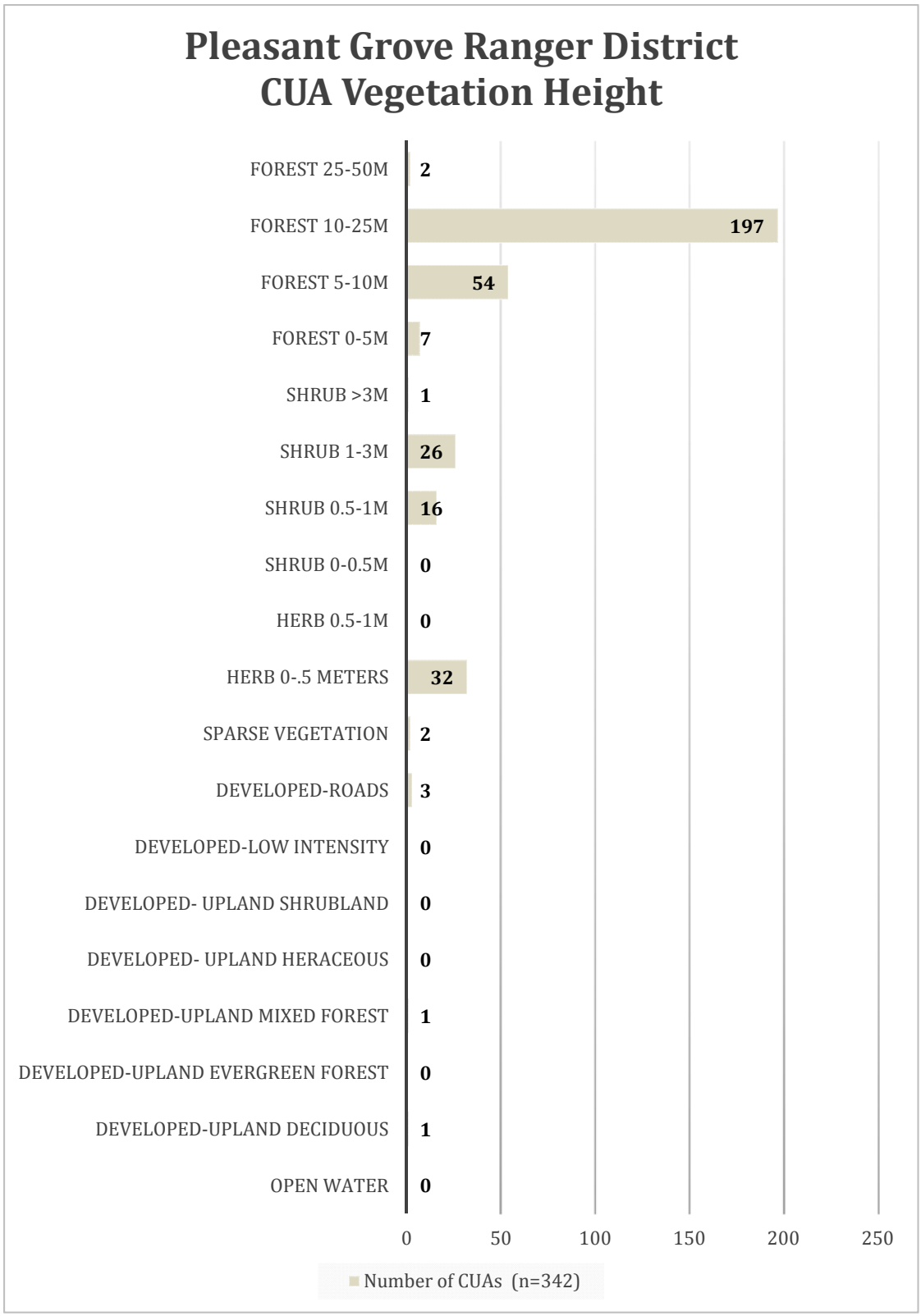

Pleasant Grove Ranger District
CUA Proximity to Springs
4
3
31
94
210
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=342)


Pleasant Grove Ranger District
CUA Aspect
NORTHWEST 292.5-337.5)
WEST (247.5-292.5)
SOUTHWEST (202.5-247.5)
SOUTH (157.5-202.5)
SOUTHEAST (112.5-157.5)
EAST (67.5-112.5)
NORTHEAST (22.5-67.5)
NORTH (337.5-360 & 0-22.5)
FLAT (-1)
77
65
36
51
43
28
17
25
0
0
20
40
60
80
100
Number of CUAs (n=342)

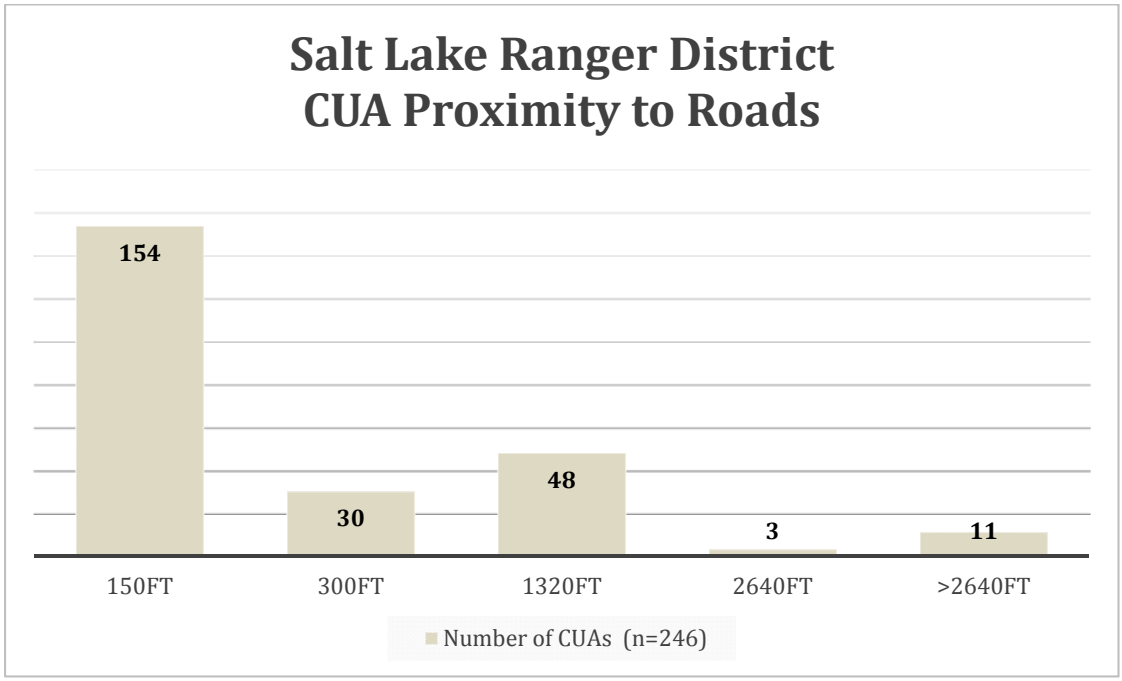

Pleasant Grove Ranger District
CUA Slopes
67
135
87
44
9
0-5%
5-10%
10-15%
15-20%
>20%
Number of CUAs (n=342)

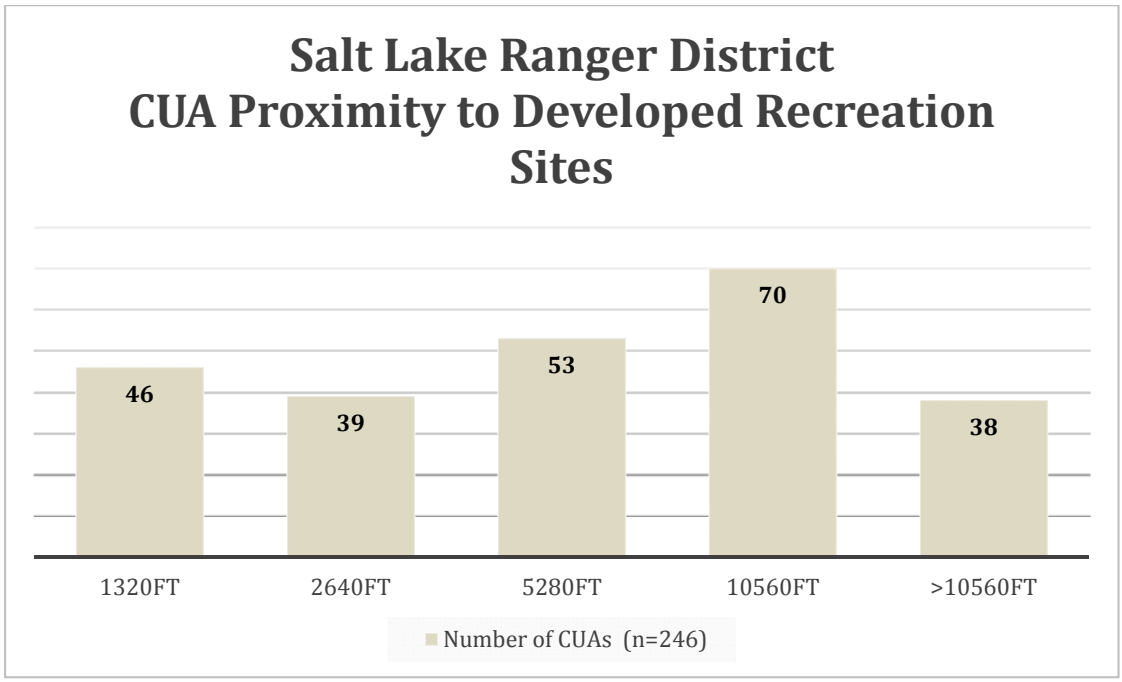

Pleasant Grove Ranger District
CUA Elevations
0
3
31
203
83
14
8
4000-5000FT
5000-6000FT
6000-7000FT
7000-8000FT
8000-9000FT
9000-10000FT
10000+FT
Number of CUAs (n=342)

