United States Department of Agriculture

Forest Service

April 2018

Central Cascades Wilderness Strategies Project

Environmental Assessment

Crescent, Sisters, and Bend/Ft. Rock Ranger Districts of the Deschutes National Forest; McKenzie River, Detroit, and Middle Fork Ranger Districts of the Willamette National Forest

Deschutes, Jefferson, Klamath, Lane, Linn, and Marion Counties, Oregon

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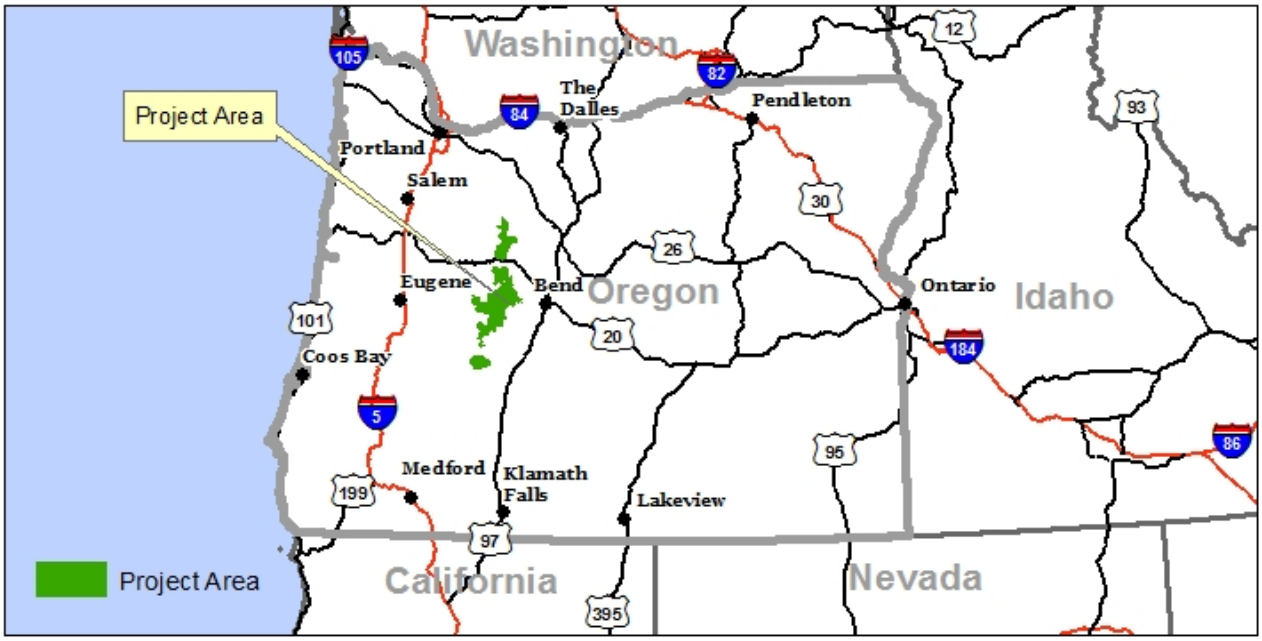

Figure 1: Vicinity of project area in Oregon.

Chapter 1 – Purpose and Need for Action

Introduction

This environmental assessment (EA) documents consideration of five alternative strategies for managing increasing recreation use within wilderness areas on the Deschutes and Willamette National Forests, all designed to reduce recreation-related impacts to the wilderness resource.

The geographic scope of this project includes five wilderness areas in the central Cascade Range of Oregon, totaling about 536,368 acres: Mount Jefferson Wilderness, Three Sisters Wilderness, Mount Washington Wilderness, and Diamond Peak Wilderness are co-managed by the Deschutes and Willamette National Forests; Waldo Lake Wilderness is managed entirely by the Willamette National Forest (see Figure 1 and Figure 2). These wilderness areas provide a great diversity of outdoor recreation opportunities; however, they continue to face increasing recreational demands that can degrade natural resources and impact the wilderness experience.

The wilderness areas of the Central Cascades in Oregon were legislated in 1964, 1968 and 1984:

- Mount Washington Wilderness, Three Sisters Wilderness, and Diamond Peak Wilderness- Designated by Public Law 88-577- Wilderness Act of 1964.
- Mount Jefferson Wilderness- Designated by Public Law 90-548 in 1968.
- Waldo Lake Wilderness designated and additions made to Mount Jefferson, Mount Washington and Three Sisters- Public Law 98-328, Oregon Wilderness Act of 1984.

As part of the National Wilderness Preservation System, Congressionally-designated wilderness areas are special places accorded a very high level of protection. The Wilderness Act sets wilderness apart from other public lands and establishes a mission objective for the agency to preserve wilderness character.

Planning Background

Comprehensive planning for visitor use management in the Central Cascades Wilderness areas through the NEPA process has not occurred since the early 1990s. A 1991 Decision Notice authorized the creation of a self-issue permit system across the Mt. Jefferson, Mt. Washington, and Three Sisters Wilderness Areas. The permit was intended to improve education of visitors and to collect data on numbers of visitors and the types and areas of use. Wilderness permits are currently required from Memorial Day until October 31st.

The 1991 NEPA process and decision also initiated the formation of a wilderness focus group which looked at the permit data collected through two seasons and then made recommendations on management strategies. The wilderness focus group developed an implementation plan that detailed a number of actions that were subsequently implemented in 1995: prohibiting campfires in certain locations, use of designated campsites in certain locations, limiting use in selected high-use areas, and wilderness education. The current management setting for each wilderness area, described as the No Action Alternative beginning on page 18, is based on that implementation plan.

This new planning effort is overdue, but we can now take advantage of the data and information that has been gathered over the last two decades to build on the past effort and prepare for a future that may see recreation pressure expanding into more primitive areas of the Three Sisters, Mt. Jefferson, and Mt. Washington Wilderness areas and into Waldo Lake and Diamond Peak Wilderness areas as well.

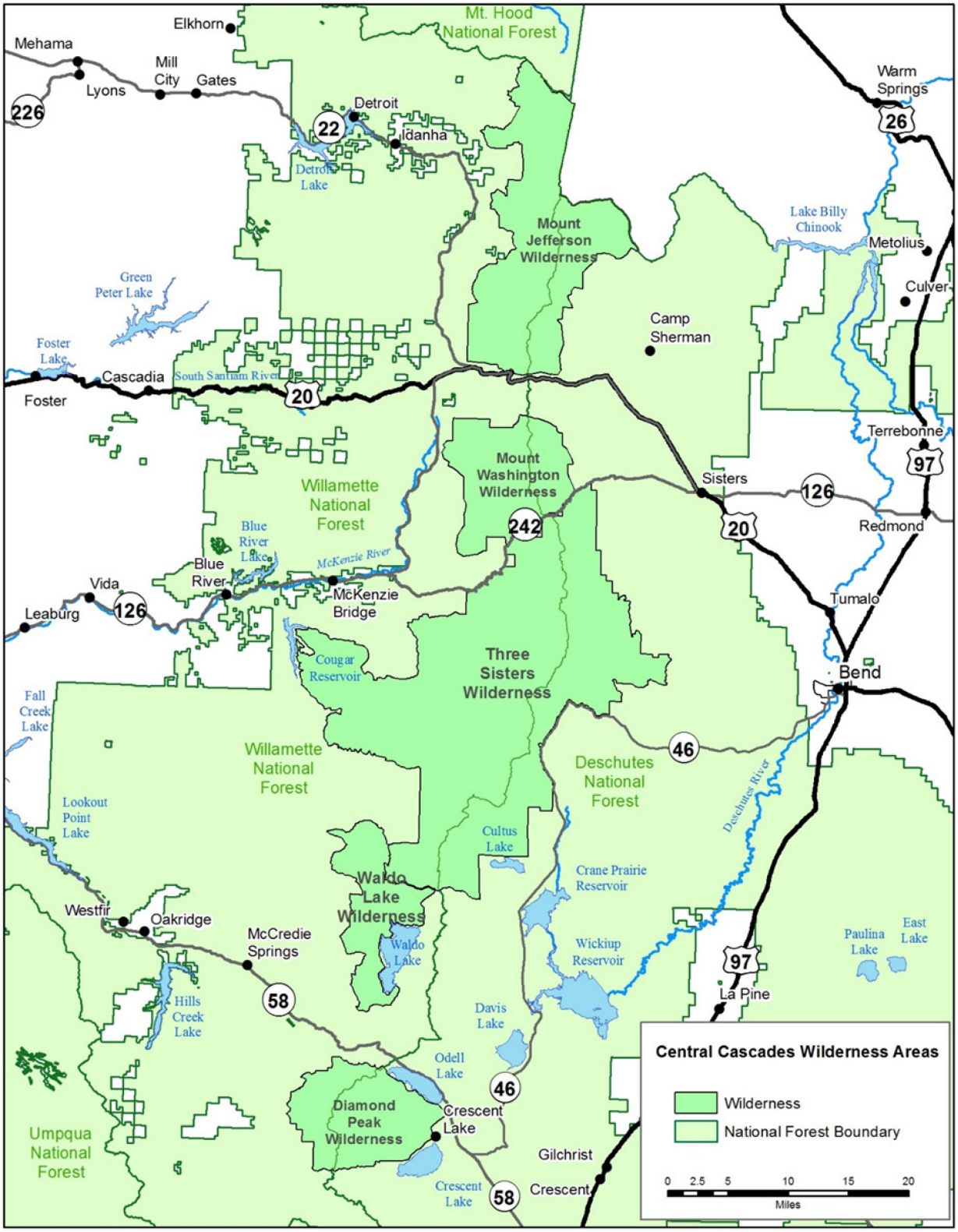

Figure 2: Vicinity of the Central Cascades Wilderness Strategies Project Area

Current Condition and Trends

Proximity to large population centers and relatively easy access make the public lands of the Deschutes and Willamette National Forests attractive and popular destinations. This holds true for the designated wilderness areas within the National Forests as well. Population growth, outdoor promotion by regional and local tourism industry, and social media are all adding to increasing use. Overall, there have been tremendous increases in visitor use in the past six years. 2015 and 2016 saw the greatest increases in visitors to the project area. Within some travel corridors visitation has increased more than 500% in the last two years.

While the past six years have shown significant increase in visitor use, the trend has been underway since the early 1990s when wilderness permits were first required. Overall use in the Three Sisters Wilderness has increased 231% since 1991 when the last planning effort took place. Figure 4 shows 181% increase in use in the Three Sisters Wilderness since 2011. Of particular concern are the areas accessed by the Cascade Lakes Scenic Byway (Highway 46) containing the Green Lakes Basin, Moraine Lake, and South Sister. Parking for the Devil's Lake and Green Lakes trailheads are beyond capacity, even on weekdays. Spill-over parking along the Cascade Lakes Highway creates dangerous conditions for motorists and pedestrians (Figure 3).

Figure 3: Cascade Lakes Highway near Green Lakes TH.

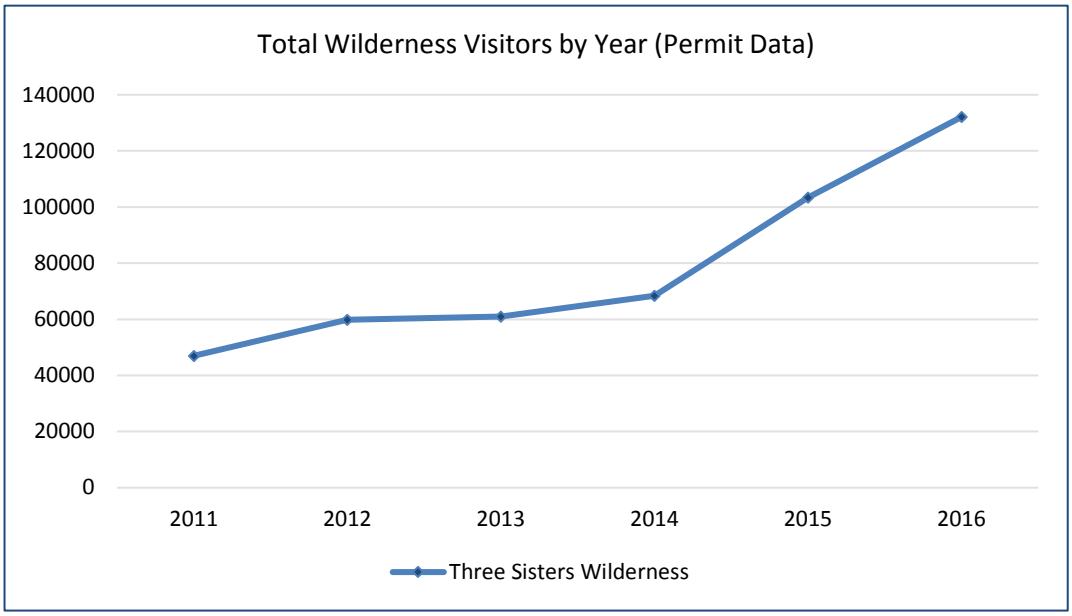

Figure 4: Between 2011 and 2016 use in the Three Sisters Wilderness Area has increased 181%.

Figure 5: Garbage left in the wilderness.

Some areas of historically low use are experiencing significant increases over the last few years. For example, Tam Rim Trailhead has seen a 538% increase in visitors and Six Lakes had a 291% increase in visitors from 2014 to 2016. [1]

Use in the Mount Jefferson Area has been climbing as well, though not as dramatically as in the Three Sisters Wilderness (Figure 6). There are several areas and trailheads, however, which have been experiencing a heavy increase in use. For example, Jack Lake Trailhead which provides access to Canyon Creek Meadows. This area has faced high use, parking congestion, proliferation of campsites and social trails, and an increase in damage to meadows and riparian areas. Jefferson Park is another area that has experienced a significant increase in use over the past few years. The most popular trailheads for accessing this area are Whitewater, Breitenbush Lake, and South Breitenbush/Crag.

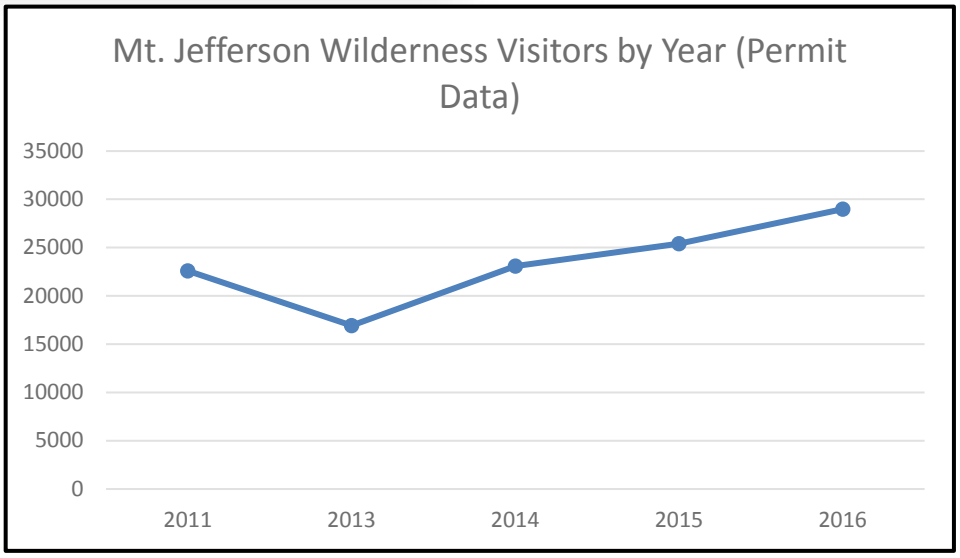

Figure 6: Between 2011 and 2016 use in the Mount Jefferson Wilderness Area has increased 28%. Certain trailheads have seen much high increases, for example Jack Lake trailhead use increased 118% in that time period.

[1] Permit Data: This chapter is discussing trends by looking at the number of visitors (number of people) who enter the wilderness and fill out a permit, rather than visitor use days, which is the number of visitors multiplied by the number of days they stay. While there have been years that no data was collected (e.g. 2010) or times when a specific trailhead has no data, overall there is a large quantity of data than can establish use trends in these wilderness areas. Compliance percentages were calculated using Wilderness Ranger Contact Reports for an entire season, creating an average compliance based on number of people contacted and number of people that have permits.

The Mount Washington and Diamond Peak Wilderness areas have seen increases in use over the last five years (Figure 7). Solitude monitoring suggests that in the Mount Washington Wilderness neither area monitored was within compliance with the Forest Plan for encounters during weekends or holidays. Areas of high use are experiencing degradation; field personnel deal with human waste, garbage, structures, and improper campsite location.

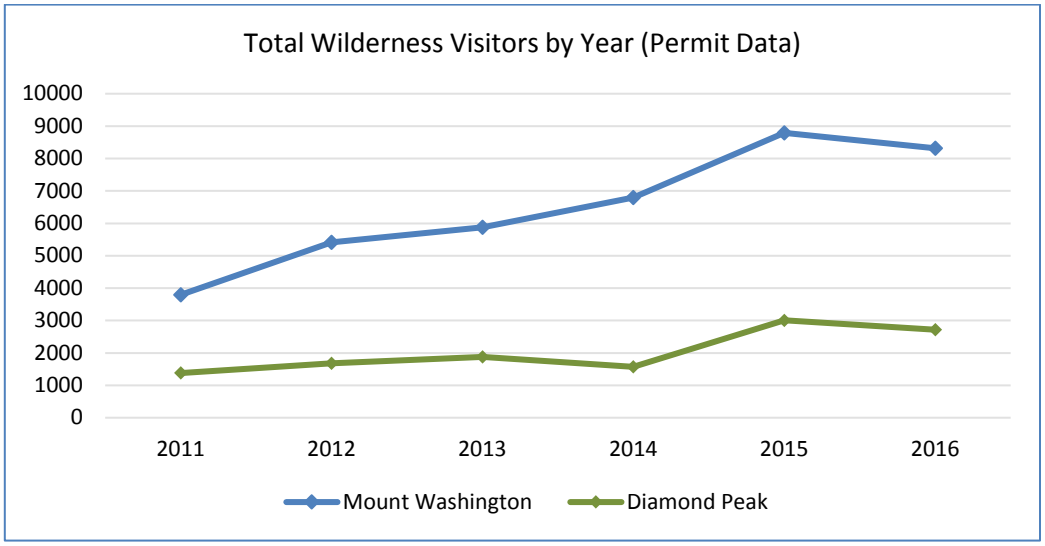

Figure 7: Between 2011 and 2016, use in the Mount Washington and Diamond Peak Wilderness Areas has increased 119% and 97% respectively.

Diamond Peak Wilderness, although small, has seen a near doubling in visitor use between 2011 and 2016. Solitude monitoring suggests encounters were within Forest Plan standards at the locations monitored, but that was prior to the 2015-2016 field seasons when visitor use increased dramatically.

The Forest Service cannot present similar visitor use by year for the Waldo Lake Wilderness Area because permits have not been routinely stocked at the trailheads due to a lack of personnel. Information on visitor use is based on wilderness ranger observations and limited permit data. Waldo Lake visitors create the most impact around high mountain lakes through fishing and camping activities and most issues occur around lakes closest to road access. High mountain lakes see impacts through fishing and camping activities. Field staff routinely deal with human waste, abandoned trash, tree damage, cached equipment, fire rings and crude shelters. The worst damage and impacts are found at lakes closest to road access. Solitude monitoring suggests that the areas monitored are currently within Forest Plan standards for encounters, but the area has potential to see more use and related impacts over time based on the trend of increasing use elsewhere.

Impacts to Natural Resources and Wilderness Character

The increase in use that has been occurring in these wilderness areas has impacts on the biophysical environment. Recreation impacts are exemplified by the number and size of campsites, social trail networks, trash left in the backcountry, fire rings built, structures built (e.g. cabins, wind walls, lean-tos), and exposed human waste. Recreation use has been demonstrated to result in the destruction of vegetation and soil communities, soil compaction, erosion, sedimentation of streams/lakes, and tree damage. Wildlife habitat can be impacted by recreation and species alter their activities to various degrees to avoid, minimize, or reduce contacts with humans.

The Wilderness Act Section 2(a) states that wilderness areas "shall be administered…so as to provide for the protection of these areas, and the preservation of their wilderness character." Wilderness character has the following qualities: Untrammeled, undeveloped, natural, unconfined recreation, and opportunities for solitude.[2] Wilderness character is impacted by both recreation use and recreation management. Heavy recreation use can impact wilderness character when the opportunity for solitude and unconfined recreation is reduced, when naturalness is degraded, or when developments are imposed to manage visitors.

Continuation of Trends

The trends described above can be expected to continue, although the future rate of growth is unknown. Oregon's population is growing faster than the national average and the U.S. Census forecasts a 19% increase over the current population by 2026. Of the counties where the project area is located, Deschutes County has the highest growth rate by far at 14.9% between 2010 and 2016. As populations increase, so does the visitor base for the Central Cascades Wilderness Areas.

The use of social media to promote outdoor recreation and encourage more visitors to particular destinations is not likely to decrease in the coming years. Web sites that encourage people to post photos and videos of their outdoor excursions can attract large crowds to sites that were previously relatively unknown.

In addition to population increases and continued popularity of outdoor recreation, shoulder season use of the outdoors has been growing. Shoulder season use may increase even more given the potential for climate change which could result in longer seasons where high elevation areas are accessible. Research by Frisichelli, et al. (2015) indicates that climate change may alter visitation patterns, resulting in increased visitation pressure across most of the year and especially during the shoulder seasons in high-latitude and high-elevation protected areas.

Purpose and Need for Action

The situation in the Central Cascades Wilderness Areas has reached a point where the Forest Service sees a need to take action. As it is a finite resource, some areas in the wilderness are not able to meet any additional demand and need to see a reduction in use. There are, however, many areas that have not yet reached a capacity threshold but could at some point because of the continuing trends of increased population near wilderness, displacement from more crowded locations, and continued promotion of outdoor recreation.

The Land and Resource Management Plans for the Deschutes and Willamette National Forests describe a non-degradation policy of management: "Policy recognizes that one can find a range of natural and social settings from the most pristine to those where naturalness and opportunities for solitude have been diminished by established uses. It is the intent of this policy to assure that appropriate diversity and existing wilderness character are maintained. Furthermore, the management shall seek to improve conditions in situations where wilderness values have been impaired. The wildest areas shall not be allowed to deteriorate to a lesser standard of naturalness to disperse and accommodate more use." (Deschutes LRMP 4-103, Willamette LRMP Appendix A-1)

[2] In-depth webinars about wilderness character are available at https://www.wilderness.net/NWPS/webinars. Wilderness.net is a website formed in 1996 through a collaborative partnership between the College of Forestry and Conservation's Wilderness Institute at The University of Montana, the Arthur Carhart National Wilderness Training Center and the Aldo Leopold Wilderness Research Institute.

The current management situation, including efforts to reduce impacts at high use areas, are not effective at reducing impacts that are mainly due to high numbers of people (e.g. day users create impacts with trash, waste, concentrated use around lakes, etc.) More people have resulted in more impacts.

The Forest Service and other public land management agencies have experience with limited entry permit systems and have seen how they can improve conditions in wilderness areas. For example, conditions have been improving in the Obsidian Limited Entry Area in the Three Sisters Wilderness since it was initiated in 1995 (Hall, personal communication).

There is a need to manage visitor use in the five wilderness areas in order to reduce recreation-related resource impacts and to protect and enhance wilderness character. Actions to reduce impacts are required to meet the purposes of the Wilderness Act and to meet the direction in the Deschutes and Willamette Forest Plans. The purpose of this project is to devise a strategy that implements management techniques in the most impacted areas and provides action thresholds for areas that may begin to see those kinds of impacts with an expected increase in use. The strategy will seek to balance the preservation of natural conditions and wilderness character, while continuing to provide opportunities for visitors to experience recreation in the wilderness.

Regulatory and Planning Framework

Wilderness Act of 1964 (Public Law 88-577)

Signed into law by President Lyndon B. Johnson, this Act initially protected 54 wilderness areas (9.1 million acres) by withdrawing them from standard multiple use management and established a process for adding new lands to the National Wilderness Preservation System. Lands classified as wilderness through the Wilderness Act could be under jurisdiction of the Forest Service, National Park Service, or Fish and Wildlife Service (The Bureau of Land Management did not manage wilderness until passage of the Federal Land Policy and Management Act in 1976). With some exceptions, prohibitions include closure to motorized and mechanized vehicles, timber harvest, new grazing and mining activity, or any kind of development.

Sec. 2(a) of the Act states: "In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness."

Wilderness is defined in the Act: "A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

Federal Regulation

36 CFR 261.18 lists general prohibitions in wilderness: (a) Possessing or using a motor vehicle, motorboat, or motorized equipment except as authorized by Federal law or Regulation; (b) Possessing or using a hang glider or bicycle; (c) Landing of aircraft, or dropping or picking up of any material, supplies, or person by means of aircraft, including a helicopter. 36 CFR 261.57 authorizes the Forest to issue orders for prohibiting or regulating actions such as entering an area, camping, or using stock animals.

36 CFR 293.2 provides direction on management objectives for National Forest Wilderness: National Forest Wilderness resources shall be managed to promote, perpetuate, and where necessary, restore the wilderness character of the land and its specific values of solitude, physical and mental challenge, scientific study, inspiration, and primitive recreation. 36 CFR 293.3 authorizes the Forest Service to require permits for, or otherwise limit or regulate, any use of National Forest land, including, but not limited to camping, campfires, and grazing of recreation livestock.

Land and Resource Management Plans

Wilderness areas are a separate Management Area under each Forest Plan with the following goals:

Willamette (Management Area 1)	**Deschutes (Management Area 6)**
Goal: Provide a lasting system of quality wilderness, recognizing public use and the unique characteristics of wilderness.	*Goal:* To feature naturalness, opportunities for solitude, challenge, and inspiration, and within these constraints to provide for recreational, scenic, scientific, educational, conservation and historical uses.

Overall direction for wilderness management is included in the Management Area standards and guidelines of each LRMP. The Forests also prepared separate management plans for each wilderness area to provide additional direction for unique situations or concerns specific to a wilderness area.

Each Wilderness area is delineated into zones called Wilderness Resource Spectrum (WRS) Zones, each having management objectives and encounter standards. See Appendix A for definition of each WRS zone and the accompanying standards. The LRMPs list actions, including limits on entry, that should be taken when conditions in wilderness exceeds standards.

The Northwest Forest Plan (NWFP) amended the Willamette and Deschutes LRMPs in 1994 for the purpose of protecting late-successional forest and related wildlife. The NWFP allocated wildernesses to Congressionally Reserved Areas. Management of these lands should follow the Forest Plan and Wilderness Act. Key watersheds and riparian reserves are an overlaying allocation with specific goals, standards, and guidelines. Standards and guidelines for key watersheds and riparian reserves should be applied where they would provide greater benefits to late-successional forest related species unless it would be contrary to legislative or regulatory language or intent.

Proposed Action

The Proposed Action was distributed to the public on May 31, 2017 for scoping. It was based on a strategy to offer an experience inside the wilderness areas that would be as unconfined as possible and consistent across the large project area. The components of the proposed action that was scoped with the public are described below, with more detail in Chapter 2:

- Overnight camping permit system; quota of number of permits by trailhead in all wilderness areas. Depending on current use levels the number of permits available for each trailhead would either accommodate fewer visitors, the current number of visitors, or allow for some expansion in number of visitors.
- Day use permit system with trailhead quotas on permits at all Three Sisters Eastside and Highway 242 Trailheads, Mt. Jefferson west side trailheads; self-issue free permits with no limits everywhere else.
- Campfire and camping regulation: Elevational campfire ban based on sustainability and range of whitebark pine. Existing designated campsite systems would be removed. Proper campsite selection would rely on visitor education.
- Visitor education: Focus would be on raising awareness of the public before they enter the wilderness. Increasing awareness of wilderness values and promoting leave-no-trace principles, presence of wilderness rangers, volunteers, and interns above existing levels. Trailhead hosts would be used to present visitors with useful information. Online registration for permits would be preceded by educational video.
- Adaptive management: The proposed action would involve a monitoring and adaptive management strategy. Through regular monitoring, the plan can be adjusted accordingly to ensure we are moving towards the goals laid out in the Forest Plan.

The proposed action is included in the range of alternatives being considered in this document as Alternative 2. More detailed description of this alternative is provided in Chapter 2.

Public Involvement and Issues

Scoping and Public Engagement

The Forest Service met with the public on a number of occasions to inform people about the intent to begin the NEPA process for this project. Forest Service line officers and staff met with several community organizations, interest groups, and elected officials, and held public meetings.

The project was first published in the Deschutes and Willamette National Forests' Schedule of Proposed Actions (SOPA) and posted to the Forests' project web sites in November 2016. A description of the proposed action, dated May 31, 2017, was distributed to a mailing list of 476 individuals, organizations, and agencies. A press release was distributed on June 1st and posted to the Deschutes and Willamette National Forest web pages. This resulted in multiple stories in radio, television, internet, and newsprint media of local, regional, and national news outlets. Additional public outreach efforts are detailed in Appendix E.

A total of 465 individual scoping responses were received during the 30-day scoping period. All comments were considered and categorized into topics that then became either a key issue (which could lead to project design or alternatives), analysis issue, or as an issue outside the scope of this analysis that will not be considered further. Key issues were used in developing alternatives to the proposed action (see following section).

Key Issues

Key Issue #1: Recreation Experience – Displacement Potential

The proposed permit system described in scoping documents was designed to provide a consistent approach across the wilderness areas and limit regulations inside the wilderness (i.e. reduce site-

specific camping restrictions and focus on leave-no-trace principles). It included limited entry for overnight use project-wide, and limited entry day use at all Mt. Jefferson trailheads, Three Sisters trailheads on the east side, and along Highway 242.

Scoping responses included full support for this proposed action as well as complete opposition to any kind of limited entry permit. Many people expressed support for some kind of permit system that would limit entry at the very high-use areas, zones, particular trailheads, or for overnight only, but didn't see the limited entry permit system as necessary on such a broad scale. Many suggested a scaled-back version of the proposed action focusing more on the very high-use areas, limited permits for weekend only, or for only a few trailheads. This issue is addressed with alternatives that include a reduced scope of limited entry permit system.

There is a concern that by limiting entry at the high-use trailheads or zones, the proposed action could cause people to disperse into less popular areas that currently have no crowding or natural resource issues. The over-use issue could, over time, be moved to other areas within wilderness potentially damaging more pristine areas. Conversely, some people felt like the issues we are seeing in wilderness could be at least partially solved if people did disperse away from over-used trailheads into areas that could accommodate more people.

Alternatives will be compared by the impact to use levels (assuming use at trailheads is similar to 2016 levels), and by assessing the potential displacement to other trailheads.

Key Issue #2: Recreation Experience – Loss of Spontaneity and Opportunity

Many scoping responses were from people who like to decide spur-of-the-moment if and where they will go on a hike. For many people who responded to scoping, it is important to be able to decide at the spur of the moment to go out and enjoy a hike in the wilderness, depending on their work schedule, the weather, or other things that aren't necessarily under their control. A permit that requires advance reservation would have the effect of making people plan ahead if they want to visit areas under that kind of system. It's also a concern for people who consider themselves "locals" who live in locations for the ease of accessing public lands, and they feel they would be affected more than people visiting from out of town who are making plans for vacation well in advance. Permits could also have a negative effect on people who would find it too expensive. Some scoping respondents feel that there should never be any fee charged for visiting any public lands; others felt that the Forest Service should charge a high fee in order to reduce use.

This issue is addressed with alternatives that have fewer areas under limited entry permit. The alternatives will be compared by how recreation experience is affected. This issue is also addressed by an element common to all action alternatives: a proportion of permits will be offered day-of and some areas will remain fee-free.

Other issues with Proposed Action

Horses

There were numerous letters from equestrians who felt that it would be unfair to limit their entry into wilderness because they felt that people using horses are not the cause of the problems in wilderness and because they are an important group of volunteers for trail maintenance. The proposed action does not include specific restrictions on people with horses. Permit data shows that horse use in Mount Jefferson Wilderness is on the decline, and horse use in the Three Sisters Wilderness is growing much slower than overall growth in visitation. People with horse trailers have a difficult time finding parking, and are frequently blocked in by cars in crowded parking lots.

The expectation is that parking will be less of a problem when trailhead quotas limit the amount of people visiting at one time. The potential for effects on recreation, including equestrians and other user groups will be assessed for all alternatives.

Emphasize the Use of Other Tools to Manage Recreation

Many of the scoping responses included suggestions for the use of tools other than permits to manage recreation in wilderness. These other tools include site-specific resource protection (e.g. camping setbacks, campfire bans) or indirect methods (more emphasis on education, promoting more areas outside wilderness), or changing access (more trails, better access to trailheads, modified difficulty). The primary focus of this EA is the limited entry permit system because of the large scope of this project; whereas identifying and analyzing numerous site-specific measures over such a large project area would be unwieldy. The Forest Service wants to determine the appropriate way to address over-use first, then other tools could be addressed as needed on more site-specific basis. The following is a brief discussion of other management tools:

Trail access and maintenance: Increasing or improving access to trailheads that are currently difficult to access in order to spread use out more; pulling trailheads back, increase parking management. Increasing trail maintenance on lesser-used routes could help distribute use more across the area; creating one-way loops could reduce the number of encounters; decreasing trail maintenance or making a trail more challenging would reduce use. Increasing trail maintenance will be dependent on funding, which may improve with fee retention. The action alternatives all incorporate one site-specific trail access modification at Broken Top/Crater Ditch trailheads.

Additional trails: It was suggested by several commenters that the Forest Service could reduce crowding by adding more trails and providing more opportunity to disperse users. Some additions are in the works for outside of wilderness and some work is planned inside wilderness, but any future trail proposals will be dealt with in separate NEPA documentation.

Campfire bans: There was public support for the proposed elevational campfire ban and some feel that more widespread campfire bans, even wilderness-wide, would be a good way to prevent resource damage. A consistent approach will improve understanding and enforcement.

Campsite restrictions: The proposed action intends to offer as much freedom inside the wilderness as possible and therefore does not propose regulated campsite setbacks (enforced by Forest Order). Many felt that this may lead to additional resource impacts. The Forests felt that additional emphasis on education and visitor contacts would be used to mitigate that concern. Camping restrictions such as setbacks, are incorporated into alternatives for a few specific sensitive locations.

Marketing/tourism: Some of the increased visitation can be attributed to promotions by local and or state tourism agencies as well as promotions for outdoor education by the Forest Service itself. Social media is also playing a role such as websites that encourage recreationists to post photos of their outdoor experiences which encourages more people to visit a site. The Forest is working with agencies such as Visit Bend and Travel Oregon.

Enforcement: Many people felt that the current regulations were not being enforced strongly enough and that the Forest Service would have trouble with enforcement if new restrictions were implemented. Enforcement of rules is always a goal, and the level of enforcement will vary based on fee retention and ability to increase funding. The strategy of enforcement may vary by alternative because it may be necessary to focus enforcement outside limited entry areas (LEAs) where use may see an increase due to displacement.

Resource Analysis Issues

In addition to the key issues, other environmental components will be considered in the environmental consequences section as a way to compare the alternatives, though they did not result in differing design elements between alternatives. These issues are important for providing the Responsible Official and public with complete information about the effects of the project and how well each alternative meets the purpose and need.

Part of the purpose and need is to reduce recreation-related impacts to natural resources. Therefore, the analysis for these resources will compare how well each alternative meets that goal:

- Soil Resources
- Aquatic Resources / Fisheries
- Wildlife: Threatened, Endangered, and Sensitive species; Management Indicator Species
- Threatened, Endangered, and Sensitive Botanical Species
- Invasive Plant Introduction and Spread
- Cultural Resources

Issues Not Given Detailed Analysis

Some comments that were received by the Forest Service were considered, but did not lead to the development of an alternative and were not carried through into analysis (Table 1). The reasons may be one of the following: 1) the comment raises an issue that is outside the scope of the proposed action; 2) raises an issue that is already decided by law, regulation, Forest Plan, or other higher level decision; 3) raises an issue that is adequately addressed in all alternatives; or 4) raises an issue that is conjectural and not supported by scientific or factual evidence.

Table 1: Comments on concerns that did not received detailed analysis.

Comment/Concern	Discussion
Fees and Permit Delivery Mechanism: Various fee structure and delivery mechanism detail concerns were expressed such as ensuring ease of use, administering the system internally, keeping fees low, or charging enough to benefit the wilderness program.	The Forest Service is mandated to utilize the National Recreation Reservation System (NRRS) for issuing reservation permits. Because this issue is already decided by law, it is not an issue that will be tracked through the analysis. The EA for the project will assess various permit strategies, such as where LEAs may be implemented. Alternatives that involve a permit system will include a fee to administer it. A decision on this project would not dictate implementation methods or the amount the fee would be if a permit system is triggered. The fee level, permit delivery details, etc. will be decided in a subsequent FLREA process that will have additional opportunity for public comment.
Exceptions to Permit System/Special Preference for Specific User Groups or Activities: Members of several user groups or demographics have commented about their desire to not be subject to a permit, or to be given preference for obtaining permits. Some commenters	It should be noted that National Forests are a public resource where access is available to all visitors who lawfully desire to visit. As with the discussion above regarding fee and permit delivery details, availability and exemptions will be decided in the subsequent FLREA process that will have additional opportunity for public comment. Organizations with a partnership or volunteer agreement with the Forest Service

Comment/Concern	Discussion
suggested that "locals" or Oregonians should receive preference for access.	may qualify for administrative exemption to permit requirements when conducting volunteer activities. Some uses that already require a permit, tag, or reservation, may be exempt from the additional wilderness permit requirement (e.g. hunters with valid license and tag; PCT through-hikers with PCT permit). See more discussion of this on pp. 55-56.
No Restriction on Public Land: Some feel that because these are public lands, they should remain open and free to all users at all times with no management or restrictions. The thought is that citizens have a right to be on public land and because they pay taxes it should be free.	The wilderness areas in this project were designated by congress with direction for the agency to manage it to preserve natural ecological conditions, provide opportunities for solitude or primitive and unconfined recreation. This project would not remove anyone's right to recreate on public lands, but they may have to plan ahead for some destinations in wilderness. Additionally, there are many areas of the National Forest System outside of wilderness that will continue to have unrestricted access to the public.
Bikes: Some commenters wanted the Forest Service to not allow bicycles in the wilderness.	Bicycles are already prohibited in wilderness per 36 CFR 261.18. Efforts underway to change that are outside the scope of this project.
Dogs: A Few commenters suggested that dogs should be banned from the wilderness entirely, while one commenter suggested the Forest Service eliminate a leash requirement on Soda Creek and Broken Top Trails.	The issue of dog conflicts and waste will be monitored rather than incorporating additional restrictions at this time because it is expected that by reducing crowded conditions, and increasing educational efforts, conditions would improve which could lead to restored off-leash opportunities.
Latrines: Some commenters suggested adding latrines in order to solve the problem of exposed human waste and toilet paper.	Latrines in wilderness areas are one of the last steps to control human waste in high use areas. While they may reduce the chance of visitor contact with human waste, it concentrates waste into small areas that slows decomposition when compared to individual cat holes (Hendee and Dawson 2002). Latrines have negative impacts to two qualities of wilderness character (undeveloped and opportunity for solitude), while having a positive impact on the natural quality by concentrating waste in one site and not having exposed human waste. Latrines in wilderness come with a list of management challenges, with the main one being removing the waste from the wilderness. Flying out barrels of waste by helicopter and packing it out on mules are all options that are used in other areas, but it comes with an incredibly high financial cost and a different set of impacts. If latrines are dug on site, they would have to be excavated in the spring and filled in and naturalized every fall, depending on use. Plus, dependent on site selection, privacy walls would need to be constructed that would be assembled and dismantled every year to avoid collapsing from snow loading. The Forest Service hopes to diminish the problem of human waste by reducing the high

Comment/Concern	Discussion
	peaks of use and improving visitor education on leave no trace principles. Hendee and Dawson (2002) note, "Toilets, and any obvious maintenance programs, are an obvious sign of humans that intrudes on wilderness conditions; they should be used only where they are clearly essential – the minimum tool to solve the sanitation problem of human waste disposal."
Increasing or decreasing designated wilderness: Some commenters suggested that if there were more designated wilderness, it would relieve crowding. Conversely, some people thought that the very high-use areas should not even be designated wilderness anymore.	Adding new designated wilderness or removing areas from the National Wilderness System is outside the scope of the proposed action. Only congress can designate additional wilderness or pass legislation to remove areas of the National Wilderness Preservation System. An increase in designation would not increase capacity, as the public lands around the existing central Cascades wilderness areas already have substantial recreation use.
Increased Risk-taking by Permit Holders: There is some concern that by having to obtain a permit for a certain day, hikers or climbers may feel compelled to use the permit even if conditions are not ideal.	The decisions that individuals make about whether or not they embark on a hike or backpacking trip in the wilderness is outside the scope of this analysis. It's possible that permits could be refundable.
Forest Plan Standards: One comment questioned why we are operating under old Forest Plans.	Forest Plan or Wilderness Management Plan revisions are outside the scope of the proposed action. The alternatives are designed to be consistent with current management direction.
Events: We received some comments about recreation events that occur around wilderness which add to parking congestion and possibly to more use of wilderness.	Recreation special events are not permitted within the wildernesses in the project. Events that are held outside of wilderness may occasionally impact some trailheads that also lead to wilderness, but modifying the way events are screened and permitted is outside the scope of this project.
Bridges: It was suggested by a commenter that visitor use could be reduced by taking out bridges on the Green Lakes Trail.	Bridges and other facilities should be carefully limited in wilderness to enhance the primitive experience and should not be provided for the convenience of visitors; they should be used to protect wilderness resources and values (Hendee and Dawson 2002). In areas with large numbers of visitors, not having a bridge can cause resource damage as users often travel up and down streambanks, trying to find a viable crossing, which negatively impacts flora and fauna in riparian zones due to trampling. If there is not a bridge, the public have often cut down trees, thrown logs into creeks, stacked up rocks, and used other methods to provide a safe and dry crossing. These actions have a negative impact on the natural quality and are most common on high use trails. Current bridges in the wilderness are few and found only on high use trails, where the potential negative impacts to riparian areas are outweighed by the negative impacts of development and loss of solitude. Bridges are often out of place in wilderness and should have limited use unless they

Comment/Concern	Discussion
	are a minimum tool to provide for safety or have historical significance (Hendee and Dawson 2002).

Decision to be Made

The responsible officials for this project are the Forest Supervisors of the Deschutes and Willamette National Forests. The scope of the decision to be made is limited to the visitor use and recreation management for Mt. Jefferson, Three Sisters, Mt. Washington, Waldo Lake, and Diamond Peak Wilderness areas. The project is limited to National Forest System lands, and could include actions that take place inside or outside the wilderness boundary.

The Responsible Officials can select the no action or one of the action alternatives as described here, or combine elements from different alternatives. The decision will be based on a comparison how well the alternatives meet the purpose and need for action, how well alternatives address the key issues, and consideration of public comment.

Chapter 2 - Alternatives

Description of Alternatives

A total of five alternatives were developed and given full analysis, including the No Action alternative. Each alternative is composed of the specific elements described below: Permit System, Site Protection and Restriction, Access Management, and Monitoring/Adaptive management.

Permit System: Mandatory permits can be used to limit the number of people entering an area. How permits are applied can vary greatly. These can specify day use only; overnight use only; can be mandatory without limiting numbers; require camping in designated sites; permit freedom of movement; etc. They may be based on trailhead or on a zone (please see Appendix C for further explanation). The use of quotas (number of permits allowed for a trailhead or zone) can help maintain the desired condition, eliminate large spikes in use, and spread use out temporally and spatially.

The Forest Service is mandated to utilize the National Recreation Reservation System for issuing reservation permits. A decision on this project will not determine the amount a fee would be if a permit system is triggered. The fee level, permit delivery details, etc. will be decided in a subsequent FLREA process that will have additional opportunity for public comment.

Site Protection and Restrictions: Regulations would be applied on a site by site or Wilderness-wide basis. These restrictions are intended to protect resources. Campfire restrictions, for example, are applied where removing vegetation for firewood is unsustainable. All site-specific restrictions would be subject to adjustment as implementation occurs due to feasibility issues or effectiveness.

Access Management: Access management can be a tool to control wilderness use. By making access more difficult (by moving trailheads back and closing roads for example), use is discouraged and impacts on resources lessened.

Monitoring / Adaptive Management: Monitoring will determine whether or not the alternative is effective in meeting management standards and can also alert the Forest Service to unexpected effects of management. Each action alternative describes a starting point for implementation of a

visitor use management strategy that could be adjusted over time to respond to increases in use, changes in visitation patterns, or an ineffective strategy.

Wilderness-wide Prohibitions or Regulations That Will Be Unchanged Under Any Alternative (Common to All Alternatives):

Motorized Equipment: Motorized equipment and equipment used for mechanical transport is generally prohibited on all federal lands designated as wilderness. This includes the use of motor vehicles, motorboats, motorized equipment, bicycles, hang gliders, wagons, carts, portage wheels, and the landing of aircraft including helicopters, unless provided for in specific legislation.

Group Size: Group size is limited to 12 people or fewer. Stock use is limited to 12 head.

Caching of Equipment: Storing equipment, personal property, or supplies (including geo-caching), unattended, for more than 48 hours is prohibited.

Rehabilitation Sites: Camping or being within an area posted as closed for rehabilitation is prohibited.

Stock Use: Hitching, tethering, picketing, or otherwise securing any pack or saddle livestock within 200 feet, slope distance of the high water mark of any permanent lake, stream, pond, spring, or National Forest System trail is prohibited.

Alternative 1 (No Action)

This alternative provides a basis for comparison to evaluate changes in the existing condition associated with the action alternatives. Under the No Action alternative, the current management situation would continue as described below. Alternative 1 is displayed in Appendix B.

Permit System

Wilderness permits are required between Friday of Memorial Day weekend and October 31st for all groups that enter the wilderness. Permits are self-issue at the trailheads; there is no limit on the number of people who can enter, except for the two areas described below.

There is one limited entry area (LEA) located in the Mt. Jefferson Wilderness in the Pamelia Lake area. Originally implemented in 1995, this LEA limits day and overnight use to 20 groups per day. Only 3 of the groups may be large (9-12 people). For the large groups, the Pamelia area is broken into three smaller areas and only one large group is allowed in each at one time.

There is one LEA within the Three Sisters Wilderness Area – Obsidian. Originally implemented in 1995, this LEA requires permits for both day (30 allowed) and overnight users (40 allowed), and campfires are prohibited within the LEA.

Site Protection and Restrictions

High use in some areas has resulted in a somewhat complex managerial situation for Mt. Jefferson and Three Sisters Wildernesses. Management actions were most recently laid out in the 1994 Implementation Plan for the 1990 Wilderness Strategies Project, with slight modifications over the years. There are no additional specific restrictions for Waldo Lake, Diamond Peak, or Mount Washington Wilderness Areas.

Campfires: Campfires are prohibited in certain areas: within 100 feet slope distance of the high water mark of any permanent lake, stream, or spring or system trail is prohibited; within ¼ mile of Table Lake, Rockpile Lake, Marion Lake, Ann Lake; within the area commonly referred to as Jefferson Park; within ¼ mile of Golden, North Mathieu, and South Matthieu Lakes; within the dispersed areas known as Sister-Mirror Lakes, Camp Lake, Chambers Lakes, and Moraine Lake; within the general area commonly known as Green Lakes Area, Husband/Eileen Area, and Obsidian area.

Camping Mt. Jefferson: Camping is prohibited in certain areas: Between the southwest shoreline of Ann Lake and 100' slope distance of trail #3436 from the outlet of Ann Lake, southeasterly to the rockslide; From the junction of trails #3422 and #3495 along the northwest shoreline of Marion Lake to, and including the peninsula located approximately ¼ mile south from the junction of trails #3495 and #3436.

Camping is required to be in designated campsites in certain areas: 250' slope distance of the high water mark of the following lakes, unless within 15' of a post designating it as an approved campsite: Duffy, Pamelia, Scout, Bays, Park, Rock, Russel, Wasco, and Square; 250' slope distance of lakes in Jefferson Park area unless at a designated site.

Camping Three Sisters: Camping is prohibited in certain areas: within 100', slope distance, of any permanent lake, stream, spring, or system trail in the Husband/Eileen Area, Obsidian Area, and Linton Area.

Camping is at designated campsites only in these areas: Within the general area commonly known as Green Lakes Area and Moraine Lake Area; within 250' slope distance of the high water marks at Otter, North Matthieu Lake, and South Matthieu Lake.

Stock: Stock animals are not allowed to graze or be tethered for more than four hours within ¼ mile of the shorelines of Marion or Ann Lakes.

Dogs: Dogs required to be on leash from July 15th through September 15th on the following trails: Broken Top #10, Crater Ditch Trail, Todd Lake Trail #34, Soda Creek Trail #11, Green Lakes Trail #17, Moraine Lake Trail #17.1, and South Sisters Climbers Trail #36.

Access and Trail Management

There would be no change to trailhead access under the No Action Alternative. Restoration of user-created trails would occur as funding allows. Other ongoing or planned trail work is described in Table 4.

Monitoring

Under Alternative 1, the Forest Service would continue monitoring activities as funding allows. The Forests would continue to compile permit data gathered at trailheads. Currently ongoing monitoring efforts include mapping and describing all user-created trails. Field rangers would continue to compile information on their: visitor contacts, garbage removal, incidences of burying human waste, fire rings naturalized, etc. Site-specific adjustments to restrictions could be expected to occur as necessitated by resource conditions. Additional NEPA would be undertaken as necessary.

Action Alternatives

Monitoring & Adaptive Management—Common to All Action Alternatives

The Forest Service acknowledges that the outcomes of the proposed visitor use management alternatives involves some uncertainty. The proposed visitor use management system is data-driven and adaptive which requires long-term monitoring of the central Cascades wilderness areas. Monitoring will be completed under a variety of methods. Adaptive management provides the ability to modify the system as needed if there are unexpected results or monitoring shows a need to respond to growing use/degradation.

The adaptive management model incorporates an "implement-monitor-adapt" strategy that provides flexibility to account for inaccurate initial assumptions, to adapt to changes in environmental conditions, or to respond to subsequent monitoring information that indicates that desired conditions are not being met. That is, adjustments are made when implementation is not giving us the desired outcomes.

The Monitoring and Adaptive Management Plan is outlined in Appendix D. Actions that could be taken as a result of monitoring are shown in Table D-2 Adaptive Management Toolbox.

Alternative 2 (Proposed Action)

This alternative is the proposed action that was scoped with the public. It would implement a wilderness-wide regulatory permit system for overnight users. It would also implement a regulatory permit system for day use at 48 trailheads across three of the wilderness areas. The strategy for Alternative 2 was to provide consistency along the Cascade Lakes Highway and Highway 242 for day use limited entry trailheads. Additionally, the strategy would allow for free movement and minimal regulation once a person was inside the wilderness. The existing Obsidian and Pamelia limited entry areas would be replaced by the system described below. Alternative 2 is displayed for each wilderness area in Appendix B.

Permit System

Overnight Use: Limited entry permits would be required for overnight use wilderness-wide in all five wilderness areas. Camping could occur anywhere in the wilderness.

Day Use: Limited entry permits for day use would be required at the following wilderness trailheads:

Three Sisters: DES – all eastside trailheads (east side of Cascade crest); WIL – all Hwy 242 trailheads.

Mt. Jefferson: DES – Jack Lake; WIL – all westside trailheads.

Mt. Washington: WIL – PCT McKenzie, Benson, Hand.

Free permits to be self-issued at all other trailheads for day use.

The permit season would run from May 1 to September 30.

Quotas: For limited entry overnight and day use, the trailhead quotas (the number of permits that would be available by trailhead) are listed in Appendix C, Table C-1.

Site Protection and Restrictions

Campfires Project-wide: Campfires would not be allowed above the 5,700 foot elevation in Three Sisters, Mt. Jefferson, and Mt. Washington; above 6,000 feet in Diamond Peak; no campfire ban in Waldo Lake.

Camping: No designated campsites. Possible setbacks in some specific locations. Increased user education on appropriate locations for campsites.

Access and Trail Management

No changes to access are proposed with Alternative 2.

Alternative 3

This alternative addresses the key issues by focusing visitor use management on the very high use areas only. Heavily used trails and areas of Three Sisters, Mt. Washington, and Mt. Jefferson wilderness areas would have a limited entry permit for certain trailheads and zones. There would be no limited entry permit for Waldo and Diamond Peak wilderness areas. Alternative 3 is displayed for each wilderness area in Appendix B.

Permit System

Overnight Use: Limited entry permits would be required for overnight use wilderness-wide in Three Sisters, Mt. Jefferson, and Mt. Washington wilderness areas. Under this alternative camping in the most popular areas ("zones") would require an additional reservation; elsewhere visitors would be free to move throughout the wilderness and camp in any location. Three Sisters zones requiring camping reservation: 2, 7, and 8. Mt. Jefferson zones requiring camping reservation: 2 and 3. These zones are delineated on maps for Alternative 3 in Appendix B.

Day Use: Limited entry permits for day use would be required at the following trailheads:

Three Sisters: DES – Lava Camp Lake, Tam Rim, Broken Top, Todd Lake, Crater Ditch, Green Lakes, Devils Lake, Sisters Mirror; WIL – Obsidian, Scott.

Mt. Jefferson: DES-Jack Lake; WIL – South Breitenbush/Crag, Whitewater, Pamelia, Marion, Duffy, PCT Breitenbush Lake.

Mount Washington: WIL – Benson, PCT McKenzie.

Free permits to be self-issued at all other trailheads for day use in the five wilderness areas.

Permit season would run from May 1 to September 30.

Quotas: For limited entry overnight and day use, the trailhead quotas (the number of permits that would be available by trailhead) are listed in Appendix C.

Site Protection and Restrictions

Campfires Project-wide: Campfires would not be allowed above the 5,700 foot elevation in Three Sisters, Mt. Jefferson, and Mt. Washington; above 6,000 feet in Diamond Peak; no campfire ban in Waldo Lake.

Camping: No designated campsites. Possible setbacks in some specific locations. Increased user education on appropriate locations for campsites.

Access and Trail Management

The trailheads to Broken Top and Crater Ditch would be pulled back to the 370 road to create one trailhead.

Alternative 4

This alternative is similar to Alternative 3 because it focuses on the high-use areas, but also includes limited entry permits for areas that are gaining in popularity and have a high likelihood of receiving displaced users. Implementing limited entry in those areas now would be a proactive move and would include an overnight permit system for all Wilderness areas. Alternative 4 is displayed in for each alternative in Appendix B.

Permit System

Overnight Use: Limited entry permits would be required for overnight use wilderness-wide in Three Sisters, Mt. Jefferson, Mt. Washington, Diamond Peak and Waldo Lake. Under this alternative camping in the most popular areas would require an additional reservation; elsewhere visitors would be free to move throughout the wilderness and camp in any location. Three Sisters zones requiring camping reservation: 2, 7, and 8. Mt. Jefferson zones requiring camping reservation: 2, 3. These zones are delineated on maps for Alternative 4 in Appendix B.

Day Use: Limited entry permits for day use would be required at the following trailheads:

Three Sisters: DES – Lava Camp Lake, Black Crater, Chush Falls, Tam Rim, Broken Top, Crater Ditch, Todd Lake, Green Lakes, Devils Lake, Sisters Mirror, Elk Lake, Six Lakes, Lucky Lake; WIL – Obsidian, Linton, Scott.

Mt. Jefferson: DES-Jack Lake, Cabot Lake; WIL – South Breitenbush/Crag, Whitewater, Pamelia, Marion, Duffy, PCT Breitenbush Lake, PCT Santiam Pass, Woodpecker, Triangulation/Triangulation Peak.

Mount Washington: WIL – Benson, PCT McKenzie.

Free permits to be self-issued at all other trailheads for day use in the five wilderness areas.

Permit season would run from May 1 to September 30.

Quotas: For limited entry overnight and day use, the trailhead quotas (the number of permits that would be available by trailhead) are listed in Appendix C.

Site Protection and Restrictions

Campfires Project-wide: Campfires would not be allowed above the 5,700 foot elevation in Three Sisters, Mt. Jefferson, and Mt. Washington; above 6,000 feet in Diamond Peak; no campfire ban in Waldo Lake.

Camping: No designated campsites. Possible setbacks in some specific locations. Increased user education on appropriate locations for campsites.

Access and Trail Management

The trailheads to Broken Top and Crater Ditch would be pulled back to the 370 road to create one trailhead.

Alternative 5

This alternative initiates the most regulation on entry for all five wilderness areas. Limited entry permits would be required wilderness-wide for overnight and day use. Overnight use would require having a reservation for the zone where the visitor would camp. Day use would be limited by a daily quota of users by trailhead. Alternative 5 is displayed for each alternative in Appendix B.

Permit System

Overnight Use: Limited entry permits would be required for overnight use wilderness-wide in all five wilderness areas, with camping reservation required for all zones. See Appendix C for trailhead quotas and maps of zones.

Day Use: Limited entry permits for day use would be required at the following trailheads:

Three Sisters Wilderness, Mt. Jefferson, Mt. Washington, Waldo Lake, Diamond Peak- All Trailheads

Quotas: For limited entry overnight and day use, the trailhead quotas (the number of permits that would be available by trailhead) are listed in Appendix C.

Permit season would run from May 1 to September 30.

Site Protection and Restrictions

Campfires Project-wide: Campfires would not be allowed above the 5,700 foot elevation in Three Sisters, Mt. Jefferson, and Mt. Washington; above 6,000 feet in Diamond Peak; no campfire ban in Waldo Lake.

Camping: No designated campsites. Possible setbacks in some specific locations. Increased user education on appropriate locations for campsites.

Access and Trail Management

The trailheads to Broken Top and Crater Ditch would be pulled back to the 370 road to create one trailhead.

Comparison of the Alternatives Considered in Detail

Alternatives vary by the geographic scope of the quota permit system to be implemented. Quotas for trailhead day use entry and overnight camping have been determined across the wilderness areas through a review of several factors, (see Appendix C). Quotas may be adjusted based on implementation monitoring.

Day Use Permits

- Day use is not limited, unless the trailhead is listed under "Day Use" in Table 2. Alternatives vary by which geographic areas (trail corridors) are subject to limited entry permit (see also maps in Appendix B).
- Listed day use trails would have a quota, and permits would be obtained on-line or at a USFS office. Number of permits that would be available per the quota is shown in Appendix C, Table C-1.
- Visitors entering wilderness at trailheads that are not listed as a limited entry permit trailhead will require a free permit to be self-issued at trailhead.

Overnight Use Permits

- For overnight use, in Alts. 2, 4, and 5 overnight permits are required for all trailheads in all wildernesses. The number of permits available for each trailhead would be limited (see Appendix C, Table C-1).
- Alt. 3 would not have overnight permits required for Waldo Lake or Diamond Peak wilderness areas. Free self-issue permits would still be required for entering Waldo Lake and Diamond Peak.
- For overnight zones listed in Table 2, a person must have a reservation to camp in that specific zone. The people who can camp in each zone would be limited (see Appendix C).
- Overnight quota permits and zone reservations would be obtained online or at a USFS office.

Table 2: Components of the Alternatives. Maps of these alternatives are included in Appendix B.

Alternative Feature	**Alternative 1** (EXISTING SITUATION)	**Alternative 2** (PROPOSED ACTION)	**Alternative 3** (FOCUS ON HIGH-USE AREAS ONLY – RESPONDS TO PUBLIC ISSUE)	**Alternative 4** (RESPONDS TO PUBLIC ISSUE AND ACCOUNTS FOR SOME ANTICIPATED DISCPLACEMENT/GROWTH)	**Alternative 5** (REGULATIONS WILDERNESS-WIDE)
Three Sisters Day Use	Obsidian Limited Entry Area Free Self-Issue Permit all other trailheads	Limited Entry Trailheads: DES – all eastside THs; WIL – Hwy 242 THs. (27 trailheads)	Limited Entry Trailheads: **DES** - Lava Camp Lake, Tam Rim, Broken Top, Crater Ditch, Todd Lake, Green Lakes, Devils Lake, Sisters Mirror; **WIL**- Obsidian, Scott	Limited Entry Trailheads: **DES** – Lava Camp Lake, Black Crater, Chush Falls, Tam Rim, Broken Top, Crater Ditch, Todd Lake, Green Lakes, Devils Lake, Sisters Mirror,	All Trailheads would have a quota and require a permit (48 trailheads)

Alternative Feature	**Alternative 1** (EXISTING SITUATION)	**Alternative 2** (PROPOSED ACTION)	**Alternative 3** (FOCUS ON HIGH-USE AREAS ONLY – RESPONDS TO PUBLIC ISSUE)	**Alternative 4** (RESPONDS TO PUBLIC ISSUE AND ACCOUNTS FOR SOME ANTICIPATED DISCPLACEMENT/GROWTH)	**Alternative 5** (REGULATIONS WILDERNESS-WIDE)
		11 trailheads would continue to require free self-issue permit.	(10 trailheads) 38 trailheads would continue to require free self-issue permit.	Elk Lake, Six Lakes, Lucky Lake; **WIL** – Obsidian, Linton, Scott (16 trailheads) 33 trailheads would continue to require free self-issue permit.	
Three Sisters Overnight	Obsidian Limited Entry Area Free Self-issue permit all other Trailheads	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads.	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads. Camping can occur in any zone, except for those that require a reservation. Overnight Zones requiring a camping reservation: 2, 7, 8	Limited Entry Permit required for all overnight use and obtained on-line. Overnight quotas are associated with trailheads. Camping can occur in any zone, except for those that require a reservation. Overnight Zones requiring a camping reservation: 2, 7, 8	Limited Entry Permit required for all overnight use. Camping reservation must be made for all zones.
Mt. Jefferson Day Use	Pamelia Limited Entry Area Free Self-Issue Permit all other trailheads	Limited Entry trailheads: **DES**-Jack Lake **WIL** – all westside THs. (18 trailheads) 4 trailheads would continue to be the free self-issue permit.	Limited Entry permit trailheads: **DES** – Jack Lake; **WIL** – South Breitenbush/Crag, Whitewater, Pamelia, Marion, Duffy, PCT Breitenbush Lake (7 trailheads) 15 trailheads would continue to be free self-issue permit.	Limited Entry Permit trailheads : **DES** – Jack Lake, Cabot Lake; **WIL** – South Breitenbush/Crag, Whitewater, Pamelia, Marion, Duffy, PCT Santiam Pass, PCT Breitenbush Lake, Woodpecker, Triangulation and Triangulation Peak (11 trailheads) 11 trailheads would continue to be free self-issue permit.	All Trailheads would have a quota and require a permit. (22 trailheads)
Mt. Jefferson Overnight	Pamelia Limited Entry Area Free Self-Issue Permit all other trailheads	Limited Entry Permit required for all overnight use. Overnight quotas are	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads.	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads. Camping can occur in any zone,	Limited Entry Permit required for all overnight use. Overnight quotas

Alternative Feature	**Alternative 1** (EXISTING SITUATION)	**Alternative 2** (PROPOSED ACTION)	**Alternative 3** (FOCUS ON HIGH-USE AREAS ONLY – RESPONDS TO PUBLIC ISSUE)	**Alternative 4** (RESPONDS TO PUBLIC ISSUE AND ACCOUNTS FOR SOME ANTICIPATED DISCPLACEMENT/GROWTH)	**Alternative 5** (REGULATIONS WILDERNESS-WIDE)
		associated with trailheads. There are no overnight zones requiring reservation.	Camping can occur in any zone, except for those that require a reservation. Overnight Zones requiring a camping reservation: 2, 3	except for those that require a reservation. Overnight Zones requiring a camping reservation: 2, 3	are associated with trailheads. Camping reservation must be made for all overnight zones.
Mt. Washington Day Use	Free Self-Issue Permit all trailheads	Limited Entry Trailhead: **WIL** – Benson, ,PCT McKenzie, Hand Free Self-Issue Permit all TH	Limited Entry Trailhead: **WIL**- Benson, PCT McKenzie	Limited Entry Trailhead: **WIL** – Benson, PCT McKenzie	All Trailheads would have a quota and require a permit. (10 trailheads)
Mt Washington Overnight	Free Self-Issue Permit all trailheads	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads.	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads. Camping can occur in any zone.	Limited Entry permit required for all overnight use. Overnight quotas are associated with trailheads. Camping can occur anywhere.	Limited Entry Permit required for all overnight use. Camping reservation must be made for all zones.
Waldo Lake Day Use	Free Self-Issue Permit all trailheads	Free Self-Issue Permit all trailheads	Free Self-Issue Permit all trailheads	Free Self-Issue Permit all trailheads	All trailheads would have a quota and require a permit. (15 trailheads)
Waldo Lake Overnight	Free Self-Issue Permit all trailheads	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads.	Free Self-Issue Permit all trailheads	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads. Camping can occur anywhere.	Limited Entry Permit required for all overnight use. Camping reservation must be made for all zones.

Alternative Feature	Alternative 1 (EXISTING SITUATION)	Alternative 2 (PROPOSED ACTION)	Alternative 3 (FOCUS ON HIGH-USE AREAS ONLY – RESPONDS TO PUBLIC ISSUE)	Alternative 4 (RESPONDS TO PUBLIC ISSUE AND ACCOUNTS FOR SOME ANTICIPATED DISCPLACEMENT/GROWTH)	Alternative 5 (REGULATIONS WILDERNESS-WIDE)
Diamond Peak Day Use	Free Self-Issue Permit all trailheads	Free Self-Issue Permit all trailheads	Free Self-Issue Permit all trailheads	Free Self-Issue Permit all trailheads	All trailheads would have a quota and require a permit. (16 trailheads)
Diamond Peak Overnight	Free Self-Issue Permit all trailheads	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads.	Free Self-Issue Permit all trailheads	Limited Entry Permit required for all overnight use. Overnight quotas are associated with trailheads. Camping can occur in any zone.	Limited Entry Permit required for all overnight use. Camping reservation must be made for all zones.
Campfire Ban	In specific locations	Elevational ban at 5,700 feet elevation for Three Sisters, Mount Jefferson, and Mount Washington. Diamond Peak will be at 6,000 feet. Waldo Lake will not have an elevation ban.			
Setbacks from Water/Trails; designated campsites	Designated camping and specified setbacks at certain areas	Increased user education on appropriately locating campsites. Possible setbacks in some specific locations. Designated campsites would be eliminated. Monitoring those areas for unwanted impacts would be a priority and designated campsites reinstated if necessary.			
Access Management	--	--	Pull back Broken Top & Crater Ditch THs to 370 Rd; create one TH		

The following table provides a summary of the Key Issue analysis and compares the analysis by alternative (Table 3).

Table 3: Comparison of how the alternatives address the key issues.

Key Issue Measure	Alt. 1 No Action	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Recreation Experience: Displacement / Loss of Opportunity and Spontaneity					
Number and proportion of trailheads under day use limited entry	Mt. Jefferson: 1 (5%) Mt. Washington: 0 (0%) Three Sisters: 1 (2%) Waldo Lake: 0 (0%) Diamond Peak: 0 (0%)	Mt. Jefferson: 18 (82%) Mt. Washington: 3 (30%) Three Sisters: 27 (56%) Waldo Lake: 0 (0%) Diamond Peak: 0 (0%)	Mt. Jefferson: 7 (32%) Mt. Washington: 2 (20%) Three Sisters: 10 (21%) Waldo Lake: 0 (0%) Diamond Peak: 0 (0%)	Mt. Jefferson: 11 (50%) Mt. Washington: 2 (20%) Three Sisters: 15 (31%) Waldo Lake: 0 (0%) Diamond Peak: 0 (0%)	Mt. Jefferson: 22 (100%) Mt. Washington: 10 (100%) Three Sisters: 38 (100%) Waldo Lake: 15 (100%) Diamond Peak: 16 (100%)
Day Use Displacement Potential	Continued pattern of unrestricted use and natural displacement to lower use trailheads and wilderness areas.	Simplifies system by using major travel corridors for permitted trailheads; however, does not account for displacement potential.	Primarily high-use areas under limited entry permit. More trailheads will have high/moderate likelihood of receiving displacement; expanding use into previously less-used areas.	Many trailheads with high likelihood of receiving displacement from high use areas are included in permit system; therefore avoids rapid increase in use at those trailheads from displacement.	All trailheads subject to limited entry; therefore impacts low, moderate, and high use trailheads equally; most potential for displacement to outside of wilderness.
Wilderness Areas under overnight limited entry (all trailheads)	None	Mt. Jefferson Mt. Washington Three Sisters Waldo Lake Diamond Peak	Mt. Jefferson Mt. Washington Three Sisters	Mt. Jefferson Mt. Washington Three Sisters Waldo Lake Diamond Peak	Mt. Jefferson Mt. Washington Three Sisters Waldo Lake Diamond Peak
Number of Zones requiring overnight camping reservation	Mt. Jefferson: 1 Mt. Washington: 0 Three Sisters: 1 Waldo Lake: 0 Diamond Peak: 0	Mt. Jefferson: 0 Mt. Washington: 0 Three Sisters: 0 Waldo Lake: 0 Diamond Peak: 0	Mt. Jefferson: 2 Mt. Washington: 0 Three Sisters: 3 Waldo Lake: 0 Diamond Peak: 0	Mt. Jefferson: 2 Mt. Washington: 0 Three Sisters: 3 Waldo Lake: 0 Diamond Peak: 0	Mt. Jefferson: all (9) Mt. Washington: all (2) Three Sisters: all (15) Waldo Lake: all (2) Diamond Peak: all (2)
Acres and proportion of wilderness areas requiring overnight camping reservation for zones	Mt. Jefferson: 7,686 (7%) Mt. Washington: 0 (0%) Three Sisters: 13,200 (4.6%) Waldo Lake: 0 (0%) Diamond Peak: 0 (0%)	Mt. Jefferson: 0 (0%) Mt. Washington: 0 (0%) Three Sisters: 0 (0%) Waldo Lake: 0 (0%) Diamond Peak: 0 (0%)	Mt. Jefferson: 21,115 (19%) Mt. Washington: 0 (0%) Three Sisters: 30,859 (11%) Waldo Lake: 0 (0%) Diamond Peak: 0 (0%)	Mt. Jefferson: 21,115 (19%) Mt. Washington: 0 (0%) Three Sisters: 30,859 (11%) Waldo Lake: 0 (0%) Diamond Peak: 0 (0%)	Mt. Jefferson: 108,909 (100%) Mt. Washington: 54,409 (100%) Three Sisters: 283,763 (100%) Waldo Lake: 36,867 (100%) Diamond Peak: 52,476 (100%)

Key Issue Measure	Alt. 1 No Action	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Overnight Use Displacement/Loss of spontaneity	Continued expansion of use at trailheads and displacement impacts widespread	Likelihood of higher use at currently popular areas because no restrictions on where to camp. Most freedom of movement	Camping reservation zones in most popular locations may cause people to explore less popular areas; potential displacement to areas of historically low use.	Camping reservation zones in most popular locations may cause people to explore less popular areas; potential displacement to areas of historically low use.	More pronounced changes in use patterns than Alts 3 and 4, mitigating impacts at popular areas; higher use in historically less use areas; less freedom of movement.

Chapter 3 – Environmental Consequences

Introduction

This section of the EA describes the components of the human environment that may be impacted by project activities described previously. Effects discussions follow CEQ guidance for scope by categorizing the effects as direct, indirect, and cumulative. The focus is on cause and consequences.

Project Record

The interdisciplinary team (IDT) includes Forest specialists for each discipline. Specialists on the IDT prepared reports to address the environmental consequences of the project. All reports are maintained in the project file, located at the Deschutes National Forest Headquarters office in Bend, Oregon. In some cases, this environmental assessment provides a summary of the report and may only reference technical data upon which conclusions were based. Specialist reports are incorporated by reference into this environmental assessment (40 CFR 1502.41).

Best Available Science

Science information improves the ability to estimate consequences and risks of decision alternatives. The effects of each alternative are predicted based on science literature and the professional experience of the IDT. The conclusions of the IDT specialists are based on the best available science and current understanding. Relevant and available scientific information is incorporated by reference and a complete bibliography is included at the end of the environmental assessment.

Cumulative Effects Analysis

The following section on environmental consequences includes a discussion of cumulative effects. Where there is an overlapping zone of influence, or an additive effect, this information is disclosed. In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. This approach is consistent with Forest Service NEPA regulations at 36 CFR 220.4(f).

The following table shows projects and activities that have been considered by the interdisciplinary team when considering potential for cumulative effects (Table 4). Within each resource section, the specific activities that contribute to cumulative effects are described.

Table 4: Ongoing and reasonably-foreseeable projects within the Central Cascades Wilderness Strategies project area.

Project / Activity	Status	Location & Description
Recreation		
Devil's Lake Trail Reroute CE	NEPA to be completed in fiscal year 2018. Implementation 2019/2020.	Reroute the beginning of the South Sister Climber's Route to use the Elk-Devil's Trail (#12) leaving Devil's Lake Trailhead for crossing under Cascade Lakes Highway. All trail construction and obliteration associated with the reroute would occur outside of the Wilderness boundary.
Mt. Jefferson and Mt. Washington Trails Project EA	NEPA to restart in 2019	Mount Jefferson Wilderness Minto Lake Trail: Decommission 4 miles and proposed reconstruction of this trail along new route that would be 4-5 miles. Brush Creek Trail: Decommission 4.1 miles of trail. Sugar Pine Ridge Trail: Decommission 6.9 miles. Jefferson Lake Trail: Change 9.1 miles from Class 3 to Class 1 Mount Washington Wilderness Dry Creek Trail: Decommission 4.8 miles
Fish Stocking	Annual stocking	All wilderness areas. Stocking of lakes by ODFW via helicopter, horse, or backpacking.
Mt. Bachelor Summit Trail	Developing proposal	High elevation hiking trail on Mt. Bachelor
General Trail Maintenance	Annually	All wilderness areas; brushing, logging out, tread work, etc. on system trails.
Group Campsites	Ongoing	Organizational camps located outside of wilderness have authorization to take group hikes into wilderness.
Special Uses		
NRCS Weather Station	Implementation to occur around 2022	Snotel weather site within the Diamond Peak Wilderness to be removed and replaced with a building outside of wilderness.
Outfitter-guides	Ongoing March - October	Climbing, backpacking and camping, llama packing in Three sisters and Mt. Jefferson Wildernesses.
USGS Seismic Monitoring	Ongoing	Two seismic stations and several GPS benchmarks in Three Sisters Wilderness
Natural Resource		

Prescribed Fire	Planning on hold	Up to 1,750 acres within Mt. Washington Wilderness
Wildfires		
Area closure	Ongoing until approximately July 2018	One segment of trail in Three Sisters will be closed due to danger of falling snags or because trails need to be reconstructed. Whitewater Trail in Mt. Jefferson currently closed for reconstruction.
Restoration	Ongoing	Crews will be completing Burned Area Emergency Restoration work which will involve trail stabilization and invasive weed detection and treatment.

Affected Environment – Recreation and Wilderness

Wilderness Recreation Context

The Deschutes and Willamette National Forests offer a wide variety of recreational opportunities both inside and outside of wilderness, through all seasons, that attract millions of visitors. Wilderness is a vital component of recreation in Central Oregon as many of the iconic vistas, lakes, and peaks are within the high elevation wilderness areas. A permit system was established in 1991 that requires all wilderness visitors to have a free, self-issue permit that is obtained at trailheads from end of May through October.

The Deschutes National Forest is 1.6 million acres, with 182,652 acres of designated Wilderness within the project area (10%). The Deschutes National Forest has 2,313 total miles of trails, with 236 miles of that within wilderness and the project area (10%).

The Willamette National Forest is 1.678 million acres with 388,600 total acres of designated Wilderness (23%), and 354,084 acres which is within the project area (21%). The Willamette National Forest has 1,848 total miles of trails, with 567 miles within the project area (31%).

A study conducted by Burns (2010) summarized the most common recreation uses within wilderness areas of the Cascade Crest, including the Three Sisters, Mt. Washington and Mt. Jefferson Wildernesses. Although this study was conducted in 2010 and use levels have changed dramatically, the Burns study creates a platform for understanding the type of use encountered in wilderness areas in general.

Burns (2010) noted that the most common, primary recreation activities are hiking or walking (45%), backpacking and camping (29.5%), and viewing natural features such as scenery or wildlife (7.3%). Less common, but still popular, primary activities include horseback riding (3.7%), fishing (1.6%), hunting (1.2%), and picnicking and family gathering (1.4%). Although hunting and horseback riding are fairly low compared to the overall percentage of use, the hunting season occurs in the fall and can be the dominant use for several weeks of the year.

The Pacific Crest National Scenic Trail (PCT), which was intentionally routed through as many protected areas as possible in order to showcase diverse and untrammeled ecosystems, traverses four of the wildernesses in the project area. The PCT is part of National Scenic Trail system (see

www.americantrails.org) and the Pacific Crest Trail Association issues permits to long-distance and section hikers (500+ miles) of the PCT.

There are 15 outfitter and guides that currently operate within the Three Sisters, Mount Washington, and Mount Jefferson wilderness areas. These companies and organizations have allocated 'use days' which allows them to operate in wilderness under a special use permit administered by the Deschutes and Willamette National Forests. These outfitters range from guided climbing trips to llama pack trips and they are required to integrate a wilderness educational component in all of their tours.

Wilderness Recreation Trends

National / Regional

Nationally, recreation trends have shown that nature-based outdoor recreation grew by 7.1% between 2000 and 2009, and the number of activity days increased by about 40% from an estimated 37 billion to about 52 billion. Due primarily to population growth, outdoor recreation activities are projected to grow in the number of participants out to 2060. Substantial growth has occurred in both participants and annual days for: viewing birds, viewing other wildlife (besides birds), fish, wildflowers/trees and other vegetation, and natural scenery (Cordell 2012).

This overall growth in recreation has affected wilderness areas, especially those close to urban centers. The challenge is that increased recreational use intensifies natural resource impacts that can diminish naturalness through de-vegetated campsites, eroded shortcuts across trail switchbacks, social trails, depleted firewood, littering and impacts on wildlife (Hendee and Dawson 2002).

Wilderness managers have routinely been turning to permit systems in order to monitor use patterns and minimize resource damage to these protected areas. Of the 765 wilderness areas managed by the U.S. Forest Service, 53 have a mandatory permit system: 19 limiting and 34 not limiting. Only one wilderness area in the Pacific Northwest Region (Enchantments area of the Alpine Lakes Wilderness in Washington) is under a mandatory, limiting permit system for overnight use. There are also climbing permits on National Forests that have a quota system such as Mt. Adams and Mt. St. Helens in Washington, and Mt. Whitney in California.

Local

The close proximity of these wilderness areas to large population centers that are fueled by a tourism economy, along with paved roads providing easy access to many trailheads, has created conditions that make these wilderness areas popular not only for backpacking trips, but ideal for day hikes, or short sightseeing trips.

In 2017, the Central Oregon Visitor Association (COVA) counted 4.3 million overnight visitors to Central Oregon. Wilderness recreation by locals and tourists occurs throughout all seasons, but the most popular months are June through September when access is easier.

Wilderness permit data collected at trailheads has displayed an increase in use across all wilderness areas, with a significant increase in the Three Sisters (181% increase from 2011 to 2016). Many of the high-use trailheads experienced significant growth over this same time frame, such as Devils Lake (267% increase), Green Lakes (279% increase), and Tam Rim (487% increase). The increasing population and a tourism economy have placed a burden on these wilderness areas to provide unlimited recreational opportunities. Additionally, "newly" discovered areas that are desirable for recreation are often popularized by social media resulting in rapid increase of use which often outpaces management actions.

Hendee and Dawson (2002) directly addressed the dilemma of increasing demand with a limited resource within the context of wilderness stating that, "Wilderness simply cannot, and should not, meet all of the demands that might be placed on it. To do so would directly violate provisions of the Wilderness Act and lead to a loss of those environmental qualities that prompted passage of the act in the first place; that is, the naturalness and solitude-the wilderness conditions- that such areas offer."

Current Conditions

The current condition of these wilderness areas has been deteriorating over time and is exemplified in the proliferation of campsites and user trails, the increase of trash and human waste, the increase in fire rings and constructed features, and diminishing opportunities for solitude evidenced in studies conducted by Oregon State University. The current condition for each wilderness area is described in detail in "Central Cascades Wilderness Strategies Project – Existing Conditions and Trends by Wilderness Area" (USDA Forest Service 2017).

Key Issue #1: Recreation Experience - Potential for Displacement

Analysis Methods

The first key issue that came out of public scoping responses was that the proposed action goes beyond what may be necessary and should be scaled back to include only high-use problem areas or only restrict overnight use. The issue is addressed with Alternative 3, which scaled back the day use limited entry to the most at-risk areas. To analyze this issue, proposed overnight and day use quotas were identified for each alternative (see Appendix C). Then the potential for displacement from trailheads was examined by comparing 2016 use data to the proposed quota numbers providing a starting place for understanding how many people would be unable to visit each trailhead with a quota on busy days under each alternative. This provides an understanding of potential day use displacement from trailheads that have quotas to trailheads that do not have quotas for each alternative. To determine likelihood of displacement, the desirability of visiting each trailhead was analyzed (professional judgement) and the amount of travel time and distance from population centers to determine the likelihood of displacement (High/Medium/Low) under each alternative.

The different alternatives will affect use in unique ways, depending on the number of wilderness areas requiring overnight permits and the number of trailheads requiring day use limited entry permits. The following tables (Table 5 through Table 10) show which wilderness areas and trailheads would require a limited entry overnight and day use permit for each alternative. These are followed by charts and a discussion on the displacement effects that the proposed quotas could create. The final table under this key issue will address the likelihood of day use displacement to every trailhead under each alternative. The final discussion summarizes potential displacement for day and overnight use for each alternative and wilderness area. This analysis will provide a tool for understanding what displacement impacts are likely under each alternative to determine how alternatives that scale back use restrictions will impact the wilderness.

Table 5: Wilderness Areas Requiring a Limited Entry Overnight Permit (Wilderness-wide) by Alternative

Wilderness Areas Requiring a Limited Entry Overnight Permit	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Three Sisters		X	X	X	X
Mount Jefferson		X	X	X	X
Mount Washington		X	X	X	X
Diamond Peak		X		X	X
Waldo Lake		X		X	X

Table 6: Trailheads within the Three Sisters Wilderness Requiring a Limited Entry Day Use Permit by Alternative

Three Sisters Wilderness Trailheads Requiring a Limited Entry Day Use Permit	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Scott		X	X	X	X
Obsidian	X	X	X	X	X
Linton Lake		X		X	X
Foley					X
Separation					X
Rainbow					X
Horse Creek					X
Upper French Pete / Pat Saddle					X
Upper Lowder					X
Upper East Fork					X
Lower East Fork					X
Lower Lowder					X
French Pete					X
Rebel					X
Olallie					X
Elk Creek					X
South Fork					X
Crossing Way					X
Box Canyon					X
Skookum					X
Taylor Burn					X
Helen Lake					X
Jack Pine					X
Irish Taylor		X			X
Many Lakes		X			X
Deer Lake		X			X
Winopee/Corral Lake		X			X
Corral Swamp		X			X
Lucky Lake		X		X	X
Six Lakes		X		X	X
Elk Lake		X		X	X

Three Sisters Wilderness Trailheads Requiring a Limited Entry Day Use Permit	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Quin Meadow		X			X
Sister Mirror		X	X	X	X
Devils Lake/Wickiup		X	X	X	X
Green Lake/Soda Creek		X	X	X	X
Todd Lake		X	X	X	X
Crater Ditch		X	X	X	X
Broken Top		X	X	X	X
Tam McArthur Rim		X	X	X	X
Three Creek Meadow		X			X
Park Meadow		X			X
Chush Falls		X		X	X
Pole Creek		X			X
Scott Pass		X			X
Millican		X			X
Black Crater		X		X	X
Lava Camp		X	X	X	X

Table 7: Trailheads within the Mount Jefferson Wilderness Area Requiring a Limited Entry Day Use Permit by Alternative

Mount Jefferson Trailheads Requiring a Limited Entry Day Use Permit	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Roaring Creek		X			X
Crown Lake		X			X
PCT Breitenbush		X	X	X	X
S. Breitenbush		X	X	X	X
Triangulation		X		X	X
Cheat Creek		X			X
Whitewater		X	X	X	X
Woodpecker		X		X	X
Pamelia Lake	X	X	X	X	X
Minto Mountain		X			X
Bingham Ridge		X			X
Marion Lake		X	X	X	X
Jefferson Lake					X
Pine Ridge		X			X
Big Meadows Horse Camp		X			X
Cabot Lake				X	X
Bear Valley					X
Duffy Lake		X	X	X	X
Maxwell Butte		X			X

Mount Jefferson Trailheads Requiring a Limited Entry Day Use Permit	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
PCT Santiam Pass		X		X	X
Jack Lake		X	X	X	X
Round Lake					X

Table 8: Trailheads within the Diamond Peak Wilderness Area Requiring a Limited Entry Day Use Permit by Alternative

Diamond Peak Trailheads Requiring a Limited Entry Day Use Permit	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Pengra Pass					X
Trapper Creek					X
Crater Butte					X
Fawn Lake					X
Whitefish					X
Snell Lake					X
Emigrant Pass					X
Diamond Peak South					X
Rockpile/Marie Lake					X
Pioneer Gulch					X
Corrigan Lake					X
Blue Lake					X
Diamond Peak North					X
Vivian Lake					X
Salt Creek Falls					X
Deer Creek					X

Table 9: Trailheads within the Mount Washington Wilderness Area Requiring a Limited Entry Day Use Permit by Alternative

Mt. Washington Trailheads Requiring a Limited Entry Day Use Permit	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Patjens					X
PCT Big Lake					X
Hortense Lake - Access Point					X
Dry Creek - Access Point					X
PCT McKenzie Pass		X	X	X	X
Hand Lake		X			X

Benson/Tenas		X	X	X	X
Fingerboard Prairie					X
Tenas Lakes					X
Robinson Lake					X

Table 10: Trailheads within the Waldo Lake Wilderness Area Requiring a Limited Entry Day Use Permit by Alternative

Waldo Lake Requiring a Limited Entry Day Use Permit	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Alt. 5**
Shadow Bay					X
Black Creek					X
Koch Mountain					X
Salmon Lakes					X
Gander Lake					X
Swan Lake					X
Winchester Lake					X
Shale Ridge					X
Blair Lake					X
Taylor Burn					X
Torrey Lake					X
Field Lake					X
North Waldo					X
Mt. Ray					X
High Divide					X

Direct and Indirect Effects

Potential Displacement from Limited Entry Permit System

Quotas are the number of permits allocated to a trailhead for the purpose of limiting entry and are based on a number of factors and datasets as described in Appendix C of this EA. Quotas for day use are based on individual people; overnight use quotas are for groups (maximum group size is 12 individuals).