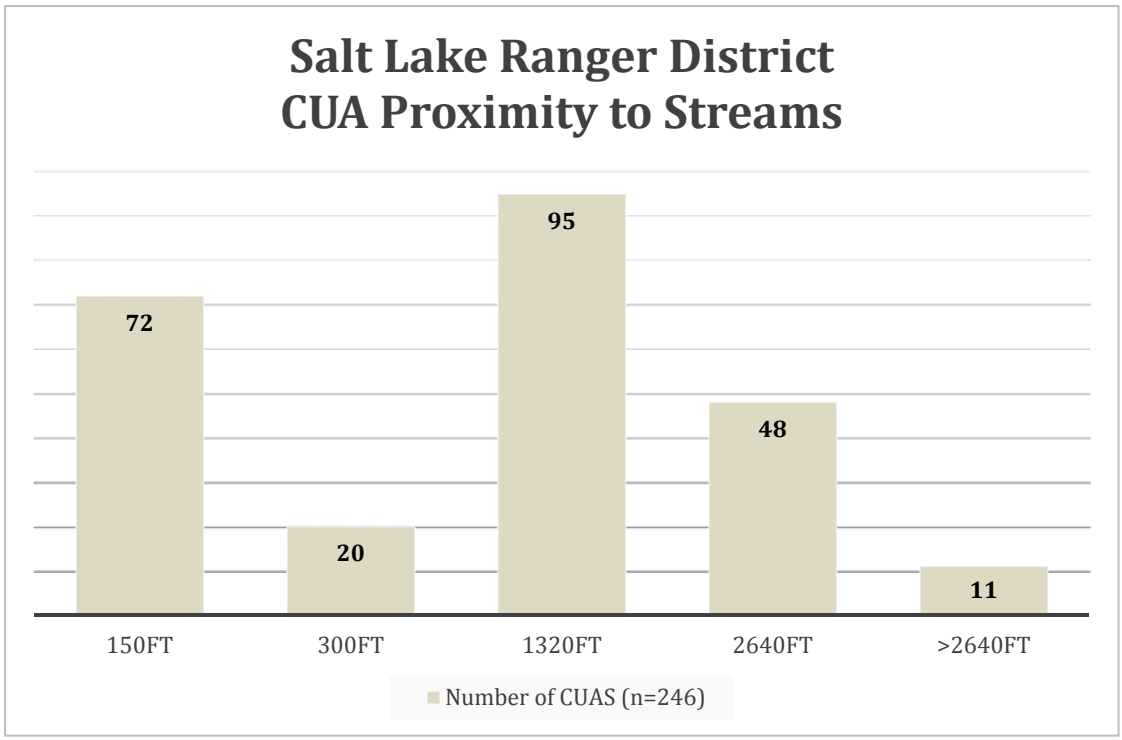

Pleasant Grove Ranger District
CUA Vegetation Cover
HERB COVER >=60-70% 0
HERB COVER >= 50-60% 8
HERB COVER >= 40-50% 0
HERB COVER >= 30-40% 24
HERB COVER >= 20-30% 0
HERB COVER >= 10-20% 0
SHRUB COVER >= 40-50% 3
SHRUB COVER >=30-40% 18
SHRUB COVER >=20-30% 15
SHRUB COVER >=10-20% 7
TREE COVER>=70-80% 5
TREE COVER >=60-70% 15
TREE COVER >=50-60% 127
TREE COVER >=40-50% 63
TREE COVER >=30-40% 26
TREE COVER >= 20-30% 20
TREE COVER >= 10-20% 4
SPARSE VEGETATION 2
DEVELOPED ROADS 3
DEVELOPED LOW INTENSITY 0
DEVELOPED UPLAND SHRUBLAND 0
DEVELOPED- UPLAND HERBACEOUS 0
DEVELOPED -UPLAND MIXED FOREST 1
DEVELOPED-UPLAND EVERGREEN FOREST 0
DEVELOPED UPLAND DECIDIOUS 1
OPEN WATER 0
0 20 40 60 80 100 120 140
Number of CUAs (n=342)

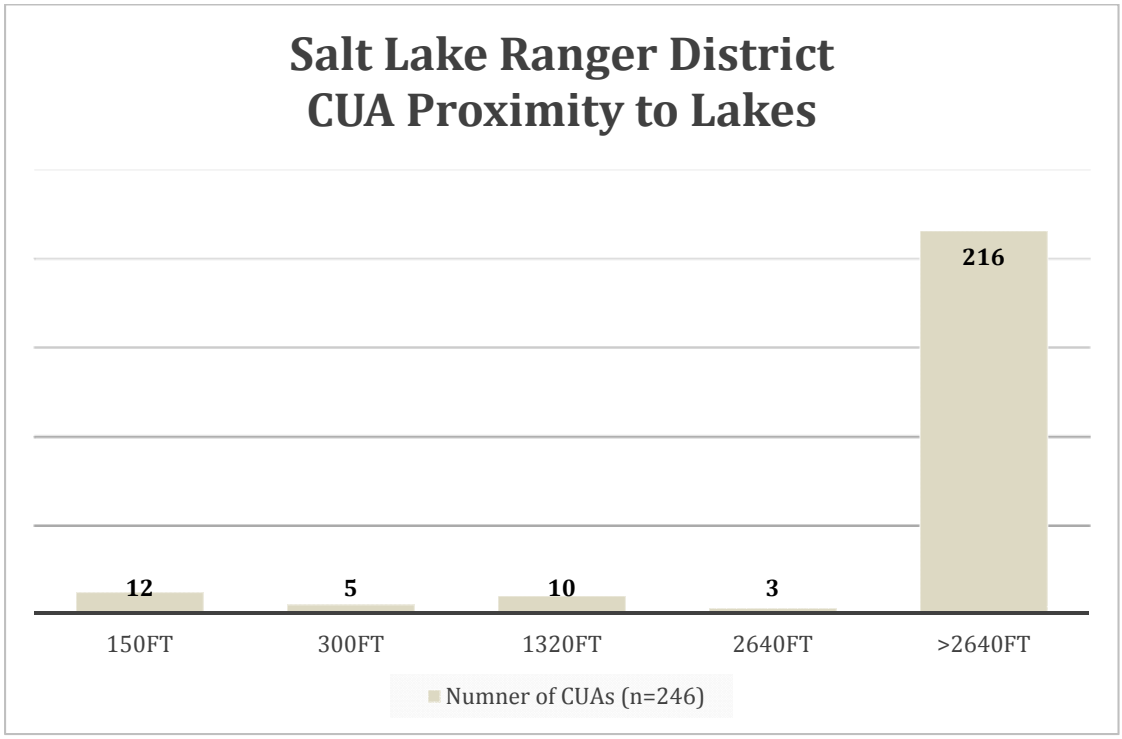

Pleasant Grove Ranger District
CUA Vegetation Height
FOREST 25-50M
2
FOREST 10-25M
197
FOREST 5-10M
54
FOREST 0-5M
7
SHRUB >3M
1
SHRUB 1-3M
26
SHRUB 0.5-1M
16
SHRUB 0-0.5M
0
HERB 0.5-1M
0
HERB 0-.5 METERS
32
SPARSE VEGETATION
2
DEVELOPED-ROADS
3
DEVELOPED-LOW INTENSITY
0
DEVELOPED- UPLAND SHRUBLAND
0
DEVELOPED- UPLAND HERACEOUS
0
DEVELOPED-UPLAND MIXED FOREST
1
DEVELOPED-UPLAND EVERGREEN FOREST
0
DEVELOPED-UPLAND DECIDUOUS
1
OPEN WATER
0
0
50
100
150
200
250
Number of CUAs (n=342)

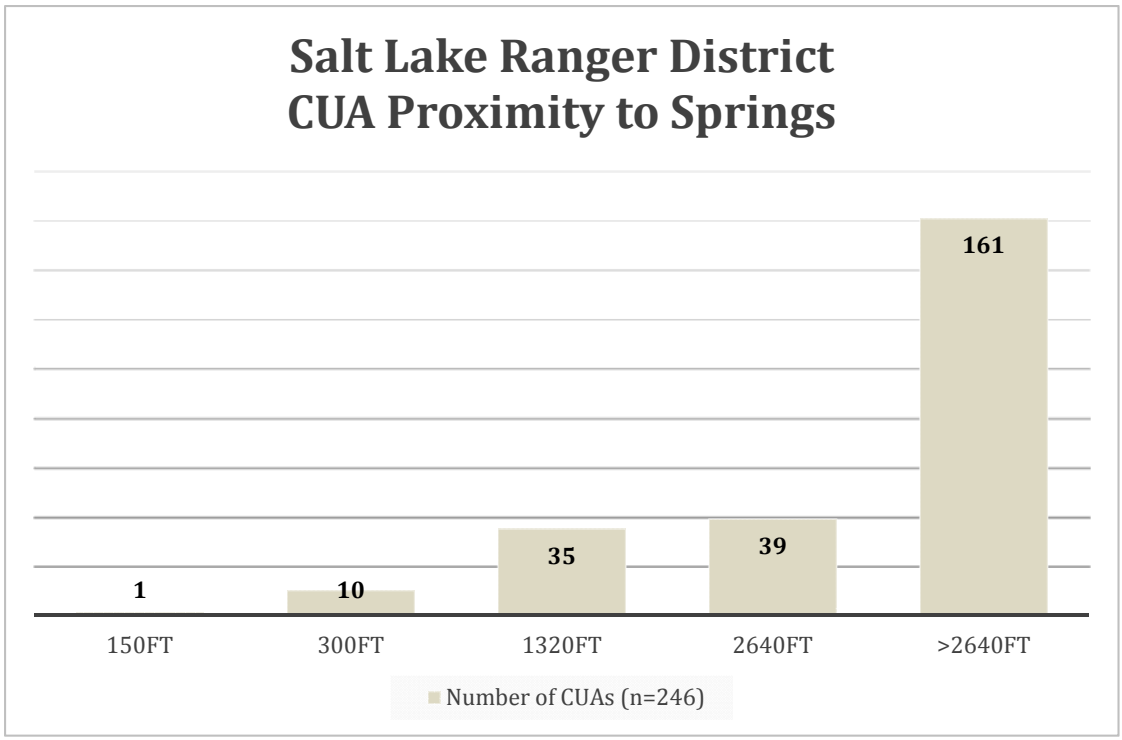
Salt Lake Ranger District.