If an alternative is chosen that has a limited entry permit system, there is a potential that visitors will not to be able to access a specific trailhead on a given day. This will cause spatial and temporal displacement as visitors may choose to (1) travel to a wilderness trailhead or wilderness area where it is easier to get a limited entry permit, (2) visit a trailhead or wilderness that does not require a limited entry permit, (3) visit an area outside of wilderness, (4) go on a different day or time of year, or (5) not go at all.

Displacement is not unique to this proposal and has already been occurring on both forests. On the Deschutes National Forest, as high-use trailhead parking lots such as Green Lakes and Devil's Lake fill beyond capacity, visitors have been travelling farther to access the wilderness. This has contributed to increased use at neighboring trailheads such as Six Lakes (476% increase from 2011 to 2016), Lucky Lake (236% increase from 2011 to 2016) and Elk Lake (194% increase from 2011 to 2016). While some of these increases can be attributed to the general rise in use, the lack of

opportunity at the popular trailheads due to a parking shortage has also added to the use in these other locations.

Permits will be required within all of these wilderness areas, whether it is accessed through a limited entry trailhead or not. If a trailhead is not designated as requiring a limited entry permit that has a quota, a free, self-issue permit that is obtained at a trailhead, will still be required.

The following charts show for a selection of trailheads the level of daily use for 2016 (from permit data) and the proposed quota level for that trailhead. These charts exemplify how the proposed quota would potentially displace visitors. Charts for more of the trailheads are included in Appendix C. It is important to note that the 2016 numbers were the highest documented use on record. From 2011 to 2016, use increased in the Three Sisters Wilderness by 181%, from 46,999 visitors to 132,118 visitors. The majority of that growth happened in 2015 and 2016. The increase in 2015 was 51%, and in 2016 it increased an additional 28%.

Chart 1 and Chart 2 display the total visitor use by day in the entire Three Sisters Wilderness in 2016 for overnight and day use. Against that is shown the total of all proposed trailhead quotas. These charts demonstrate the potential wilderness-wide impact if all trailheads were subject to limited entry permit for day and overnight use at the determined quota level (the Alternative 5 scenario). It shows that across the wilderness as a whole, there are only 17 days where use exceeds the proposed quota for overnight use and 14 days for day use. These charts highlight that if a limited entry system is implemented, it will still allow abundant access to the wilderness. The most displacement will occur at high-use trailheads during the peak season.

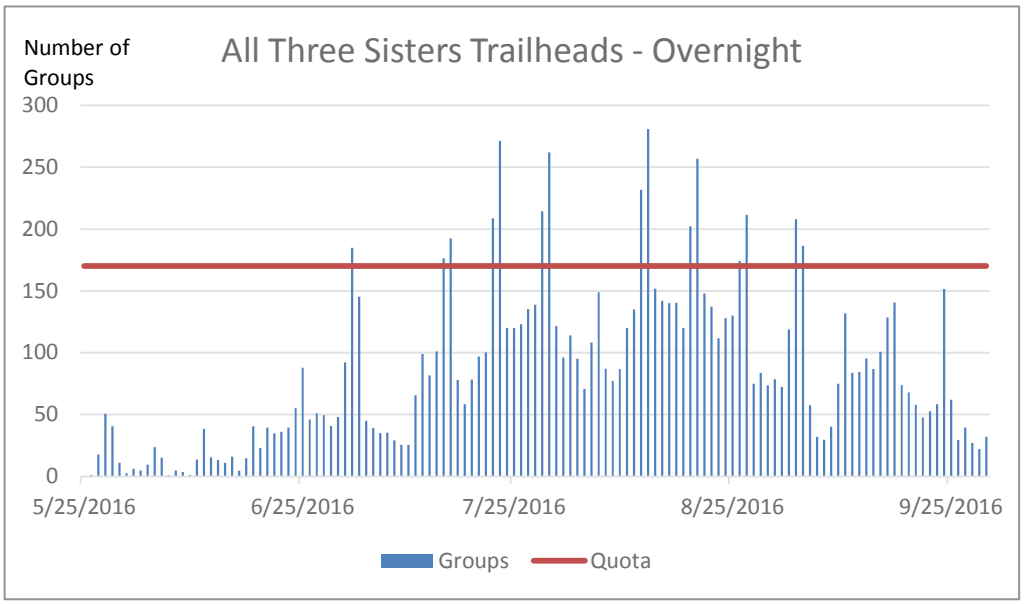

Chart 1: Total Overnight Visitor Groups during 2016 and Total of Trailhead Quotas in Three Sisters Wilderness. Groups can be 2 to 12 individuals and average 2.5 individuals.

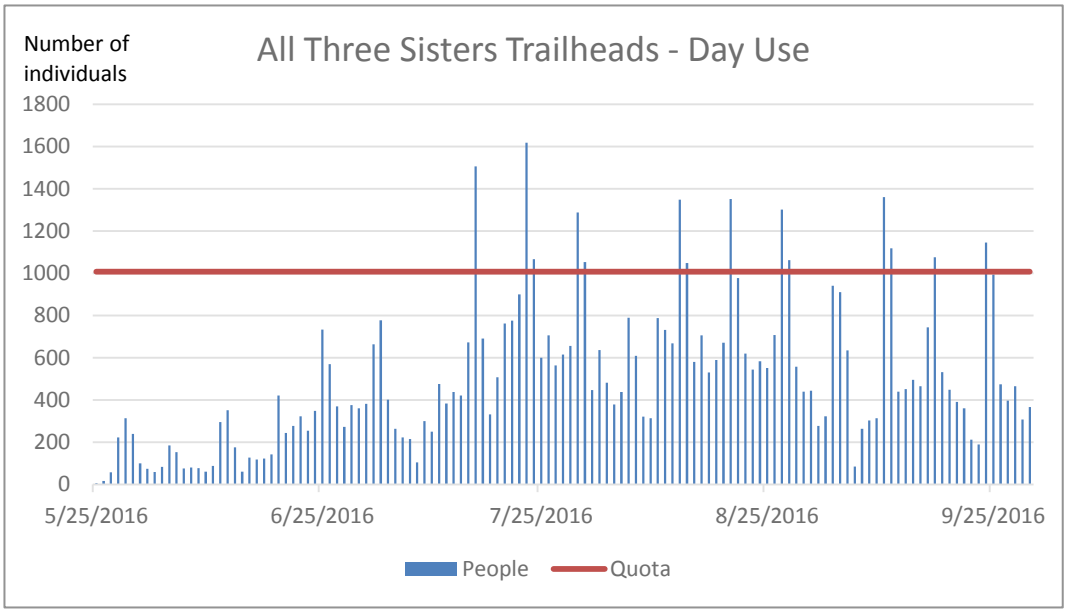

Chart 2: Total Visitor Use by Day 2016 and Trailhead Quotas in Three Sisters Wilderness

The Green Lakes/Soda Creek Trailhead is an example of a high-use area in the Three Sisters Wilderness (Chart 3 and Chart 4). This type of site has easy access to scenic vistas and lakes and has the greatest potential to be impacted by a limited entry system. If the proposed quota had been in place in 2016, displacement would have occurred on 27 days for overnight use and 56 days for day use.

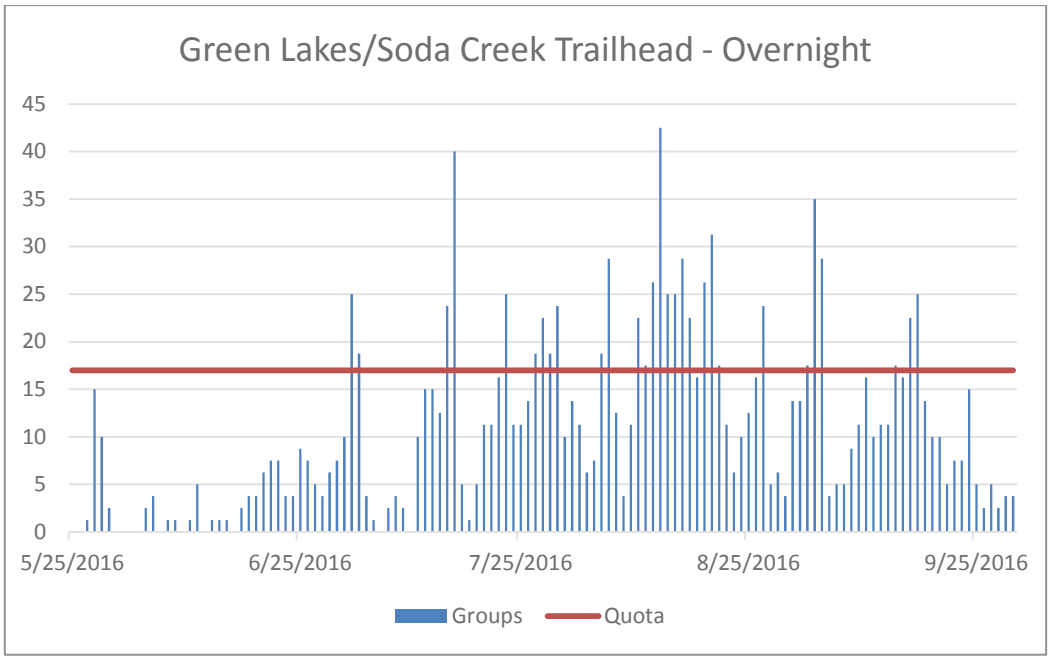

Chart 3: Overnight Visitor Groups in 2016 and Proposed Quota for Green Lakes/Soda Creek Trailhead

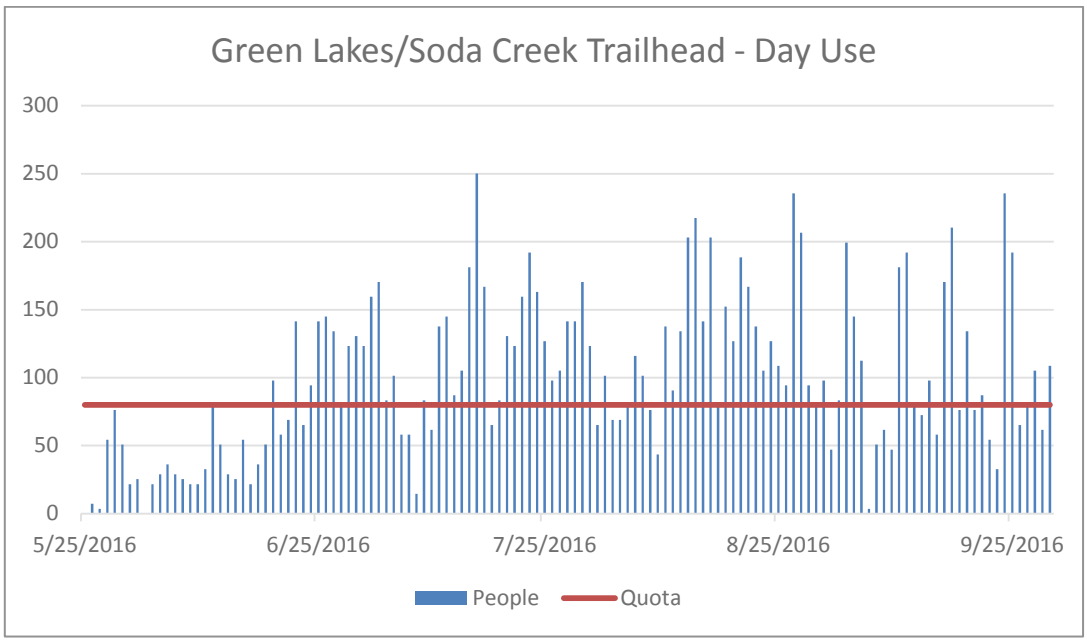

Chart 4: Visitor Use by Day in 2016 and Proposed Trail Quota for Green Lakes/Soda Creek Trailhead

The Whitewater Trailhead is an example of a high-use area in the Mount Jefferson Wilderness (Chart 5 and Chart 6). This type of site has access to scenic vistas and lakes and has the greatest potential to be impacted by a limited entry system. Due to the length of the trail to get to Jefferson Parks, this trailhead provides primarily overnight use. If a quota had been in place in 2016, displacement would have occurred on 49 days for overnight use and 8 days for day use. The quota was determined in part by how many appropriate campsites are present in the area. The continuation of the excessive use seen in 2016 would lead to effects of campsite expansion described earlier. For the Mt. Jefferson Wilderness as a whole, potential wilderness-wide impact if all trailheads were subject to limited entry permit for day and overnight use at the determined quota level (the Alternative 5 scenario), there would be 15 days where use exceeds the proposed quota for overnight use and one day for day use.

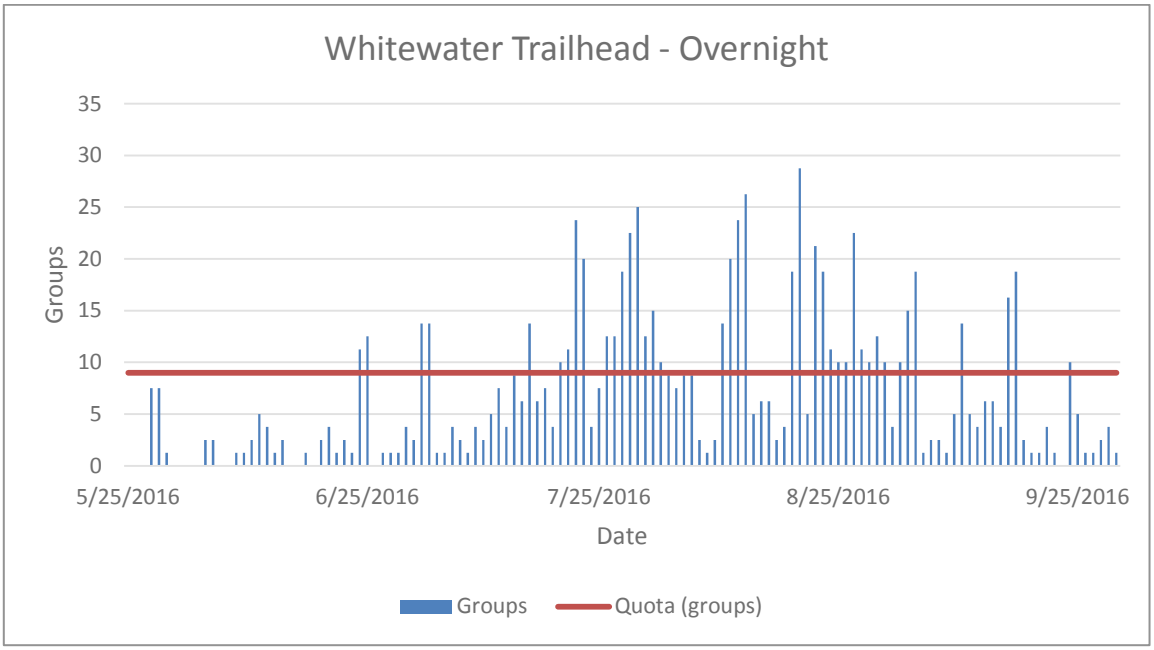

Chart 5: Overnight Visitor Use in 2016 and Proposed Trail Quota for Whitewater Trailhead.

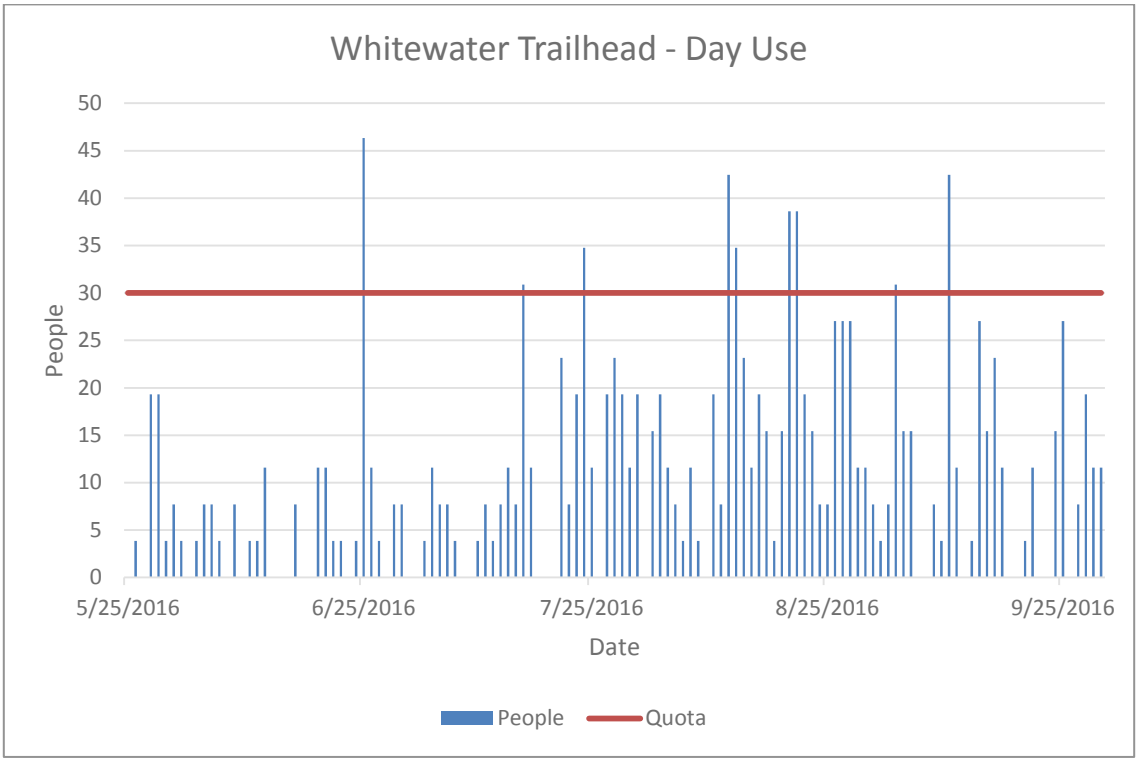

Chart 6: Visitor Use by Day in 2016 and Proposed Trail Quota for Whitewater Trailhead.

These charts highlight potential displacement in high use areas across both forests. There are many more trailheads that have historically low use that would have no displacement effects from the quota system. Rebel is an example of a lower use trailhead that would have minimal effects from a

limited entry system (Charts 7 and 8). If a quota had been in place for this trailhead in 2016, displacement would have occurred on one day for overnight use and no days for day use.

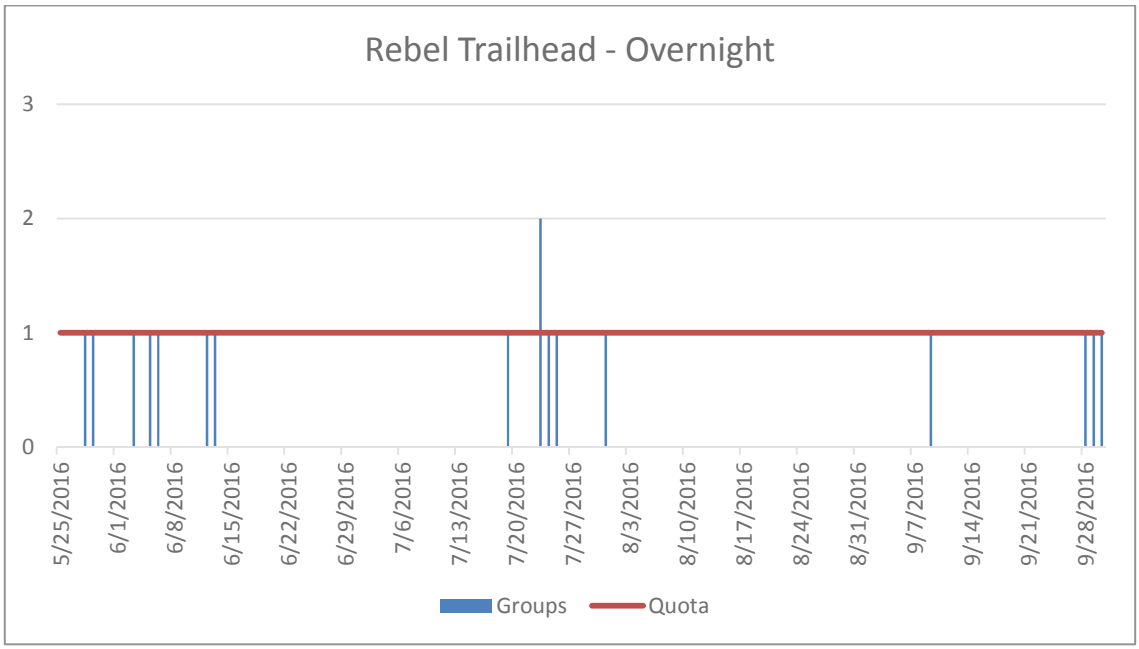

Chart 7: Overnight Visitor Use in 2016 and Proposed Trail Quota for Rebel Trailhead. This and other low-use trailheads are only affected by quota permit system under Alternative 5.

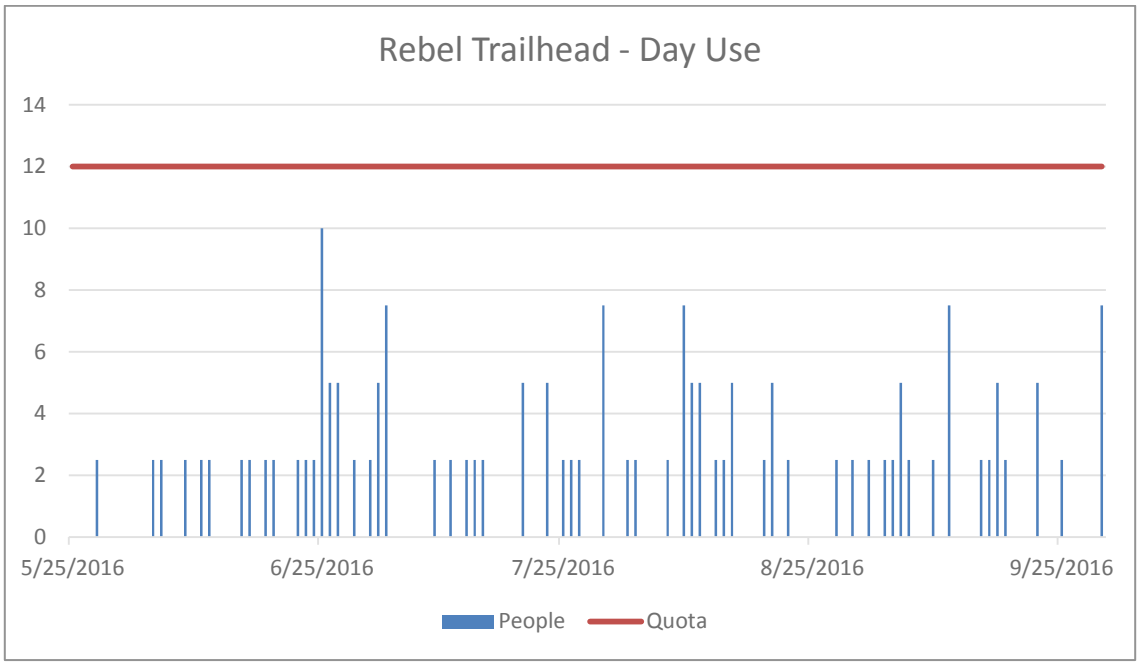

Chart 8: Visitor Use by Day in 2016 and Proposed Trail Quota for Rebel Trailhead.

Day Use Displacement by Trailhead

The following tables describe the likelihood that each trailhead will receive day use displacement under Alternatives 2-5 (increased visitation due to people not being able to access a first-choice destination). Factors considered were distance and time from the nearest population center; the median distance visitors will travel for day and overnight use; and the characteristics of the trail/destination that could affect visitor's decisions. A study by Cole & Hall (2008) describe trip characteristics for 36 trailheads within 13 wilderness areas in Washington and Oregon. They found that day users were willing to travel a median distance of 60 miles and overnight users 100 miles. They also noted that one half of visitors live within 2 hours of the trailhead they visited (Cole & Hall 2008).

Alternative 2 has limited entry permits required at trailheads that have low, moderate, and high likelihood of displacement as it primarily uses highway corridors to designate areas where permits are mandatory. Although Alternative 2 requires permits at some trailheads that are unlikely to receive displacement, it simplifies the quota system to the public by establishing consistent use restrictions along a travel corridor.

Alternative 3 has limited entry trailheads in only the high-use areas, and has the potential to displace visitors to neighboring trailheads, resulting in new use in previously less used areas and more high-use trailheads in the future. Alternative 4 captures many of those trailheads that have a high probability of receiving displacement, and establishes them as a limited entry trailhead under a quota system.

Alternative 5 has every trailhead in every wilderness designated as limited entry. This alternative would affect low, moderate, and high use trailheads equally, reduce impacts from displacement by capping use levels, and is the most restrictive for day use.

Because causing displacement to lower use areas within wilderness, the action alternatives may increase use in areas outside wilderness, particularly in areas near high- use wilderness destinations.

Table 11: Three Sisters Wilderness Trailheads and Likelihood of Receiving Day Use Displacement. "Quota" in the table signifies that the trailhead would be under a limited entry permit under that alternative, which eliminates the potential for it to receive day use displacement.

Trailhead Name	Miles from pop. center	Travel Time (min.)	Likelihood of trailhead receiving displacement	Likelihood of receiving displacement by alternative			
				Alt 2	Alt 3	Alt 4	Alt 5
Scott	40.16	56	Medium – This trailhead access is a lava field. Views are spectacular but it is hot during the summer.	Quota	Quota	Quota	Quota
Obsidian	40.04	56	High – Cultural site, excellent views	Quota	Quota	Quota	Quota
Linton Lake	48	65	High – Nice lake basin, short hike	Quota	High	Quota	Quota
Foley	63	94	Medium/low. One nice vista at Substitute Point, long drive, hiking through fire area	Low	Low	Low	Quota
Separation	61	89	Medium – Nice lake within day hike range, fishing in lake	Low	Low	Low	Quota
Rainbow	58	80	High – Short hike to a nice waterfall	Mod.	Mod.	Mod.	Quota
Horse Creek	58	83	Low – Forested, beautiful hike but limited scenery for day use	Low	Low	Low	Quota

Trailhead Name	Miles from pop. center	Travel Time (min.)	Likelihood of trailhead receiving displacement	Likelihood of receiving displacement by alternative			
				Alt 2	Alt 3	Alt 4	Alt 5
Pat Saddle	63	107	High – Historic lookout on Olallie Mtn, excellent views, recent burn may detract	Mod.	Mod.	Mod.	Quota
Upper Lowder	58	101	High – Excellent views, great flowers	Mod.	Mod.	Mod.	Quota
Upper East Fork	52	85	Low – Forested, beautiful hike but limited scenery for day use	Low	Low	Low	Quota
Lower East Fork	49	77	Low – Forested, beautiful hike but limited scenery for day use	Low	Low	Low	Quota
Lower Lowder	51	75	Low – Forested, beautiful hike but limited scenery for day use, trail is not well maintained	Low	Low	Low	Quota
French Pete	51	82	Low – Forested, beautiful hike but limited scenery for day use. Large river crossing after 2 miles	Low	Low	Low	Quota
Rebel	53	93	High – Excellent wildflowers and scenery	Mod.	Mod.	Mod.	Quota
Olallie	52	70	Low – Forested, beautiful hike but limited scenery for day use, Very Steep at offset.	Low	Low	Low	Quota
Elk Creek	64	136	Low – Forested, beautiful hike but limited scenery for day use, Very Steep at offset.	Low	Low	Low	Quota
South Fork	64	136	Low – Forested, beautiful hike but limited scenery for day use	Low	Low	Low	Quota
Crossing Way	67	140	Low – Forested, beautiful hike but limited scenery for day use	Low	Low	Low	Quota
Box Canyon	60	110	Low – Forested, beautiful hike but limited scenery for day use	Low	Low	Low	Quota
Skookum	75	146	High – Erma bells area popular lakes, but outside of day use distance	Low	Low	Low	Quota
Taylor Burn	78	163	Low – Forested, in old burn scar, outside of median day use, outside of median day use travel time and distance.	Low	Low	Low	Quota
Helen Lake	72	145	Low – Forested, in old burn scar, outside of median day use travel time and distance	Low	Low	Low	Quota
Jack Pine	45	132	Low – Forested, in old burn scar	Low	Low	Low	Quota
Irish Taylor	56	110	Low – Forested with small lakes	Quota	Low	Low	Quota
Many Lakes	42	80	Low – Forested with small lakes	Quota	Low	Low	Quota
Deer Lake	39	80	Low – Forested with small lakes	Quota	Low	Low	Quota
Winopee/ Corral Lake	37	60	Medium – Forested with larger lakes and quality scenery	Quota	Mod.	Mod.	Quota
Corral Swamp	34	75	Low – Forested with small lakes	Quota	Low	Low	Quota
Lucky Lake	35	75	High – Easy hike to a beautiful lake	Quota	High	Quota	Quota
Six Lakes	34	70	High – Easy hike to beautiful lakes	Quota	High	Quota	Quota

Trailhead Name	Miles from pop. center	Travel Time (min.)	Likelihood of trailhead receiving displacement	Likelihood of receiving displacement by alternative			
				Alt 2	Alt 3	Alt 4	Alt 5
Elk Lake	30	65	Medium – Forested with larger lakes and quality scenery, but longer distance to lakes	Quota	Mod.	Quota	Quota
Quinn Meadow	29	62	Moderate – From horse camp, long ways to anything picturesque, but does access some popular areas and is one of the only areas along Cascade Lakes Highway without a permit	Quota	Mod.	Mod.	Quota
Sister Mirror	29	60	High – Easy hike to a beautiful lakes	Quota	Quota	Quota	Quota
Devils Lake/ Wickiup	27	55	High – Access to popular area	Quota	Quota	Quota	Quota
Green Lake/Soda Creek	25	52	High – Access to popular area	Quota	Quota	Quota	Quota
Todd Lake	22	48	High – Access to popular area	Quota	Quota	Quota	Quota
Crater Ditch	31	75	High – Access to popular area	Quota	Quota	Quota	Quota
Broken Top	20	75	High – Access to popular area	Quota	Quota	Quota	Quota
Tam McArthur Rim	21	70	High – Access to popular area	Quota	Quota	Quota	Quota
Three Creek Meadow	23	60	Moderate – Access to popular areas	Quota	Mod.	Mod.	Quota
Park Meadow	21	55	Moderate– Access to popular areas	Quota	Mod.	Mod.	Quota
Chush Falls	26	50	High – close to town, short hike	Quota	High	Quota	Quota
Pole Creek	31	50	Moderate – Access popular areas, but long hike through fire scars	Quota	Mod.	Mod.	Quota
Scott Pass	31	60	Moderate – access views, and Matthieu lake through burn	Quota	Mod.	Mod.	Quota
Millican	30	50	Moderate – access views, and Matthieu lake through burn	Quota	Mod.	Mod.	Quota
Black Crater	32	50	High, access to popular area with beautiful views	Quota	High	Quota	Quota
Lava Camp	34	90	High, Access to popular areas	Quota	Quota	Quota	Quota

Table 12: Mount Jefferson Trailheads and Likelihood of Receiving Day Use Displacement. "Quota" in the table signifies that the trailhead would be under a limited entry permit under that alternative, which eliminates the potential for it to receive day use displacement.

Trailhead Name	Miles from pop. center	Travel Time (min.)	Likelihood of Trailhead Receiving Displacement	Alt 2	Alt 3	Alt 4	Alt 5

Roaring Creek	72	105	Moderate – High desirability, easy short trail, both go to Crown Lake. May be a little on the short side given how long people have to drive to get there	Quota	Mod.	Mod.	Quota
Crown Lake	72	107	Moderate – High desirability, easy short trail, both go to Crown Lake. May be a little on the short side given how long people have to drive to get there	Quota	Mod.	Mod.	Quota
PCT Breiten-bush	75	115	High desirability accesses many popular areas including Jeff Park	Quota	Quota	Quota	Quota
South Breiten-bush	62	79	High desirability accesses many popular areas including Jeff Park	Quota	Quota	Quota	Quota
Triangu-lation	68	97	Moderate– Desirability is high, Triangulation Peak is 2 miles out. Still pretty far to get to	Quota	Mod.	Quota	Quota
Cheat Creek	67	129	Low – Accesses a west side meadow, very far from town.	Quota	Low	Low	Quota
Whitewater	71	102	High desirability and likely high access to many popular areas including Jeff Park	Quota	Quota	Quota	Quota
Wood-pecker	69	96	High – Views are gained quickly, accesses Jeff park. Historically low use	Quota	High	Quota	Quota
Pamelia Lake	68	88	High desirability accesses many popular areas	Quota	Quota	Quota	Quota
Minto Mountain	63	85	Low – Low desirability hiking.	Quota	Low	Low	Quota
Bingham Ridge	67	90	Low – Does have a bit of a view. Fire impacted.	Quota	Low	Low	Quota
Marion Lake	64	92	High desirability accesses many popular areas	Quota	Quota	Quota	Quota
Jefferson Lake	43	75	Low – Burnt lava field	Low	Low	Low	Quota
Pine Ridge	61	78	Moderate – Good swimming access, Some good views	Quota	Mod.	Mod.	Quota
Big Meadows Horse Camp	52	61	Low - Big Meadows added 2 miles compared to Duffy Lake which is far away.	Quota	Low	Low	Quota
Cabot Lake	43	60	High – Beautiful lake and vistas	High	High	Quota	Quota
Bear Valley	44	76	Low – burned area, some vistas	Low	Low	Low	Quota
Duffy Lake	51	68	High desirability accesses many popular areas	Quota	Quota	Quota	Quota
Maxwell Butte	44	55	Low – Forested hike for first 5 miles	Quota	Low	Low	Quota
PCT Santiam Pass	39	50	High – High desirability, very easy access. Many views right out the gate	Quota	High	Quota	Quota
Jack Lake	44	76	High – Beautiful hike with water and vistas.	Quota	Quota	Quota	Quota
Round Lake	40	65	Low – burned area, some vistas	Low	Low	Low	Quota

Table 13: Mount Washington Trailheads and Likelihood of Receiving Day Use Displacement. "Quota" in the table signifies that the trailhead would be under a limited entry permit under that alternative, which eliminates the potential for it to receive day use displacement.

Trailhead	Miles from pop. center	Travel Time (min.)	Likelihood of Trailhead Receiving Displacement	Alt 2	Alt 3	Alt 4	Alt 5
Patjens	40	57	Moderate - Views, campground next to it, close to town. Burned over.	Mod.	Mod.	Mod.	Quota
PCT Big Lake	44	56	High - Good views, peak, easy trail, small amount burned.	High	High	High	Quota
Hortense Lake Access Point	37	60	Low - No trail access, burned over	Low	Low	Low	Quota
Dry Creek Access Point	34	50	Low - No trail access, burned over	Low	Low	Low	Quota
PCT McKenzie Pass	40	50	High - beautiful	Quota	Quota	Quota	Quota
Hand Lake	41	53	Moderate - Small parking lot, beautiful hike, historic shelter in pretty meadow	Quota	Mod.	Mod.	Quota
Benson/Tenas	62	61	High - Beautiful lakes	Quota	Quota	Quota	Quota
Fingerboard Prairie	65	89	Low - Long access drive, pretty hike	Low	Low	Low	Quota
Tenas Lakes	66	93	Low - Long access drive, pretty hike	Low	Low	Low	Quota
Robinson Lake	57	78	Low - Timbered fishing lake	Low	Low	Low	Quota

Table 14: Diamond Peak Trailheads and Likelihood of Receiving Day Use Displacement. "Quota" in the table signifies that the trailhead would be under a limited entry permit under that alternative, which eliminates the potential for it to receive day use displacement.

Trailhead	Miles from pop. center	Travel Time (min.)	Likelihood of trailhead receiving displacement	Alt 2	Alt 3	Alt 4	Alt 5
Pengra Pass	68	81	Low – Mostly forested with some lakes.	Low	Low	Low	Quota
Trapper Creek	71	82	Low –Mostly forested.	Low	Low	Low	Quota
Crater Butte	75	97	Moderate – Accesses to Fawn lake, beautiful hike, easy grade, developed site at trailhead. It is more than 60 miles away from a population center.	Mod.	Mod.	Mod.	Quota
Fawn Lake	60.23	74	High – Accesses to Fawn lake, beautiful hike, and easy grade.	High	High	High	Quota
Whitefish	64	90	Low – Mostly forested hike.	Low	Low	Low	Quota
Snell Lake	74	94	Low – challenging road, forested hike.	Low	Low	Low	Quota
Emigrant Pass	78	102	Moderate – accesses PCT and Diamond Peak.	Mod.	Mod.	Mod.	Quota
Diamond Peak South	77	106	Low – forested	Low	Low	Low	Quota

Rockpile/ Marie Lake	80	110	Moderate scenery – rocky terrain, neat geology	Mod.	Mod.	Mod.	Quota
Pioneer Gulch	72	124	Moderate – High desirability because of main approach to diamond peak	Mod.	Mod.	Mod.	Quota
Corrigan Lake	71	120	Low – Moderate desirability, beautiful lake, approach to diamond peak, but far from	Low	Low	Low	Quota
Blue Lake	67	120	Low – forested	Low	Low	Low	Quota
Diamond Peak North	93	151	Low – forested	Low	Low	Low	Quota
Vivian Lake	60.93	99	Moderate – high desirability, far but accesses popular Notch Lake. Too far from Bend and other restricted trailheads to have high displacement	Mod.	Mod.	Mod.	Quota
Salt Creek Falls	61	120	Low – Falls are outside of wilderness	Low	Low	Low	Quota
Deer Creek	61	103	Low	Low	Low	Low	Quota

Table 15: Waldo Lake Trailheads and Likelihood of Receiving Day Use Displacement. "Quota" in the table signifies that the trailhead would be under a limited entry permit under that alternative, which eliminates the potential for it to receive day use displacement.

Trailhead	Miles from pop. center	Travel Time (min.)	Likelihood of Trailhead Receiving Displacement	Alt 2	Alt 3	Alt 4	Alt 5
Shadow Bay	82	107	Low – Forested, access some lakes. Occasional views	Low	Low	Low	Quota
Black Creek	62	110	Low – moderate desirability for hiking due to falls but very long drive	Low	Low	Low	Quota
Koch Mountain	65	133	Low – moderate desirability but long drive	Low	Low	Low	Quota
Salmon Lakes	60	104	Moderate – Moderate desirability for hiking, nice lake, but long drive	Mod.	Mod.	Mod.	Quota
Gander Lake	60	120	Low – Moderate desirability for hiking, nice lake, but long drive	Low	Low	Low	Quota
Swan Lake	63	105	Low – Moderate desirability for hiking, nice lake, but long drive	Low	Low	Low	Quota
Winchester Lake	62	103	Moderate – High desirability for hiking, nice lake, but long drive.	Mod.	Mod.	Mod.	Quota
Shale Ridge	67	116	Low – Very difficult hike, forested but beautiful. Long drive.	Low	Low	Low	Quota
Blair Lake	57	90	Low – forested hike, no views.	Low	Low	Low	Quota
Taylor Burn	83	136	Low – Very far to drive into. Moderate scenery.	Low	Low	Low	Quota
Torrey Lake	82	130	Low – Forested, or in the burn and a far drive.	Low	Low	Low	Quota
Fields Lake	82	142	Low – Forested and a far drive.	Low	Low	Low	Quota
North Waldo	76	109	Low – Moderate scenery, nice swimming lakes.	Low	Low	Low	Quota
Mt. Ray	54	91	Low – hard work to get to views, far hike.	Low	Low	Low	Quota

High Divide	89	124	Low – forested and very steep trail. Lots of work to hike the trail.	Low	Low	Low	Quota

The scope of the limited entry system varies for each alternative and has different potential displacement effects. The following description of alternatives will concentrate on the potential for displacement within the five wilderness areas addressed in this project.

Day Use Displacement by Wilderness Area

Alternative 1

Alternative 1 is the no action alternative and will result in a continuation of the current pattern of unrestricted use and natural displacement as popular trailheads fill to capacity, shifting day visitors to lower use trailheads and wilderness areas.

Alternative 2

Alternative 2 implements day use quotas at 45 trailheads in the Three Sisters, Mount Washington and Mount Jefferson areas. The day use quota under Alt 2 was designed to minimize displacement effects and simplify the understanding of the quota system to the public by placing quotas along busy road corridors. The result is a mixture of quotas at some areas that are unlikely to receive displacement, such as Irish Taylor and Many Lakes, and a lack of a quota at some areas that are highly likely to receive displacement, such as Cabot Lake.

For the Three Sisters Wilderness, Alt 2 places day use quotas at all areas that would otherwise be highly and moderately likely to receive displacement, with the exception of four trailheads, all of which are likely to receive moderate displacement. Additionally, Alt 2 places day use quotas at four trailheads that are unlikely to otherwise have displacement (Table 11).

For the Mount Jefferson wilderness, Alt 2 restricts day use at all areas that would otherwise be highly and moderately likely to receive displacement. Additionally, Alt 2 places day use quotas at four areas that are unlikely to receive displacement (Table 12).

For the Mount Washington Wilderness, Alternative 2 restricts day use at all areas that would otherwise be highly and moderately likely to receive displacement with the exception of Patjens Trail (Moderate) and the PCT at Big Lake Youth Camp (High Likelihood). Alt 2 does not place any day use quotas at trailheads which have a low probability of receiving displacement (Table 13).

Alternative 2 does not include any day use quotas for Diamond Peak and Waldo Lake Wilderness areas. Under Alt 2 we expect a moderate displacement likelihood at five trailheads and high displacement likelihood at one trailhead in the Diamond Peak Wilderness (Table 14). We also anticipate a moderate likelihood of displacement at the Salmon Lakes and Winchester Lake trailheads in the Waldo Wilderness (Table 15).

Alternative 3

Alternative 3 has day use quotas at 19 trailheads, which are primarily the currently high-use trailheads in the Three Sisters, Mount Jefferson and Mount Washington areas.

Under Alternative 3, in the Three Sisters, there is a high likelihood of displacement at five trailheads. Additionally, there is a moderate likelihood of displacement impacts at 12 trailheads, many of which are traditionally less used trailheads and access primitive or pristine wilderness (Table 11).