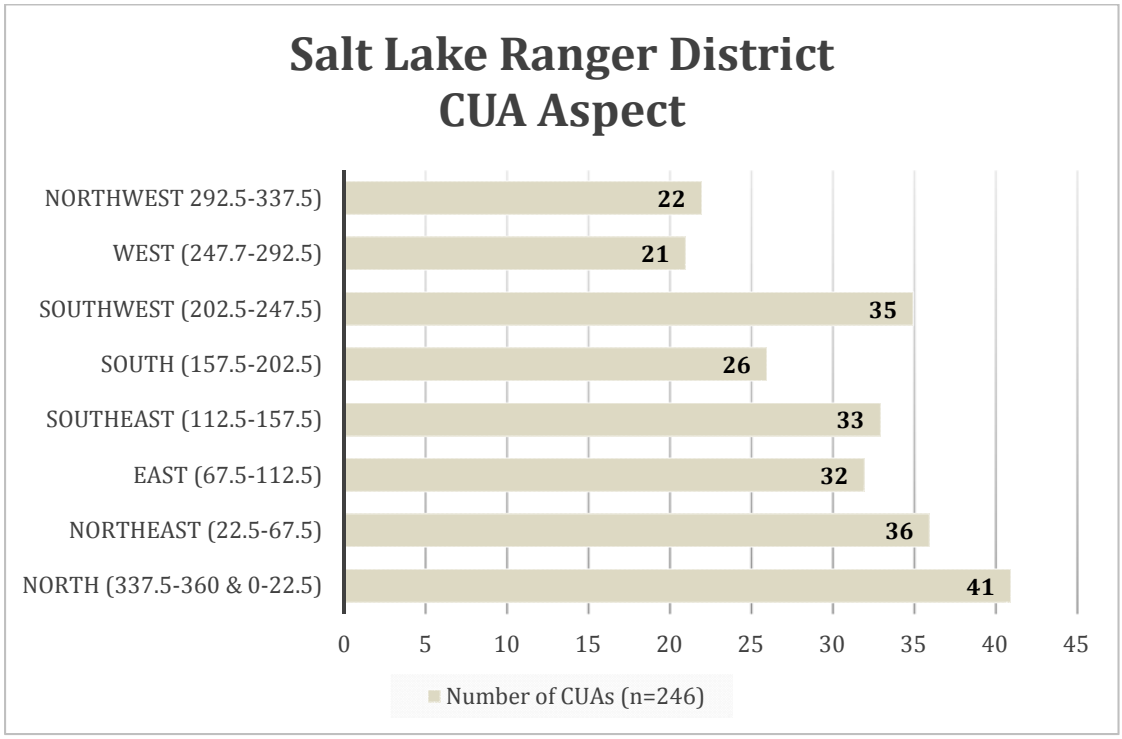


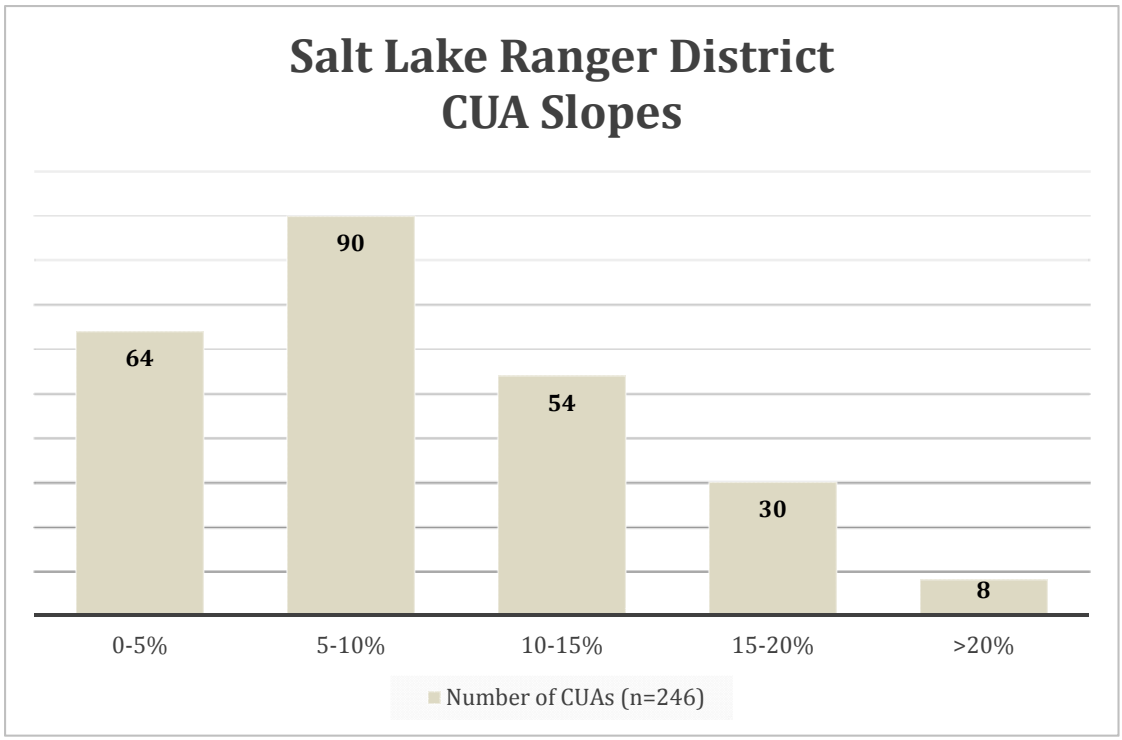


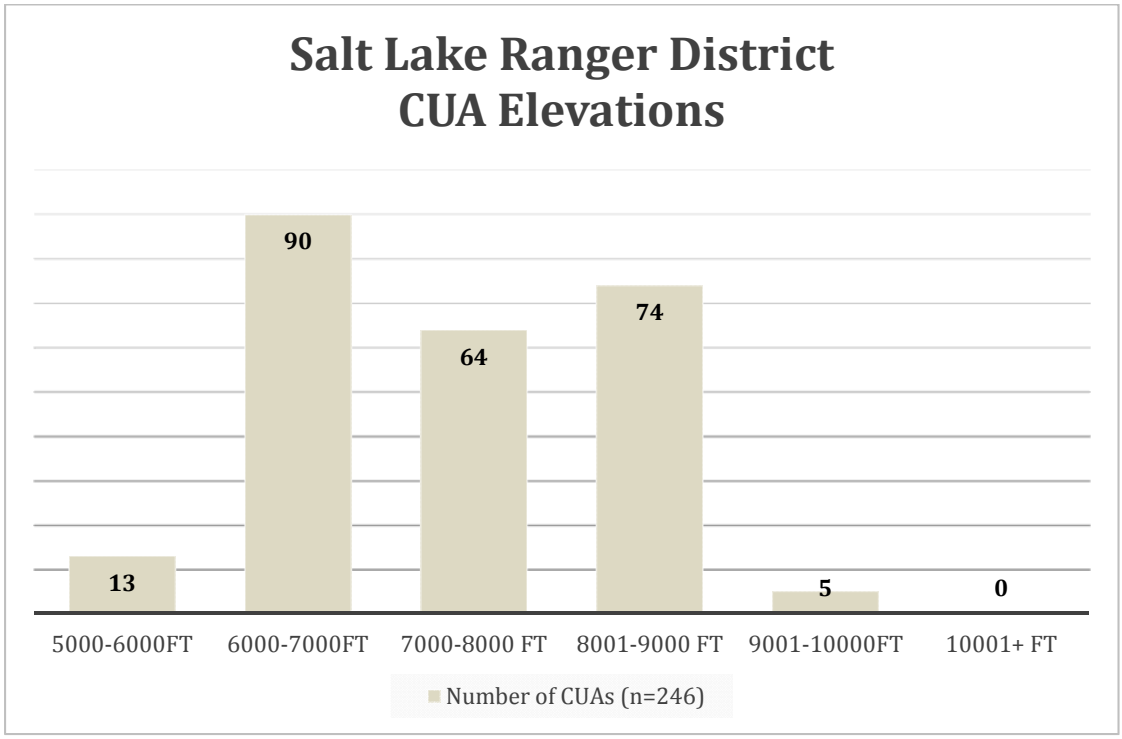

Salt Lake Ranger District
CUA Proximity to Streams
72
20
95
48
11
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAS (n=246)

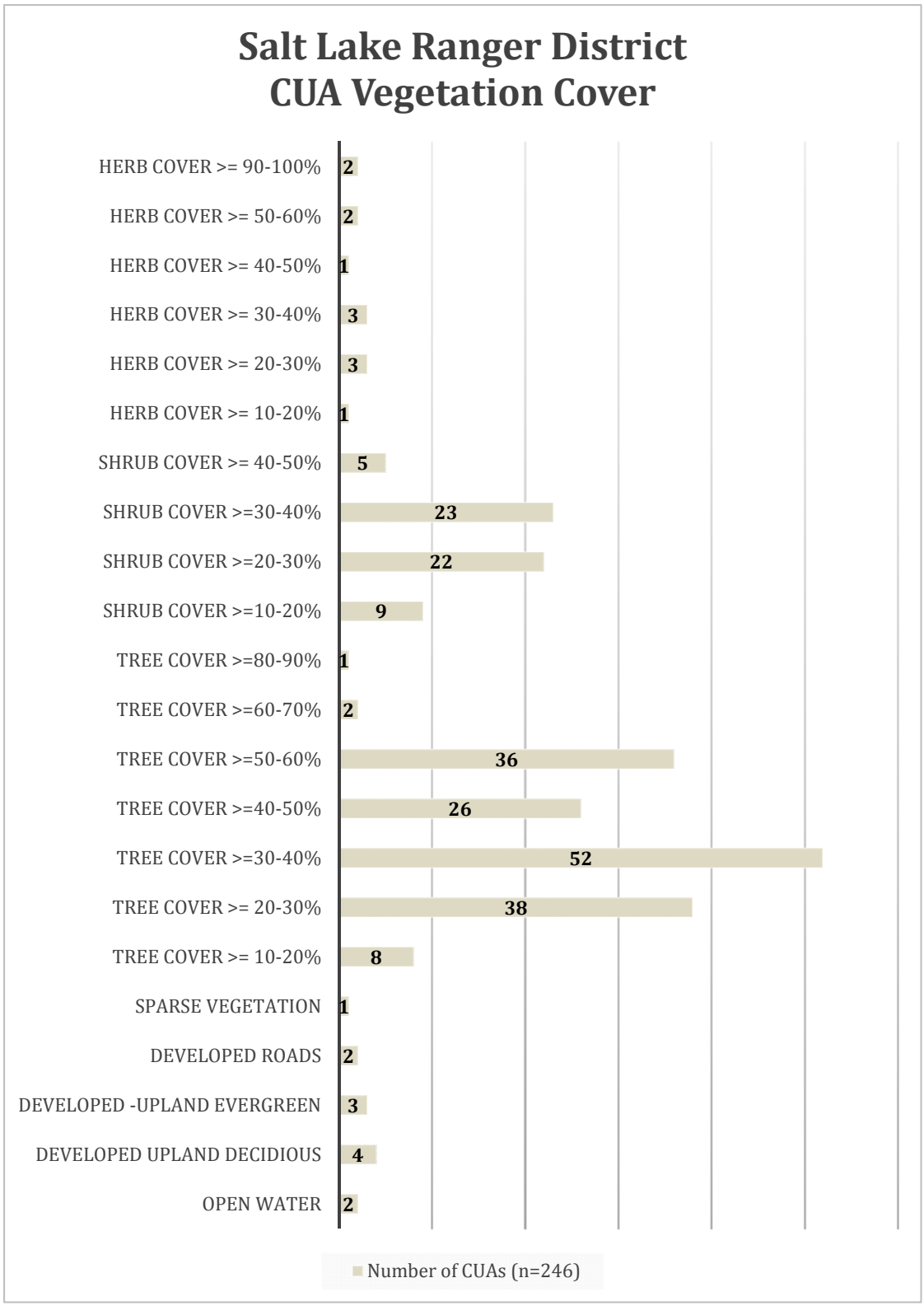

Salt Lake Ranger District
CUA Proximity to Lakes
12
5
10
3
216
150FT
300FT
1320FT
2640FT
>2640FT
Numner of CUAs (n=246)

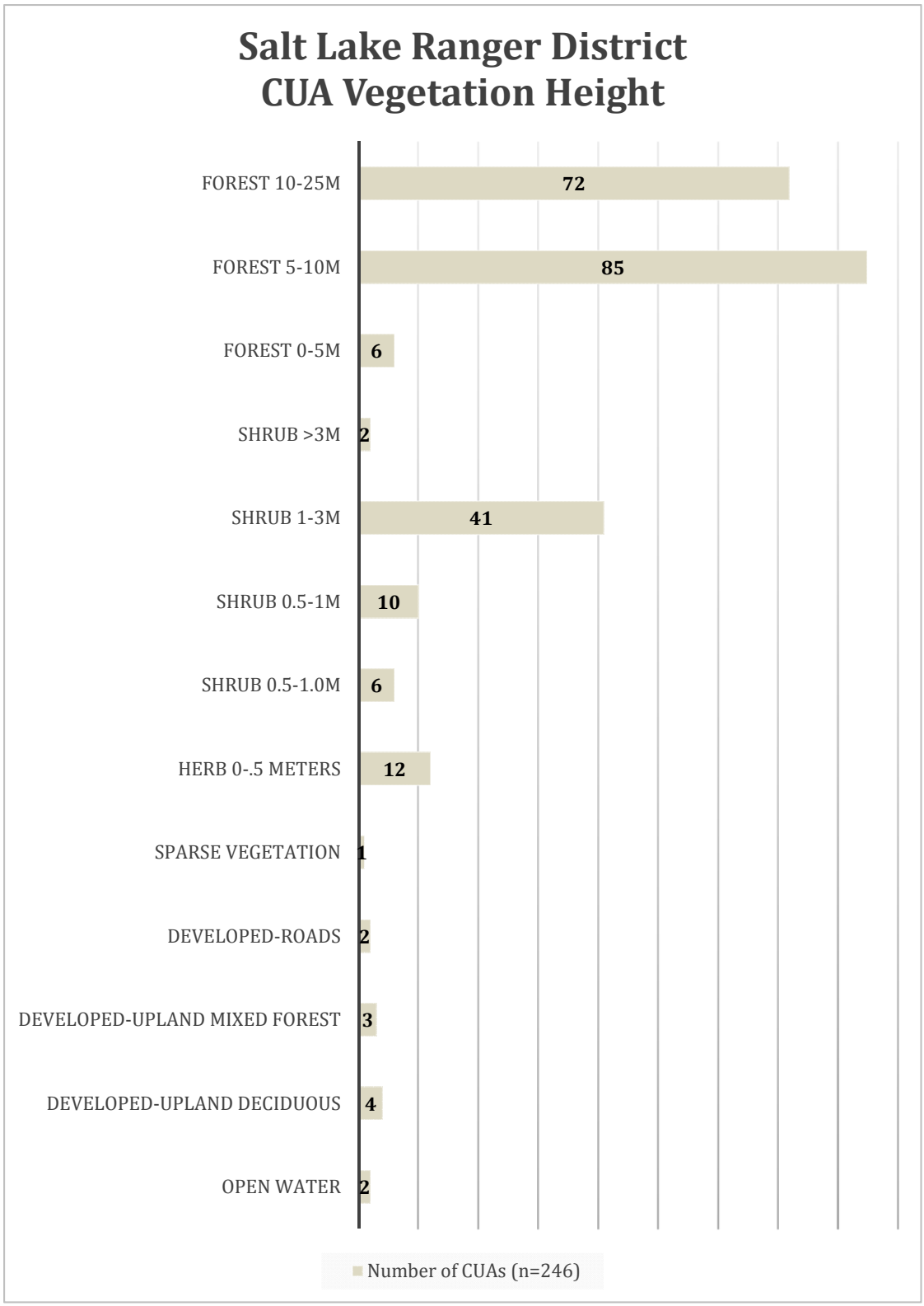

Salt Lake Ranger District
CUA Proximity to Springs
1
10
35
39
161
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=246)


Salt Lake Ranger District
CUA Aspect
NORTHWEST 292.5-337.5)
WEST (247.7-292.5)
SOUTHWEST (202.5-247.5)
SOUTH (157.5-202.5)
SOUTHEAST (112.5-157.5)
EAST (67.5-112.5)
NORTHEAST (22.5-67.5)
NORTH (337.5-360 & 0-22.5)
22
21
35
26
33
32
36
41
0
5
10
15
20
25
30
35
40
45
Number of CUAs (n=246)

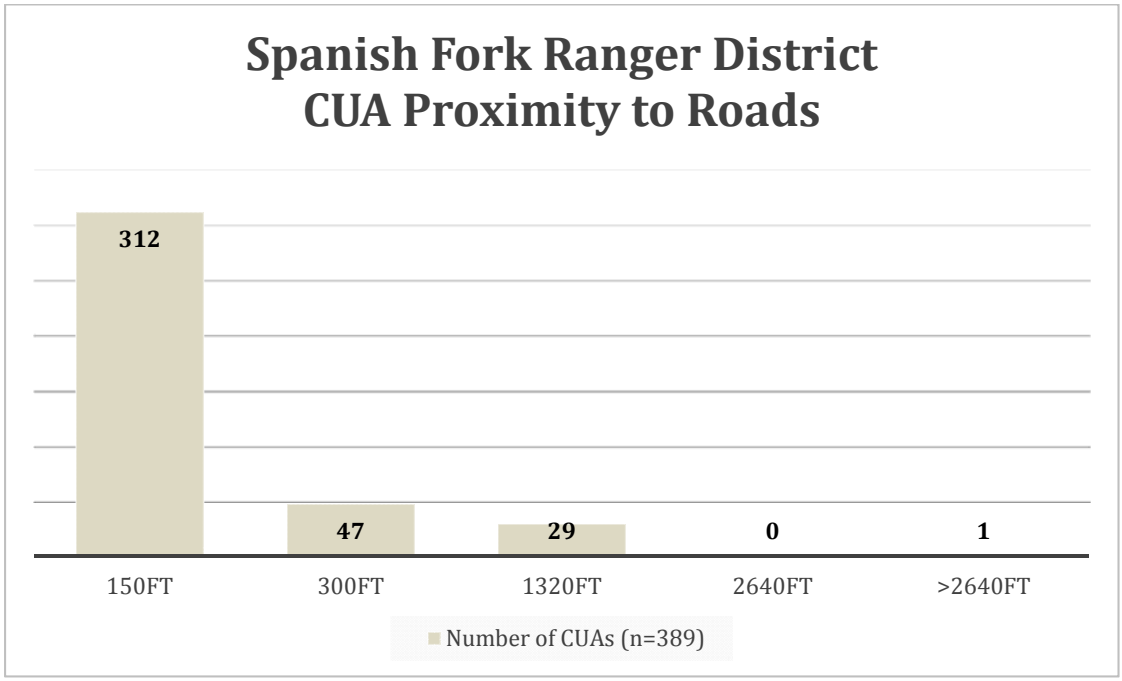

Salt Lake Ranger District
CUA Slopes
64
90
54
30
8
0-5%
5-10%
10-15%
15-20%
>20%
Number of CUAs (n=246)

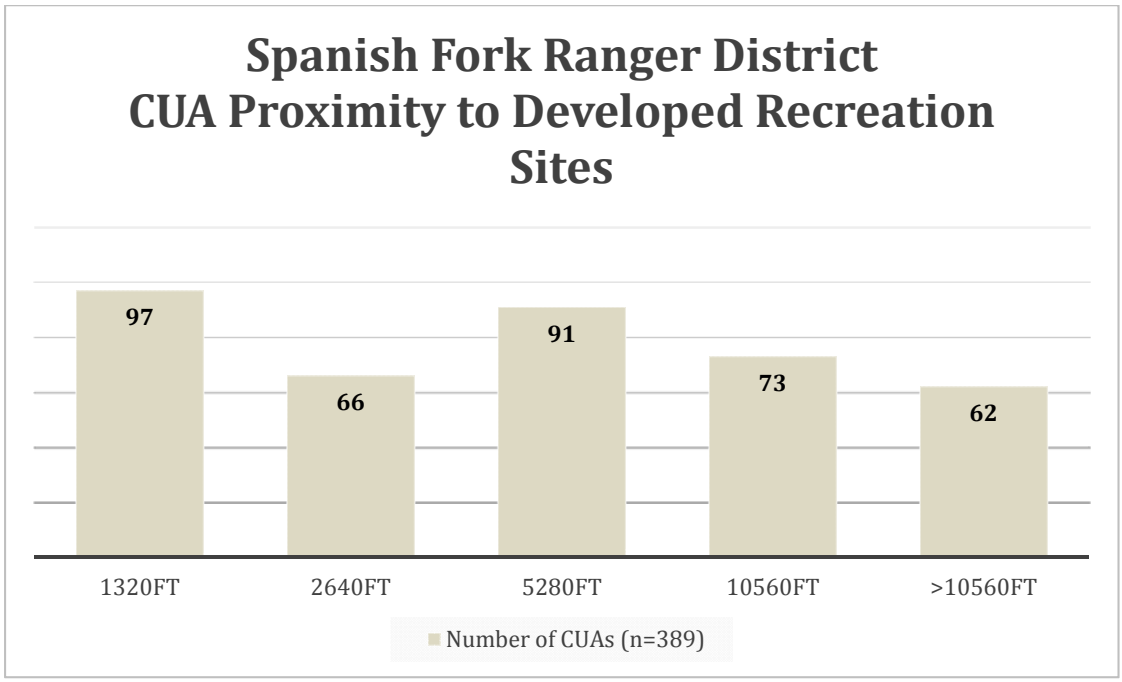

Salt Lake Ranger District
CUA Elevations
13
90
64
74
5
0
5000-6000FT
6000-7000FT
7000-8000 FT
8001-9000 FT
9001-10000FT
10001+ FT
Number of CUAs (n=246)