In the Mount Jefferson Wilderness Area, Alternative 3 again includes day use restrictions at the currently high use areas, but does not include limited entry at several areas which are highly likely to receive displacement including Woodpecker, Cabot Lake and Santiam Pass PCT Trailheads. In addition to these trailheads, several areas which have a moderate likelihood of displacement at four trailheads (Table 12).

Alternative 3 has day use restrictions at popular trailheads, but does not include a quota at the Pacific Crest Trail Trailhead at Big Lake which is highly likely to have impacts from displacement. Additionally, there are two trailheads which will have moderate displacement likelihood under Alternative 3 (Table 12).

For the Diamond Peak and Waldo Wilderness Areas, Alternative 3 does not include any day use restrictions. Under these conditions, there is a high likelihood of displacement at the Fawn Lake Trailhead, and moderate likelihood of impacts from displacement at five trailheads (Table 14 and Table 15). There are two trailheads in the Waldo Wilderness that are moderately likely to receive displacement and do not have an associated quota (Table 15). In other words, there's potential to push people from limited-entry trailheads to areas that do not have limited entry.

Alternative 4

Alternative 4 includes day use quotas at 28 trailheads in the Three Sisters, Mount Jefferson and Mount Washington, with the intention of limiting areas that are highly likely to receive displacement in addition to areas that are currently busy. This alternative does not include day use limitations in the Diamond Peak and Waldo Wilderness Areas (see Table 14 and Table 15).

Under Alternative 4 in the Three Sisters Wilderness, there are not any use restrictions at trailheads that have a low current use or low likelihood of displacement. Additionally, there are day use restrictions at all trailheads that currently have high use or have a high likelihood of having displacement impacts. Alternative 4 does include ten trailheads that do not have day use restrictions and are moderately likely to have displacement impacts (Table 11).

Similarly, Alt 4 does not include any use restrictions at trailheads in the Mount Jefferson Wilderness that currently have low use and low likelihood of displacement. It also includes day use limitations at all trailheads that currently have high use or are highly likely to have impacts from displacement. There are three trailheads that are moderately likely to receive day use impacts from displacement under Alt 4 (Table 12).

Though Alternative 4 does include day use restrictions at most trailheads with a high potential of displacement, it does not protect the Pacific Crest Trailhead at Big Lake Youth Camp from displacement, which is highly likely to occur. Additionally, there are two trailheads that are moderately likely to receive displacement impacts (See Table 12).

Alternative 5

Alternative 5 includes trailhead quotas for day use in all five wilderness areas, a total of 111 trailheads. This alternative will completely mitigate displacement within all proposed wilderness areas, but will result in day use restrictions at many trailheads that have currently low use and a low likelihood of day use displacement impacts including 19 trailheads in the Three Sisters, eight trailheads in the Mount Jefferson, five Trailheads in the Mount Washington, ten trailheads in the Diamond Peak and 13 trailheads in the Waldo Wilderness.

Overnight Use Displacement

Alternatives 2, 3, 4 and 5 all include overnight restrictions at all trailheads in the Mount Jefferson, Mount Washington, and Three Sisters Wilderness areas. Additionally, Alternatives 2, 4 and 5 include overnight permits from all trailheads within the Diamond Peak and Waldo Wilderness Areas. In the areas that have overnight use restrictions, Alt 2 differs from Alts 3, 4 and 5 in that it does not include camping reservation zones. Alternatives 3 and 4 have five camping reservation zones, with the bulk of the wilderness areas providing for unconfined travel and overnight stays. Alternative 5 creates zones in every area of all five wilderness areas, requiring overnight visitors to obtain a reservation to camp in all zones.

Overnight use displacement differs from day use displacement in several ways. Cole & Hall (2008) observed that the median travel distance for overnight visitors is 100 miles, as compared to 60 miles for day use. Additionally, overnight users travel further distances over multiple days to reach destinations and can, therefore, impact areas that are many miles from their original trailhead of departure. In light of this extended willingness to travel and the ability to get to desirable locations within the wilderness areas from nearly every trailhead, we find that every trailhead has a high likelihood of receiving impacts from displacement from potential use restrictions. Below is a brief summary of how overnight use is likely to interact with all five alternatives.

Under Alt 1, we expect a continued expansion of use at trailheads and displacement impacts as new areas become popularized through social media, and new areas are explored as popular areas become overcrowded. We expect this impact to be widespread throughout all wilderness areas in the project area.

Alternative 2 includes overnight use restrictions at all five wilderness areas, and does not include any travel restrictions within the wilderness. Under alternative 2, there is a high likelihood that overnight visitors will congregate in popular areas, resulting in higher use at currently popular areas and lower use at less popular areas. Impacts are likely to continue at these high use sites.

Alt 3 includes overnight use restrictions in the Mount Jefferson, Mount Washington, and Three Sisters Wilderness Areas. Alternative 3 also includes five camping reservation zones in the most popular locations in wilderness. The overnight camping reservation zones may result in some altered use patterns as people potentially explore historically less popular areas of the wilderness. This will result in some displacement effects from overnight use to areas of historically low use, and will be similar to Alt 4, but not a pronounced as in Alt 5. Additionally, Alt 3 does not include overnight use restrictions in the Diamond Peak and Waldo Wilderness Areas. Due to the fact that there are highly desirable locations in both the Diamond Peak and Waldo Wilderness areas, and the fact that all of the trailheads are within the median travel distance from a major population (100 miles), there is a high likelihood of considerable impacts from displacement under Alternative 3.

Alt 4 is similar to Alt 3, with the exception that it includes overnight use restrictions in the Diamond Peak and Waldo Wilderness areas which will greatly mitigate the displacement impacts of overnight users in the two wilderness areas.

Alt 5 will implement overnight use restrictions at all five wilderness areas and will require overnight users to stay in particular zones throughout all of the wilderness areas. Though this will mitigate impacts at popular areas, it is likely to result in higher use in historically less used areas of the wilderness, as people will not be free to travel and will need to stay in the particular zone for which they have obtained a permit.

Cumulative Effects – Displacement

One closure in the Three Sisters Wilderness due to a 2017 wildfire may displace some users, but is expected to be opened by mid-2018. At the project scale, there are no other activities in the wilderness areas that would cause users to be displaced from sites they want to access. Therefore, there would be no cumulative effect from any action alternative.

Key Issue #2: Recreation Experience – Loss of Opportunity & Spontaneity

Introduction

The alternatives were developed to respond to the key issue that "A limited entry permit system may eliminate spontaneity and opportunity because of the need to plan ahead or the inability to get a permit." This key issue is analyzed by identifying the proportion of trailheads available for day and overnight use with and without a limited entry quota in each wilderness area, under each alternative. The second measure is the number of zones requiring an overnight camping reservation in each alternative. The third measure is the number acres of wilderness available for overnight camping that require a reservation to those that do not. These metrics provide an understanding of the opportunities for spontaneity for each alternative, including the ability to spontaneously decide to visit the wilderness, and also the ability to travel freely once a visitor is in the wilderness. (Table 16 to Table 20).

Direct and Indirect Effects

Table 16: Proportion of Three Sisters Wilderness under Regulated Permit System

Three Sisters	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
% THs under quota permit Day use	2%	56%	21%	34%	100%
% THs under quota Overnight	2%	100%	100%	100%	100%
Number of zones requiring overnight camping reservation	1	0	3	3	15
Number of acres available for camping that a reservation is needed/total acres	13,200/ 283,763	0/ 283,763	30,859/ 283,763	30,859/ 283,763	283,763/ 283,763

Table 17: Proportion of Mt. Jefferson Wilderness under Regulated Permit System

Mt. Jefferson	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
% THs under quota permit Day use	5%	82%	32%	50%	100%
% THs under quota Overnight	5%	100%	100%	100%	100%
Number of zones requiring overnight camping reservation	1	0	2	2	9
Number of acres available for camping that a reservation is needed/total acres	7,686/ 108,909	0/ 108,909	21,115/ 108,909	21,115/ 108,909	108,909/ 108,909

Table 18: Proportion of Diamond Peak Wilderness under Regulated Permit System

Diamond Peak	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
% THs under quota permit Day use	0%	0%	0%	0%	100%
% THs under quota Overnight	0%	100%	0%	100%	100%
Number of zones requiring overnight camping reservation	0	0	0	0	2
Number of acres available for camping that a reservation is needed/total acres	0/ 52,476	0/ 52,476	0/ 52,476	0/ 52,476	52,476/ 52,476

Table 19: Proportion of Mount Washington Wilderness under Regulated Permit System

Mt. Washington	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
% THs under quota permit Day use	0%	30%	20%	20%	100%
% THs under quota Overnight	0%	100%	100%	100%	100%
Number of zones requiring overnight camping reservation	0	0	0	0	2
Number of acres available for camping that a reservation is needed/total acres	0/ 54,409	0/ 54,409	0/ 54,409	0/ 54,409	54,409/ 54,409

Table 20: Proportion of Waldo Lake Wilderness under Regulated Permit System

Waldo Lake	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
% THs under quota permit Day use	0%	0%	0%	0%	100%
% THs under quota Overnight	0%	100%	0%	100%	100%
Number of zones requiring overnight camping reservation	0	0	0	0	2
Number of acres available for camping that a reservation is needed/total acres	0/ 36,867	0/ 36,867	0/ 36,867	0/ 36,867	36,867/ 36,867

There are two different ways to consider opportunity and spontaneity. The first is the opportunity and spontaneity to access the wilderness with no limits or planning. The second is the spontaneity of travel and freedom inside the wilderness which is reduced by regulations such as areas requiring camping reservations, designated campsites and camping/campfire setbacks from water and trails.

Alternative 1 would allow unrestricted growth of use and would not affect opportunity or spontaneity to visit the wilderness other than the existing limited entry areas of Pamelia and Obsidian allowing the most spontaneity of any alternative in the Mount Jefferson, Mount

Washington, and Three Sisters Wilderness areas. Alternative 1 provides for improved spontaneity to visit the wilderness in comparison of all other alternatives for the Diamond Peak and Waldo Wilderness Areas with the exception of Alt 3, which does not include use restrictions in the two areas and provides equal opportunity for spontaneity as Alt 1. Under Alt 1 there would still be a reduced sense of spontaneity when traveling and camping inside the wilderness in comparison to Alt 2 due to areas that have designated campsites, campfire setbacks from water and trails, and the limited entry areas which require permits for camping overnight or traveling through.

Alternative 2 would limit opportunity and spontaneity for overnight use as an overnight limited entry permit would be required in all 5 wilderness areas, limiting spontaneity more than any other alternative except Alt 5. While there are trailheads that would be available for spontaneous day trips, they may not be in popular locations. Under this alternative, day use limited entry permits would be required on 57% of the trailheads in the Three Sisters Wilderness, 82% in the Mount Jefferson Wilderness and 30% in the Mount Washington Wilderness, while not affecting the other two areas. Conversely, Alt 2 removes the existing Limited Entry Areas in Pamelia and Obsidian, as well as removing designated campsites which will increase spontaneity and freedom of travel inside the wilderness to the highest level of any alternative.

Alternative 3 would limit opportunity and spontaneity for overnight use in the Three Sisters, Mount Jefferson, and Mount Washington as a limited entry permit would be required, while Diamond Peak, and Waldo Lake would not be affected. While there are trailheads that would be available for spontaneous day trips, they may not be in popular locations. Under this alternative, day use limited entry permits would be required on 21% of the trailheads in the Three Sisters, 32% in Mount Jefferson, and 20% in Mount Washington. Other than the no-action alternative, this alternative has the least impact to opportunity and spontaneity to visit wilderness. Comparatively, there would be three zones in the Three Sisters Wilderness and two zones in the Mount Jefferson Wilderness that would require a separate camping reservation for overnight use. The Three Sisters would require a camping reservation in 30,859 acres out of a total 283,763 acre wilderness, or 11%. The Mount Jefferson would require a camping reservation in 21,115 acres out of a total of 108,909 acres, or 19%.

Alternative 4 would limit opportunity and spontaneity for overnight use in all of the wilderness areas as a limited entry permit would be required. While there are trailheads that would be available for spontaneous day trips, they may not be in popular locations. Under this alternative, day use limited entry permits would be required on 34% of the trailheads in the Three Sisters, 50% in Mount Jefferson, and 20% in Mount Washington. This alternative moderately impacts opportunity and spontaneity to visit wilderness, but is less restrictive than both 2 and 5. Alternative 4 will provide a similar amount of spontaneity and freedom of travel within the wilderness as Alt 3, as there would be three zones in the Three Sisters Wilderness and two zones in the Mount Jefferson Wilderness that would require a separate camping reservation for overnight use. The Three Sisters would require a camping reservation in 30,859 acres out of a total 283,763 acre wilderness, or 11%. The Mount Jefferson would require a camping reservation in 21,115 acres out of a total of 108,909 acres, or 19%.

Alternative 5 has the greatest impact to opportunity and spontaneity to visit wilderness as a limited entry permit would be required for overnight and day use in all wilderness areas. Additionally, a camping reservation would be required for all zones so that extensive trip planning would be required which would reduce spontaneity and freedom of travel inside wilderness.

Cumulative Effects –Spontaneity & Opportunity

At the scale of the project area, there are no other actions that would affect the sense of spontaneity or opportunity to enter the wilderness except for one short-term closure associated with area of Three Sisters burned in 2017 wildfire. Most closures have been lifted at the time of this writing. The Black Crater area remains closed but is likely to be opened before this project is implemented. Therefore there would be no cumulative effects to spontaneity and opportunity from any action alternative.

Other Recreation Effects

Below is a summary of the effects of proposed actions that are common under all action alternatives including permit requirements, a campfire ban and changes to regulated campfire setbacks which requires campfires to be 100 feet from water and trails.

Recreation Users and Permit Requirements

Under all action alternatives, a permit will still be required. Alternatives 2-4 will require a limited entry permit for some trailheads, and a free, self-issue ones at others. Alternative 5 would require a limited entry permit for all trailheads. Some trailheads provide access to more than one wilderness trail. Trailhead quotas are associated with a trailhead entry point and not a specific trail. If a non-wilderness trail leaves from a wilderness trailhead and the user does not access wilderness, no wilderness permit is required.

In addition to the impacts described under the Key Issue analysis, there are many different users that would be affected by a proposed limited entry system such as Pacific Crest Trail (PCT) hikers, outfitter and guides, and hunters. Estimated use from these groups will be evaluated with the proposed quotas to determine how to manage potential recreation impacts from these users, and this use would be loosely monitored after implementation to determine if changes are necessary to meet the desired condition. To account for this use, quota limits for both overnight and day use may be decreased during the times that these users are in the wilderness.

Details of implementation for a reservation permit system are to be determined through a separate process; however there are a number of uses that already require some kind of permit; this project seeks to incorporate those uses in the most efficient way.

- Outfitters and guides are an important partner of the Forest Service with objectives of facilitating public access, including to wilderness. The permitted outfitter and guides will work with permit administrators and wilderness managers to ensure their use levels are within levels that contribute to meeting the desired condition.
- The Pacific Crest National Scenic Trail was established in 1968 with passage of the National Trails System Act and is intended for long-distance travel. The Pacific Crest Trail Association (PCTA) administers a permit for long-distance hikers, which is authorized through a Memorandum of Understanding between National Forests, National Park Service, Bureau of Land Management, and state agencies. Pacific Crest Trail through hikers and section hikers (500+ miles) would not be affected by this project as their PCT permit would serve as their limited entry permit.
- Hunting regulations are written and enforced by the state of Oregon. Hunting in accordance with state rules is a valid use of the wilderness, and none of the five wilderness areas are off-limits to hunting. Hunting is a seasonal activity; some hunting seasons overlap the wilderness permit season. Currently, hunters that enter the wilderness are expected to have

a wilderness permit during the wilderness permit season. A potential scenario for accommodating hunting use would be to allow hunters with a hunting license and certain tags, around the dates of their season, to enter these wilderness areas without wilderness permit. Concurrent issues to be addressed include scouting and individuals accompanying a hunter.

Forest Service employees and volunteers that are working in an official capacity will have administrative use privileges and will not be required to have a limited entry permit, and their presence in the wilderness will be in addition to the assigned quota.

All other wilderness users such as hikers, backpackers, anglers, equestrians, climbers, mountain climbing groups, and other organized non-commercial groups will be required to abide by the proposed permit system under the chosen alternative. Recreationists that do not use a wilderness trailhead will still need to have a permit that is associated with the closest trailhead from their point of access.

Equestrian users would have a positive impact for access from Alternatives 2-5, as crowding at trailheads has limited the areas where they can go due to no parking for horse trailers. A quota system would increase their ability to have access to parking. Additionally, there would be less interactions with backpackers and day hikers, which would reduce conflicts between users.

Monitoring and Adaptive Management

The Forest Service acknowledges that outcomes of the proposed visitor use management alternatives involve some uncertainty. The proposed visitor use management system is data-driven and adaptive, which requires long-term monitoring of the central Cascades wilderness areas. Monitoring will be completed under a variety of methods. Adaptive management provides the ability to modify the system as needed if there are unexpected results or monitoring shows a need to respond to growing use/degradation.

The adaptive management model incorporates an "implement-monitor-adapt" strategy that provides flexibility to account for inaccurate initial assumptions, to adapt to changes in environmental conditions, or to respond to subsequent monitoring information that indicates that desired conditions are not being met. That is, adjustments are made when implementation is not giving us the desired outcomes. The Monitoring and Adaptive Management Plan is outlined in Appendix D.

Campfire Ban

An elevational campfire ban has been proposed in alternatives 2-5, for all Wilderness areas with the exception of Waldo Wilderness. Three Sisters, Mount Jefferson, and Mount Washington would have a fire ban above 5700' and Diamond Peak would have a fire ban above 6000'. The differences in the elevational gradient are due to specialist concerns and the varied ecosystems. This elevational ban would replace the numerous site specific campfire regulations that are currently in place in order to provide regulation consistency, reduce natural resource impacts related to campfires, and protect whitebark pine trees.

However, there will be a few additional site specific fire bans to address high use areas or fragile ecosystems. Site specific fire bans will be at Benson and Tenas Lakes in the Mount Washington Wilderness, as well as, Marion and Table Lakes in the Mount Jefferson Wilderness.

Campfires cause resource damage through burning of downed wood which is lost to natural nutrient recycling, mutilation of live trees, compaction of soil, construction of fire rings, and blackened rocks and soil. While most of the lower elevation ecosystems in the central Cascades are resilient to

campfire impacts, high mountain environments are particularly sensitive to the above disturbance by recreation use (Parsons, 2002). Parsons (2002) observed that, "Steep topography, thin soils, sparse vegetation, short growing seasons, and climactic extremes all contribute to the sensitivity of high mountain environments." The proposed campfire ban, along with the site specific fire bans, will protect the most sensitive ecosystems within the project area.

Whitebark pine has been declining across its entire range due to a combination of infection from the introduced fungus white pine blister rust and an unprecedented outbreak of mountain pine beetles (Jensen 2011). Whitebark pine is a Candidate for Federal Listing as a threatened or endangered species. Because of this status, the Forest Service considers whitebark pine a sensitive species.

Locally on the Deschutes and Willamette National Forests, Whitebark pine exists between 5,250 feet to almost 9,200 feet and condition surveys have confirmed the same overall national trend of declining heath and increased mortality as the rest of the United States. Blister rust infection rates vary from 0 to 80 percent of trees, with a pattern of higher infection rates closer to the Pacific Crest. Large populations of pine beetles have crept upward to the higher elevations and are killing many of the mature and large cone bearing trees. Wilderness users have damaged both live and dead whitebark pines and other tree species by cutting down trees and removing branches for firewood. Due to these threats, whitebark pine should be considered for conservation and actions should be taken to minimize any damage to live trees (Jensen 2011). Though the elevational fire ban is placed at a higher elevation than the lower range of whitebark pine, specialists believe the 5700 foot level will be adequate for white bark pine protection.

An elevational campfire ban would have positive effects on the untrammeled, natural, undeveloped, and solitude components of wilderness character as there would be no chance for an escape campfire to start a wildfire, no damage to trees, there would be an absence of campfire rings, and no signs of campfires in the most sensitive ecosystems within the project area.

Campfire Setbacks and Designated Campsites

In addition to designated campsites, a regulation requiring all campfires to be further than 100 feet from water or trails (3 6CFR 261.52a) has been previously implemented in the project area (and would continue under Alternative 1). The action alternatives propose to remove the campfire setback CFR and the designated campsites in the project area.

Campsite proliferation and expansion is one of the most serious concerns of camping impacts. Proliferation can occur rapidly even when use levels remain the same. For example, a study conducted by Cole (1993a) in the Eagle Cap Wilderness in Oregon found extensive campsite proliferation in the area. The amount of campsites in the wilderness more than doubled from 1975 to 1990 even though use levels had not drastically increased. Proliferation has a tendency to occur in wilderness areas with unregulated camping policy. Often, established campsites in an area will have a trend of slight deterioration while new sites appear (Cole 1993a). Cole (1993a) defines the activity of users finding new pristine areas to camp as site pioneering. Site pioneering can lead to the proliferation of camping impacts, which results in a cumulative nature of camping impacts and leads to the need for management actions. Designating campsites with a related quota is the best known approach to limiting vegetative impacts of any management actions available and is a tool that has been implemented in the project area with success.

Though designated campsites have been shown to limit vegetative damage within wilderness areas (Cole 1993a), designated campsites require active management and felling of all hazard trees in areas that surround them. The action alternatives eliminate that kind of active management inside

wilderness because the level of management necessary would negatively impact the wilderness character by falling hundreds of snags (impacts to wildlife and naturalness).

In addition to eliminating designated sites in wilderness, the action alternatives propose to remove the campfire setback CFR and replace it with site-specific camping setbacks at Green Lakes and Moraine Lake, which previously had designated sites, where high use has the potential to negatively impact shorelines because people desire to camp near water and the use levels will remain relatively high in these locations.

The action alternatives include, along with the elevational campfire ban, imposing a campfire and camping setbacks at a few site-specific locations where either there have been designated campsites in the past that were successful in preserving resource conditions, or where enforcement and restoration efforts are likely to be highly successful due to education and an increased Wilderness Ranger presence. Leave No Trace principles and the Forest Plans recommend camping away from water and trails; management actions will reinforce this in education materials, outreach efforts and during public contacts in the field.

Access Management

In order to provide convenient visitor access and an appropriate trailhead, Broken Top and Crater Ditch trailheads would be decommissioned and a common trailhead constructed to access both trails along the 4600-370 road. All infrastructure at both trailheads would be removed. The 4600-380 is the access road from the 4600-370 road to Broken Top trailhead and would be converted from a road to a trail.

The Crater Ditch trailhead and Crater Ditch trail are user-created parking areas and routes. The Crater Ditch trail would be added to the official trail system and extended to connect with the new parking area. The additional hike would be 1 to 2 miles. The 4600-378 road is the current access to the Crater Ditch trailhead and it would be gated to only allow administrative use. Quotas associated with the new combined trailhead would be re-evaluated when construction is planned.

Wilderness Character

Introduction

Part of the purpose and need for this project is to protect and enhance wilderness character. Wilderness character provides a structure for analyzing actions in wilderness within the context of the Regulatory Framework, and with respect to meeting the purpose and need. The Wilderness Act Section 2(a) quoted above delineates that wilderness areas "shall be administered…so as to provide for the protection of these areas, and the preservation of their wilderness character." This quote is the affirmative legal mandate for the four land management agencies with jurisdiction over wilderness and applies to all wilderness areas across the National Wilderness Preservation System. Drawing from Wilderness Act Sec. 4(c), Landres et al. (2015) describe the four major categories of wilderness character as: untrammeled, natural, undeveloped, and opportunities for solitude or primitive and unconfined recreation. The Wilderness Act also gives strong consideration to wilderness values, which include aspects of "ecological, geological, or other features of scientific, educational, scenic, or historical value" (Sec. 4(c), 1964). This section analyzes how each of the alternatives interact with the qualities of wilderness character.

Components of Wilderness Character

Below is a review of how visitor use and management affects each quality of wilderness character, and the related components of analysis. This is followed by a summary describing how wilderness character is affected by each alternative in each wilderness area.

Untrammeled Quality

The untrammeled quality of wilderness relates directly to the freedom of natural processes to continue unimpeded. As a quality, untrammeled monitors actions that intentionally manipulate or control ecological systems. This is in juxtaposition to the natural quality, which monitors the effects from actions taken inside wilderness. While limiting human use will improve the ability for the ecosystems to function unhindered by humans, the use limitations are not a direct and intentional manipulation or control of the ecological system and, therefore these actions will not be considered as a positive or negative affect to this quality of wilderness character.

Natural Quality

The natural quality of wilderness character includes three subgroups: lack of human effect, freedom from intentional human control, and historic range of variability (Cole et al. 2008). The concept of naturalness is very broad and can include anything from plant communities, to wildlife, to climate. In general, visitor use results in the degradation of this quality of wilderness character. The effects include denuded bare soil, hard-pan soil and total loss of vegetation, and tree damage, campfire impacts, trash proliferation and exposed human waste (Marion et al. 2016). Though much impact is caused by overnight users, day use contributes to many of the same impacts, as day users utilize lake shores and concentrate in areas which provide view sheds or lunch spots. Parsons (2002) noted that recreation impacts from overcrowding, campfires, trash proliferation and exposed human waste can also have negative impacts on the natural quality of wilderness, however, these effects are analyzed under the opportunities for solitude or primitive and unconfined recreation quality of wilderness character.

One of the primary negative impacts from human use on the natural quality of wilderness character is to wildlife. Wildlife are known to be affected by human interaction in four primary ways – harvesting, habitat modification, pollution and disturbance (Knight & Cole 1991). Recreation activities resulting in the biophysical impacts listed above negatively impact wildlife by changing the microclimates and micro habitats. For example, Blakesley and Reese (1998) found that camping was negatively impacting ground and shrub nesting birds. In addition to habitat modification, wildlife are affected through pollution, such as discarded food or deliberately feeding animals. Lastly, and likely the largest contributing factor to the deterioration of the natural quality of wilderness character, is the disturbance (intentional or unintentional) caused by being in or near wildlife habitat. Wildlife may be impacted immediately from the activity, through a behavioral change, or in the long term through altered behavior, altered vigor, altered productivity or even death (Knight & Cole 1991). These concerns are pronounced in areas of the wilderness where recreational use has been traditionally low and wildlife is living in a more natural setting and, because of this effect, even small increases in use in historically less popular areas can cause pronounced impacts to the natural quality of wilderness.

A systematic review of scientific journals by Larson et al. (2016) showed that in 93% of reviewed articles, at least one effect to animals was attributed to recreation. The majority (59%) of those effects were classified as negative. This review found that, " Recreation is a leading factor in endangerment of plant and animal species on United States Federal lands (Losos et al. 1995), and is

listed as a threat to 188 at risk bird species globally (Steven, 2013). Effects of recreation on animals include behavioral responses such as increased flight and vigilance (Maini et al. 1993; Naylor et al. 2009); changes in spatial or temporal habitat use (George and Crooks 2006; Rogala et al. 2011); declines in abundance, occupancy, or density (Reed and Merenlender 2008; Banks and Bryant 2007; Heli et al. 2007); physiological stress (Arlettaz et al. 2007; Mullner et al. 2004); reduced reproductive success (Beale and Monaghan, 2005; Finney et al. 2005); and altered species richness and community composition (Kangas et al. 2010; Riffell et al. 1996). Many species respond similarly to human disturbance and predation risk, meaning that disturbance caused by recreation can force a trade-off between risk avoidance and fitness-enhancing activities such as foraging or caring for young (Frid 2002)." This systematic review by Larson et al. (2016), also found that non-motorized activities had more evidence for negative effects than motorized activities across a wide range of study locations and taxa.

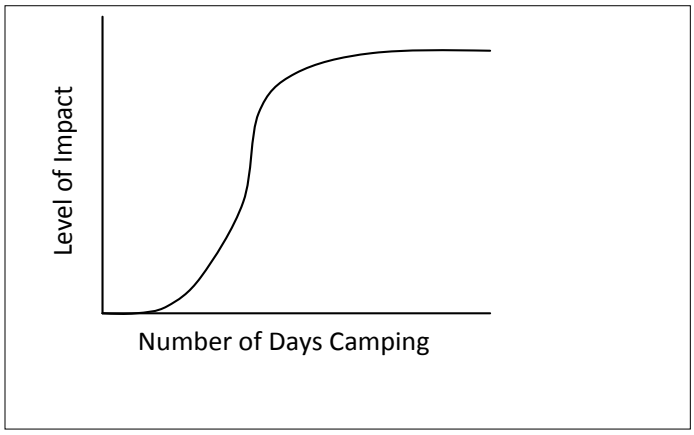

Figure 8: The relationship between days of camping and impact.

In addition to the effect of recreation to wildlife, recreation can negatively impact the natural quality of wilderness character by impacting the vegetative communities of the wilderness. Camping impacts are a matter of ecological concern, and can detract from visitor experiences (Cole 2004). A summary of camping impacts show that camping activities are known to heavily impact soils and vegetation by user trampling (Cole 1987). Camping activities damage and eliminate plants, compact mineral soils and displace organic soil horizons. The effect of soil compaction and vegetation loss often cascades down ecosystems and can alter the structure, composition and function of ecosystems. Trampling effects models show these cascading influences (Cole 2004). The scale and magnitude of this impact depends on the amount of use. Cole (2004) uses the following example of feedback loops in trampling studies;

> *"...trampling eliminates vegetation cover, which reduces inputs of organic matter and root exudates into the soil. Along with the physical effects of soil compaction, this alters the microorganisms that live in the soil. Since soil microorganisms are critically important both to the alleviation of soil compaction and the establishment and growth of vegetation, soil and vegetation are further altered by these changes to the soil biota. Consequently, sites can remain compacted and barren, even in the absence of further trampling." (Cole 2004: pp. 108)*

The amount of use at a campsite in relationship to the amount of impact has been studied extensively (Cole 1992; 1993b; 1987). Cole (2004) found that there is a common relationship with the life cycle of a campsite. Typically, the first few days that vegetation is camped on creates little impact. As the vegetation is camped on for longer, the impact accelerates rapidly. Eventually, vegetation will be disturbed and the site will remain relatively stable, with little further impact. This relationship shows that the amount of impact a camper creates depends on, and changes with,

the amount of nights spent at a site (Marion 1998), and is observed generally across vegetation trampling studies (Cole 1992; 1993b; 1987).

Though overnight use has been the focus of most studies, day use can have many of the same impacts on vegetation as overnight use, particularly in areas where people tend to congregate such as lunch spots and lake shores (Cole 2004). These effects are pronounced as new areas become popular either through displacement or attention in social media.

Similar damage and effects to the natural quality of wilderness character can result from user created, or "social trails". Social trails provide access to areas that may have been lightly used in the past, or simply parallel system trails, and can have negative effects to the environment. Social trails can open up areas to more visitors and as previously discussed, the increase in recreation use can not only affect wildlife, but also negatively impact plant communities and potentially the ecosystem.

Barros and Pickering (2017) identify that unregulated use can result in widespread user created trails which cause landscape level damage to areas with high conservation value. Barros and Pickering (2017) stated, "Recreational trails have a range of negative environmental impacts including on soils, water ways, animals, and plants (Ballantyne and Pickering 2015; Monz et al. 2010a; Newsome et al. 2012). This includes damage to plant communities of high conservation value from the formation and use of trails (Ballantyne and Pickering 2015; Dixon et al. 2004; Pickering and Barros 2015; Pickering and Norman 2017). Impacts include declines in plant cover, height and changes in plant composition (Barros et al. 2013; Leung et al. 2011), introduction of weeds (Barros and Pickering 2014b; Wells and Lauenroth 2007; Wolf and Croft 2014), and soil loss and compaction (Deluca et al. 1998; Lucas-Borja et al. 2011; Ólafsdóttir and Runnström 2013; Tomczyk et al. 2016). Some of these impacts are from trails formally designed, constructed, and maintained by land managers (Hill and Pickering 2006; Pickering and Norman 2017), while others are from informal trails created by visitors (Ballantyne and Pickering 2015; Barros et al. 2013; Nepal and Nepal 2004)."

Social trails can have landscape level impacts, including the fragmentation of plant communities by trail networks. Barros and Pickering (2017) noted, "Internal fragmentation can occur when formerly contiguous areas of vegetation become separated by areas of bare compacted soils due to the creation and use of trail networks (Ballantyne et al. 2014; Leung et al. 2011). As a result there is a reduction in the total amount of undisturbed habitat in a given area (Ballantyne et al. 2014). Internal fragmentation from trail networks can alter hydrology and soil moisture regimes, restrict movement of some native animals and plants among fragments, and enhance the movement of some invasive species along the trails (Leung et al. 2012; Pickering and Mount 2010; Wimpey and Marion 2011)."

Social trails can negatively affect alpine meadows, which are of limited distribution at local and regional scale. These areas are critical biodiversity hotspots that often sustain rare and endemic biota and provide key ecosystem services such as carbon sequestration and water regulation (Barros 2014; Buono et al. 2010; Squeo et al. 2006). These meadows are more likely to be subject to fragmentation because they have moist soils and visitors were often observed dispersing to avoid muddy areas and stock are often left to graze in these plant communities (Barros et al. 2014a; Farrel and Marion 2001; Walden-Schreiner et al. 2017). The damage to alpine meadows, such as reduction in plant cover or trail incision, can alter the depth of the water table, which could affect the productivity and water regulation of the meadow ecosystem (Buono et al. 2010; Clymont et al. 2010).

Social trails decrease overall vegetation cover and the isolation of vegetation areas can have long-term negative effects such as change in vegetation structure, composition, and function (Ballantyne and Pickerint 2015; Haddad et al 2015; Lindenmayer and Fischer 2006). These changes due to social trail networks could affect soil moisture, favor trampling-resistant species, and increase the spread of weeds (Barros 2014; Barros et al. 2013; Mendez et al. 2006; Mount and Pickering 2009).

Other subsidiary impacts to the natural quality of wilderness can result from human activities relating to recreation. People will use soap that is not biodegradable for cooking and cleaning and human waste is often not properly disposed (Leung & Marion 2000). People will leave trash and food at campsites, and camping may adversely affect wildlife. These common negative effects from recreation cause a deterioration of the environment and negatively affect the natural quality of wilderness character, though this analysis houses the effects under the opportunities for solitude or primitive and unconfined recreation quality.

Lastly, recreation can negatively impact the natural quality of wilderness character by acting as a vector for the spread of invasive plant species and creating disturbances which allow invasive species to gain a foothold and proliferate in wilderness (Anderson et al. 2015). Off trail travel, and the proliferation of people into new areas is of greatest concern, as invasive species management becomes even more difficult.

Undeveloped Quality

The Wilderness Act, Sec. 2(c)(1964), defines the wilderness as “an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation.” The undeveloped quality typically deals with installations and structures found in wilderness, such as scientific research structures or historic buildings, as well as the use of motorized equipment or mechanized transport. Recreation management requires certain developments, such as trails, signs and facilities (e.g. toilets), which take away from the undeveloped quality of wilderness character. Though the impacts from recreation facilities are generally reviewed under the “opportunities for solitude and unconfined recreation” quality section. Similarly, recreational users often create structures such as campfire rings, rock shelters and benches. These structures may also take away from the undeveloped quality of wilderness character.

Opportunities for Solitude and Unconfined Recreation

Opportunities for solitude or a primitive and unconfined type of recreation is the fourth quality of wilderness character. This quality of wilderness is often confused with the perception of what wilderness is, the expectations visitors have in wilderness or the satisfaction that visitors feel after visiting a place. It is important to understand that The Wilderness Act of 1964 describes wilderness areas as pristine tracts of land untrammeled by man (sic). The wilderness is to be managed in such a way as to provide solitude, and to appear "to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticed" (Wilderness Act of 1964, § 2c).

There are distinct components to this quality of wilderness character, with the first component being solitude. Solitude can be defined as the ability to visit an area of wilderness with limited or no encounters with other people. Hendee and Dawson (2002) state that “Solitude in wilderness generally refers to a group of visitors meeting relatively few other groups of visitors.” In addition to encounters with other visitors, recreation use can result in widespread impacts to solitude by taking away from the “primeval character” of the landscape, which is a detriment to the sense of being in a truly wild place (Landres et al. 2015). For example, studies indicate that campsite impacts can give the wilderness a "soiled" or "used" appearance (Leung & Marion 2000). Even the mere presence of campsite impacts can detract from solitude if the user is in an area that is to be pristine (Shelby,

Vaske & Harris 1988). Farrell, Hall and White (2001) indicate that certain impacts such as campfires and tree damage can evoke symbolic meanings, and while the impact may not be significant ecologically it can have profound impacts to solitude. Similarly, trash, human created structures, vandalism, unburied human waste and pet waste all detract from the primeval nature of wilderness (Leung & Marion, 2000). Wilderness management recognizes that opportunities for solitude often vary significantly across and within the wilderness areas, and the Deschutes and Willamette National Forest Land and Resource Management Plan's reflect this concept by implementing a system of four "classes" or areas where differing levels of solitude can be expected ranging from areas of premium solitude (pristine) to areas where regular encounters from others can be expected (transition). The management plans also establishes standards and guidelines for encounters within those four classes.

Within the context of this quality of wilderness character, and distinct from solitude, the Wilderness Act also describes the wilderness as a place of "primitive and unconfined recreation." This language sets the foundation for which we manage opportunities for solitude or primitive and unconfined recreation experience. In juxtaposition to solitude, primitive and unconfined recreation can be defined as the ability to travel and camp as one sees fit, within the constraints of a primitive form of recreation. Primitive recreation is generally considered to be non-motorized and non-mechanized travel and recreation that reinforces our connection with our heritage and ancestors (Landres et al. 2015). Primitive recreation also encompasses the reliance on personal skills rather than outside facilities or help. This compares to unconfined recreation which involves attributes such as exploration, self-discovery and freedom from societal or managerial controls (Landres et al. 2015).

Though the social and biological impacts to a wilderness from recreation discussed under the natural quality of wilderness character often create a direct necessity for managing use in wilderness, these restrictions come at a cost to the unconfined quality of wilderness character. Hendee and Dawson (2002) identify that the "two main considerations of wilderness visitor management are (1) to provide visitors opportunities for quality wilderness experiences and (2) to limit impacts on resource caused by visitor use." These management considerations are frequently in direct opposition to each other. The development of campsites, trails, signs, toilets, travel restrictions in wilderness and permits all result in a deterioration of the primitive and unconfined recreation quality of wilderness.

Other Features of Value

Other features of value in the wilderness include recreation, scenic, scientific, education, conservation and historic resources. Recreation generally does not impact the "other features of value" of wilderness except for positively impacting the education component by providing a direct and practical wilderness experience. The exception to this rule is that increased recreation use will often times have a negative impact on historic and archeological resources through increased theft and vandalism (see cultural resources report).

The analysis below identifies how each of the alternatives interacts with each of the qualities of wilderness character to analyze these challenging tradeoffs. This is a summary of the analysis detailed in Tables E1 to E6, Appendix E.

Analysis Methods

In an effort to analyze how the alternatives will affect the qualities of wilderness character within each wilderness area, we have identified 11 components of analysis which compartmentalize the various ways that recreation use impacts wilderness character (see Appendix E). Though each

component of analysis may impact multiple qualities of wilderness character, a primary quality has been identified. The components of analysis that impact the natural quality are visitor interactions with wildlife, spread of invasive species, visitor impacts on vegetation at campsites and lunch spots, and user created trails. The components of analysis that impact the opportunities for solitude or primitive and unconfined recreation are trash and vandalism, human waste, travel restrictions within the wilderness, use restrictions, amount of administrative signs in wilderness, and impacts to solitude. The component of analysis that impacts other values is the impact to cultural resources.

Appendix E provides detailed discussions identifying how each of the 11 components will be impacted under each of the 5 alternatives within the context of a particular wilderness area. A qualitative rating of impact from -5 (heavy negative impact to wilderness character relative to other alternatives) to +5 (heavy positive impact to wilderness character relative to other alternatives) was then assigned. The impact ratings are comparative, and do not relate the overall impact of each action to wilderness character, but rather rate the impact of each action to wilderness character relative to the other alternatives. For example, an impact rating of -5 identifies the action as being the most negative of all the alternatives in relation to its effect on the component of analysis. The impact ratings are not weighted and are merely a method for comparison. The analysis does leave room for alternatives to share impact ratings if they are comparative. Appendix E contains a detailed table with this analysis. Below, the impact of each alternative compared to the no action alternative is summarized.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

The no action alternative does not limit wilderness use through a permit system, with the exception of the current Obsidian and Pamelia Limited Entry Areas. With population growth, use will continue to grow in popular areas based on the current use trends. In addition to use growing in currently popular areas, other areas that are desirable to the public, such as locations with scenic vistas, lakes, wildflower blooms, or destinations such as peaks or historic buildings, are likely to become increasingly popular as social media posts appear. Additionally, less popular or desirable locations may see some rise in visitation due to displacement of users seeking solitude and less crowded areas of the wilderness (Hall & Cole 2007). Displacement of users to previously less used areas is of particular concern as this displacement may result in increased use of areas with traditionally low use and/or areas in a WROS class that has high higher standards for solitude. Though we expect use patterns to remain similar to 2016 in the near future, followed by heavier displacement and increased use in the long run. Table E1, Appendix E provides a detailed explanation of how the no action alternative will affect wilderness character. Below is a summary of how the No-action alternative impacts wilderness character.

Mount Jefferson, Mount Washington, Three Sisters, Diamond Peak and Waldo Wilderness Areas

Under the no action alternative, there is likely to be a continued and expanding negative impact to the natural quality of wilderness character. In the long run, the no action alternative will result in an increase in visitor interactions with wildlife and a further spread of invasive species. Additionally the no action alternative is likely to have a large impact to the vegetation within the wilderness through increased vegetative impacts at campsites and lunch spots as well as increased user created

trails. We also expect the no action alternative to result in high levels of trash and vandalism, as well as human and pet waste.

Conversely, the no action alternative is a favorable alternative in terms of having few travel restrictions within the wilderness. Additionally, the no action is the most positive alternative for unconfined recreation. The no action alternative will limit the amount of signs needed for management. In addition, the no action alternative is highly impactful to solitude, resulting in both positive and negative affects to the opportunities for solitude or primitive and unconfined recreation quality of wilderness character. Lastly, the no action alternative is likely to result in a continued potential loss of cultural resources resulting in continued negative consequences to the historic value of wilderness character.

Alternative 2 – Proposed Action

Under the proposed action, a permit system will be implemented by placing an overnight use quota at all trailheads in all five wilderness areas. Additionally, Alt 2 will require limited entry day use permits at 27 trailheads in the Three Sisters, 18 trailheads in the Mount Jefferson and 3 trailheads in the Mount Washington Wilderness. Quotas designed to meet the purpose and need were developed for all trailheads (See Appendix C of this EA). There are no day use restrictions in the Diamond Peak or Waldo Lake Wilderness areas under this alternative. The proposed action differs from Alternatives 3, 4 and 5 in that it lacks campsite reservation zones, which may result in backpackers congregating in popular or sensitive locations within the wilderness. Although management would have the ability to lower quotas at trailheads which are associated with the high use areas, overnight backpacking objectives will likely remain the same amongst visitors, resulting in the potential for visitors to trek further distances to reach the same destinations. Below is a summary of how Alt 2 impacts wilderness character.