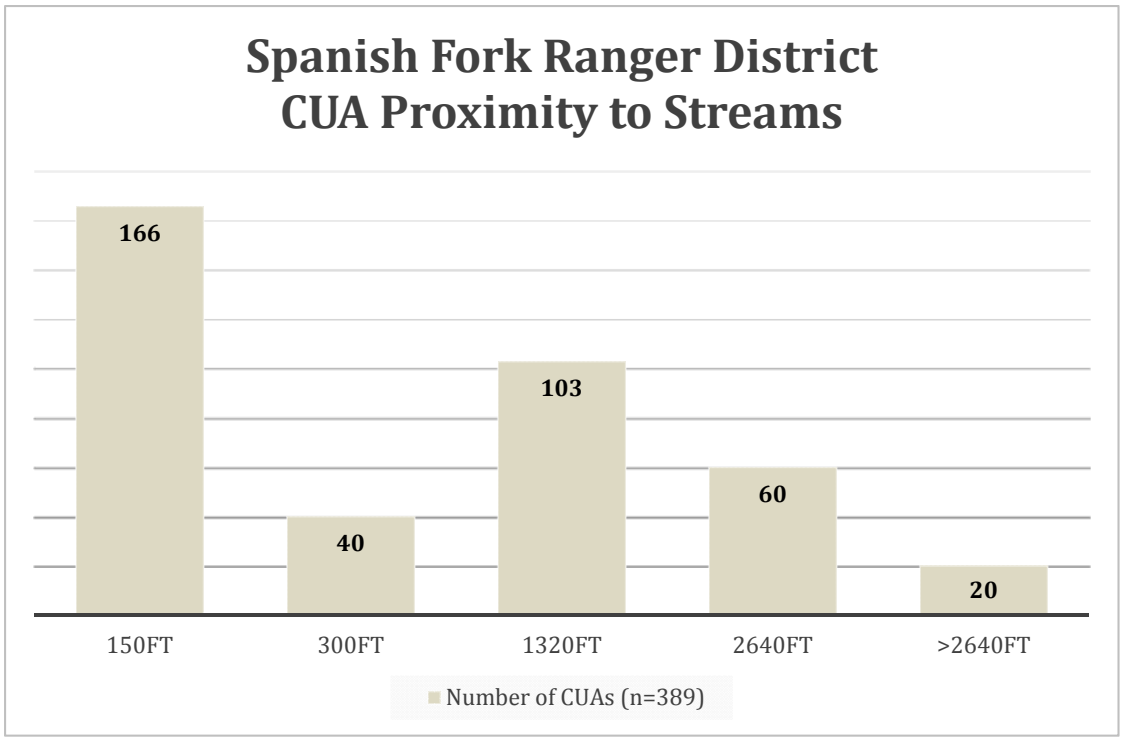

Salt Lake Ranger District
CUA Vegetation Cover
HERB COVER >= 90-100%
2
HERB COVER >= 50-60%
2
HERB COVER >= 40-50%
1
HERB COVER >= 30-40%
3
HERB COVER >= 20-30%
3
HERB COVER >= 10-20%
1
SHRUB COVER >= 40-50%
5
SHRUB COVER >=30-40%
23
SHRUB COVER >=20-30%
22
SHRUB COVER >=10-20%
9
TREE COVER >=80-90%
1
TREE COVER >=60-70%
2
TREE COVER >=50-60%
36
TREE COVER >=40-50%
26
TREE COVER >=30-40%
52
TREE COVER >= 20-30%
38
TREE COVER >= 10-20%
8
SPARSE VEGETATION
1
DEVELOPED ROADS
2
DEVELOPED -UPLAND EVERGREEN
3
DEVELOPED UPLAND DECIDIOUS
4
OPEN WATER
2
Number of CUAs (n=246)

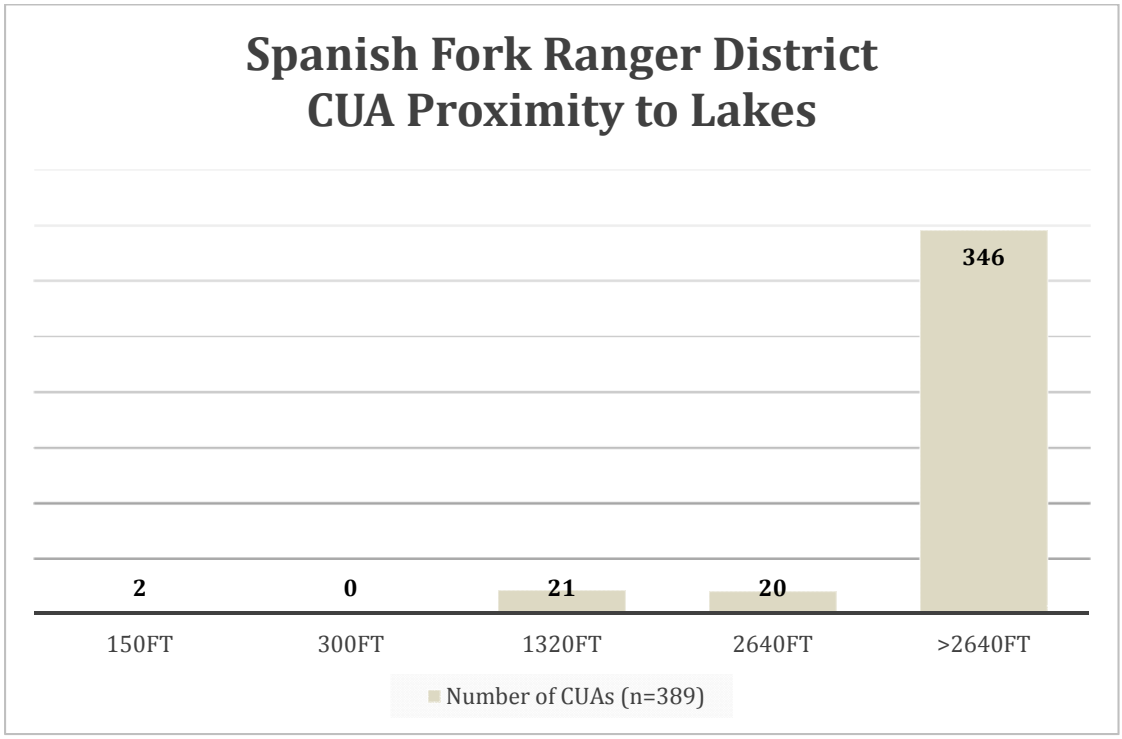

Salt Lake Ranger District
CUA Vegetation Height
FOREST 10-25M
72
FOREST 5-10M
85
FOREST 0-5M
6
SHRUB >3M
2
SHRUB 1-3M
41
SHRUB 0.5-1M
10
SHRUB 0.5-1.0M
6
HERB 0-.5 METERS
12
SPARSE VEGETATION
1
DEVELOPED-ROADS
2
DEVELOPED-UPLAND MIXED FOREST
3
DEVELOPED-UPLAND DECIDUOUS
4
OPEN WATER
2
Number of CUAs (n=246)

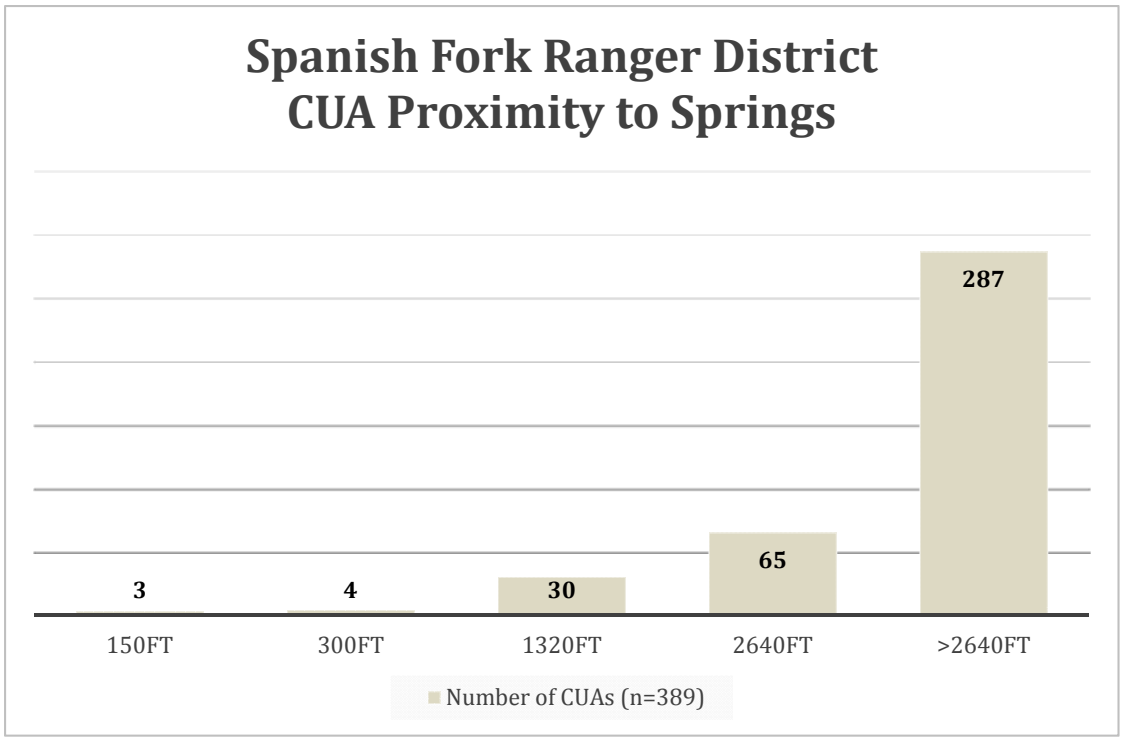
Spanish Fork Ranger District.