Mount Jefferson, Mount Washington and Three Sisters Wilderness Areas

The impact to the natural quality of wilderness from visitor interactions with wildlife are expected, above all other alternatives to be minimized under Alt 2, resulting in the highest protection for wildlife of any alternative. The spread of invasive plant species, as well as additional visitor impacts on vegetation at campsites and lunch spots, are less likely under this alternative than the no action alternative. This alternative will largely protect the landscape from the proliferation of user created trails in comparison to the no action. Alternative 2 is likely to result in far less impacts from trash and human and pet waste in the long run than the no action alternative. Alternative 2 will provide visitors with the largest amount of freedom to travel within the wilderness, as it removes the Obsidian and Pamelia Limited Entry Areas and does not implement any new overnight reservation zones. Similarly, Alt 2 will require less signage than any other alternative due to the lack of Limited Entry Areas or overnight reservation zones. Alternative 2 will restrict use more than the no action at trailheads, which is detrimental to the primitive and unconfined recreation quality of wilderness character. Though alternative 2 will result in less protection for cultural resources in the Obsidian Limited Entry area by removing overnight stay restrictions, the overall impact to the historic value of wilderness should be an improvement over the no action alternative.

Diamond Peak and Waldo Wilderness areas

Alternative 2 does not propose any day use restrictions in Diamond Peak or Waldo wilderness. Alternative 2 will likely result in less visitor interactions with wildlife, and spread of invasive species than the no action alternative. Visitor impacts on vegetation and at lunch spots, user created trails, levels of trash and vandalism and impacts from human waste will all improve under Alt 2

compared to the no action alternative. Similar to the no action alternative, there will be no travel restrictions within the wilderness once someone obtains the proper permit to enter the wilderness. Comparatively, Alt 2 will place use restrictions at overnight trailheads degrading the primitive and unconfined recreation quality of wilderness character compared to the no action alternative.

Alternative 3

Under Alt 3, a permit system will be implemented by placing an overnight use quota at all trailheads in the Mount Jefferson, Mount Washington and Three Sisters Wilderness Areas. Additionally, Alt 3 will require limited entry permits for day use at 10 trailheads in the Three Sisters, 7 trailheads in the Mount Jefferson and 2 trailheads in the Mount Washington Wilderness. Quotas designed to meet the purpose and need were developed for all trailheads (See Appendix C). There are no overnight or day use restrictions in the Diamond Peak wilderness under this alternative. Alternative 3 differs from Alt 2, in that it has several campsite reservation zones, which result in more protection for popular or sensitive locations within the wilderness. Below is a summary of how Alt 3 impacts wilderness character.

Mount Jefferson, Mount Washington and Three Sisters Wilderness Areas

Alternatives 3 will protect the natural quality of wilderness character, resulting in a high degree of protection for wildlife, and reduced impacts from invasive plants, visitor impacts on vegetation at campsites and lunch spots, user created trails and interactions with wildlife compared to the no action alternative. Alternative 3 will also result in reduced impacts from human waste. Comparatively, Alt 3will result in more travel restrictions within the wilderness than the no action alternative. In comparison to the no action alternative, Alt 3 is likely to have a negative impact to wilderness character due to increased signs in the wilderness at the campsite reservation zone boundaries. Alternative 3 does offer a higher degree of protection to the historic value of wilderness through the implementation of zone boundaries and, overall, is likely to protect historic resources more than the no action alternative. Solitude will be more protected under Alt 3 than the no action alternative.

Diamond Peak and Waldo Wilderness Areas

Alternative 3 is likely to be the most impactful alternative to the natural quality of wilderness character in Diamond Peak and Waldo Wilderness Areas, resulting in the most interactions with wildlife, potential spread of invasive plants, visitor impacts on vegetation at campsites and lunch spots and user created trail proliferation of any alternative. Additionally Alt 3 will result in the most impacts from trash, vandalism and human and pet waste of any alternative. Most of these impacts are related to displacement, primarily from overnight users, who were unable to obtain permits for the three larger wilderness areas. Conversely, Alt 3 will not restrict travel within the wilderness, resulting in a congruent impact to the unconfined recreation quality of wilderness character. Alt 3 does not include any use restrictions and, along with the no action alternative, is the best alternative for protecting the unconfined recreation quality. Alternative 3, will not require additional signing. Due to the expectation of increased use in Diamond Peak and Waldo under Alt 3, cultural resources will be the most exposed to harm of any alternative. Lastly, solitude will be the most impacted under this alternative.

Alternative 4

Under Alt 4, a permit system will be implemented by placing an overnight use quota at all trailheads in all 5 wilderness areas. Additionally, Alt 4 will require limited entry permits for day use at 16 trailheads in the Three Sisters, 11 trailheads in the Mount Jefferson and 2 trailheads in the

Mount Washington Wilderness. Quotas designed to meet the purpose and need were developed for all trailheads (See Appendix C). There are no day use restrictions in the Diamond Peak and Waldo wildernesses under this alternative. Alternative 4 differs from Alt 2, in that it has several campsite reservation zones, which result in more protections for popular or sensitive locations within the wilderness. Below is a summary of how Alt 4 impacts wilderness character.

Mount Jefferson, Mount Washington and Three Sisters Wilderness Areas

Alternatives 4 will protect the natural quality of wilderness character, resulting in a high degree of protection for wildlife, and reduced impacts from invasive plants, visitor impacts on vegetation at campsites and lunch spots, user created trails and visitor interactions with wildlife. Alternative 4 will also result in reduced impacts from human waste. Comparatively, Alt 4will result in more travel restrictions within the wilderness. Alternative 4 is likely to have a negative impact to wilderness character due to increased signs in the wilderness at campsite reservation zone boundaries. Alternative 4 offers a higher degree of protection to the historic value of wilderness through the implementation of zone boundaries. Solitude will be more protected under Alt 4 than the no action alternative.

Diamond Peak and Waldo Wilderness Areas

Alternative 4 does not propose any day use restrictions in Diamond Peak or Waldo wilderness. Alternative 4 will likely result in less visitor interactions with wildlife, and spread of invasive species than the no action alternative. Visitor impacts on vegetation and at lunch spots, user created trails, levels of trash and vandalism and impacts from human waste will all improve under Alt 4 compared to the no action alternative. There will be no travel restrictions once someone obtains the proper permit and enters the wilderness under Alt 4. Comparatively, Alt 4 will place use restrictions at overnight trailheads degrading this component of the primitive and unconfined recreation quality of wilderness character. Additionally, Alt. 4 will result in more signs in the wilderness than the no action alternative.

Alternative 5

Under Alt 5, an overnight limited use permit system will be implemented by dividing all the wilderness areas into zones. Visitors will need to obtain camping permits for each night in the zone that they wish to stay in. Visitors will be able to travel throughout the wilderness during the day, but will need to be in the zone they have a permit for by sunset. Alternative 5 will also implement a system of limited entry permits for day use at all trailheads in all 5 wilderness areas. Below is a summary of how Alt 5 impacts wilderness character.

Mount Jefferson, Mount Washington, Three Sisters, Diamond Peak and Waldo Wilderness Areas

Alternative 5 does offer a greater amount of protection for wildlife than the no-action alternative. Alternative 5 will also limit the spread of invasive plant species and limit visitor impacts on vegetation at campsites and lunch spots, and is a major improvement from the no action alternative. Alt. 5 will limit user created trails more than the no action alternative. Alt 5 offers the highest level of protection of any alternative from trash and vandalism, as well as the effects of human waste. Alternative 5 is the most detrimental of all of the alternatives to the unconfined recreation quality by imposing the most travel restrictions, as well as the most use restrictions. Alternative 5 will result in the most signs in the wilderness of any alternative, which will be a detriment to the primitive and unconfined recreation quality of wilderness. Conversely, Alt 5 will result in the most protection of any alternative for cultural resources and solitude.

Cumulative Effects

The geographic scale for cumulative effects to the qualities of wilderness character is the five wilderness areas in the project. There are no ongoing or reasonably foreseeable projects that affect visitor use levels or patterns of use at that scale. Site-specific incidents of management such as campsite restoration have localized impacts to wilderness character but would not contribute to cumulative effects at the project scale when considering the character of wilderness areas as a whole.

Aquatic Resources: Hydrology and Fisheries

Introduction

This aquatics analysis is focused only on the relevant aquatic features that are potentially impacted by this project. Unless otherwise noted, the geographic scale used to assess direct, indirect, and cumulative effects to aquatic resources for this project is the 5th field watersheds included in the wilderness areas being analyzed (Figure 9). In regard to this proposed project, any permit system that limits the number of visitors recreating from a specific trailhead is expected to equate to fewer potential concentrated impacts to aquatic related features like streams, wetlands, lakes, springs, riparian areas, and aquatic organisms including fish. However, it is important to realize that the limited entry system may not actually result in fewer visitors in the wilderness than currently occur. Limited entry would only reduce or limit visitor use in a specific area if the current use is higher than the limited entry quota, or when an area is added to the permit system through adaptive management. Also, the limited entry system would maintain a carrying capacity for an area, which may also displace users to another area within the same wilderness area. Consequently, there may be cases where the same number of visitors are using a specific wilderness, but spread out over different limited entry areas. This potential for displacement to other areas is addressed in the recreation resource report.

The indicators used for the effects analysis are fine sediment, stream temperature, bacterial contamination, and fisheries. The fish species used to analyze effects will be Management Indicator Species and Sensitive Species, including Cutthroat trout and Redband trout. Adaptive management and education through leave-no-trace principles are also expected to minimize aquatic impacts into the future.

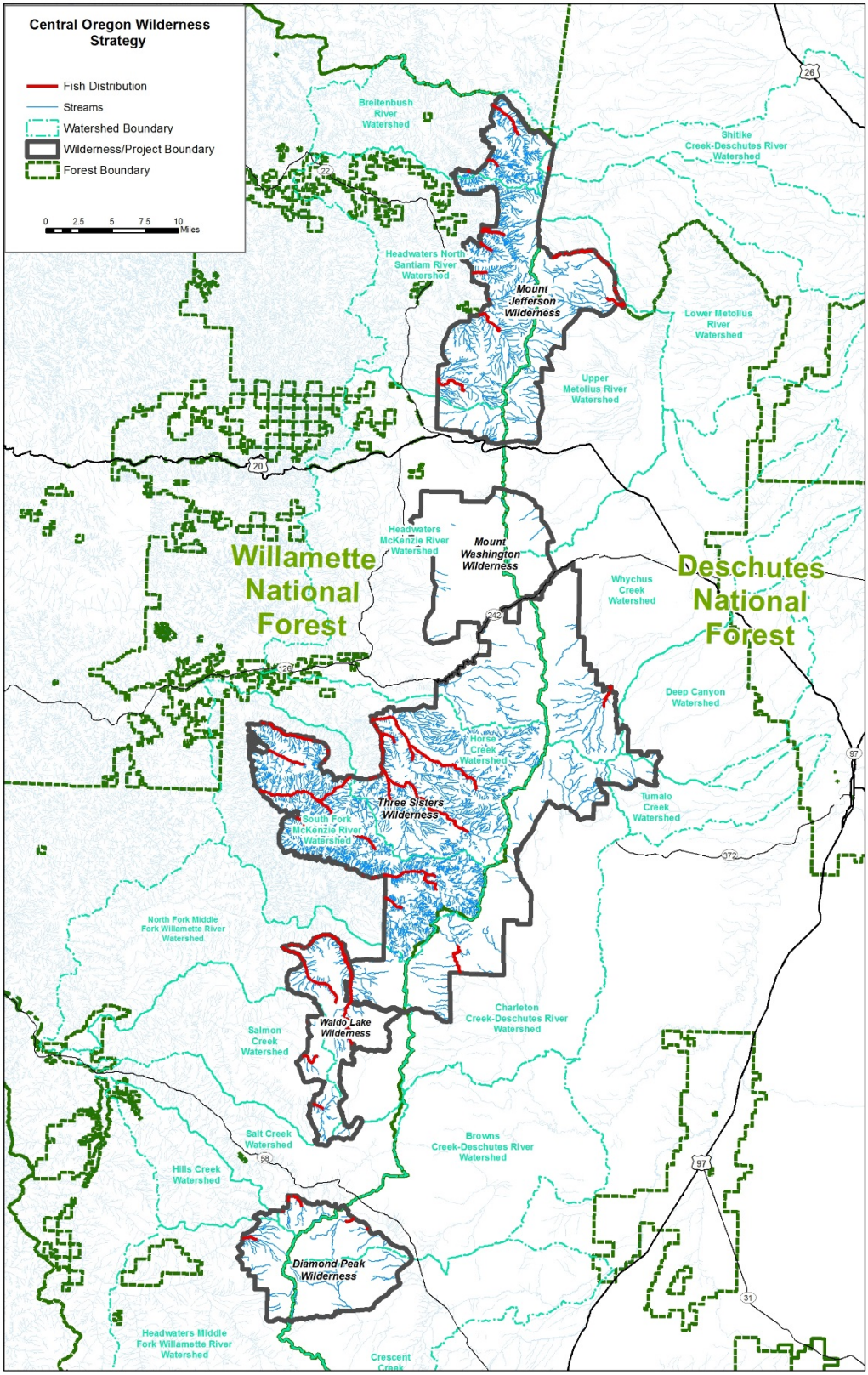

Figure 9: Project Area 5th-Field Watersheds and the distribution of streams and fish.

Regulatory Framework

Management of this project, as it relates to aquatic ecosystem function, is directed by the Northwest Forest Plan (USFS 1994), the Deschutes Land and Resource Management Plan (USFS 1990), the Willamette Land and Resource Management Plan (USFS 1990), the Clean Water Act (1972) and Executive Orders 11988, 11990, and 12088. Additional scientific guidance and background information is available within the Watershed Condition Framework (WCF) (USFS 2011) and the National Best Management Practices for Water Quality Management (USFS 2012).

Northwest Forest Plan (1994)

Applicable standards and guidelines for Riparian Reserves within the Northwest Forest Plan include the following:

- As a general rule, standards and guidelines prohibit or regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy (ACS) objectives. See pages C31-C38 of the Northwest Forest Plan for more specific information. The following Standards and Guidelines are of particular importance for this project:
    - RM-1 New recreational facilities within Riparian Reserve, including trails and dispersed sites, should be designed to not prevent meeting Aquatic Conservation Strategy objectives. Construction of these facilities should not prevent future attainment of these objectives. For existing recreation facilities within Riparian Reserves, evaluate and mitigate impact to ensure that these do not prevent, and to the extent practicable contribute to, attainment of ACS objectives.
    - RM-2 – Adjust dispersed and developed recreation practices that retard or prevent attainment of ACS objectives.
    - WR-1- Design and implement watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and attains ACS objectives.

Deschutes National Forest Land and Resource Management Plan (1990)

The 1990 Deschutes National Forest Land and Resource Management Plan (Forest Plan), as amended by the Northwest Forest Plan, provides additional management guidance in the project area.

Applicable standards and guidelines for riparian areas within the LRMP are outlined on pages 4-61 through 4-67. Those applicable to this project are RP-1 through RP-26, RP-28, RP-29, RP-33 through RP-37, and RP-43 through RP-47. Fisheries and water standards and guidelines are outlined on pages 4-67 through 4-68 and 4-69 through 4-70, respectively.

Willamette National Forest Land and Resource Management Plan (1990)

The 1990 Willamette National Forest Land and Resource Management Plan (Forest Plan), as amended by the Northwest Forest Plan, provides additional management guidance in the project area, including specification of Cutthroat trout as a Management Indicator Species (MIS) of fish for the Willamette NF.

The Clean Water Act (1972) and Sections 319 and 303(d)

The primary objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of all waters to protect the 'beneficial uses' as documented

according to criteria by the Oregon Department of Environmental Quality (ODEQ). A beneficial use is a resource or activity that would be directly affected by a change in water quality or quantity. Beneficial uses are defined on a basin scale in the Oregon Administrative Rules for water quality and cover large areas of land.

Under Section 319 of the 1987 CWA Amendments, States are required to determine those waters that will not meet the goals of the CWA, determine those non-point source activities that are contributing pollution, and develop a process on how to reduce such pollution to the "maximum extent practicable." Section 303(d) of the CWA requires that a list be developed of all impaired or threatened waters within each state. The ODEQ is responsible for compiling the 303(d) list, assessing data, and submitting the 303(d) list to the Environmental Protection Agency (EPA) for federal approval. The 303(d) list identifies waters where water quality standards are not met and where pollutant load limits (Total Maximum Daily Loads) are needed. Table 21 and Figure 10 show the waterbodies on the 2012 303(d) list within the project area.

Table 21: Project Area Waterbodies that are on the 2012 303(d) List for exceeding State Standards.

Wilderness	Impairment Listing	Waterbody
Diamond Peak Wilderness	Dissolved Oxygen	Crystal Creek
Mount Jefferson Wilderness	Aquatic Weeds Or Algae	Marion Lake/Marion Creek
	Sedimentation	South Fork Breitenbush River
	Water Temperature	First Creek
Three Sisters Wilderness	Biological Criteria	Tipsoo Creek
	Water Temperature	Whychus Creek
	Biological Criteria	North Fork Whychus Creek

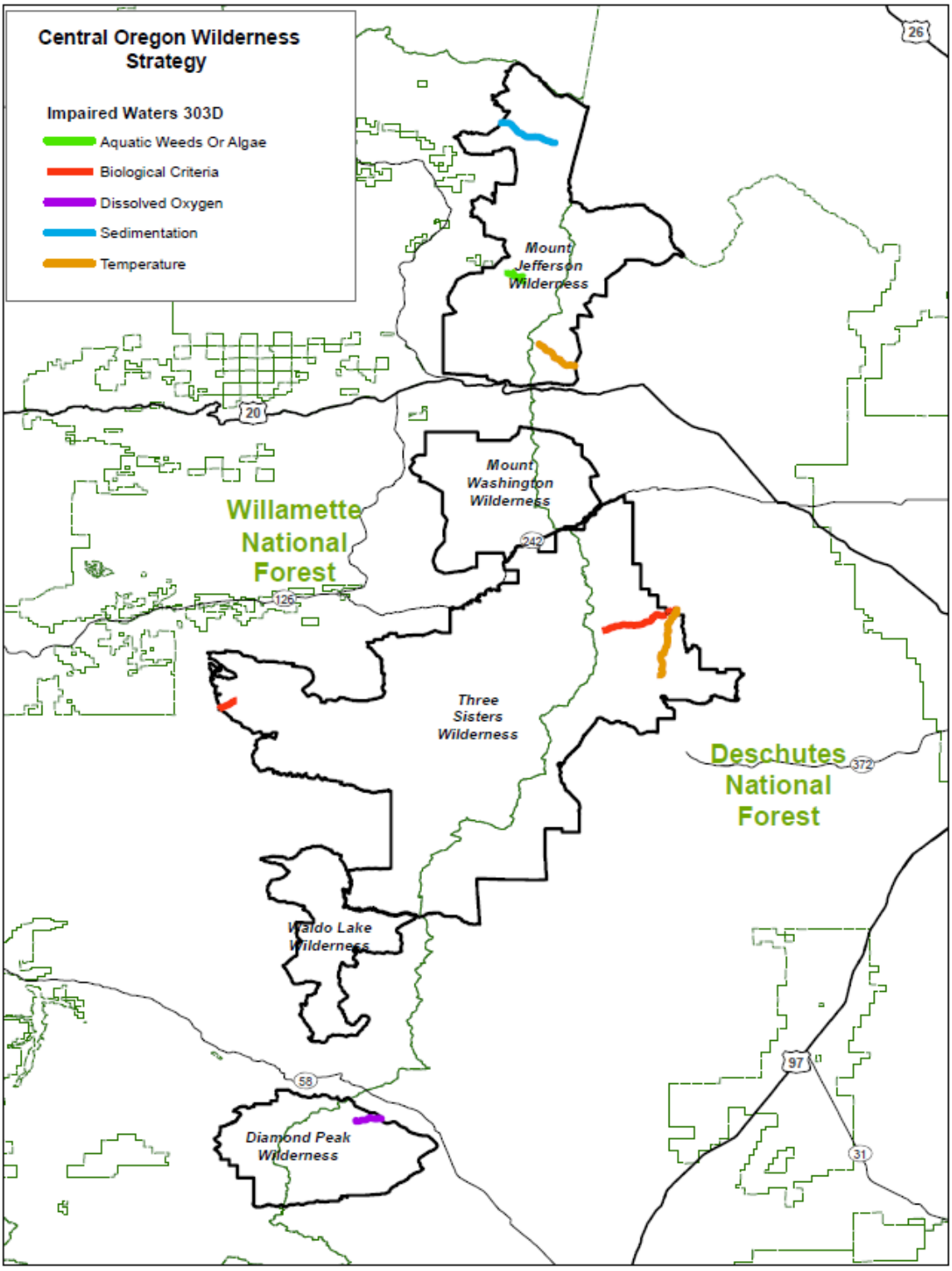

Figure 10: Project Area Waterbodies that are on the 2012 303(d) List for exceeding State Standards.

Executive Orders

The following Executive Orders pertain to this project:

- Executive Order 12088 requires Federal compliance with pollution control standards (i.e. the Clean Water Act).
- Executive Order 11988 requires agencies to avoid adverse impacts associated with the occupancy and modification of floodplains.
- Executive Order 11990 requires agencies to avoid adverse impacts associated with the destruction or modification of wetlands.

National Best Management Practices for Water Quality Management on National Forest System Lands (April 2012)

This document was developed to improve agency performance and accountability in managing water quality consistent with the Federal Clean Water Act (CWA) and State water quality programs. Current Forest Service policy directs compliance with required CWA permits and state regulations and requires the use of Best Management Practices (BMPs) to control nonpoint source pollution to meet applicable water quality standards and other CWA requirements.

Analysis Methods

The primary factors that are assessed in this report are those physical and biological aquatic features that are directly and indirectly influenced by the proposed activities within each alternative. Effects are displayed with anticipated incorporation of site specific Best Management Practices (BMPs) and mitigation.

This analysis will describe direct, indirect and cumulative effects and differences between alternatives in terms of relative magnitude and trend. The four aquatic elements and measures that will be used to assess impacts of this project are:

- Temperature – stream temperature can be affected through alteration of riparian vegetation that provides shade and influences stream temperatures (Marion et al 2016). The measure will be the relative potential area of altered riparian vegetation due to recreational use (i.e. camping and trails) adjacent to waterbodies.
- Sediment – sediment input/turbidity can be impacted by recreational activities due to soil compaction and displacement and removing vegetation (Marion et al, 2016). The measure will be the relative potential area of compacted and denuded recreational use areas adjacent to waterbodies.
- Water Chemistry – bacterial contamination due to human and domesticated animal waste near water bodies can be affected by increased recreational use (Marion et al, 2016). The measure will be the relative potential for fecal coliform concentrations within waterbodies due to recreational use adjacent to waterbodies.
- Native Fisheries – water quality impacts (temperature, sediment, and/or water chemistry) can influence occupied habitat of native fish species, including Cutthroat and Rainbow/Redband trout, to the extent that fish population levels are altered at the site scale (individual lakes or stream catchment). The measure will be the potential for one or more of these water quality parameters to be altered in occupied fish habitat, relative to the existing condition, as described previously. While the primary contributor to direct effects upon native fisheries is angling pressure, the focus of this analysis is on direct, indirect, and cumulative effects of water quality upon native fish species. Direct and indirect effects are

more likely to be measurable over shorter periods of time, generally less than one month, than cumulative effects, which would be more likely to be detected after longer periods of time. Angling pressure has been reducing over time in and around these wilderness areas (ODFW pers. comm.), while overall recreational pressure has been increasing. Therefore, angling pressure is not considered to be an accurately predictable indicator of effects of overall recreation use upon native fish species. Effects to non-native fisheries is outside the scope of this analysis.

Affected Environment – Aquatics (Hydrology and Fisheries)

The wilderness areas of interest, generally span the east and west sides of the central Cascade Mountain Range in Oregon. These higher elevational headwater areas feed the mid and lower elevational aquifer from both surface and sub-surface flow routes. Maintaining clean water in these higher elevational areas is critical towards sustaining high water quality at lower elevational populated areas.

In general, water quality is a topic of interest on public lands in the area covered by the Northwest Forest Plan (NWFP). Streams and lakes within the project area generally exhibit good water quality with low temperatures, low conductivity, low turbidity and high dissolved oxygen. Impacts to water quality are normally localized and of short duration. Water bodies in the project area on the State 303(d) list of impaired water bodies are listed in Table 21.

Many system and user-created trail treads and campsites are located on or leading to and through desired destinations like lakes and meadows or along streams. Consequently the potential to adversely impact water quality is greater than in areas away from water. Compacted trails and campsites are currently variable sources of erosion. Although system trails are generally maintained with water bars and control structures to drain water and minimize erosion, they, along with user-created trails created by hikers, are susceptible to erosion from the overland flow of water during rain events. This is especially apparent where the trail tread has been widened or short cuts have been created and no drainage structures are in place. In this case, erosion and sedimentation may alter the physical and biological nature of nearby waterbodies. Like trails, campsites can intercept, concentrate, and increase the velocity of runoff resulting in erosion of the campsite and increased sedimentation into adjacent waterbodies. Campsites are generally located on flatter terrain, and therefore are less susceptible to overland flow and subsequent erosion.

Turbidity measurements are not available, but trail crossings of streams and stream-and-lake-side camping areas are considered the main contributor to human caused increases in fine sediment and turbidity in streams in the project area. Use of user-created trail crossings may temporarily increase turbidity levels, potentially causing displacement of fish, reduced feeding success, and other negative behavioral changes. Use of designated trail stream crossings are generally designed with BMPs and mitigations to minimize or eliminate potential sediment effects.

In addition, user-created trails and campsites can reduce shade if vegetation is removed during construction. The primary concern here is with user-created trails/campsites that are not designed with BMPs and/or mitigations to minimize/eliminate adverse impacts to water quality. However, the usual impact of this is at such a small scale that adverse effects to water temperatures are non-measureable and inconsequential. There is limited shade and stream temperature data throughout the project area. In general, the waterbodies within the project area exhibit good water quality, however, some waterbodies have data that exceed the State water temperature standard and have been added to the 303(d) list of impaired waterbodies (see Table 21 and Figure 10).

Designating tent/camp sites has localized the extent of human waste in many areas, but increased overall use throughout the wilderness areas has spread the impacts into other areas. Waste from humans, dogs and pack stock (i.e. horses and mules) near poorly located campsites is a growing concern in popular wilderness areas. Waste can be mobilized or leach into nearby waterbodies during precipitation events, resulting in degraded water quality (Marion et al. 2016). This is especially the case where campsites and associated waste are found near water. Of similar concern is where water is limited and pack animals are watering at the same groundwater dependent ecosystem (springs, seeps and other upwellings of water) on a daily basis. Recreational stock also have impacts on springs and seeps which may result in loss of herbaceous and woody vegetation as well as trampling and subsequent soil erosion and sedimentation.

Mobilization of human and pack animal waste into nearby waterbodies can result in fecal coliform contamination. Variable soil depths across the landscape of these wilderness areas influences the effectiveness of human waste disposal. Areas of deeper soil at lower elevations where organic matter is present can harbor and breakdown buried waste without affecting groundwater quality. Maintenance of soil organic matter and surface horizon integrity is necessary for these soil profiles to effectively decompose and sanitize buried human waste. However, areas of shallower soils near and above tree line have less organic matter in the profile and a much lower ability to breakdown these wastes.

Fish distribution and streams in the project area can be seen on the map in Figure 9. A majority of the lakes in the wilderness did not historically have native fish populations. Fish have been stocked in relatively recent times to provide for angling (Figure 11) (Hutchison 2011). Fish that are stocked include hatchery-raised Brook trout, Rainbow trout, and Cutthroat trout. Some of these hatchery-derived stocks now naturally reproduce. Native fish species include Coastal Cutthroat trout (only west slope drainages), and Mountain whitefish and Rainbow/Redband trout, which occur in some project area streams and lakes. Rainbow trout residing in eastern Cascade slope drainages are predominantly Redband trout, a subspecies that has limited distribution within the project area, primarily in the drainage between Winopee Lake and Cultus Lake. Redband trout are a species of conservation concern and are designated as a Sensitive Species for the Deschutes National Forest. Fish are re-stocked for anglers on a bi-annual rotation by the Oregon Department of Fish and Wildlife (ODFW).

The majority of impacts to trout populations result from angling pressure. Over the past many years, there has been a downward trend in overall angling pressure in Oregon, including within these wilderness areas (Hodgson 2018). These fish populations are susceptible to water quality degradation, especially increases in water temperature, but as discussed above, water temperatures are generally in good condition across the project area. In-water recreation activities can displace fish, resulting in minimal changes of short duration to their location and behavior, relative to natural conditions.

A few specific areas currently have controls on use. With the No Action, these would continue to be enforced and therefore the conditions would not see the same impacts as elsewhere. Visitor use management include Pamelia and Obsidian limited-entry areas, designated campsites at Green Lakes. All forest orders are outlined in the description of Alternative 1 in the EA.

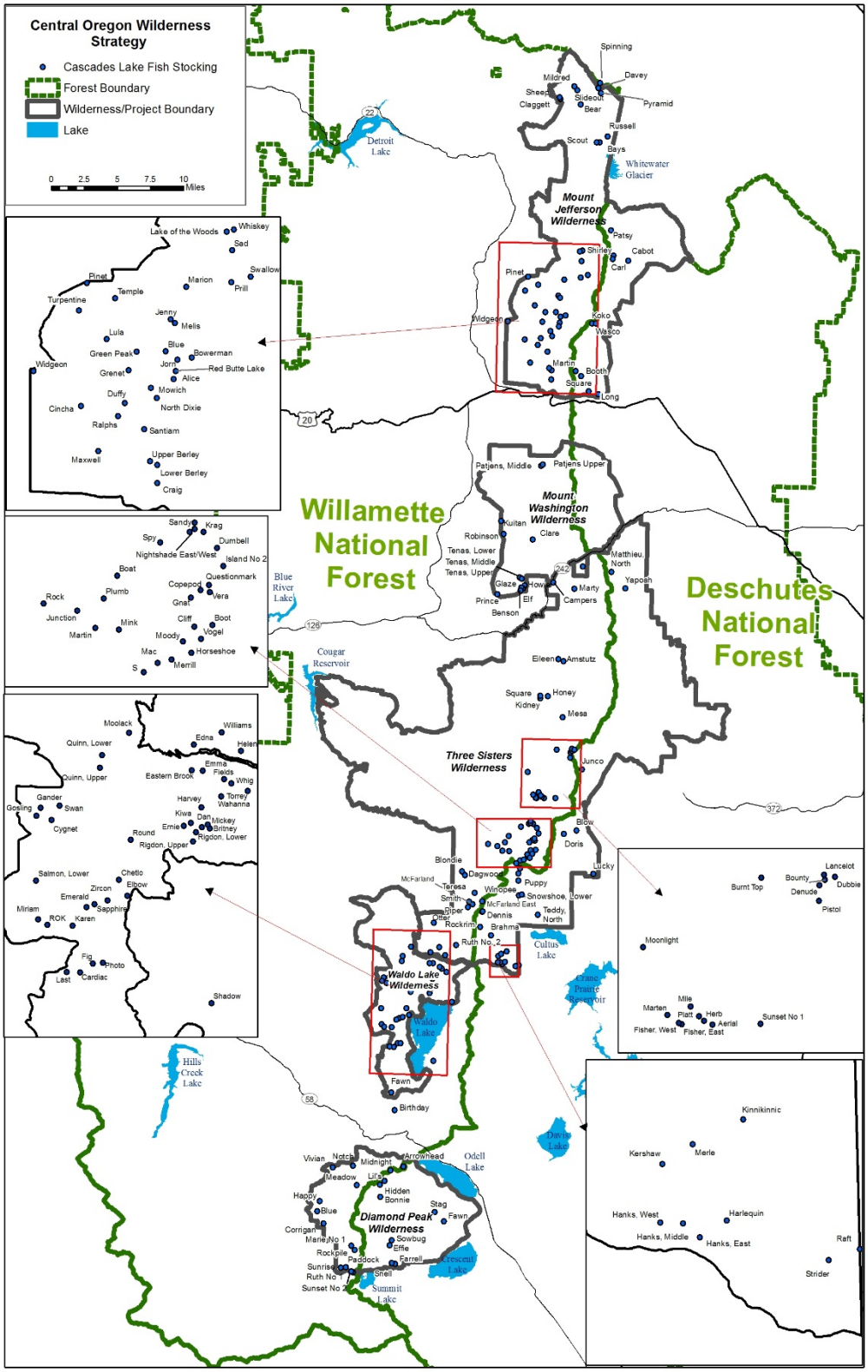

Figure 11: Lakes within the project area that have been stocked with fish by ODFW in recent times and may continue to be stocked.

Environmental Consequences

Alternative 1 – No Action

Under the No Action Alternative, visitor use would likely continue to increase, contributing to increased potential for water quality degradation. Water temperatures related to recreation impacts to shade could slightly increase as increased visitor use impacts more vegetation adjacent to water bodies. Visitor use related sedimentation would continue to increase as more visitors further developed trails and/or established more campsites adjacent to waterbodies, especially in the most popular areas, as described in the existing condition section. Fecal coliform concentrations in water bodies resulting from increased visitor use would continue to increase. Ongoing impacts to native fisheries due to angling pressure are considered to be decreasing based upon declining statewide angler participation rates. The impact to native fish would increase slightly with the increase of visitor use and degradation to water quality, especially in the most popular areas. Impacts to water quality and fisheries resulting from the no action alternative are expected to increase over time as more visitors have more impact to the natural character of wilderness.

Alternatives 2, 3, 4 and 5

All of the action alternatives would have visitor restrictions greater than current restrictions, and would potentially reduce the number of visitors impacting aquatic resources in the project area. Although there are differences between alternatives in the amount, location, and timing of restrictions, they would generally all have a positive effect to the aquatic resources due to less concentrated impacts from visitors. However, the overall number of visitors in the wilderness and within limited entry areas would only be limited by these alternatives if the current use is higher than the overall wilderness area or limited entry area quota, respectively, or when future use reaches these quotas. Therefore, those areas that have lower current use levels than the proposed thresholds are expected to continue to experience increased recreational use. When the proposed quotas are met, monitoring of conditions would determine if management actions should be taken. During this uncertain duration, effects from increased recreational use are expected to result in increased disturbance to soil, water, and native fish. Also, the limited entry system would essentially maintain a carrying capacity for an area, which may also displace users to another area within the same wilderness, potentially resulting in a limited amount of disturbance to soil, water, and native fish at the wilderness area level, but increased disturbance to soil, water, and native fish at limited entry areas until associated user carrying capacity levels are reached. Therefore, there may be cases where the same number of visitors are using a specific wilderness, but spread out over different limited entry areas.

Temperature

Many of the Water Quality Restoration Plans (WQRPs) completed for the NWFP area found that management of riparian areas as required by the NWFP Aquatic Conservation Strategy (ACS) can provide sufficient stream shade to protect or recover stream temperature in waters listed as impaired for temperature on the State's 303(d) list. The potential impact of concentrated or over capacity visitor use upon riparian vegetation providing shade to water bodies would be reduced in all of the action alternatives. The indirect effect of the project to temperature is expected to be positive, but will be of immeasurable magnitude.

Sedimentation

There is no data available on turbidity, but the extent of human and pack animal use at stream crossings is considered the most significant source of sediment in the project area. There is some

potential erosion from camping areas denuded of ground cover vegetation. The effect of all action alternatives would be to maintain a level of carrying capacity of the recreation areas to reduce potential for concentrated resource damage and subsequent erosion and sedimentation.

Water Chemistry

All of the action alternatives would generally reduce the concentration of potential visitors camping near water waterbodies. Consequently, the impacts to water from an fecal coliform contamination standpoint should be reduced. In addition, education and awareness outreach efforts are expected to inform users of conservation tactics to aid in reducing impacts to water quality and the wilderness character.

Native Fisheries

The Willamette Forest Plan recognized anadromous and resident salmonids as economically important species and designated them as Management Indicator Species for riparian habitat and water quality. Salmonid fish are good indicators because they are predators in the stream ecosystem. This means that they are not only affected by the physical conditions of their habitat but also by the metabolic energy pathways in the watershed from primary production to decomposition. The most common salmonid sport fish that have habitat in the project area are Rainbow trout and Coastal Cutthroat trout.

The majority of streams and lakes in the project area do not support native fish populations, therefore visitor impacts to water quality in these areas will not affect native fish, including Sensitive Species and Management Indicator Species. In the few lakes and streams with residing native fish populations, changes to water quality parameters as previously described may have small beneficial indirect, direct, and cumulative effects upon occupied fish habitat and native fish species. The magnitude of the effect would be immeasurable but would not be to the extent that fish population levels are altered at the site scale (individual lakes or stream catchment). The timing of the anticipated beneficial effect would occur when the recreational use threshold is reached and administered for a given area. Therefore, until such use thresholds occur, and anticipated use continues to increase in associated areas, small negative effects upon occupied fish habitat and native fish species may occur. Displacement of recreational users may also increase the disturbance of aquatic resources in areas that receive additional recreation use, until adaptive management of user thresholds and best management practices are employed to ameliorate this disturbance. Negative effects to fish from direct displacement of fish and indirect and cumulative effects to water quality parameters in fish habitat are expected to be immeasurable in magnitude because they would not occur to the extent that fish population levels are altered at the site scale (individual lakes or stream catchment).

At full recreational use thresholds, no measureable effect to Management Indicator Species or Sensitive Species of fish is expected from any alternative for the same reason there would be no measurable effect to the water quality parameters. Overall, the degradation to water quality associated with visitor use is minimal, sporadic, of immeasurable magnitude, but will be somewhat reduced by all the action alternatives.

Summary of Effects

All of the action alternatives would have visitor restrictions greater than current restrictions, and would potentially reduce the concentration of visitors impacting aquatic resources. Although there are differences between alternatives in the amount, location and timing of restrictions, they would generally all have a positive effect to the aquatic resources due to less concentrated impacts from

visitors. However, it is important to realize that the limited entry system may not actually result in less visitors in the wilderness than currently occurs. Limited entry would only reduce visitor use in a specific area if the current use is higher than the limited entry quota. Also, the limited entry system would essentially maintain a carrying capacity for an area, which may also displace users to another area within the same wilderness. Consequently there may be cases where the same number of visitors are using a specific wilderness, but spread out over different limited entry areas.

The overall impact to the aquatic resources of reducing concentrated visitor use from all action alternatives is expected to be positive. In addition, adaptive management is built into this project to allow modification to the limited entry system as needed if there are unexpected results or a need to respond to growing use/degradation. See Appendix A for the Aquatic Conservation Strategy Objectives discussion.

Connected Actions

Short and long term goals for management of the wilderness areas include an increase in trail crews for trail maintenance and restoration activities. Fees associated with the quota system may help fund trail crews for these purposes and the reduction in overnight and day use numbers should allow some social trails and excess campsites to be restored for the long term. The implementation of these activities is expected to benefit the aquatic resources by returning compacted and denuded areas to a more natural state capable of supporting vegetation and infiltrating water. Regular maintenance of trails will help reduce erosion and associated impacts to adjacent waterbodies and restoration activities will return localized areas to a condition capable of supporting vegetation.

Cumulative Effects

Ongoing and reasonably foreseeable activities include wildfire rehabilitation, routine trail maintenance, limited special uses, and fish stocking. All of these are implemented with site-specific best management practices and project design intended to prevent adverse impacts to water quality. Regardless, small localized effects from some of these activities may overlap with recreational disturbance to aquatic areas, resulting in immeasurable cumulative effects to water quality and fisheries over a short period of time. Because the proposed alternatives would not measurably impact any of the water quality parameters or fisheries, there would be no measurable cumulative effects to aquatic resources under the action alternatives.

Wildlife: Threatened, Endangered, and Sensitive Terrestrial Species

Introduction

The wildlife analysis is focused only on the relevant wildlife features that are potentially impacted by this project. This analysis will display the effects of permitting visitor use to maintain wilderness objectives on proposed, threatened, endangered, and sensitive species, management indicator species, and landbirds potentially found in the Mt. Jefferson, Mt. Washington, Three Sisters, Waldo Lake, and Diamond Peak wilderness areas of the Deschutes and Willamette National Forests.

This analysis will include a qualitative analysis based on the magnitude and trend related to habitat alteration, disturbance, and habituation (pollution). General effects to species will be discussed and these will be common to all alternatives. Species specific effects are discussed in the biological evaluation and wildlife report.

The proposed actions would reduce the potential for vegetative habitat loss, disturbance, and habituation from reduced human use as a result of implementing a permit system within wilderness areas along the Cascade crest on the Deschutes and Willamette NFs. Unregulated use has the potential to fragment, damage, or eliminate habitats or to disturb the use of some habitats due to noise or frequency of visits. The proposed permit system will limit the number of visitors to heavily impacted areas and this is expected to reduce impacts to habitat and lessen disturbance to some degree. Permitted areas will result in less use and this may allow some sites to recover over time. Disturbance will still occur at these sites but likely at reduced levels due to fewer numbers of people allowed. Displacement may occur into less used areas. Adaptive management will aid in monitoring these areas.

The following will be used to describe qualitative effects to wildlife and their habitats:

- Habitat alteration
- Disturbance
- Habituation

Regulatory Framework

Deschutes National Forest Land and Resource Management Plan (1990): The 1990 Deschutes National Forest Land and Resource Management Plan (Deschutes LRMP), as amended by the Northwest Forest Plan, provides additional management guidance in the project area. Applicable standards and guidelines for wildlife within the LRMP are outlined on pages 4-51 through 4-60. Those applicable to this project are WL-1, 2, 7, 9, 14, 17, 23, 25, 31, 37, 40, 41, 52, 61, 62, 64-70, 72, 74, and 75. Wilderness (MA-6) standards and guidelines specific to wildlife are outlined on pages 4-111 through 4-112. Applicable S&Gs include M6-91 and M6-92.

Willamette National Forest Land and Resource Management Plan (1990): The 1990 Willamette National Forest Land and Resource Management Plan (Willamette LRMP) as amended by the Northwest Forest Plan, provides additional management guidance in the project area. Applicable standards and guidelines for wildlife within the LRMP are outlined on pages IV-65 through IV-73. Those applicable to this project are FW-121, 133, 134, 154, 156, 157, and 169. Wilderness (MA-1) standards and guidelines specific to wildlife are outlined on pages IV-108 through IV-109, page IV-114, page IV-117, IV-121 and page IV-124. Applicable S&Gs include MA-1-35, MA-1-43, MA-1a-08, MA-1b-09, MA-1c-1and MA-1d-15.