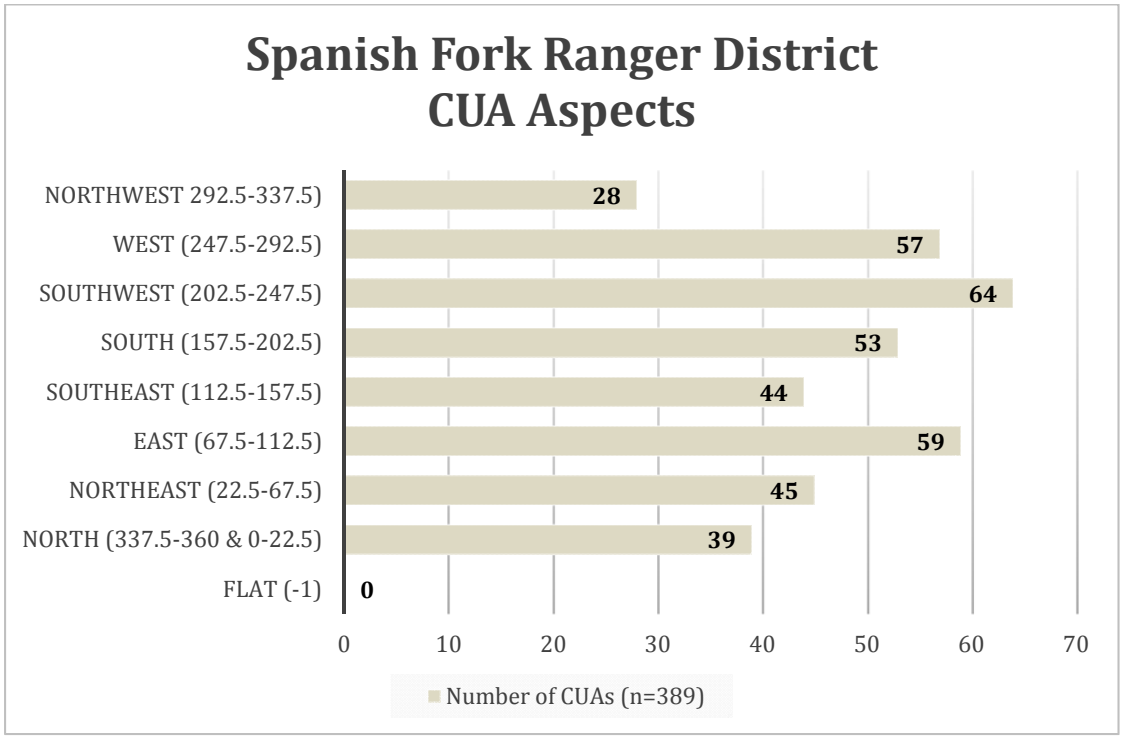


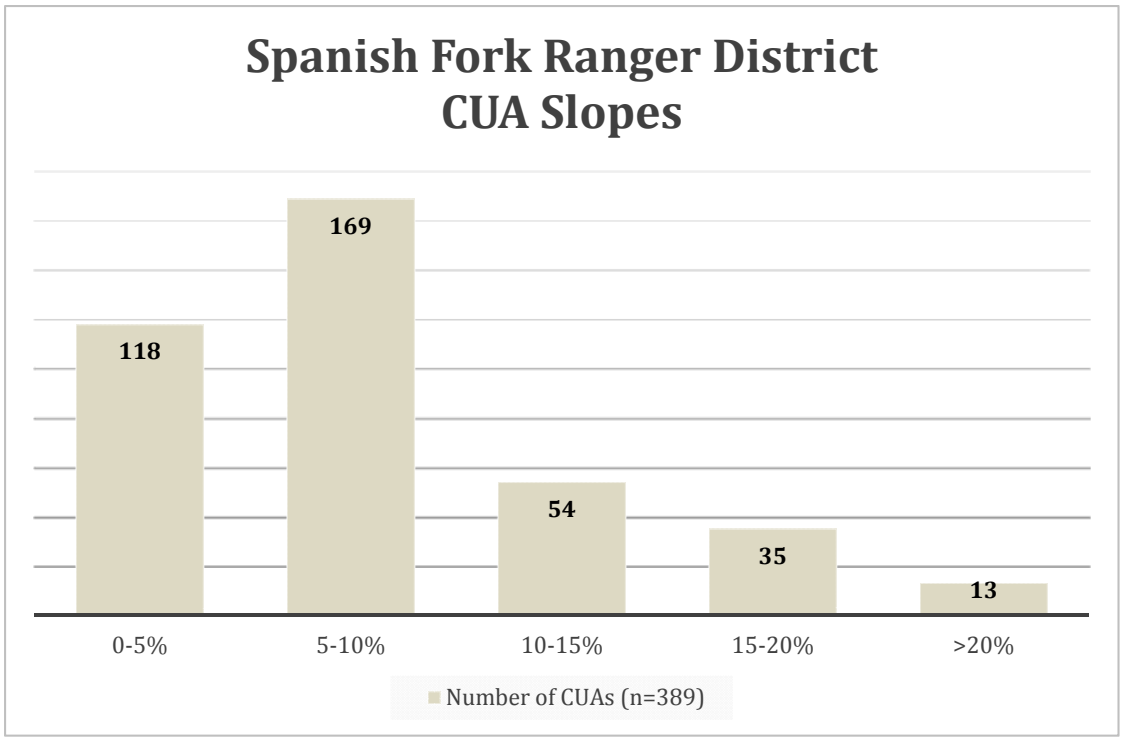


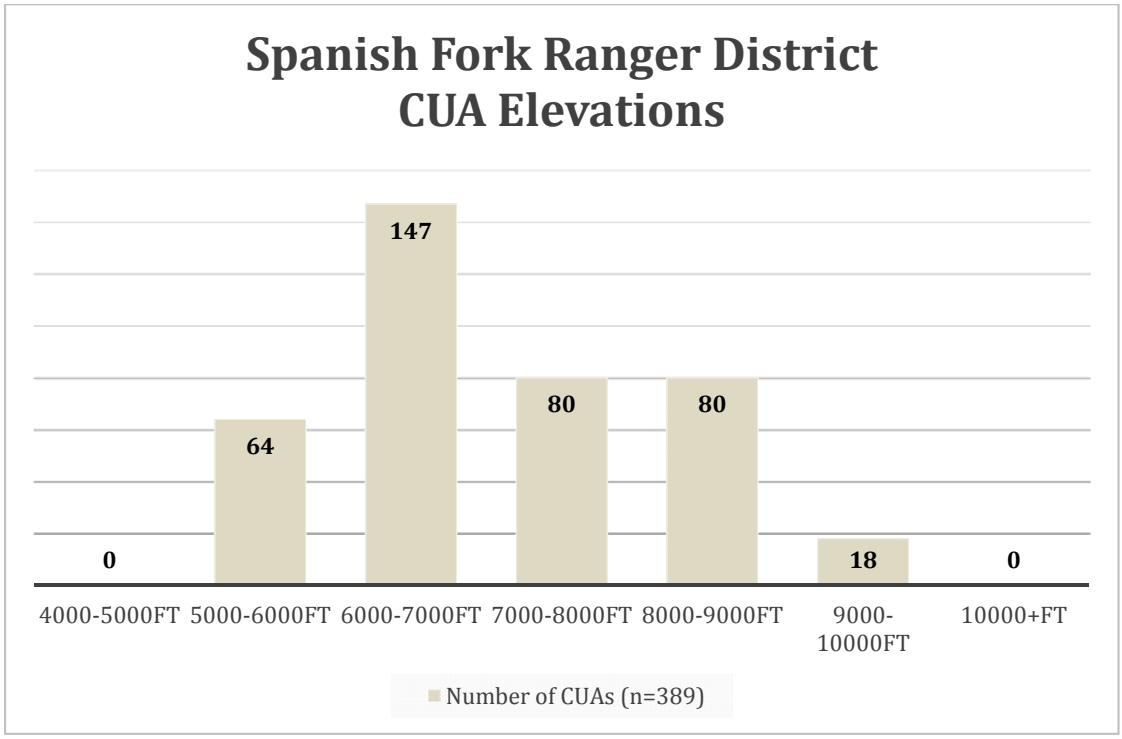

Spanish Fork Ranger District
CUA Proximity to Streams
166
40
103
60
20
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=389)