Deschutes and Ochoco Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Lands within the Deschutes and John Day River Basin's Administered by the Deschutes and Ochoco National Forests (2014): The Deschutes and Ochoco Programmatic BA covers maintenance activities associated with trails. Work involving clearing vegetation and wind thrown trees, improving drainage, protecting stream and riparian area crossings and relocating trails out of sensitive areas are covered through informal consultation if they meet established project design criteria for the northern spotted owl. These activities were determined to may affect, but not likely adversely affect the northern spotted owl and its habitat. The programmatic BA does not cover trail maintenance or construction in riparian areas or bridge construction/reconstruction adjacent to or at Oregon spotted frog sites or critical habitat. This action is not covered under the programmatic BA and will be subject to further consultation.

Biological Assessment for Routine Land Management Activities with a Potential to Modify Habitat which are Not Likely to Adversely Affect Federally Listed Species with the Willamette Planning Province of Oregon (2017): This BA and associated consultation covers maintenance of existing trails in Oregon spotted frog critical habitat in wilderness areas of the

Willamette National Forest. No trees greater than 11" diameter may be cut in Oregon spotted frog critical habitat as part of trail maintenance without seeking a waiver. On-going trail maintenance was determined to may affect, but not likely to adversely affect Oregon spotted frogs and their critical habitat.

Oregon Spotted Frog Critical Habitat: U. S. Fish and Wildlife Service designated final critical in 50 CFR Part 17, Volume 81, No. 91, May 11, 2016, pages 29336 to 29396.

Analysis Methods

Wildlife are an integral component of wilderness ecosystems but also an important element of the wilderness recreation experience. The increasing presence of human visitors and their interactions with wildlife can cause changes in physiology and behavior that compromise wildlife health (Knight and Gutzwiller 1995).

Research focusing on recreation impacts to wildlife was sparse until the 1990s. Since the 1990s, this body of research has been expanding. Researchers have classified human impacts on wildlife into four categories: exploitation, disturbance, habitat alteration, and pollution (Knight and Gutzwiller 1995). Exploitation results in the immediate death to wildlife (vehicle collisions) and is not pertinent to this analysis. Disturbance results in harassment that can lead to temporal or spatial displacement of wildlife from suitable to less suitable habitat. Habitat alteration and pollution are indirect impacts that result in changes to soil, water, flora, and fauna.

This analysis will include a qualitative analysis based on the magnitude and trend related to habitat alteration, disturbance, and habituation (pollution). General effects to species will be discussed and these will be common to all alternatives. Species specific effects are discussed in the biological evaluation and wildlife report.

Scientific Literature Review

Recent, relevant literature was reviewed on the general effects of habitat alteration, disturbance, and habituation on wildlife. Literature is not available for all species or types of conditions found within these wilderness areas. Much of the information came from Knight and Gutzwiller (1995), and recent research on recreation effects to wildlife. The Knight and Gutzwiller book covers some issues related to wildlife and recreationists but represents some of the earlier research available.

Wildlife Data

Comprehensive surveys for wildlife or effects of recreational activities on species or habitats has not been completed. A few surveys have been completed (e.g. Oregon spotted frog, western bumble bee) but these do not encompass each wilderness area and have not been consistently surveyed through the years. Opportunistic observational data is available in the NRIS Wildlife database available on both forests.

Habitat Alteration

Recreation visitation to protected natural areas inevitably degrades natural resources. These impacts occur primarily in locations that receive substantial use and occur on or near recreation sites like campsites, vista points and along trail corridors (Marion et al. 2016). Impacts include vegetation trampling, soil compaction, loss of vegetation, introduction of invasive species, loss of snags and down woody material, tree damage, erosion/sedimentation, trail proliferation, and habitat fragmentation. Habitat changes can affect the behavior, distribution, survivorship, and reproductive ability of individual wildlife by impacting an animal's food supply and availability as well as shelter (Hammit and Cole 1998, Cole and Landres in Knight and Gutzwiller 1995).

Snags, down wood, and brush piles tend to decline in recreation areas as it's collected as firewood, or cleared for a variety of reasons. Loss of downed wood can adversely affect water and nutrient conservation on the site as well as impact wildlife use of these habitat components (Knight and Gutzwiller 1995).

Disturbance

Non-consumptive outdoor recreation, once thought to be environmentally benign, has been shown to effect individuals, populations, and wildlife communities (Miller et al. 1998). For example, Boyle and Samson (1985) reported that 81% of the studies reviewed showed non-consumptive recreation had negative effects on wildlife while Larson et al. (2016) found non-motorized and winter activities had more negative effects on wildlife than motorized activities. These effects are greater if dogs are accompanying hikers, especially if off-leash (Blanc et al. 2006).

Disturbance can be described operationally as any relatively discrete event in time that disrupts ecosystems, communities, or populations, where disruption refers to a change in behavior, physiology, numbers, or survival. Disturbance varies in its magnitude, frequency, predictability, spatial distribution, and duration. The disturbance "effect" is the reaction of the animal (which can be visible or not for the observer) following a disturbance. (Blanc et al. 2006)

Disturbance seems to be more intense when activities are dispersed within habitats or not practiced on predictable paths. Disturbance from recreation may have both immediate and long-term effects on wildlife: a) immediate response of many animals to disturbance is a change in behavior (cessation of foraging, fleeing, or altering reproductive behavior), b) over time energetic losses from flight, decreased foraging time, or increased stress levels come at a cost of energy resources needed for survival, growth, and reproduction, c) the presence of humans in wildlife habitat may result in avoiding parts of their normal range, d) the loss of otherwise suitable habitat may be sufficient to reduce the carrying capacity of some lands for wildlife, and e) the energetic cost for wildlife of responding to disturbance from recreation can also affect the carrying capacity of wildlife habitat (Taylor and Knight 2003).

Habituation

Animals can get used to disturbance under certain circumstances through habituation and compensation. Habituation is the mechanism by which organisms minimize their reaction or stop reacting completely avoiding useless energy expenses. This can only appear when animals face repeated and predictable stimuli which do not pose a true threat. All species do not have the capacity for habituation. Habituation depends on individuals and species as well as local conditions and the nature of the disturbing activity (intensity and frequency). Habituation reduces energy loss but may make them more susceptible to other risks like predation or poaching. (Blanc et al. 2006).

Affected Environment

The five wilderness areas span the Cascade crest and include variety of plant associations from high elevation true firs to mixed conifer habitats, of which Pacific silver fir and mountain hemlock are the dominant plant associations found. This provides habitat for a variety of wildlife species, primarily those species that inhabit high elevation forests. See Table 22 for a list of potential proposed, threatened, endangered, and sensitive species, as well as Table 23 for a list of management indicator species (MIS) and landbirds potentially found within the project area.

Three known federally listed species and one proposed species are known to occur or use the wildernesses – gray wolf, northern spotted owl, Oregon spotted frog, and wolverine. Spotted owls nest in the lower forested areas of all wilderness areas. Potential impacts may result due to disturbance near nest sites or foraging areas. Loss of structural components like down woody material from firewood harvest may impact prey habitat.

There are four known Oregon spotted frog (OSF) breeding populations and critical habitat in the Three Sisters wilderness. There are existing system trails occurring within OSF critical habitat as well as dispersed camping. These have the potential to result in the trampling of vegetation and potential introduction of invasive plant species due to use of stock animals. Disturbance may result to all life stages of frogs from recreational activity in and adjacent to frog habitat. Human waste and garbage may result in decreased water quality.

Gray wolves have been documented traveling through the Deschutes NF and wilderness areas. There are no known packs, denning sites, or rendezvous sites known on either forest. Wolves are likely to avoid habitats in heavily used areas.

Wolverine utilize high elevation (7,000 to 9,000 feet) alpine habitat where snow coverage remains well into the denning season (spring) with only slight variations in habitat use between summer and winter (Copeland et al. 2007). Several historic sightings have been documented in the Mt. Jefferson and Three Sisters wilderness areas but there have been no documented detections in the past 20 years. Impacts stem from increased disturbance potential from increased use.

Seven sensitive species are known to occur in the wilderness areas and nine species have potential habitat. Peregrine falcons, bald eagles, bufflehead, harlequin ducks, Townsend's big-eared bats, Sierra Nevada red fox, and western bumble bee have all been documented. Lewis' woodpecker, white-headed woodpecker, horned grebe, black swift, spotted bat, Crater Lake tightcoil, silver-bordered fritillary, Pacific fisher and Johnson's hairstreak all have potential habitat within the wilderness areas but have not been documented as surveys are not often conducted within wilderness. There is habitat for all management indicator species for both forests in the wilderness areas as well as habitat for numerous landbird species.

Environmental Consequences

Alternative 1 – No Action

Use has increased greatly in all five wilderness areas over the past six years. Intensity, frequency, and magnitude of use is expected to increase with expected population growth in Oregon. Increased habitat alteration and disturbance is likely to occur within increased use along trail corridors and popular traditional use areas. Displacement into more remote areas may also occur for those seeking more solitude experiences. This is likely to affect/impact wildlife species and habitat incrementally.

All Action Alternatives

Disturbance and harassment of wildlife by humans in wilderness is an unavoidable consequence of any of the alternatives. However, all alternatives have use restrictions greater than the existing condition, resulting in less use, disturbance potential, and habitat alteration. All alternatives will result in recreational activity being dispersed throughout the wilderness. Disturbance and habitat impacts occur primarily along trail corridors and at popular camping destinations. The vast majority of wilderness areas do not experience the same amount of human use and thus have less disturbance and habitat alteration potential. However, human use is often concentrated in highly

diverse or important habitat types for wildlife like meadows and water sources and wildlife are likely avoiding these areas.

Limited entry and overnight permits will likely result in decreased human use due to established quotas in high use areas (e.g. Green Lakes, Jeff Park, South Sister Climbers trail) resulting in less disturbance potential and potentially less habitat alteration and habituation (less trash and human waste). Decreased use and camping at these high use areas may allow some sites to recover over time resulting in increased habitat. Displacement may occur into more remote or less used areas as a result of the permit system and zoning. This could result in a slight increase in the disturbance potential and a minor increase in habitat alteration/habituation (more trash/human waste). Monitoring will occur in these areas to determine if and when thresholds are met and this will determine if further action is required.

The elevational campfire ban will result in existing designated campsites being removed resulting in increased habitat. This will also result in a decreased potential for habitat loss from human escaped fires. In addition, pulling back the Broken Top and Crater Ditch trailheads to the 370 road and combining these into one trailhead will reduce habitat fragmentation and disturbance and may eventually increase habitat after this site recovers.

No measureable effects or impacts to threatened, endangered, sensitive and proposed (TESP) species, management indicator species, or landbirds is expected from any of the alternatives. Overall, the amount of habitat alteration associated with human use is minimal and will be reduced by the action alternatives. Disturbance will continue but will also be reduced from current conditions.

Cumulative Effects

Implementation of any of the action alternatives in combination with area closures for wildfire and decommissioning of trails in the Mt. Jefferson and Mt. Washington wilderness areas would provide an additional benefit to wildlife species due to reduced disturbance.

Summary of Effects

See Table 22 for individual species. Alternative 2 will see improvements over the No Action alternative. However, there is potential for more displacement of people, especially on the eastside as permits are required at all eastside trailheads. Use in all other areas would likely follow traditionally used areas and result in less displacement. Disturbance from overnight camping will be potentially be reduced from No Action due to quotas.

Alternative 3 will see some improvement over the No Action alternative. This alternative will see the least amount of day use displacement (of people) as fewer trailheads require permits. Use may move to those areas that were traditionally used and less into more remote areas. Habitat impacts and disturbance are likely to persist in these traditionally used areas due to a lack of quotas. Zoned areas will likely see improvements due to the limited number of overnight campers allowed. Over time, habitat may improve as sites recover from less use. Overnight camping outside of the zones will also see some improvement over the existing condition due to quotas on specified trailheads for Mt. Jefferson, Mt. Washington and Three Sisters wildernesses.

Alternative 4 will see some improvements over the No Action alternative as well as Alternative 3 as there are slightly more trailheads requiring day use permits and all wilderness areas will have quotas for overnight camping. All other effects are the same as Alternative 3.

Alternative 5 will see improvements over the No Action alternative as well as all action alternatives as far as day use is concerned. Displacement potential is greatest for this alternative as all trailheads will require permits but use will be capped at known quotas for each wilderness. Overnight camping effects will be the same as Alternative 4 with the exception of lower use due to the quotas.

Adaptive management will be applied to this project to allow for modifications to the quota numbers as needed if unexpected results or there is a need to address increasing use or degradation.

All alternatives are consistent with the Deschutes and Willamette LRMP's standards and guidelines.

Consultation will be required with U.S. Fish and Wildlife Service to document the slight beneficial effect to both spotted owls and Oregon spotted frogs and their critical habitat as this action is not covered under the Deschutes and Ochoco Programmatic BA. The Willamette NF has consultation coverage for recreational disturbance to spotted owls and all alternatives would within the range of effects consulted on. Consultation may be needed for the slight beneficial effect to Oregon spotted frogs and their critical habitat on the Willamette National Forest depending on the alternative selected.

Table 22: Proposed, Threatened, Endangered, and Sensitive Wildlife Species for the Deschutes and Willamette National Forests

Species	Suitable Habitat in Wilder-ness?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Gray Wolf	Yes	Habitat avoidance of high use areas. Effects deemed very low.	No Effect	No Effect	No Effect	No Effect	No Effect
Northern Spotted Owl	Yes	Visitor recreational use does not affect NSO habitat at a meaningful scale. Effects are deemed very low in all alternatives. Potential disturbance to spotted owl habitat on the Deschutes NF. Effects from disturbance thought to be very low on the Willamette.	Low potential for impacts from current recreational use.	This project will improve conditions for spotted owls in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for spotted owls in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for spotted owls in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for spotted owls in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.
Northern Spotted Owl Critical Habitat	No	No CH in wilderness-not an issue	No effect to CH	No effect to CH	No effect to CH	No effect to CH	No effect to CH
Wolverine	Yes	Reduced disturbance potential to denning habitat. Denning should be completed by the time recreational users enter habitat.	There is a potential for disturbance to wolverine denning habitat near trails.	Would have less potential for disturbance to denning habitat than Alt 1, 3 and 4.	Would have less potential for disturbance to denning habitat than Alt 1.	Would have less potential for disturbance to denning habitat than Alt 1 and 3.	Would have the least potential for disturbance to denning habitat
	Yes	Potential disturbance to all	There is limited	May Effect, not likely to adversely	May Effect, not likely to adversely	May Effect, not likely to adversely Effect	May Effect, not likely to adversely Effect the

Species	Suitable Habitat in Wilder-ness?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Oregon Spotted Frog and Critical Habitat	Yes	life stages from recreational activities at known spotted frog breeding sites. Minor habitat impacts from recreational activities within Critical Habitat.	impacts to OSF habitat from recreational use currently (WIL) based on lack of evidence of dispersed camping, trampling, garbage and fire circles in CH during monitoring. More dispersed camping occurring on DES. Low negative effects to OSF habitat expected under this alternative. Low negative effects to habitat not likely to adversely affect OSFs and CH.	Effect the Oregon spotted frog and its habitat. May Effect, not likely to adversely affect Oregon spotted frog Critical Habitat. Some reduction in already low impacts to OSF CH from recreational users expected.	Effect the Oregon spotted frog and its habitat. May Effect, not likely to adversely affect Oregon spotted frog Critical Habitat. Very small reduction in already low impacts to OSF habitat from recreational users expected	the Oregon spotted frog and its habitat. May Effect, not likely to adversely affect Oregon spotted frog Critical Habitat. Very small reduction in already low impacts to OSF habitat from recreational users expected	Oregon spotted frog and its habitat. May Effect, not likely to adversely affect Oregon spotted frog Critical Habitat. Some reduction in already low impacts to OSF CH from recreational users expected.
Peregrine Falcon	Yes	Reduced disturbance	No Impact. No known	No Impact. No known nesting	No Impact. No known nesting sites	No Impact. No known nesting sites	No Impact. No known nesting sites are being

Species	Suitable Habitat in Wilder-ness?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
		potential due to limited entry; reduced habitat loss especially for prey species due to reduced trampling, loss of habitat components	nesting sites are being affected by recreational users. No measurable effects to foraging habitat.	sites are being affected by recreational users. No measurable effects to foraging habitat. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	are being affected by recreational users. No measurable effects to foraging habitat. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	are being affected by recreational users. No measurable effects to foraging habitat. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	affected by recreational users. No measurable effects to foraging habita Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.t.
Bald Eagle	Yes	Potential disturbance to nesting and foraging	Some potential for disturbance to BE nesting at Marion Lake from dispersed camping and off-trail use. Adverse effects to foraging at lakes in wildernesses thought to be low.	May Impact but Less potential for disturbance to BE nesting and foraging compared to Alt 1, 3 and 4. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	May Impact but Less potential for disturbance to BE nesting and foraging compared to Alt 1. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	May Impact but Less potential for disturbance to BE nesting and foraging compared to Alt 1 and 3. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	May Impact but Would have the least potential for disturbance to BE nesting and foraging than the other alternatives. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.
White-headed Wood-pecker	Yes	Potential disturbance to nesting habitat near trails and campsites.	Potential adverse effects from disturbance	May Impact but less potential for adverse effects	May Impact but less potential for adverse effects	May Impact but less potential for adverse effects from	May Impact but least potential for adverse effects from disturbance.

Species	Suitable Habitat in Wilder-ness?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
		However habitat would occur in old fire scars where recreational use is lower.	thought to be low.	from disturbance than Alt 1, 3 and 4.	from disturbance than Alt 1.	disturbance than Alt 1 and 3.	
Lewis' Wood-pecker	Yes	Potential disturbance to nesting habitat near trails and campsites. However habitat would occur in old fire scars where recreational use is lower.	Potential adverse effects from disturbance thought to be low.	May Impact but less potential for adverse effects from disturbance than Alt 1, 3 and 4.	May Impact but less potential for adverse effects from disturbance than Alt 1.	May Impact but less potential for adverse effects from disturbance than Alt 1 and 3.	May Impact but least potential for adverse effects from disturbance.
Bufflehead	Yes	Disturbance potential to nesting habitat along shorelines	There is a potential for disturbance to bufflehead nesting rearing at suitable lakes/ponds, but buffleheads seem to have some tolerance for recreational users.	May Impact but Would have less potential for disturbance to buffleheads than Alt 1, 3 and 4.	May Impact but Would have less potential for disturbance to buffleheads in some areas than Alt 1.	May Impact but Would have less potential for disturbance to buffleheads than Alt 1 and 3.	May Impact but Would have the least potential for disturbance to bufflehead
Northern Waterthrush	No	None	No Impact	No Impact	No Impact	No Impact	No Impact

Species	Suitable Habitat in Wilder-ness?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Harlequin Duck	Yes	Potential for disruption to nesting/breeding ducks adjacent to streams from recreational users	Potential for disruption is thought to be low because limited habitat occurs in the wilderness areas and current breeding populations in wilderness are low or absent	May Impact but Would have less potential for disturbance to harlequin than Alt 1, 3 and 4.	May Impact but Would have less potential for disturbance to harlequins in some areas than Alt 1.	May Impact but Would have less potential for disturbance to harlequins than Alt 1 and 3.	May Impact but Would have the least potential for disturbance to harlequins
Sage Grouse	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Yellow Rail	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Tule Goose	No	None	No Impact	No Impact	No Impact	No Impact	
Black Swift	Potential	Very unlikely because they nest behind waterfalls that are typically steep and inaccessible. One known site on WIL is a non-wilderness developed trailhead where many people come to view the falls and hike trails	No Impact	No Impact	No Impact	No Impact	No Impact
Purple Martin	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Pacific Fisher	Yes	WIL-Recreational use is not affecting	Potential adverse	May Impact but less potential for	May Impact but less potential for	May Impact but less potential for adverse	May Impact but least potential for adverse

Species	Suitable Habitat in Wilder-ness?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
		habitat at a meaningful scale. Risks from disturbance seems low.	effects from disturbance thought to be low.	adverse effects from disturbance than Alt 1, 3 and 4.	adverse effects from disturbance than Alt 1.	effects from disturbance than Alt 1 and 3.	effects from disturbance.
Sierra Nevada Red Fox	Yes	Disturbance potential to denning and foraging habitat in high use areas and along trails. SNRF seem to tolerate some human presence.	Potential adverse to denning and foraging habitat in high use areas and along trails.	May Impact but Would have less potential for disturbance to denning and foraging habitat than Alt 1, 3 and 4.	May Impact but Would have less potential for disturbance to denning and foraging habitat than Alt 1.	May Impact but Would have less potential for disturbance to denning and foraging habitat than Alt 1 and 3.	May Impact but Would have the least potential for disturbance to denning and foraging habitat
Townsend's big-eared bat	Yes	Wilderness recreational users are not affecting COTO forest habitat at a measurable scale. Some potential for disturbance to COTO in caves.	Potential adverse effects from disturbance thought to be low.	May Impact but less potential for adverse effects from disturbance than Alt 1, 3 and 4.	May Impact but less potential for adverse effects from disturbance than Alt 1.	May Impact but less potential for adverse effects from disturbance than Alt 1 and 3.	May Impact but least potential for adverse effects from disturbance.
Pallid Bat	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Spotted Bat	Yes	Potential disturbance to roosting habitat from climbers and to foraging habitat along trails.	Potential adverse effects from disturbance thought to be low	May Impact but less potential for adverse effects from disturbance than Alt 1, 3 and 4.	May Impact but less potential for adverse effects from disturbance than Alt 1.	May Impact but less potential for adverse effects from disturbance than Alt 1 and 3.	May Impact but least potential for adverse effects from disturbance.
Fringed Myotis	No	None	No impact.	No impact.	No impact.	No impact.	No impact.

Species	Suitable Habitat in Wilder-ness?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Columbia Spotted Frog	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Foothill Yellow-legged Frog	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Western Pond Turtle	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Johnson's Hairstreak	Yes	Wilderness recreational users are not affecting forest mistletoe habitat at a measurable scale.	No Impact	No Impact	No Impact	No Impact	No Impact
Silver-bordered Fritillary	Yes	Potential habitat alteration to wet areas	Localized impacts to habitat from camping and walking	May Impact but less potential for adverse effects than Alt 1, 3 and 4.	May Impact but less potential for adverse effects than Alt 1.	May Impact but less potential for adverse effects than Alt 1 and 3.	May Impact but least potential for adverse effects from impacts to nectar and pollen sources.
Western Bumble Bee	Yes	Recreational trails including user trails and dispersed camping may have impacts to nectar and pollen sources	Potential impacts to pollen and nectar sources are thought to be very low but may occur in some high-use areas	May Impact but less potential for adverse effects than Alt 1, 3 and 4.	May Impact but less potential for adverse effects than Alt 1.	May Impact but less potential for adverse effects than Alt 1 and 3.	May Impact but least potential for adverse effects from impacts to nectar and pollen sources.
Crater Lake Tightcoil	Yes	Very low potential that recreational impacts to riparian areas would have negative	Potential adverse effects thought to be negligible.	Less potential for adverse effects than Alt 1, 3 and 4.	Less potential for adverse effects than Alt 1.	Less potential for adverse effects than Alt 1 and 3.	Least potential for adverse effects from impacts to riparian areas.

Species	Suitable Habitat in Wilder-ness?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
		consequences to individuals or populations					
Shiny Tightcoil	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Gray-Blue Butterfly	No	None	No Impact	No Impact	No Impact	No Impact	No Impact
Mardon Skipper	No	None	No Impact	No Impact	No Impact	No Impact	No Impact

Table 23: Management Indicator Species for the Deschutes and Willamette National Forests

Species	Suitable Habitat in Wz?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Northern Goshawk	Yes	Potential disturbance to nesting and foraging along trails and campsites	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for northern goshawks in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for northern goshawks in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for northern goshawks in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for northern goshawks in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.
Coopers Hawk	Yes	Potential disturbance to nesting and foraging along trails and campsites	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for Cooper's hawk in the project area. Therefore, the Cascades Crest	This project will improve conditions for Cooper's hawk in the project area. Therefore, the Cascades Crest	This project will improve conditions for Cooper's hawk in the project area. Therefore, the Cascades Crest	This project will improve conditions for Cooper's hawk in the project area. Therefore, the Cascades Crest

Species	Suitable Habitat in Wz?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
				Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.
Sharp-shinned Hawk	Yes	Potential disturbance to nesting and foraging along trails and campsites	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for sharp-shinned hawks in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for sharp-shinned hawks in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for sharp-shinned hawks in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for sharp-shinned hawks in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.
Great Gray Owl	Yes	Potential disturbance to nesting and foraging along trails and campsites. Potential habitat impacts to meadows from camping.	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for great gray owl in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for great gray owl in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for great gray owl in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for great gray owl in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.
Great Blue Heron	Yes	Potential disturbance to nesting and foraging along trails,	Potential adverse effects from disturbance	This project will improve conditions for great blue heron in the project area.	This project will improve conditions for great blue heron in the project area. Therefore, the	This project will improve conditions for great blue heron in the project area. Therefore, the	This project will improve conditions for great blue heron in the project area. Therefore, the

Species	Suitable Habitat in Wz?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
		campsites, and shorelines	thought to be low.	Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.
Golden Eagle	Yes	Potential disturbance to nesting and foraging along trails and campsites	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for golden eagle in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for golden eagle in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for golden eagle in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for golden eagle in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.
Waterfowl	Yes	Potential disturbance to nesting and foraging at lakes	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for waterfowl in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for waterfowl in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for waterfowl in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for waterfowl in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.
Cavity Excavators	Yes	Potential disturbance to nesting and foraging	Potential adverse effects from disturbance	This project will improve conditions for cavity excavators in the	This project will improve conditions for cavity excavators in the project area.	This project will improve conditions for cavity excavators in the project area.	This project will improve conditions for cavity excavators in the project area.

Species	Suitable Habitat in Wz?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
		along trails and campsites	thought to be low.	project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.
Pileated Woodpecker	Yes	Potential disturbance to nesting and foraging along trails and campsites	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for pileated woodpecker in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Willamette NF.	This project will improve conditions for pileated woodpecker in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Willamette NF.	This project will improve conditions for pileated woodpecker in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Willamette NF.	This project will improve conditions for pileated woodpecker in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Willamette NF.
Red-tailed Hawk	Yes	Potential disturbance to nesting and foraging along trails and campsites	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for red-tailed hawk in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for red-tailed hawk in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for red-tailed hawk in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for red-tailed hawk in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.

Species	Suitable Habitat in Wz?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Osprey	Yes	Potential disturbance to nesting and foraging along trails and campsites especially near fish bearing lakes	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for osprey in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for osprey in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for osprey in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.	This project will improve conditions for osprey in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes NF.
Marten	Yes	Disturbance potential to denning and foraging habitat in high use areas and along trails. Some habitat impacts from the loss of down woody material collected as firewood.	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for marten in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for marten in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for marten in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for marten in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.
Elk	Yes	Disturbance potential to summer habitat	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for elk in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the	This project will improve conditions for elk in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the	This project will improve conditions for elk in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the	This project will improve conditions for elk in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the

Species	Suitable Habitat in Wz?	Impacts	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
				Deschutes and Willamette NFs.	Deschutes and Willamette NFs.	Deschutes and Willamette NFs.	Deschutes and Willamette NFs.
Deer	Yes	Disturbance potential to summer habitat	Potential adverse effects from disturbance thought to be low.	This project will improve conditions for deer in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for deer in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for deer in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.	This project will improve conditions for deer in the project area. Therefore, the Cascades Crest Wilderness Strategies project will not contribute to a negative trend in viability on the Deschutes and Willamette NFs.

Botany (Threatened, Endangered, and Sensitive Species) and Invasive Plants

Introduction

This analysis will examine the effects of changing visitor use objectives to maintain wilderness values on threatened, endangered, and sensitive (TES) plants and invasive plants in the central Cascades Wilderness Areas including Mt. Jefferson, Mt. Washington, Three Sisters, Waldo, and Diamond Peak Wilderness Areas.

Destruction of special habitats and TES plants can occur through trampling, firewood collection, improper disposal of human waste, campsite establishment, and fire ring construction. The risk of spread of noxious weeds increases with human use. Trampling and compaction and increases in bare soil open sites for potential invasion by invasive plants and noxious weeds. Indicators are the number of people using the wilderness for day use, and number of groups, both gauged by permits from trailheads.

Affected Environment

The central Oregon Cascade wildernesses support a wide variety of vegetation communities, including forested, non-forested, upland, alpine, riparian, fen, and other wetland environments. This variety of plant communities supports a wide variety of plant species, including rare plant species with special protections under law and regulation (See Table 25 for species documented or suspected in the central Cascade wildernesses).

No federally-listed plant species habitat occurs in the project area. Therefore, no consultation with Fish and Wildlife Service will be necessary and protections under the Endangered Species Act do not apply. However, there is a Candidate for listing and Forest Service policy is to avoid any adverse actions that may contribute to the need for listing.

Several USFS sensitive plant species are likely to or are known to have habitat in the project area. The Forest Service is required under Forest Service policy to manage to maintain viable populations of these species under FSM 2670.32.4, The National Forest Management Act (36 CFR 219.20) and USDA Departmental Regulation 9500-4.

Threatened Endangered and Sensitive (TES) Plants

Whitebark pine (*Pinus albicaulis*), a candidate species for federal listing, is found in the project area. A candidate species is one for which the US Fish and Wildlife Service has sufficient information on biological vulnerability and threats to support a proposal for listing as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions. Whitebark pine, though in decline is a frequent component of subalpine forests in the mountain ranges of western North America.

Whitebark pine is found in the appropriate habitat on both sides of the Cascade crest from about 5,250 feet to almost 9,200 feet. Trees are clumped but scattered across the slopes of the taller peaks. At the highest elevations, whitebark pine is a dominant species in subalpine krummholz plant communities. Krummholz is a bent and stunted forest shaped by continual exposure to fierce, freezing winds. The Whitebark Pine Restoration Strategy (2008) lists four threats to whitebark pine: white pine blister rust, mountain pine beetle, fire and climate change. In the central cascades, white bark pine is commonly infected with white pine blister rust (*Cronartium ribicola*). Outbreaks of mountain pine beetle affect trees on both sides of the Cascade crest. The central Cascades have

experienced many fires in the past two decades; white bark pine is adapted to fire, but stand replacing fires are detrimental. Climate change brings lower snowpack, warmer winter temperatures, shorter winters, all of which impact white bark pine habitat.

White bark pine is located in the heart of the high country with high lakes, large meadows and unobstructed vistas. Impacts from firewood collection, user created trails and user created camp sites are common (Cole 1989). Firewood collection depletes the already open understory of limited woody debris, important for its moisture holding capacity, nutrient contribution, and substrate for nonvascular plants, fungi, and invertebrates. Long-term impacts from tree damage and felling, tree root exposure, and loss of tree regeneration can result in a reduction and loss of the forest canopy (Marion et al. 2016) Campsites and user created trails trample fragile vegetation found in white bark pine habitat, such as grouse whortleberry (*Vaccinium scoparium*), a valuable source of food for wildlife.

Recreational impacts on understory vegetation are primarily trampling and crushing, from campsites and cross country travel, which over time lead to the destruction of plants leaving bare soil, prime for erosion (Cole 1989; Marion, et al. 2016; Willard and Mars 1970, 1971). Meadow vegetation consisting of sedges and grasses is most resilient due to low stature, narrow leaves, and available moisture and nutrients. Forest vegetation, with large leaves and upright stature and woody shrubs are the most susceptible to trampling and crushing. Even meadow systems succumb to the effects of moderate to heavy trampling (Marion et al. 2016).

Thirty-two sensitive plant species are known to occur in the project area. Fourteen are liverworts, small, inconspicuous moss-like plants. Most grow in areas that are unlikely to be disturbed by trail use or camping. Three species have the potential to be trampled because they grow on soil in open areas (*Haplomitrium hookeri*), along trails near Denude Lake in the Sister's Mirror Lake basin (*Trematodon asanoi*) or in meadows (*Nardia japonica*). Several are found in the Linton Meadow/Eileen Lake and Husband Lake basin at the base of The Husband on the west side of Three Sister's Wilderness (*Chiloscyphus gemmiparus, Schofieldia montocola, Haplomitrium hookeri*). Linton Meadows had five very rare bryophytes found mostly in the southern end of the meadow. This is a basin where there is a moderate to high density of camping because of meadows for level camping, easily obtainable water and proximity to the Pacific Crest Trail.

Several sensitive vascular plants are located in the central Cascade wilderness areas. There is one wildflower (*Gentiana newberryi* var. newberryi), and a grass (*Calamagrostis breweri*), in the project area that are meadow species and could be subject to trampling. Newberry gentian, located near Hand Lake in Mt. Washington Wilderness, is also experiencing some natural decline due to lack of fire thinning out young, competing lodgepole pine.

Park Meadow is an area of concern with lots of campsites in combination with the junction of Green Lakes Trail and Park Meadow Trail and sensitive *Carex capitata* (captiate sedge) and sensitive aquatic plant *Utricularia minor* (lesser bladderwort) as well as whitebark pine.

Calamagrostis breweri is of concern because it is a disjunct endemic grass species whose known distribution on National Forest lands within Oregon is limited to Mt. Hood and Mt. Jefferson. The population in the project area is located at Jefferson Park, a heavily used camping area at the western base of Mt Jefferson. Many heavily used areas adjacent to Bays, Scout and Russell Lakes, overlap with known *Calamagrostis* habitat.

Many wetland species are documented from the western side of the crest: Scheuchzeria palustris, *Lycopodiella inundata*, *Carex diandra* and *C. livida* and *Utricularia minor* and *U. ochroleuca*.

While these habitats, usually wet throughout the summer, are very important for wildlife, they don't tend to draw people to camp or aggregate in them because they are simply too wet.

There are ten sensitive plant species that are associated with rock, cliffs, scree or gravel, some of which might be subject to impacts from rock climbing and social (informal, user-created) trails.

There are many species associated with old growth forests (Northwest Forest Plan Survey and Manage Species) documented from the project area, including forty-one species of fungi, seven lichen species, five bryophytes, and one orchid. Diamond Peak Wilderness is home to a number of SM fungi sites at least two are along the Trapper Creek trail. There is also a site of *Jungermannia polaris* (liverwort) at a spring below Diamond Peak; a spring that hikers may access. Since the proposed project does not include ground disturbing activities, Survey and Manage species will not be discussed in detail.

There are likely more sensitive and rare species in the high Cascades wilderness areas, because there have been relatively few sensitive plant surveys conducted in wilderness. Surveys have occurred in some high probability habitat in Waldo Lake, Diamond Peak and Three Sisters Wildernesses, but not all areas have been covered with survey.

Invasive Plants

Invasive plants are generally sun-loving and come in after disturbance. However, there are some invasive plants that can tolerate shade, such as false brome. Spotted, diffuse and Russian knapweeds, leafy spurge, and yellow star thistle, all have histories of moving into relatively undisturbed areas. Invasive plants are masters of spread, equipped with highly effective distribution methods. Weeds are spread by vehicles, humans, horses, livestock, wind, water, and wildlife (Asher and Harmon 1995). In the case of back country recreationists, seeds can adhere to backpacks and other equipment, boots, socks, pack animals and dogs. In combination with trampling, which can cause reduction or elimination of native vegetation, the introduction and spread non-native plants is a potentially serious threat.

OSU in partnership with the Willamette National Forest, conducted backcountry invasive weeds surveys concentrated in wilderness areas in 2008 and 2009 along high traffic corridors in high traffic areas of Mount Jefferson, Three Sisters, and Diamond Peak Wilderness Areas. The survey indicated that in general, the major trail corridors of wilderness areas of Central Oregon were relatively unoccupied by invasive species (Reuter 2011). More recent information about weeds in the central Cascades Wilderness Areas is spotty. Some surveys were completed in 2013 as part of the Chief's Wilderness Challenge, but only a small percentage of the Wildernesses was surveyed. The focus of the 2013 surveys was on trailheads and the first couple of miles of trail.

There are eleven species of noxious weeds documented from the project area (Table 24). Weeds are found along trails, at trailheads and other disturbed areas. The most concerning weed species in the project area is spotted knapweed. It is found along most of the highway corridors that bisect the crest wildernesses (Highway 20 between Mt. Jefferson and Mt. Washington Wildernesses, Highway 242 between Mt. Washington and the Three Sisters Wildernesses). Knapweed is pulled regularly at the PCT trailhead on Highway 20. On the east side of Mt. Jefferson Wilderness, cheat-grass and spotted knapweed have invaded the Jefferson Lake Trailhead and it extends down the trail. False brome, now a roadside species on Highway 242, is currently outside of the Wilderness, but the wildfires of 2017 have created open areas where it could spread. False brome is also found at the Olallie Trailhead. False brome is typically found at elevations below 3500 feet (Washington) in

Douglas-fir and western hemlock plant associations, although it can reach up into the Pacific silver fir associations. The sites adjacent to the central Cascades Wildernesses are under 4000 feet.

The lakes on the west side of Mount Jefferson Wilderness are another area of concern Canada thistle is located adjacent to Pamelia Lake and shiny buttercup was located last summer (2016) at Marion Lake. Both of these areas experience very heavy recreational use. There have been and continue to be efforts to rehabilitate sites at Pamelia Lake in conjunction with school groups and non-profit organizations.

Table 24: Invasive Plant Species Documented or Suspected in the Central Cascade Wilderness Areas

DESCHUTES NATIONAL FOREST				
Species	**Diamond Pk**	**Mt Jeff**	**Mt Wash**	**Three Sisters**
Bromus tectorum		2		
Centaurea diffusa	1		1	1
Centaurea stoebe ssp. micranthos	1		1	1
Cirsium arvense	1			
Cirsium vulgare	1			
Cytisus scoparius	1	1		
Hypericum perforatum	1			
Verbascum thapsus	1	2		
WILLAMETTE NATIONAL FOREST				
Species	**Mt Jeff**	**Mt Wash**	**Three Sisters**	**Waldo Lake**
Brachypodium sylvaticum		1	4	1
Centaurea stoebe ssp. micranthos	1		1	
Cirsium arvense			3	
Cirsium vulgare			2	
Phalaris arundinacea			2	1
Senecio jacobaea				1

Regulatory Framework

Legislative Direction: The Wilderness Act of 1964 directs agencies to manage wilderness to preserve natural ecological conditions.

1976 NFMA statute and implementing regulations of 1982 provide statutory direction for managing the National Forest System to provide for diversity of plant and animal communities.

FSM 2620 includes direction regarding habitat planning and evaluation, including specific forest planning direction for meeting biological diversity requirements.

The 1983 USDA Departmental Regulation 9500-4 provides further direction to the Forest Service, expanding the viability requirements to include plant species

Specific FSM direction, from 1986, concerning viability of plant and animal species includes:

"Management of habitat provides for the maintenance of viable populations of existing native and desired non-native wildlife, fish, and plant species, generally well-distributed throughout their current geographic range" (FSM 2622.01(2))

"Maintain viable populations of all native and desired non-native wildlife, fish and plant species in habitats distributed throughout their geographic range on National Forest System lands." (FSM 2670.22(2))

Deschutes NF and Willamette NF Land Resource Management Plans express the desire to provide for plant and animal community diversity and ecological health in the interest of conservation and effective forest management practices.

Environmental Consequences

Analysis Methodology

Person days at site, based on early documentation, link trampling by human visitors to the degradation of alpine ecosystems (Willard and Marr 1970; Willard and Marr 1971; Cole 1989; Cole and Landres 1996). However other considerations such as changes in species composition, plant vigor, and soil loss are also key to understanding human impacts on vegetation in wilderness settings (Cole 1989; Cole and Landres 1996; Leung and Marion 2000; Monz et al. 2013). Due to a lack of consistent and uniform botanical inventory and assessment of botanical resources in the central Cascades Wilderness, the alternatives will be compared by how much use is reduced in sites and areas where recreational use is currently high.

Comprehensive botanical surveys for sensitive plants, community composition, and trampling impacts specific to the condition of subalpine and alpine habitats in the central Oregon Cascades wildernesses have not been completed. There are a handful of surveys that have been done in the recent past for TES plants (Veverka and Dewey 2015; Salix and Associates 20015 and 2007) and invasive plants (Reuter 2011).

Spatial and Temporal Context for Effects Analysis

Available literature suggests that one summer of heavy use can reduce vegetation cover by about twelve percent on user created trails, two seasons of heavy use can reduce vegetation cover to about one third of its original extent in alpine tundra (Willard and Marr 1970). Direct effects to vegetation include: loss of ground vegetation cover/ soil exposure, loss of species, loss of shrub and tree species, tree trunk damage, and introduction of invasive species.

Willard and Marr (1970) reported it took about 38 years to virtually remove all vegetation from a well-loved viewpoint. Habitat, number of people and time are all factors in how quickly an area will lose vegetation. Indirect effects include: soil compaction, reduced height and vigor, composition change, altered microclimate, accelerated soil erosion.

The spatial context is the extent of the central Cascade Wilderness Areas. The temporal context is ten years, based on recent wildfire history and the general life expectancy of planning documents.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis: Wildfires are part of the Cascades ecosystem. While wildfires are not planned activities, they are likely in the foreseeable future and may affect how the public uses the Central Cascades Wilderness. However, they are not considered in cumulative effects analysis because they are unplanned and unpredictable. Post-fire management actions, such as re-routing trails and area closures for safety reasons, have the potential to concentrate use in areas that have had less impact from recreational use in the past. Continued unregulated recreational use in a growth area, such as the central

Cascades, could have long term impacts of vegetation over time. The loss of less trampling resilient plants can result in long term compositional changes, including the introduction and proliferation of non-native invasive plants (Marion et al. 2016).

Environmental Consequences

Alternative 1 – No Action

Under the No Action Alternative, unregulated use of the central Cascade Wilderness areas by hikers will continue over most of the area, with the exception of current limited entry at some trailheads (Obsidian in Three Sisters and Pamelia in Mt. Jefferson). Intensity and frequency of use is likely to continue to increase as the population of western and central Oregon increases. As nearby urban centers increase in population, it is reasonable to expect an increasing popularity of the Central Cascade Wilderness areas.

With increased use, it is reasonable to assume there will be increased trampling along trails and in camping areas. Trampling initially destroys the above ground portions of forbs and grasses as well as killing lichens and bryophytes that provide ground cover (Willard and Mar 1970). Ground cover is key to conserving soil. Soil loss and soil compaction have negative effects on plant communities, resulting in a decline of population size and potentially population viability of rare and endemic plants in the area. Disturbance leading to loss of native plant cover increases the risk of spreading invasive plant species. In addition, soil loss and compaction has negative effects on the mycorrhizal community, which includes a number of rare and sensitive fungi (Trappe et al. 2009). In a study of campsites in the wilderness, Reuter (2011) found that of the 132 sampled sites in Jefferson, Three Sisters and Diamond Peak Wildernesses, 60 had two or less damaged trees, the remaining 54% of the campsites had more than two trees showing evidence of camper abuse.

While one could argue that the no action is the baseline, no action is not a static condition in an area where recreational use is growing so quickly. The number of people visiting the central Cascade wilderness areas has increased dramatically between 2011 and 2016, ranging from 28% in Mount Jefferson Wilderness to 181% increase for the Three Sisters Wilderness (based on records of the number of permits issued at trailheads). The effects may not change, but the area that is impacted will likely increase.

The effect of no action would be the expansion into new campsites and more user created trails, which would have negative effects on all TES plants, and a potential loss in biodiversity of all habitats through increased recreational use and subsequent increased risk for the introduction and spread of non-native invasive species.

Alternative 2 – Proposed Action

The proposed action focuses on reducing recreational use on the east side of Three Sisters Wilderness and the areas accessing Jefferson Park in the Mt. Jefferson Wilderness. Twenty-seven trailheads would require day use permits based on trailhead quotas in the Three Sisters Wilderness. Eighteen trailheads in Mt. Jefferson Wilderness could require day use permits based on trailhead quotas. There would be overnight permits and quotas for all the wilderness areas, but no restrictions on where camping could occur. Day use would remain unregulated for the Mt. Washington, Waldo, and Diamond Peak Wildernesses.

Use monitoring and adaptive management to adjust for any displacement of hikers and campers that impact resources. Measure for TES plants could be loss of individuals or groups and areas with evident signs of trampling and bare soil, focusing on trailheads, trails, and campsites where use is

increasing. Increasing use could be calibrated using permit data and campsite inspections. Invasive plants could be monitored through inventories of high use areas for presence/absence, concentrating on trailheads, TES plant sites, and heavily used campsites.

Trampling of vegetation, including TES plants, can cause not only the loss of individuals and populations, but habitat loss through changes in community composition, increases in bare soil, and soil compaction. Indirect effects are losses in plant health and viability and reduction in canopy cover. Repeated damage over time can cause the loss of individuals and eventual loss of populations.

The proposed action would reduce negative impacts to areas of greatest concern including all east side access points for the Three Sisters Wilderness and access from Highway 242, and all west side access for Jefferson Wilderness. However, increased use of currently less used trail heads and trails might result and with it damage to associated TES plant populations. The 5700 foot and greater ban on campfires could help impacts to white bark pine and other high elevation trees in all wilderness areas except Diamond Peak and Waldo. The elevation limit in Diamond Peak Wilderness would be 6000 feet. There will be no elevation ban on campfires in Waldo Wilderness. Campfires substantially alter soil properties, including a reduction in soil biota, and organic content. It can take 10-15 years for soil to recover.

Setbacks from water sources would be changed from a designated distance to an educational outreach to recreationists and subsequent application. Impacts to special habitats along lake shores such as willow thickets and meadows could be possible. Increased use of Mt. Washington, with limits at only four trailheads, as well as Waldo, and Diamond Peak Wildernesses where no day use regulation would be in place, could cause increased use and subsequent negative impacts on native vegetation, special habitats and TES plant populations.

Areas of specific concern for increases in damage to TES plants would be the Cabot Lake trail head and trail, possibly others on the east side to the south accessing the Mt. Jefferson Wilderness. Linton Meadow is of concern with five rare bryophytes. Alternative 2 will limit access on all trailheads along highway 242, which should help protect botanical resources at Linton Meadow.

Mt Washington Wilderness is to the north of highway 242. There are infestations of false brome and knapweed along road 242. Wildfires from 2017 have opened the understory as well as canopy, creating new potential habitat for knapweed and false brome. All trails accessing Mt. Washington wilderness from 242 could be at risk of spreading false brome and knapweed into the wilderness. Although false brome is typically found at lower elevations, climate change may allow false brome to survive at increasingly higher elevations.

Cumulative Effects

The creation of the central Cascades wilderness areas and current restrictions for Pamelia Lake and Obsidian in combination with the actions described in Alternative 2, the proposed action, would benefit TES plants, and special habitats in general. Other projects, such as general trail maintenance and annual fish stocking transport would have minimal negative effects.

Alternative 3

Alternative 3 would focus on current high use areas. Permitting and quotas focus is on the most used parts of Three Sisters and Mt. Jefferson Wilderness. There are fewer trailheads requiring permits for day use than in the proposed action, with ten trailheads for Three Sisters, seven for Mt. Jefferson, and two for Mt. Washington. Day use in the remainder of the central Cascades wilderness areas would be unpermitted. Overnight camping would require permits in zones where use is

heaviest in Three Sisters and Mt. Jefferson wilderness areas. The remainder of the central Cascades wilderness areas would be open to camping anywhere with no permits or quotas. Monitoring and adaptive management would be the same as in the proposed action, Alternative 2.

Alternative 3 would reduce negative impacts to areas of greatest concern. However, increased use of currently less used trails outside the high use areas might result in damage to associated TES plant populations, sensitive habitats and native vegetation in general. Unlike Alternative 2, the proposed action, Alternative 3 allows for possible setbacks from water and the use of adaptive management to put setbacks in place. The setbacks could be beneficial to TES plants and sensitive habitats by reducing tramping and soil compaction of seasonally wet areas.

Permits for overnight camping would be implemented only in zones of the Three Sisters and Mt. Jefferson where use is currently heaviest. The remainder of the central Cascades wilderness areas would be open for camping anywhere. Camping would be allowed anywhere except designated areas of high use in the Three Sisters and Mt. Jefferson Wildernesses, where reservations would be required. The reservation requirement could benefit TES plants and special habitats in specific locations, particularly Brewers reedgrass at Jefferson Park. White bark pine could benefit from the 5700 ft. campfire ban. Linton Lake may be subject to increased use with the closure of Obsidian off Highway 242.

Trampling of vegetation, including TES plants, can cause not only the loss of individuals and populations, but habitat loss through changes in community composition, increases in bare soil, and soil compaction. Indirect effects are losses in plant health and viability and reduction in canopy cover. Repeated damage over time can cause the loss of individuals and eventual loss of populations.

Areas of specific concern for increases in damage to TES plants would be all trails accessing Mt. Washington wilderness from Highway 242 could be at risk of spreading false brome and knapweed into the wilderness. Climate change may allow false brome to survive at increasingly higher elevations.

Increased use of the central Cascades wildernesses outside of high use areas, could occur, but perhaps with less displacement impacts to TES plants, special habitats and native vegetation in general because more area is left open for unpermitted use.

Cumulative Effects

As for the proposed action described in Alternative 2, the creation of the central Cascades wilderness areas and current restrictions for Pamelia Lake and Obsidian in combination with the actions described in Alternative 3, would benefit TES plants, and special habitats in general; however some sites, such as Linton Lake could experience increased use through displacement.

Alternative 4

Alternative 4 would focus on reducing visitor impacts at current high use trailheads, while accounting for some anticipated displacement and growth. Seventeen trailheads in the Three Sisters Wilderness and 10 trailheads in the Mt. Jefferson Wilderness would have limited entry, similar to Alternative 3. High use zones in Three Sisters and Mt. Jefferson would require overnight reservations, as in Alternative 3. The main difference between Alternative 3 and Alternative 4 with respect to TES plants and special habitats is that a permit would be required for overnight use for all the central Cascades Wilderness areas. This would provide greater protection for TES plants, special habitats and native plants in general. Day use for trailheads in the central Cascades wilderness areas not identified as high use/potentially high use in the near future would be open for

unpermitted use without quotas. Monitoring and adaptive management would be the same as in the proposed action, Alternative 2.

Direct and Indirect effects for Alternative 4 are the same as those for Alternative 3, except that the effects of camping in less popular areas might be reduced with the implementation of permits based on quotas. Linton Meadows botanical resources will be more likely conserved in Alternative 4.

Cumulative Effects: Cumulative effects would be similar to those for Alternatives 2 and 3.

Alternative 5

All trailheads would require permits for day use and overnight use. There would be camping reservations implemented for all zones in all five central Cascades wilderness areas. Monitoring and adaptive management would be the same as other action alternatives.

Trampling of vegetation, including TES plants, can cause not only the loss of individuals and populations, but habitat loss through changes in community composition, increases in bare soil, and soil compaction. Indirect effects are losses in plant health and viability and reduction in canopy cover. Repeated damage over time can cause the loss of individuals and eventual loss of populations.

Alternative 5 would provide the greatest "protection" from use levels that create negative impacts. Alternative 5 would provide the greatest benefit for TES plants, special habitats and native plant communities. Like Alternatives 3 and 4 setbacks from water would be implemented when monitoring indicated a need. As in all the action alternatives, there would be a campfire ban for sites at or over 5,700 feet in Three Sisters, Mount Jefferson, and Mount Washington wildernesses, benefitting high elevation trees. Reducing the number of users for both day and overnight would be the most effective way to reduce trampling of vegetation, habitat loss, and soil compaction. Less disturbance will reduce the risk of introduction, or spread of invasive plants. Problems with displacement of use to currently pristine areas would be eliminated, which would benefit all botanical values.

Cumulative Effects: Cumulative effects for Alternative 5 are the same as for the other action alternatives.

Summary of Effects

All the action alternatives comply with relevant laws, regulation, policies, and the Willamette and Deschutes Forest Plans. Alternatives 2 and 3 do not conserve botanical resources as effectively as Alternative 4 and 5. Alternative 5 provides the best conservation of botanical resources as described in Forest Service and Wilderness guidance.

Table 25: Effects determinations based on known TES plant sites

Species	Growth Form	Mgt type	Rationale for Effects Call	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Anastrophyllum minutum	Liverwort	Rocks, Cliffs, Scree, gravel	One site in Three Sisters. Location unlikely to experience much recreational use.	NI	NI	NI	NI	NI
Anthelia julacea	Liverwort	Soil	One site in Diamond Peak. Six sites in Three Sisters. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI

Species	Growth Form	Mgt type	Rationale for Effects Call	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Arnica viscosa	Sunflower	Rocks, Cliffs, Scree, gravel	One site in Three Sisters. Location would receive less use with implementation of any of the action alternatives.	MIIH	BI	BI	BI	BI
Barbilophozia lycopodioides	Liverwort	Rocks, Cliffs, Scree, gravel	Two sites in Mt Jefferson. This area has existing limited entry.	NI	NI	NI	NI	NI
Botrychium pumicola	Ferns	Rocks, Cliffs, Scree, gravel	Eight sites in Three Sisters. Location would receive less use with implementation of any of the action alternatives.	MIIH	BI	BI	BI	BI
Calamagrostis breweri	Grass	Meadow	Nine sites in Mt Jefferson. Locations would receive less use with implementation of any of the action alternatives.	MIIH	BI	BI	BI	BI
Carex capitata	Sedge	Meadow	Three sites in Three Sisters. Alternatives 3 and 4 leave access to some sites unregulated.	MIIH	BI	MIIH	MIIH	BI
Carex diandra	Sedge	Wetland	Two sites in Three Sisters. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Carex livida	Sedge	Wetland	One site in Three Sisters. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Cephaloziella spinigera	Liverwort	Wetland	One site in Three Sisters. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
*Chiloscyphus gemmiparus (Rivulariella gemniparus)**	Liverwort	Aquatic/ Riparian	Six sites in Mt Jefferson and eight sites in Three Sisters. Locations would receive less use with implementation of any of the action alternatives.	MIIH	BI	BI	BI	BI
Eucephalus gormanii	Sunflower	Rocks, Cliffs, Scree, gravel	One site in Mt Jefferson. Location would receive less use with implementation of any of the action alternatives.	MIIH	BI	BI	BI	BI
Gentiana newberryi var. newberryi	Gentian	Meadow	One site in Three Sisters. Location would receive less use with implementation of any of the action alternatives.	MIIH	BI	MIIH	MIIH	BI
Haplomitrium hookeri	Liverwort	Soil	One site in Three Sisters. Would receive less use with implementation of any of the action alternatives.	MIIH	BI	MIIH	MIIH	BI
Harpanthus flotovianus	Liverwort	Wetland	Four sites in Three Sisters. Locations would receive less use with implementation of any of the action alternatives.	MIIH	BI	BI	BI	BI

Species	Growth Form	Mgt type	Rationale for Effects Call	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Helvella crassitunicata	Morels, Elfin Saddles, Cup Fungi	Forest	One site in Mt Jefferson and 1 site in Mt Washington. Some locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Hieracium horridum	Sunflower	Rocks, Cliffs, Scree, gravel	One site in Three Sisters. Location may experience greater use due to displacement.	MIIH	BI	BI	BI	BI
Jungermannia polaris	Liverwort	Rocks, Cliffs, Scree, gravel	One site in Three Sisters. Locations would receive less use with implementation of the action alternatives except 3. One site in Diamond Peak. Location unlikely to experience much recreational use.	MIIH	BI	MIIH	BI	BI
Lycopodiella inundata	Clubmoss	Wetland	Three sites in Diamond Peak and three sites in Mt Washington. Some locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Marsupella emarginata var. aquatica	Liverwort	Aquatic/ Riparian	One site in Waldo. Location unlikely to experience much recreational use.	NI	NI	NI	NI	NI
Nardia japonica	Liverwort	Meadow	One site in Three Sisters. Location unlikely to experience much recreational use.	NI	NI	NI	NI	NI
Pinus albicaulis	Conifer (Tree)	Forest	Throughout central Cascades. Elevational range for PIAL is 5250 to 9200 ft. Elevational fire ban is too high in Diamond Pk and nonexistent in Waldo for all alternatives.	MIIH	MIIH	MIIH	MIIH	MIIH
Preissia quadrata	Liverwort	Rocks, Cliffs, Scree, gravel	Four sites in Mt. Jefferson Wilderness. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Ramaria amyloidea	Coral and Club Fungi	Forest	Five sites in Diamond Peak. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Romanzoffia thompsonii	Waterleaf	Rocks, Cliffs, Scree, gravel	One site in Waldo. Location may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Scapania obscura	Liverwort	Riparian	One site in Three Sisters. Location unlikely to experience much recreational use.	NI	NI	NI	NI	NI
Scheuchzeria palustris ssp. americana	Rush-like	Wetland	Two sites in Three Sisters. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI

Species	Growth Form	Mgt type	Rationale for Effects Call	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Schofieldia monticola	Liverwort	Riparian/ Soil	Three sites in Three Sisters and one site in Waldo. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Tholurna dissimilis	Fruticose Epiphyte	Forest	One site in Three Sisters. Location may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Trematodon asanoi	Moss	Riparian/ Soil	One site in Three Sisters. Location would receive less use with implementation of any of the action alternatives.	MIIH	BI	BI	BI	BI
Utricularia minor	Bladder- wort	Aquatic	One site in Diamond Peak. Six sites in Three Sisters. Locations may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI
Utricularia ochroleuca	Bladder- wort	Aquatic	One site in Waldo. Location may experience greater use due to displacement.	MIIH	MIIH	MIIH	MIIH	BI

*Notes for Table 25 (*Impact Sensitive Species from R1/4/6 Streamlining BE/BAs (1995)):

No Impact (NI) = A determination of "No lmpact" for sensitive species occurs when a project or activity will have no environmental effects on habitat, individuals, a population or a species.

May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing or Cause A Loss Of Viability To The Population Or Species (MIIH) = Activities or actions that have effects that are immeasurable, minor or are consistent with Conservation Strategies would receive this conclusion. For populations that are small - or vulnerable - each individual may be important for short and long term viability.

Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population or Species (WIFV) = Loss of individuals or habitat can be considered significant when the potential effect may be: 1. Contributing to a trend toward Federal listing (C-1 or C-2 species); 2. Results in a significantly increased risk of loss of viability to a species; or, 3. Results in a significantly increased risk of loss of viability to a significant population (stock).

BI = Projects or activities that are designed to benefit, or that measurably benefit a sensitive species should receive this conclusion.

Soils

Management direction

The Deschutes Forest Plan mandates that the soil resource be maintained in a productive capacity over at least 80% of an activity area. The total amount of the soil resource within the wilderness areas currently dedicated to trails and campsites is less than 20% of the surface area and conditions currently meet this criteria as written in the Forest Plan.

Affected Environment

The physical geography of the five wilderness areas being considered in this analysis is dominated by large stratovolcanoes of the Cascade Mountain Range and other volcanic vent sources such as cinder cones. Lava flows from these volcanic features comprise the foundation of much of the landscape. Subsequent advance and retreat of glaciers has created additional landforms such as moraines and defined drainage patterns on the landscape. Glaciation also contributed to the

weathering process of the landform surfaces and formed a variety of soil types ranging from shallow and rocky colluvium to deeper glacial tills. Localized ash, pumice and/or cinder deposits comprise a surface mantle of varying depths on the surface of many glacial and volcanic features across this landscape.

Elevational gradients on the landscape range from 4,000 to over 11,000 feet. This topography creates precipitation gradients that range from 80 plus inches per year on the western slopes of the Cascade crest and higher elevations above tree line to 20 inches and less to the east of the crest. These gradients influence the types and distribution of vegetation communities within the wilderness areas under analysis. Major vegetation types range from high elevation alpine and subalpine meadow communities to a variety of wet and dry mixed conifer forest communities at mid and lower elevations.

Upland soils across the landscape are medium to coarse textured due to their volcanic origin and relative youth. Soils on the west slopes of the Cascades are finer textured than those on the east slopes as a result of higher organic composition from more abundant vegetative growth and decomposition. Infiltration in these soils is directly related to vegetative litter and duff on the surface. Soils on the east side of the crest and at higher elevations are generally coarser textured due to their younger age and lower rates of decomposition. The coarser textures provide good infiltration of snowmelt and rainfall and are generally resistant to surface erosion in an undisturbed condition, especially with an established vegetative or duff layer present on the surface. Soils located in meadows, around lake shores and along creek drainages are generally finer textured from the accumulation of organics in the surface horizon and have lower infiltration rates. These soils are readily compacted by foot traffic and campsite establishment, both of which also denude the surface of vegetation and reduce infiltration capacities.

Environmental Consequences

Current Trends

Compacted areas of soil on trails or at campsites are sources of overland flow during rainfall events that can route sediment to adjacent streams and lakes and affect water quality and aquatic species. Designated tent/camp sites have localized the extent of compaction in many areas but increased overall use throughout the wilderness areas continues to spread the impacts in popular use areas. Gentle slopes in campsite areas generally keep erosion fairly localized although the current spread of these impacts as use increases is exacerbating erosion and runoff in popular areas. Continued use of these areas will maintain compacted and denuded conditions on these sites since natural recovery of these areas is very slow due to a short growing season that overlaps with the predominant time of use.

The majority of system trails are located on upland soils and are generally maintained with water bars and control structures to drain water and minimize erosion. Social trails created by hikers or stock often do not have these features and places where the trail tread has been widened or short cuts have been created are currently sources of erosion throughout the wilderness areas. Maintenance of system trails has slackened in recent years due to budget shortfalls and localized erosion is occurring on some trails.

Human waste disposal has become an issue in popular use areas within the wilderness as use numbers increase. Variable soil depths across the landscape of these wilderness areas influences the effectiveness of human waste disposal. Deeper soils at lower elevations with higher organic matter content have a greater capacity to harbor and breakdown buried waste without affecting

groundwater quality. Maintenance of soil organic matter and surface horizon integrity is necessary for these soil profiles to effectively decompose and sanitize buried human waste. Shallower soils near and above tree line have little organic matter in the profile and a much lower ability to breakdown these wastes. Increases in overnight and in some cases day use are challenging the capacity for the soil environment to effectively decompose and sanitize buried human waste in high use areas. Public health and water quality concerns are heightened in areas such as Green Lakes and No Name Lake near Broken Top in the Three Sisters Wilderness as overnight and day use increases in these popular alpine destinations.

Alternative 1

Soil resource conditions in the wilderness areas are likely to continue deteriorate under the No Action alternative. Foot traffic on system and user created trails and overnight use at campsites would continue to increase in accordance with recent use number trends associated with the continued popularity of the wilderness areas as day and overnight destinations. This trend is likely to result in the expansion of compacted and denuded soil areas, especially in popular destination areas around lakes. Unregulated conditions in the Tenas Lakes area of the Mt Washington wilderness are reflective of this trend as day and overnight use overwhelmed the site capacity of the area in the last few years. Closing some sites to overnight use has improved the experience for day users but caused overnight users to create new sites in other spots around these lakes.

Soils that are currently impacted would continue to be susceptible to erosion and new areas would likely be impacted under this alternative as campsites are expanded and/or created when existing sites are full. Although localized in most areas, the compacted and denuded condition of the surface soil in campsite or day use areas adjacent to water bodies can contribute to surface runoff during storms and snowmelt. Surface runoff and associated erosion in these areas is likely to increase as use numbers increase and campers are forced to create new campsites. Impacts would be expected to increase at popular day and overnight destination areas if use numbers continue to increase at rates observed in the past five years.

Additional impacts resulting from increasing use numbers under the No Action alternative include a continued risk associated with human waste disposal. Soils on many mid and upper elevation sites within the wilderness areas have limited abilities to harbor and decompose human waste. Diligent and responsible disposal is necessary to prevent human waste from negatively affecting areas surrounding lakes and streams and continued increases in overnight use at these sites is likely to increase the risk of water body contamination. High elevation areas like those around No Name Lake on the east side of Broken Top have very limited capacity to decompose waste due to the coarse nature of the soils and limited season of biological activity. Waste “caches” underneath rocks have become prevalent in these areas as use numbers have increased significantly in the last few seasons.

Alternatives 2, 3, 4, and 5

Proposed changes to access within the five wilderness areas for all action alternatives will maintain or reduce existing overnight and day use numbers and generally have a positive effect on the soil resource. All alternatives reduce day use numbers at high use trailheads where popular destinations are seeing accelerated degradation of resources. All action alternatives also implement a quota permit for all overnight use with some variance of where camping is allowed. The quota numbers are associated with trailheads to help reduce use where necessary, and meet sustainable campsite capacities. As a result, the direct and indirect effects to the soil resource will be similar between the action alternatives and are described under one heading in this report. However, the extent of these

effects may be slightly different in scale between alternatives due to the variance in the number and spatial extent of trailheads at which day and overnight quotas are implemented.

The reduction of day and overnight use under quotas implemented at high use trailheads will have the greatest positive effect on the soil resource. Destination areas accessed from Three Sisters Wilderness trailheads like Green Lakes, Devils Lake, Broken Top and Tam MacArthur have seen the greatest increase in soil degradation from trampling associated with foot traffic and camping in recent years. These areas would see less use as a result of the quotas on peak days when camping capacities and reasonable wilderness experience day use numbers have been exceeded in recent years and resource degradation has expanded. Overnight quotas implemented under the action alternatives were formulated to match overnight use numbers with the number of sites determined to be appropriate for continued camping use in each zone. The reduction of peak overnight use levels in the most popular areas will help minimize the expansion and creation of new campsites and focus use in campsites that are sustainable and less impactful to adjacent resources.

A reduction in day and overnight use numbers will also allow for the long term rehabilitation of compacted and denuded campsites and trails identified as unsustainable, especially in destination areas around lakes. Although displacement of use from these areas is likely to occur, overnight quotas at other trailheads, day use quotas at some trailheads and adaptive management monitoring at other trailheads under all alternatives are intended to keep use within reasonable limits to maintain the wilderness experience in terms of encounters and protect the soil resource. As a result, there is expected to be an overall reduction in the amount of the soil resource committed to a compacted and denuded condition for campsites and user created "social" trails within the wilderness areas under all action alternatives.

The action alternatives also include an increased ranger presence at trailheads and primary destination points such as Green Lakes to interact with the public and promote sustainable use. Educating the public of the risks and vulnerabilities of the natural resource conditions at these mid and upper elevation sites will help reduce their impacts on the landscape and promote a "Leave No Trace" use philosophy. Information regarding sustainable campsite use, wood collection restrictions, and human waste disposal will increase public awareness and help reduce impacts to the soil resource.

Campfire (and thereby firewood collection) ban above 5,700 feet will benefit the soil resource by retaining woody biomass on site to function as microsites harboring bacterial and fungal growth, as well as providing roughness on the soil surface to slow overland flow energies during storm runoff events. Increased awareness and responsibility for proper human waste disposal will also help reduce potential impacts to the soil and waterbodies within the wilderness areas. A reduction in overnight use in popular destination areas will result in less human waste generated and more sustainable levels of disposal.

Monitoring and adaptive management is incorporated into all action alternatives in order to address the degree of uncertainty to which the implementation of a quota system may change use patterns and associated effects to the soil resource. Monitoring data will be used to identify resource degradation, should it occur, and help improve the Forest Service's ability to adaptively manage the permit system in a timely manner.

Connected Actions

Short and long term goals for management of the wilderness areas include an increase in trail crews for trail maintenance and restoration activities. Fees associated with the quota system may help fund

trail crews for these purposes and the reduction in overnight and day use numbers should allow some social trails and excess campsites to be restored for the long term. The implementation of these activities is expected to benefit the soil resource by returning compacted and denuded areas to a more natural state capable of supporting vegetation and infiltrating water. Regular maintenance of trails will help reduce erosion and associated impacts to adjacent waterbodies and restoration activities will return localized areas to a condition capable of supporting vegetation.

Cumulative Effects

Ongoing and reasonably foreseeable future actions in the wilderness that have the potential to impact the soil resource include the current rehabilitation of wildfire suppression activities and routine trail maintenance. These activities are undertaken using Best Management Practices designed to prevent or mitigate adverse impacts to the soil resource. Therefore, there would be no cumulative effects to the soil resource under the proposed alternatives when considered in combination with these reasonably foreseeable actions.

Cultural Resources

Introduction and Affected Environment

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires that Federal agencies take into account the effect of a Federal undertaking on any cultural resource that is eligible to or listed in the National Register of Historic Places (NRHP). This is accomplished through inventory, evaluation, and determination of effects in consultation with the State Historic Preservation Officer (SHPO), appropriate Native American Tribes, and the public.

Other Laws that help protect cultural resources on Federal lands include:

- Antiquities Act of 1906
- National Environmental Policy Act of 1969
- American Indian Religious Freedom Act of 1978
- Native American Grave Protection and Repatriation Act (NAGPRA) 1990

Decisions that will authorize overnight visitor use and day visitor use through a permitting system are considered a Federal undertaking.

Within all five wilderness areas, approximately 22,262 acres have been previously inventoried for cultural resources. This represents 4%, of 536,591 acres, for all five wilderness areas combined. The inventories resulted in the identification and recordation of 280 cultural resource sites, 11 of which are determined eligible for listing in the NRHP, five are "not eligible," and 264 have not been evaluated for their eligibility to the NRHP. All unevaluated sites are treated as NRHP eligible until a formal determination of eligibility can be made.

Human use of the landscape has not changed much over the millennia: popular areas for hiking and camping are often associated with water bodies or areas with other desirable resources which were, and still are, important to indigenous people as well as early settlers. When these popular recreation areas are collocated with cultural resources, damage to the resource occurs from soil disturbance and erosion, exposure from denuded vegetation, looting, and vandalism. All leading to a loss of irretrievable archaeological information (Jarvis 2008). Ground disturbance can affect the surface and subsurface integrity of an archaeological site and thus its significance to the National Register of Historic Places.

Within the five wilderness areas there has been a substantial increase in visitor use within popular areas. Within Three Sisters there has been a 181% increase in visitors from 2011 to 2016. Many of the high-use trailheads experienced significant growth over this same time frame, such as Devils Lake with a 267% increase, Green Lakes with a 279% increase, and Tam Rim with a 487% increase. This has resulted in increased numbers and sizes of campsites, the creation of social trails, and the construction of fire rings and other built structures. Generally, backpackers, hikers, hunters and anglers have the ability to disturb all types of cultural resources ranging from lithic scatters, campsites, and rock art to historic sites. Cultural sites and features can be impacted by ground disturbance, such as digging cat holes or fire pits, displacement, such as movement of artifacts from features, graffiti, vandalism, or theft. Furthermore, congregations of people around water sources have the potential to significantly damage or destroy cultural resources by accelerating soil erosion in the surrounding area, which also leaves the artifacts vulnerable to collection/theft.

Within Mount Jefferson Wilderness along the west side of the Cascade Mountains, Forest Service archaeologists conducted systematic surveys within and adjacent to all the high visitor use areas from 1988 through 1991. Dozens of new cultural resource sites were recorded consisting mainly of lithic material left behind from the manufacturing of stone tools. Most if not all of these sites have been revisited at least once over the past thirty years to monitor their condition. In all instances, cultural material that had been recorded in high use recreation areas has diminished over the years. In one particular area, nine cultural sites were revisited on three occasions (last visit in 2016). Seven of these sites are recorded in areas of high recreation use and adjacent to a lake or within and to either side of a trail. The other two cultural sites are located in areas not frequented by visitors. The results clearly indicate that artifacts numbers are diminishing in areas of high recreation use. In some cases, no artifacts were found where once there were dozens. In comparison, the two cultural sites recorded in low recreation use areas were virtually unchanged from their initial recording in 1988. The other impact noted during the 2016 visit, are the newly created user trails. One of these trails exposed a new cultural site that will continue to be impacted by recreation users.

Within the Three Sisters area, looting of archaeological sites has been noted as evidenced by piles of artifacts collected and left behind from visitors. In addition, in order to address resource damage in the Obsidian Trails area, which contains the Obsidian Cliffs NRHP eligible site, a limited permit system was instituted. The permitting system allows 30 Day Use passes and 40 Overnight passes from May 1 through October 31st. Institution of the permitting system has reduced the impacts to resources by reducing the number of camp sites and social trails, as well as other impacts left by visitors.

In addition, monitoring and observation of archaeological sites outside of the Obsidian Trails area, but within the Three Sisters Wilderness, has shown that sites located adjacent to popular camping areas continue to be disturbed by trampling, artifact collection – evidenced by piles of artifacts collected and left behind, and erosion due to denuded vegetation.

Environmental Consequences

While previous cultural resource inventories within the five wilderness areas has resulted in the discovery of 280 cultural resource sites, the majority of the project area (more than 95%) has not been inventoried. Thus, it is likely that numerous, undocumented cultural resources are present within the Wilderness Areas. In addition, these resources could be at risk from the increased visitor use in the Wilderness. Impacts associated with hiking, backpacking, and camping may directly

affect surface artifacts and could also impact Native American use of Traditional Cultural Properties (TCP), and traditional hunting and gathering areas.

Alternative 1 - No Action

Under the No Action Alternative, visitor use would likely increase contributing to increased cultural resource damage. Cultural resources are a non-renewable resource and damage, removal, and destruction would affect the ability of future generations to learn from, utilize (Tribal use), and enjoy the resource.

Cultural resources within the Obsidian Trails permit area would continue to receive protection from limited entry.

Alternative 2

The goal of the proposed action is to reduce impacts to resources from increased visitor use in the Wilderness by limiting entry at some trailheads, while also having permit quotas for all overnight use.

The proposed visitor management activities in the form of limited entry would likely decrease the human impacts on cultural resources. The reduction in the number of visitors through a permitting system would decrease visitor use and potentially allow impacted areas to recover, which would result in better protection of cultural resources.

Under Alternative 2, the current boundaries for the Obsidian Trail area would change. This area would be included in Zone 2 and could potentially receive more impacts due to access allowed from other trailheads.

Alternative 3

Under Alternative 3 Limited Entry will occur only in areas that are “overrun” or that receive very high use. Fewer trailheads will require permits and no overnight permits would be required for three of the five wilderness areas. Cultural resources would likely be subjected to more impacts under this alternatives than under Alternative 2, but fewer impacts than under the No Action Alternative. With the exception of the Obsidian Trail area.

Under this alternative the Obsidian Trail area would be in, and surrounded by, Zones that would require limited entry and therefore would be protected from increased visitor use. The effects to the Obsidian Trail area would be similar to the No Action Alternative.

Alternative 4

Alternative 4 is similar to Alternative 3 with the exception of Day Use Permits required at 9 additional trailheads. Overnight use permits are also similar to Alternative 3, with exception that permits would be acquired on-line and quotas would be associated with each trailhead. Cultural resources would likely be subjected to less impacts under this alternative than under Alternatives 1, 2, and 3.

As with Alternative 3, under this alternative the Obsidian Trail area would be in, and surrounded by, Zones that would require limited entry and therefore would be protected from increased visitor use. The effects to the Obsidian Trail area under Alternative 4 would be similar to the No Action Alternative.

Alternative 5

This alternative provides the greatest protection for cultural resources by instituting Day Use and Overnight quotas for each wilderness area through a permitting system. Cultural resources would likely be subjected to less impacts under this alternative than under any other Alternative.

However, less popular or less used areas may see a rise in visitor use due to displacement. Displacement of users to previously less used areas may result in increased use of areas with traditionally low use resulting in potential effects to cultural resources.

As with Alternatives 3 and 4, the Obsidian Trail area would be in, and surrounded by, Zones that would require limited entry and therefore would be protected from increased visitor use. The effects to the Obsidian Trail under Alternative 5 would be similar to the No Action Alternative.

Cumulative Effects

Ongoing and foreseeable projects listed in Table 4 are undertaken using measures to avoid impacts to cultural resources. The action alternatives would not contribute to any cumulative effects to cultural resources.

Other Disclosures

Prime Farm Lands, Range Lands, and Forest Lands

All alternatives are consistent with the Secretary of Agriculture memorandum 1827 for the management of prime farmland. The project area does not contain any prime farm land or rangelands. Prime Forestland, as defined in the memorandum, is not applicable to lands within the National Forest System.

Wetlands and Floodplains

Floodplains: Executive Order 11988 provides direction to avoid adverse impacts associated with the occupancy and modification of floodplains. Avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

Wetlands: Executive Order 11990 provides direction to avoid to the extent possible adverse impacts associated with destruction or modification of wetlands. Avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

The action alternatives would have no adverse impacts to floodplains or wetlands. There would be no modifications or developments. The alternatives may prevent expansion of negative impacts into sensitive areas such as wetlands.

Civil Rights and Environmental Justice

There is no specific data on income of visitors to the five wilderness areas in this project. Neither is there specific data on visitors' race and ethnicity. No studies were found that focused on trends in minority populations' use of wilderness. Census data shows that in the counties surrounding the project area the percentage of minority populations ranges from 4.5% in Deschutes County to 24.8% in Jefferson County. The census data also shows that "persons in poverty" range from 10.6% in Deschutes County to 19% in Klamath County.

Environmental justice is addressed in Executive Order 12898 and ensures that Forest Service programs, policies, and activities affecting human health of the environment do not exclude minorities and low-income groups from participation in, or the benefits of, programs or activities based on race of economic status. None of the alternatives would disproportionately affect use of the wilderness by women, minorities, or groups with low income. None of the alternatives would

disproportionately affect use of the wilderness by women, minorities, or groups with low income. In any alternative that limits or restricts use, everyone would have an equal opportunity for obtaining a wilderness permit.

Executive Order 12898 does not mandate that agencies consider the effects of their projects on low-income households unless these households exist within low-income populations. Nonetheless, the administrative cost associated with reserving a visitor use permit may cause a hardship for some individuals or families, and could deter individuals from low-income households from using trailheads that require a fee permit.[3]

Alternatives 1, 2, 3, and 4 provide the opportunities for free entry into the wilderness areas with Alternative 1 providing the most free use and Alternative 5 the least amount of free use. The Forest intends to have an undetermined number of the limited entry permits available for free regardless of the alternative selected; one possibility would be to make the free permits available for "check-out" at local libraries. The permit system would not have a disproportionate effect on individuals with low income. The overall impact of this administrative fee on recreationists more broadly would be very minor due to the large number of popular, high quality, and free recreational opportunities throughout the Deschutes and Willamette National Forest.

[3] The fee associated with a permit is to be determined through a separate process pursuant to the Recreation Enhancement Act. The total cost of a permit will be dependent on the administration cost charged by Recreation.gov and if the Forest Service chooses to add additional fee for management purposes. Some fees associated with other outdoor recreational activities for comparison purposes are: Three-day pass to Newberry National Volcanic Monument $10; Crater Lake National Park one day pass $15 per car; Mt. Saint Helens climbing permit $22; Mt. Whitney climbing permit $15.

Chapter 4 – Consultation and Coordination

Interdisciplinary Team

Core Team

Beth Peer – IDT Leader, Deschutes NF
Matt Peterson – IDT Leader, Willamette NF
Jason Fisher – Wilderness and Recreation Lead, Deschutes NF
Tyson Cross – Wilderness and Recreation Lead, Willamette NF
Brett Blundon – Fisheries/Hydrology
Lauri Turner – Wildlife Biologist, Deschutes NF
Jennifer Ferriel – Botanist, Deschutes NF
Peter Sussmann – Soil Scientist, Deschutes NF
Penni Borghi – Archaeologist, Deschutes NF

Interdisciplinary Team Support

Dino Borghi – Geographic Information Systems, Deschutes NF
Brad Peterson – Wilderness Specialist, Detroit RD, Willamette NF
Brian McGinley – Wilderness Specialist, Sweet Home RD, Willamette NF
Dylan McCoy – Wilderness Specialist, McKenzie River RD, Willamette NF
Jean Nelson-Dean – Public Affairs Officer, Deschutes NF
Judith McHugh – Public Affairs Officer, Willamette NF
Jason Wilcox – Fisheries Program Manager, Deschutes NF
Rob Tanner – Asst. Forest Hydrologist, Deschutes NF
Lance Gatchell – Hydrologist/Fish Biologist, Sweet Home RD, Willamette NF
Joe Doerr – Wildlife Biologist, Willamette National Forest
Jenny Lippert – Botanist, Willamette National Forest
Cathy Lindberg – Archaeologist, Willamette National Forest

Agencies and Persons Consulted

Tribal Government

A request to participate in the project in Section 106 of NHPA was sent to the governments of the following: Burns Paiute Tribe, The Klamath Tribes, the Confederated Tribes of the Warm Springs, Confederated Tribes of Grand Ronde, and Confederated Tribes of the Siletz Indians of Oregon. The Tribes raised no concerns about the proposal.

State Historic Preservation Office

Changing the management of recreation within wilderness areas would not affect any historic or pre-historic artifacts or features; therefore no consultation with the Oregon State Historic Preservation Officer is required.

U.S. Fish and Wildlife Service

There is likely to be a beneficial effect to some Federally-listed wildlife, fish, or plant species; therefore, consultation with the U.S. Fish and Wildlife Service will occur before a decision is made.

Oregon Department of Fish and Wildlife

The Forest Service received input from the ODFW regarding hunting regulations and seasons pertinent to the wilderness areas, general patterns of hunting use in wilderness, and hunter participation levels in the High Cascades deer season based on harvest reporting.

Individuals and Organizations

On May 31, 2017 a scoping letter was sent to an e-mailing list of interested parties maintained in GovDelivery system. About 460 emails were delivered, and 16 hardcopy letters delivered. The names and addresses are maintained at the Deschutes National Forest headquarters in Bend.

Notification of the availability of the draft Environmental Assessment has been made via email. Currently, there are 609 individual subscribers to the project who receive email notifications.

Extensive public outreach has taken place in the planning process. The following is a list to-date of public and other meetings with stakeholders:

November 2016	Project appears on the Schedule of Proposed Actions for the Deschutes and Willamette National Forests.
January 2017	Staff met with representatives of Great Old Broads for Wilderness
Feb/March 2017	Staff attended Eugene and Salem chapters of Backcountry Horsemen, attended state level winter convention, and met with Eugene chapter Oregon Equestrian Trails.
March 2017	Two public meetings held at the Deschutes NF headquarters in Bend (covered by local media).
March 2017	Presentation to Obsidians Hiking Club in Eugene.
April 2017	Forest Service staff attended Crescent Community Action Team meeting in Gilchrist.
June 2017	Notice of proposed action distributed to 476 individuals, organizations, and agencies and posted to the internet.
August 2017	Forest Supervisor and Bend Ft./Rock District Ranger attended Congressman Greg Walden's round-table discussion on wilderness planning (covered by local media).
October 2017	Forest Service staff met with representatives of the outfitter/guide community.
November 2017	Staff presented project information and answered questions for the Rotary Club of Crook County at their request.
February 2018	Forest staff presented information on the project alternatives and visitor use objectives.
March 2018	Forest Staff attended Oregon Hunters Association, Emerald Valley chapter meeting.
April 2018	Forest Staff attended Crescent Community Action Team in Gilchrist, providing project update and information on public meetings.

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Appendices

Appendix A – Wilderness Recreation Spectrum Class Definitions and Standards from Forest Plan

The Forest Plans and Wilderness Management Plans recognize that different areas within wilderness can and should provide different opportunities and experiences. Therefore, each wilderness has been divided into areas calls Wilderness Resource Spectrum (WRS) Classes. Each class has its own definition and set of management objectives (Table A1). The WRS Classes for each wilderness area in the project are displayed in Figures A1 through A4 on the following pages.

Table A1: Wilderness Recreation Spectrum (WRS) classes, definition, and standards.

WRS Class	Definition	Trail Encounter Standard	Campsite Encounter Standard†
Transition (WRS Class I)	Characterized by conditions of relatively concentrated visitor use where opportunities for solitude are limited and management activities are highly evident. Those portions of the Wilderness where Transition class management applies are typically staging areas or trailheads. Also included are areas where day use is predominant due to easy access and relatively short trails.	There should be greater than an 80% chance of not more than 12 encounters with other parties per day while on trails.	There should be an 80% probability that 5 or fewer camps are visible from any other campsites.
Semi-primitive* (WRS Class II)	Characterized by predominately unmodified natural environments of moderate to large size. Visitor use may be low, but encounters between users may be fairly common and evidence of human use may be relatively apparent.	There should be greater than an 80% chance of not more than 10 encounters [per day] while on trails.	There should be an 80% probability that 2 or fewer camps are visible or audible from any other camp.
Primitive (WSR Class III)	Areas surrounding existing trails which are essentially unmodified natural environments. Concentration of visitors is low and evidence of human use is minimal.	There should be greater than an 80% chance of not more than 7 encounters with other parties per day while on trails.	There should be an 80% probability that 1 or fewer camps are visible or audible from any other camp.
Pristine (WRS Class IV)	The untrailed areas of Wilderness: these are areas characterized by an extensive, unmodified environment. Natural ecosystem processes and conditions have not been measurably affected by human use. This management area provides the most outstanding opportunities for isolation and solitude and is virtually free of evidence of past human activities. Visitors to Pristine Wilderness areas have only infrequent encounters with other users. Extensive opportunities exist to travel cross-country.	There should be greater than an 80% chance of not more than 1 encounter with other parties per day while on trails.	Camps should not be visible or audible from any other campsites.
* The DNF Wilderness Management Plan includes only three WRS classes: semi-primitive (transition), primitive, and pristine. The semi-primitive class in the WNF and the semi-primitive (transition) class in the DNF have the same encounter standards.			