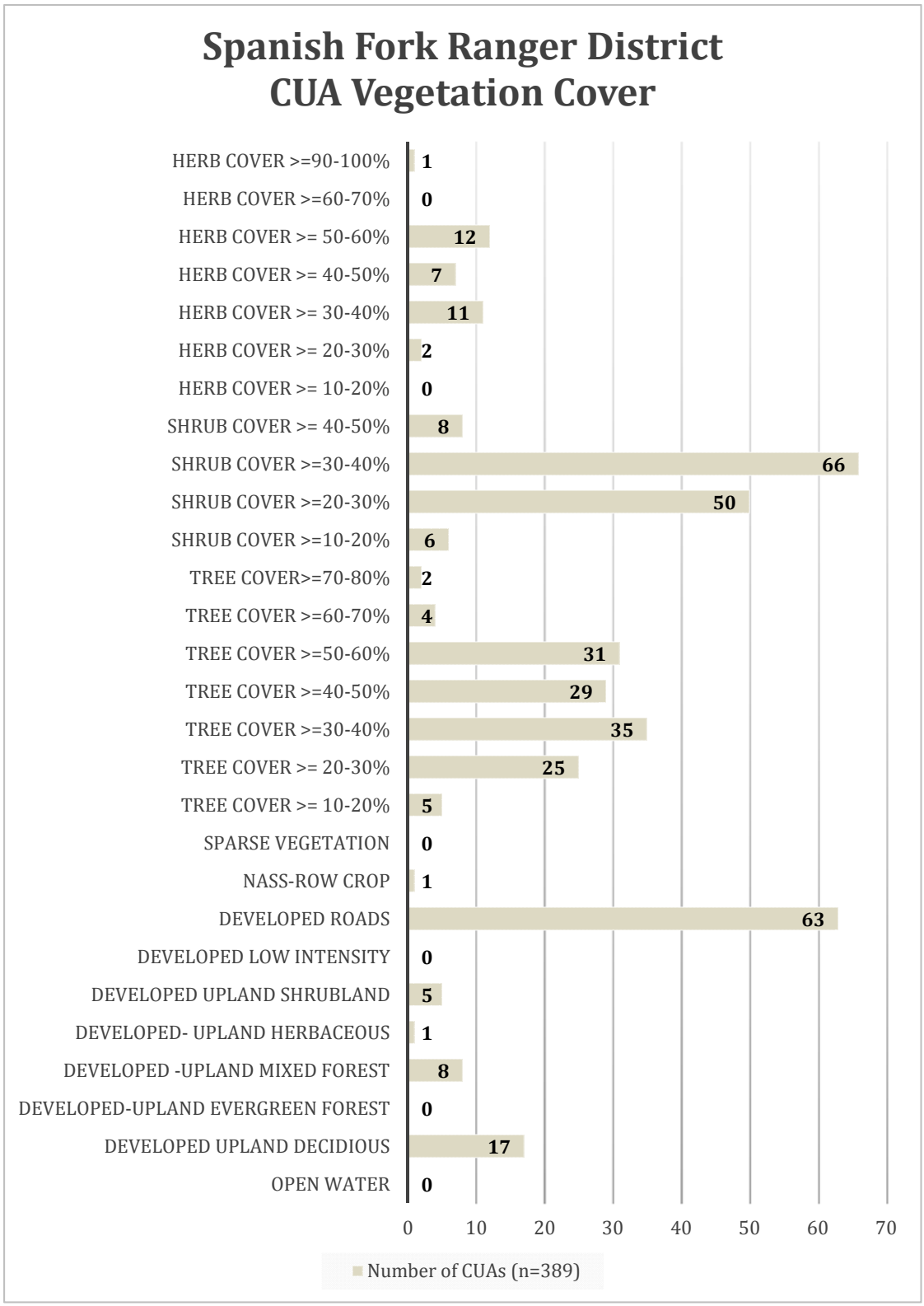

Spanish Fork Ranger District
CUA Proximity to Lakes
2
0
21
20
346
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=389)

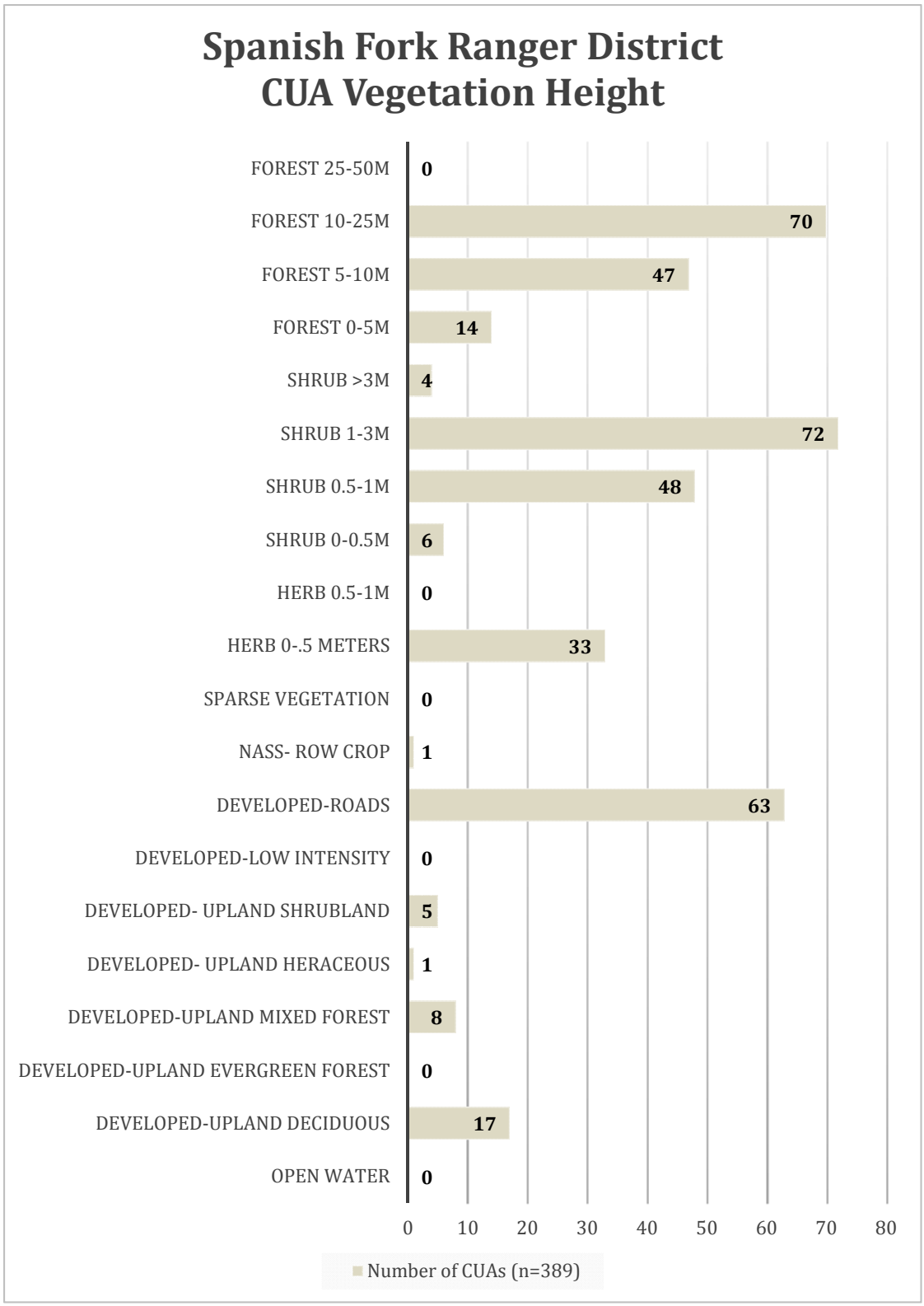

Spanish Fork Ranger District
CUA Proximity to Springs
3
4
30
65
287
150FT
300FT
1320FT
2640FT
>2640FT
Number of CUAs (n=389)


Spanish Fork Ranger District
CUA Aspects
NORTHWEST 292.5-337.5)
WEST (247.5-292.5)
SOUTHWEST (202.5-247.5)
SOUTH (157.5-202.5)
SOUTHEAST (112.5-157.5)
EAST (67.5-112.5)
NORTHEAST (22.5-67.5)
NORTH (337.5-360 & 0-22.5)
FLAT (-1)
28
57
64
53
44
59
45
39
0
0
10
20
30
40
50
60
70
Number of CUAs (n=389)


Spanish Fork Ranger District
CUA Slopes
118
169
54
35
13
0-5%
5-10%
10-15%
15-20%
>20%
Number of CUAs (n=389)


Spanish Fork Ranger District
CUA Elevations
0
64
147
80
80
18
0
4000-5000FT
5000-6000FT
6000-7000FT
7000-8000FT
8000-9000FT
9000-10000FT
10000+FT
Number of CUAs (n=389)


Spanish Fork Ranger District
CUA Vegetation Cover
HERB COVER >=90-100%
1
HERB COVER >=60-70%
0
HERB COVER >= 50-60%
12
HERB COVER >= 40-50%
7
HERB COVER >= 30-40%
11
HERB COVER >= 20-30%
2
HERB COVER >= 10-20%
0
SHRUB COVER >= 40-50%
8
SHRUB COVER >=30-40%
66
SHRUB COVER >=20-30%
50
SHRUB COVER >=10-20%
6
TREE COVER>=70-80%
2
TREE COVER >=60-70%
4
TREE COVER >=50-60%
31
TREE COVER >=40-50%
29
TREE COVER >=30-40%
35
TREE COVER >= 20-30%
25
TREE COVER >= 10-20%
5
SPARSE VEGETATION
0
NASS-ROW CROP
1
DEVELOPED ROADS
63
DEVELOPED LOW INTENSITY
0
DEVELOPED UPLAND SHRUBLAND
5
DEVELOPED- UPLAND HERBACEOUS
1
DEVELOPED -UPLAND MIXED FOREST
8
DEVELOPED-UPLAND EVERGREEN FOREST
0
DEVELOPED UPLAND DECIDIOUS
17
OPEN WATER
0
0
10
20
30
40
50
60
70
Number of CUAs (n=389)


Spanish Fork Ranger District
CUA Vegetation Height
FOREST 25-50M
0
FOREST 10-25M
70
FOREST 5-10M
47
FOREST 0-5M
14
SHRUB >3M
4
SHRUB 1-3M
72
SHRUB 0.5-1M
48
SHRUB 0-0.5M
6
HERB 0.5-1M
0
HERB 0-.5 METERS
33
SPARSE VEGETATION
0
NASS- ROW CROP
1
DEVELOPED-ROADS
63
DEVELOPED-LOW INTENSITY
0
DEVELOPED- UPLAND SHRUBLAND
5
DEVELOPED- UPLAND HERACEOUS
1
DEVELOPED-UPLAND MIXED FOREST
8
DEVELOPED-UPLAND EVERGREEN FOREST
0
DEVELOPED-UPLAND DECIDUOUS
17
OPEN WATER
0
0
10
20
30
40
50
60
70
80
Number of CUAs (n=389)