Figure A1 – Wilderness Recreation Spectrum Classes, Mount Jefferson Wilderness Area

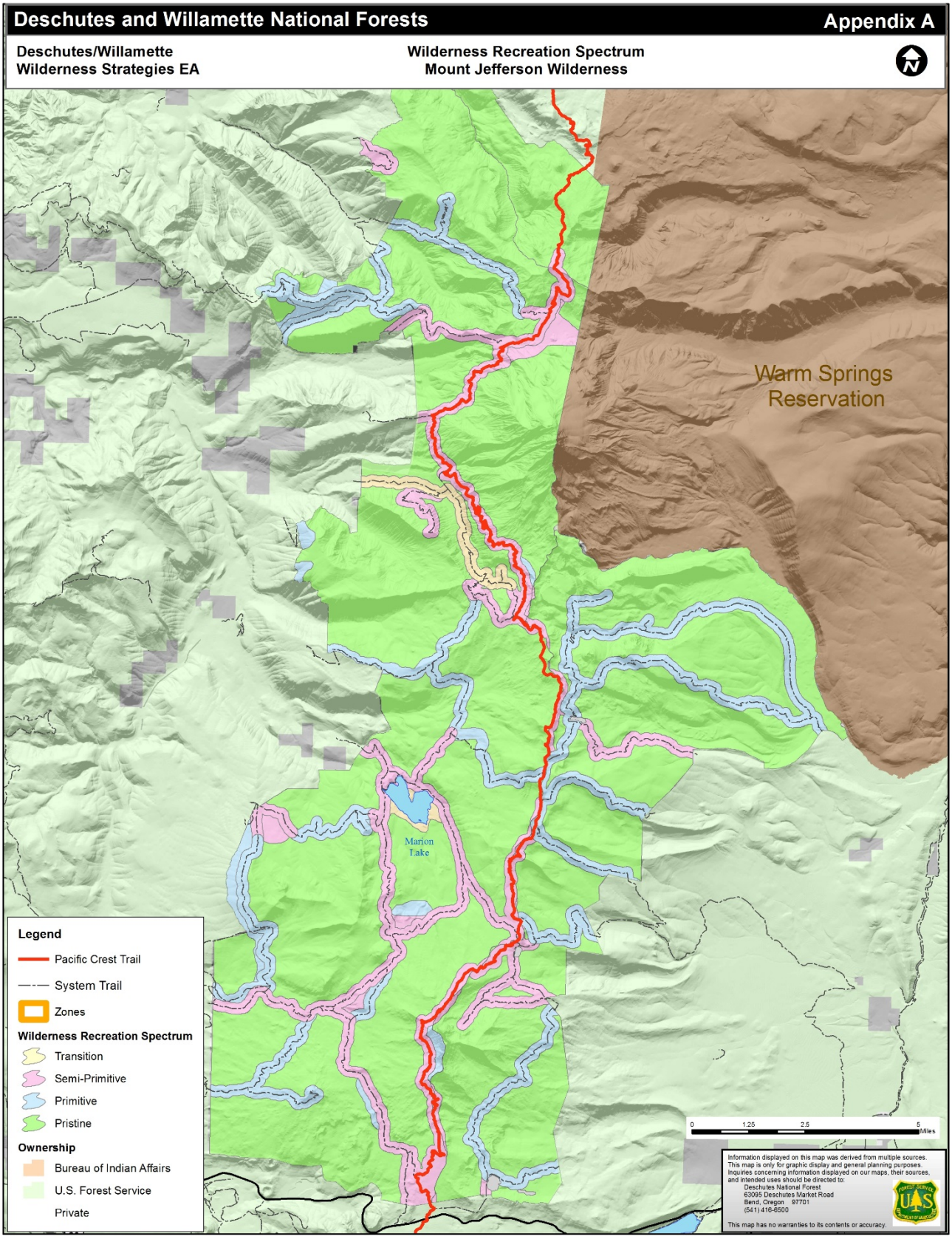


Figure A2 – Wilderness Recreation Spectrum Classes, Mt. Washington and Diamond Peak Wilderness Areas

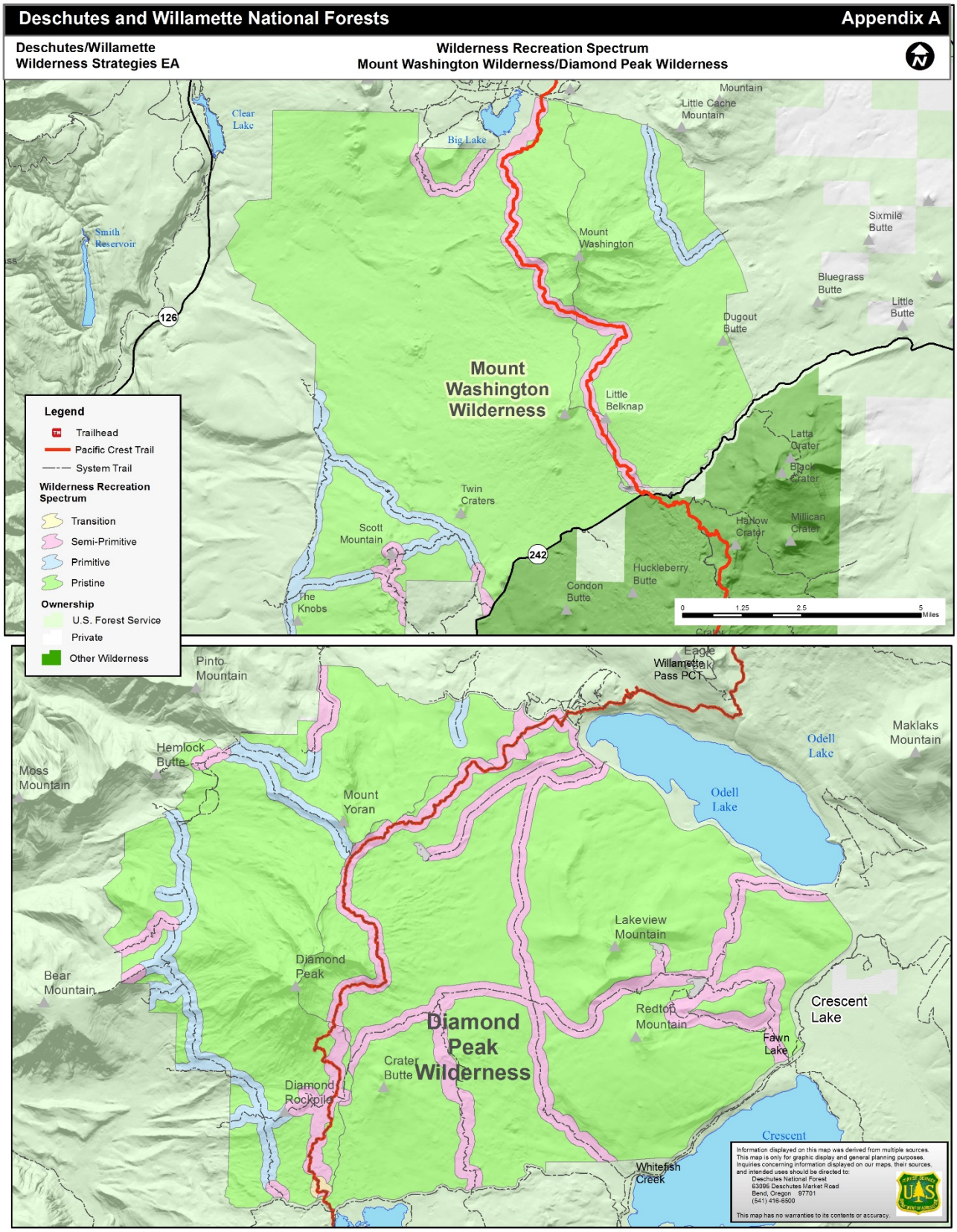


Figure A3 – Wilderness Recreation Spectrum Classes, Three Sisters Wilderness (North)

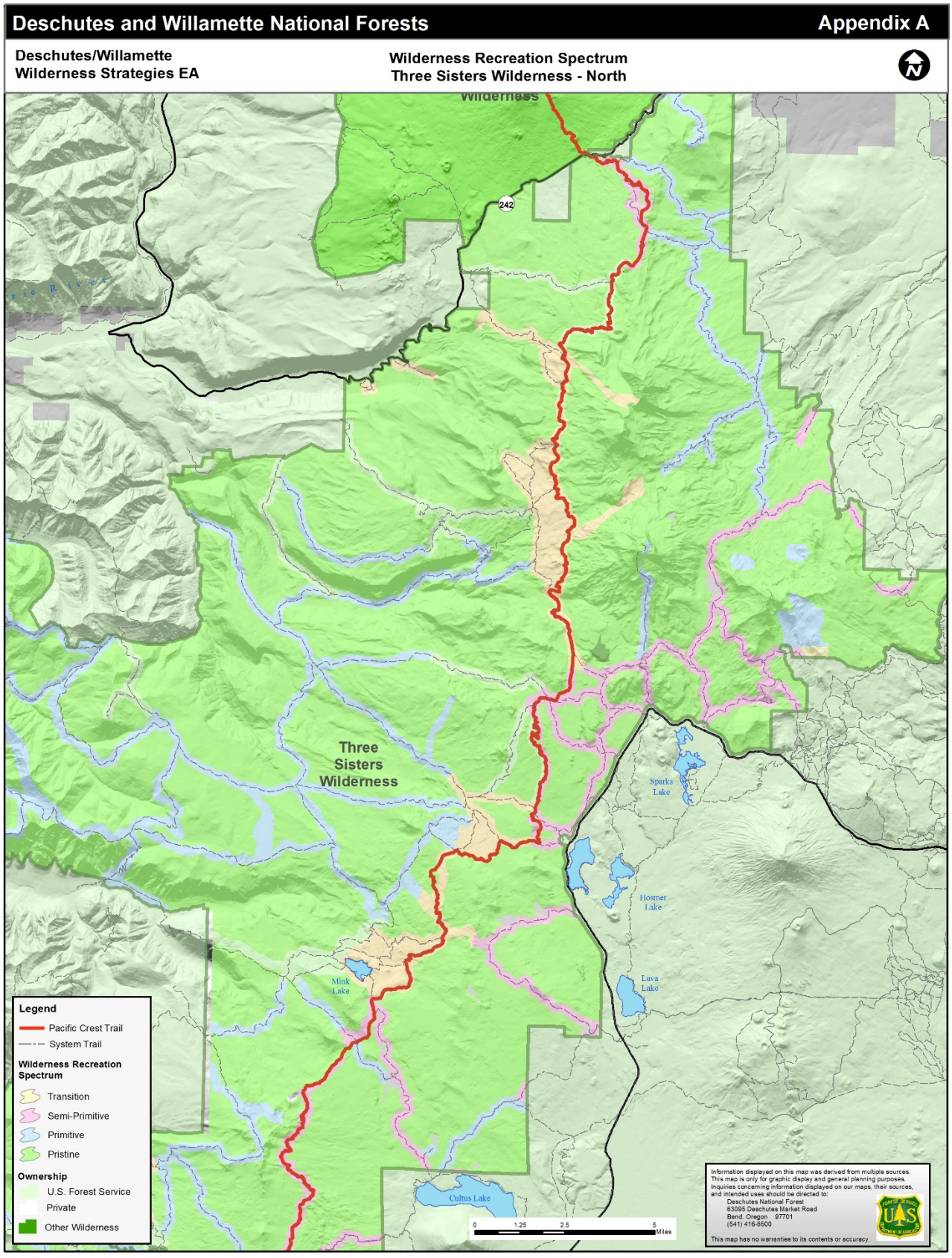
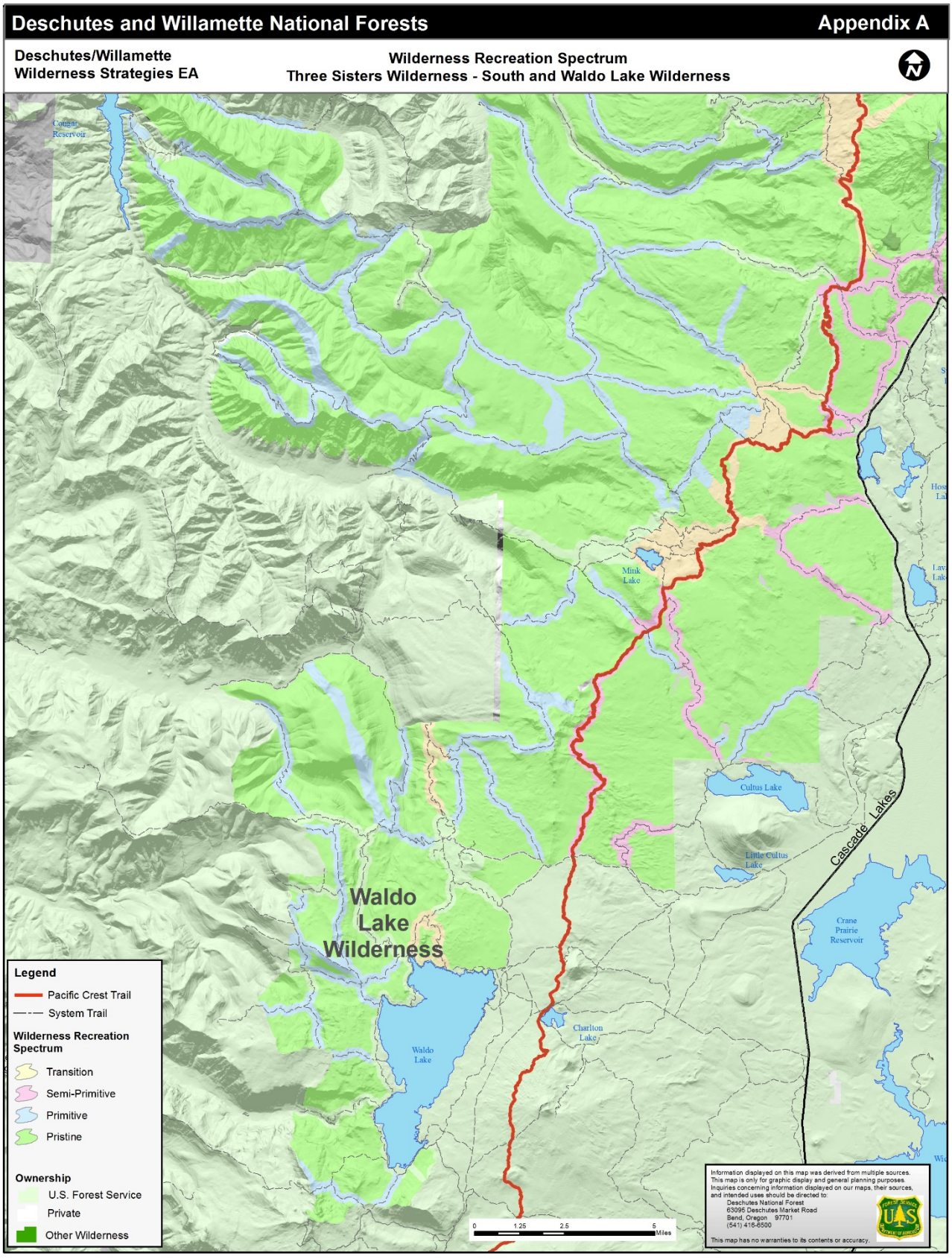


Figure A4 – Wilderness Recreation Spectrum for Three Sisters (South) and Waldo Lake



Appendix B – Alternative Maps

Mount Jefferson –
- Alternative 2
- Alternative 3
- Alternative 4
- Alternative 5

Mount Washington & Diamond Peak –
- Alternative 2
- Alternative 3 and 4
- Alternative 5

Three Sisters East –
- Alternative 2
- Alternative 3
- Alternative 4
- Alternative 5

Three Sisters West –
- Alternative 2
- Alternative 3
- Alternative 4
- Alternative 5

Waldo Lake –
- Alternatives 2, 3, and 4
- Alternative 5

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Appendix C –Trailhead and Zone Visitor Use Objectives and 2016 Use Charts

A limited entry permit system involves the process of determining how many permits would be made available. The appropriate number of permits was determined by looking at a number of factors. Each trailhead served as the smallest geographic area for determining quotas. The process used is described in this appendix.

Quota Process

In order to develop quotas for each trailhead, we began with the goal of preserving current wilderness character which includes both the natural resource conditions and recreation use. To do this, we used the most current data available, 2016, and focused on our current peak use period, from July 1st to September 15th. Our quota process treated day use and overnight use differently:

- Overnight use is based on groups (maximum group size is 12 individuals), as the method relied heavily on the number and class of campsites in each zone as an initial estimate of camping capacity, assuming that each group will likely share a campsite.
- Day use is based on people as it provides a cap for use in popular areas and maximize public access, avoiding the situation where many permits are taken up by groups of 1 or 2.

Overnight Quotas

Overnight quotas were developed using the following guidelines:

- Group quotas for overnight camping are not based on daily launches, but rather the number of groups that can occupy an area at one time. For example, if a group leaves from a trailhead for four nights, those four days are removed from the quota for that trailhead until they return.
- Trailheads that share parking lots are combined, so that one will get a permit for a trailhead, but one can use either trail. The following areas exemplify this:
    - Green Lakes/Soda Creek
    - Devils/Wickiup Plains
    - Winopee/Corral Lake
    - Upper French Pete/Pat Saddle
- Wilderness areas were delineated into zones which are a logical geographic or trail boundary. See Figures C1 through C4 of this appendix for maps.

In order to develop the overnight use quotas, we divided the wilderness areas into zones and developed an occupancy quota for each zone. The following criteria was used:

- The total amount of campsites available in a zone was calculated. In order to accomplish this, campsite rating impact was developed for each campsite based on national protocol, resulting in a rating from 1-9, with 1 being the least impacted and 9 being the most impacted. Through a GIS exercise, campsites with a rating of 4-9, that were 100’ from water and trails, were identified. These more heavily impacted sites that are far enough from water and trails are considered desirable as restoration is unlikely and they have already been proven to be in popular locations resulting in the least chance of recovery.
- The existence of designated camps in the zone

- Peak and average use from 2016
- The Wilderness Resource Opportunity Spectrums (WROS) for the zone
- Natural Resource concerns
    - Presence of rare plant species
    - Invasive plant species
    - Threatened or endangered species
    - Archeological sites
- Solitude monitoring data
- Professional judgement

Following the process for each zone, a quota was designated. These zone quotas were then divided among trailheads to determine related overnight use quotas. Trailhead quotas for overnight use were developed by looking at:

- The total amount of overnight use in 2016
- The average overnight use in 2016
- The peak overnight use in 2016
- Historic use patterns
- Parking lot size
- Day use vs. overnight use percentages
- Zone allocation
- WROS designation
- Professional judgement

Day Use Quotas

A similar process was used to develop day use quotas. The following variables were accounted for:

- Historic use patterns
    - Total, average, and peak use from 2016
- Parking lot size
- Day use vs. overnight use percentages from 2016
- Travel patterns
- WROS designation
- Natural Resource concerns
    - Presence of rare plant species
    - Invasive plant species
    - Threatened or endangered species
    - Archeological sites
- Professional judgement

Quotas were assigned for day and overnight use for every trailhead. Though the amount of trailheads requiring a quota varies by alternatives, the use quotas may be used as a trigger for management to examine resource damage in the area to determine if action needs to be taken in the adaptive management phase. Table C1 starting on the following page lists the trailheads for each wilderness area, the proposed overnight group quota and day use people quota as well as which alternatives that trailhead limited entry would be included in.

Table C1: Overnight and day use visitor use objectives for each wilderness area by trailhead ("n/a" in the table means that historically there has rarely or never been overnight use on the trail; permit would be obtained from adjacent trailhead).

Wilderness Area Trailhead	Overnight Group Quota	Alternatives that this overnight quota is included in	Day Use People Quota	Alternatives that this day use quota is included in
Three Sisters Trailheads				
Scott TH	2	2, 3, 4, 5	12	2, 3, 4, 5
Obsidian	13	2, 3, 4, 5	30	1, 2, 3, 4, 5
Linton Lake	2	2, 3, 4, 5	24	2, 4, 5
Foley	8	2, 3, 4, 5	12	5
Separation	3	2, 3, 4, 5	12	5
Rainbow	1	2, 3, 4, 5	12	5
Horse Creek	1	2, 3, 4, 5	8	5
Upper French Pete/Pat Saddle	1	2, 3, 4, 5	12	5
Upper Lowder	1	2, 3, 4, 5	12	5
Upper East Fork	n/a	2, 3, 4, 5	12	5
Lower East Fork	1	2, 3, 4, 5	24	5
Lower Lowder	1	2, 3, 4, 5	8	5
French Pete	1	2, 3, 4, 5	12	5
Rebel	1	2, 3, 4, 5	12	5
Olallie	1	2, 3, 4, 5	12	5
Elk Creek	1	2, 3, 4, 5	12	5
South Fork	1	2, 3, 4, 5	12	5
Crossing Way	7	2, 3, 4, 5	12	5
Box Canyon	1	2, 3, 4, 5	12	5
Skookum	5	2, 3, 4, 5	20	5
Taylor Burn	1	2, 3, 4, 5	12	5
Helen Lake	1	2, 3, 4, 5	12	5
Jack Pine	1	2, 3, 4, 5	12	2, 5
Irish Taylor	8	2, 3, 4, 5	12	2, 5
Many Lakes	1	2, 3, 4, 5	12	2, 5
Deer Lake	1	2, 3, 4, 5	12	2, 5
Winopee/Corral Lake	3	2, 3, 4, 5	12	2, 5
Corral Swamp	1	2, 3, 4, 5	12	2, 5
Lucky Lake	5	2, 3, 4, 5	30	2, 4, 5
Six Lakes	9	2, 3, 4, 5	60	2, 4, 5
Elk Lake	4	2, 3, 4, 5	24	2, 4, 5
Quin Meadow	1	2, 3, 4, 5	16	2, 4, 5
Sister Mirror	5	2, 3, 4, 5	16	2, 3, 4, 5
Devils Lake/Wickiup	24	2, 3, 4, 5	100	2, 3, 4, 5

Wilderness Area Trailhead	Overnight Group Quota	Alternatives that this overnight quota is included in	Day Use People Quota	Alternatives that this day use quota is included in
Green Lake/Soda Creek	17	2, 3, 4, 5	80	2, 3, 4, 5
Todd Lake	2	2, 3, 4, 5	12	2, 3, 4, 5
Crater Ditch	1	2, 3, 4, 5	16	2, 3, 4, 5
Broken Top	2	2, 3, 4, 5	40	2, 3, 4, 5
Tam McArthur Rim	5	2, 3, 4, 5	80	2, 3, 4, 5
Three Creek Meadow	1	2, 3, 4, 5	12	2, 5
Park Meadow	3	2, 3, 4, 5	12	2, 5
Chush Falls	1	2, 3, 4, 5	20	2, 4, 5
Pole Creek	9	2, 3, 4, 5	24	2, 5
Scott Pass	1	2, 3, 4, 5	12	2, 5
Millican	1	2, 3, 4, 5	12	2, 5
Black Crater	1	2, 3, 4, 5	24	2, 4, 5
Lava Camp	9	2, 3, 4, 5	40	2, 3, 4, 5
Mt. Jefferson Trailheads				
Roaring Creek	2	2, 3, 4, 5	8	2, 5
Crown Lake	1	2, 3, 4, 5	8	2, 5
PCT Breitenbush	5	2, 3, 4, 5	14	2, 3, 4, 5,
S. Breitenbush	2	2, 3, 4, 5	12	2, 3, 4, 5
Triangulation	1	2, 3, 4, 5	16	2, 3, 4, 5
Cheat Creek	1	2, 3, 4, 5	8	2, 5
Whitewater	9	2, 3, 4, 5	30	2, 3, 4, 5,
Woodpecker	1	2, 3, 4, 5	12	2, 4, 5
Pamelia Lake	12	2, 3, 4, 5	24	1, 2, 3, 4, 5
Minto Mountain	1	2, 3, 4, 5	8	2, 5
Bingham Ridge	2	2, 3, 4, 5	12	2, 5
Marion Lake	10	2, 3, 4, 5	40	2, 3, 4, 5
Jefferson Lake	1	2, 3, 4, 5	14	5
Pine Ridge	2	2, 3, 4, 5	24	2, 5
Big Meadows HC	2	2, 3, 4, 5	12	2, 5
Cabot Lake	5	2, 3, 4, 5	14	4, 5
Bear Valley	1	2, 3, 4, 5	14	5
Duffy Lake	10	2, 3, 4, 5	30	2, 3, 4, 5
Maxwell Butte	1	2, 3, 4, 5	14	2, 5
PCT Santiam	15	2, 3, 4, 5	50	2, 4, 5
Jack Lake	5	2, 3, 4, 5	60	2, 3, 4, 5
Round Lake	1	2, 3, 4, 5	12	5

Wilderness Area Trailhead	Overnight Group Quota	Alternatives that this overnight quota is included in	Day Use People Quota	Alternatives that this day use quota is included in
Diamond Peak				
Pengra Pass	3	2, 4, 5	12	5
Trapper Creek	3	2, 4, 5	16	5
Crater Butte	2	2, 4, 5	12	5
Fawn Lake	5	2, 4, 5	24	5
Whitefish	1	2, 4, 5	12	5
Snell Lake	1	2, 4, 5	12	5
Emigrant Pass	5	2, 4, 5	40	5
Diamond Peak South	1	2, 4, 5	12	5
Rockpile/Marie Lake	2	2, 4, 5	12	5
Pioneer Gulch	2	2, 4, 5	12	5
Corrigan Lake	2	2, 4, 5	12	5
Blue Lake	2	2, 4, 5	12	5
Diamond Peak North	1	2, 4, 5	12	5
Vivian Lake	2	2, 4, 5	12	5
Salt Creek Falls	3	2, 4, 5	30	5
Deer Creek	1	2, 4, 5	12	5
Mt. Washington				
Patjens	2	2, 3, 4, 5	24	5
PCT Big Lake	2	2, 3, 4, 5	20	5
Hortense Lake - Access Point	1	2, 3, 4, 5	8	5
Dry Creek - Access Point	1	2, 3, 4, 5	8	5
PCT McKenzie Pass	6	2, 3, 4, 5	24	2, 3, 4, 5
Hand Lake	1	2, 3, 4, 5	30	2, 5
Benson/Tenas	8	2, 3, 4, 5	30	2, 3, 4, 5
Fingerboard Prairie	1	2, 3, 4, 5	8	5
Tenas Lakes	1	2, 3, 4, 5	8	5
Robinson Lake	1	2, 3, 4, 5	12	5
Waldo Lake				
Shadow Bay	1	2, 4, 5	20	5
Black Creek	n/a	2, 4, 5	12	5
Koch Mountain	n/a	2, 4, 5	12	5
Salmon Lakes	3	2, 4, 5	16	5

Wilderness Area Trailhead	Overnight Group Quota	Alternatives that this overnight quota is included in	Day Use People Quota	Alternatives that this day use quota is included in
Gander Lake	1	2, 4, 5	12	5
Swan Lake	1	2, 4, 5	12	5
Winchester Lake	2	2, 4, 5	12	5
Shale Ridge	n/a	2, 4, 5	12	5
Blair Lake	1	2, 4, 5	12	5
Taylor Burn	2	2, 4, 5	12	5
Torrey Lake	1	2, 4, 5	12	5
Field Lake	n/a	2, 4, 5	12	5
North Waldo	2	2, 4, 5	20	5
Mt. Ray	n/a	2, 4, 5	12	5
High Divide	n/a	2, 4, 5	12	5

Table C2: Wilderness Zones Camping Quotas

Three Sisters Wilderness Zones	Quota	Alternatives that this zone's camping reservation requirement is included in
1	10	5
2	16	3, 4, 5
3	2	5
4	6	5
5	11	5
6	7	5
7	20	3, 4, 5
8	20	3, 4, 5
9	11	5
10	9	5
11	22	5
12	8	5
13	8	5
14	10	5
15	10	5
Mt. Jefferson Wilderness Zones		
1	3	5
2	20	3, 4, 5
3	15	3, 4, 5
4	14	5

5	1	5
6	15	5
7	10	5
8	6	5
9	6	5
Diamond Peak Wilderness Zones		
1	27	5
2	9	5
Mt. Washington Wilderness Zones		
1	12	5
2	9	5
Waldo Lake Wilderness Zones		
1	8	5
2	6	5

Overnight Camping Zone Maps

The following maps display how the wilderness areas were delineated into overnight camping zones. The alternatives that would require a camping reservation for the zones are listed in Table C2, above, as are the quota numbers.

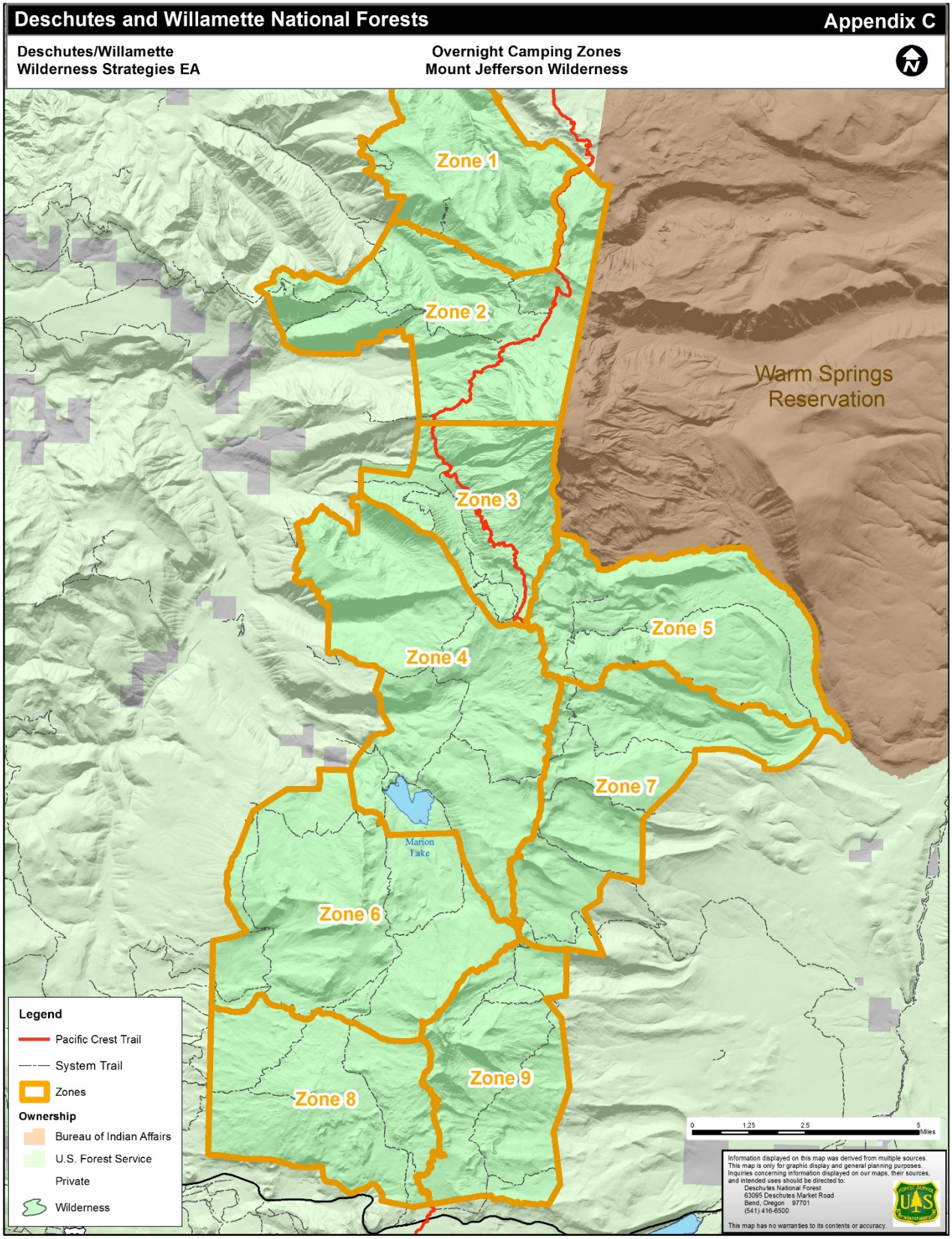


Figure C-1: Mt. Jefferson Overnight Camping Zones

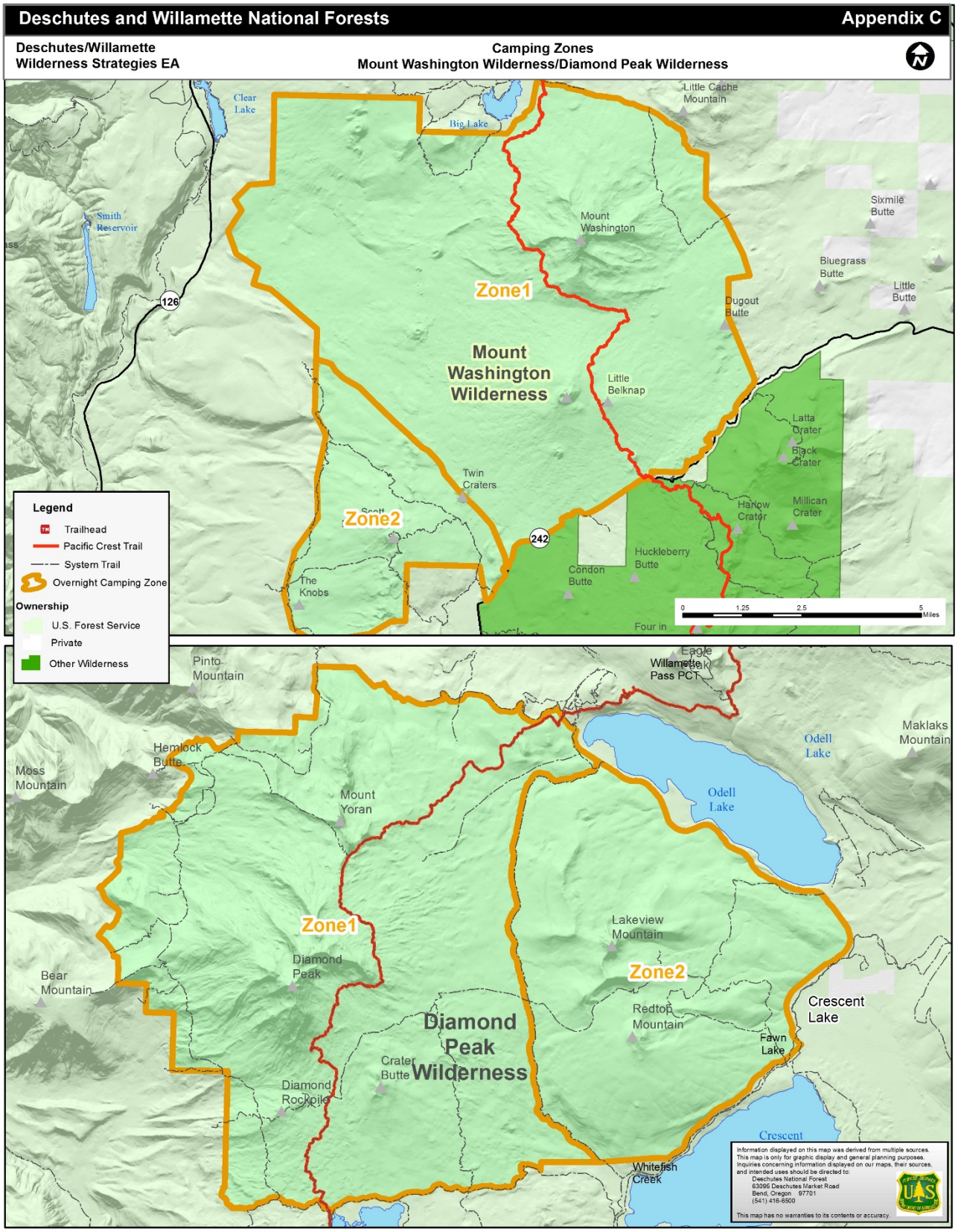


Figure C-2: Mt. Washington and Diamond Peak Overnight Camping Zones

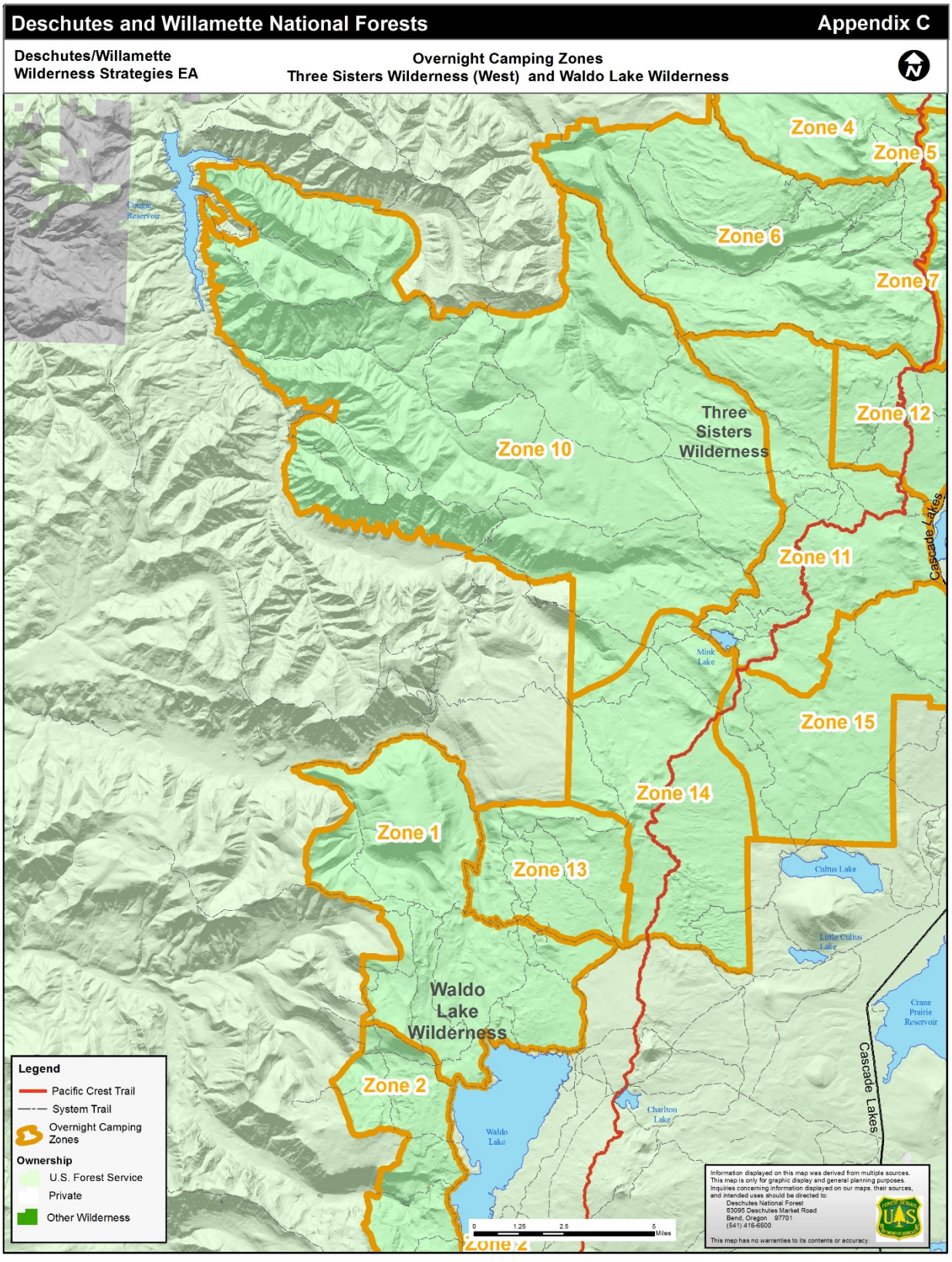


Figure C-3: Three Sisters (west) and Waldo Lake Overnight Camping Zones

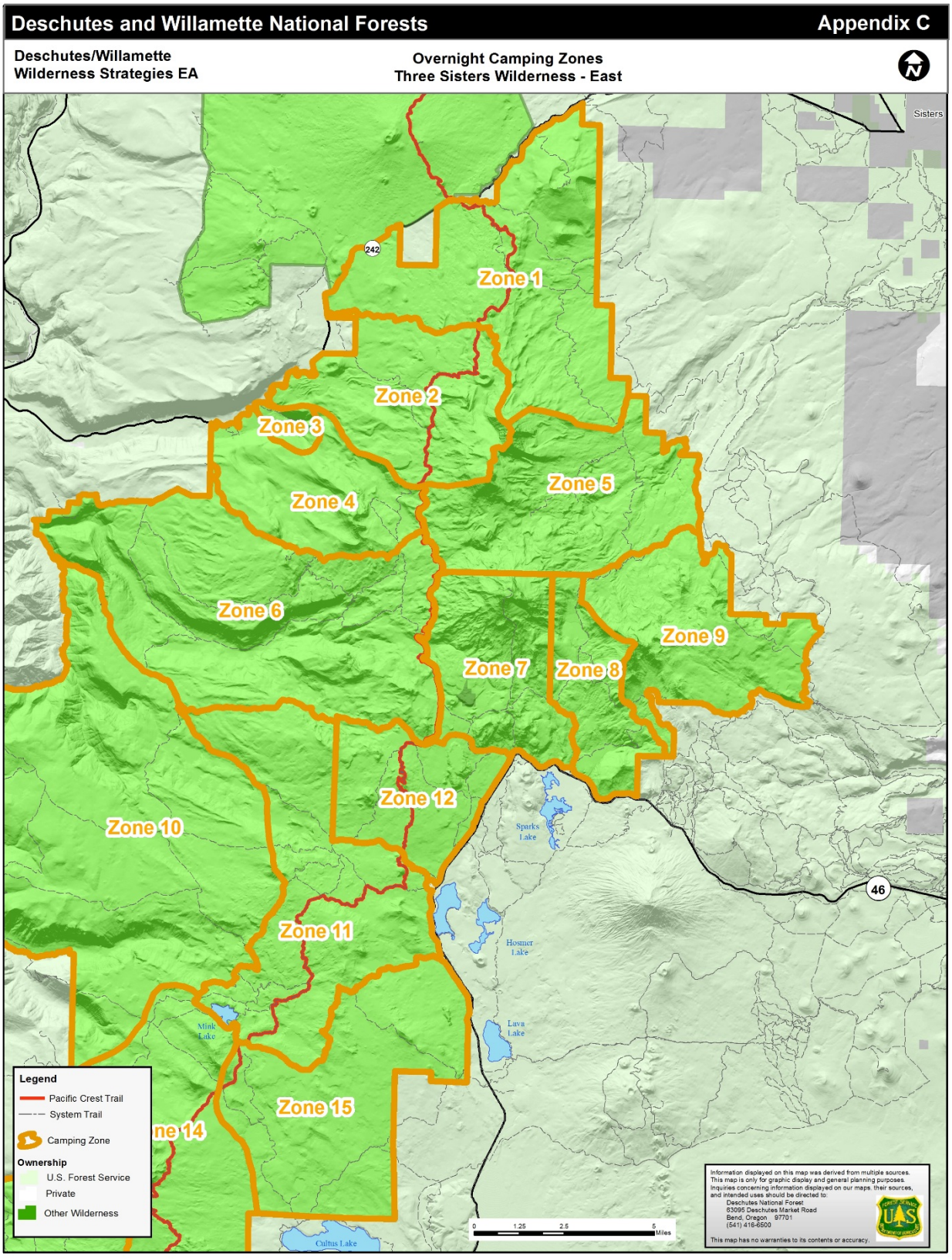
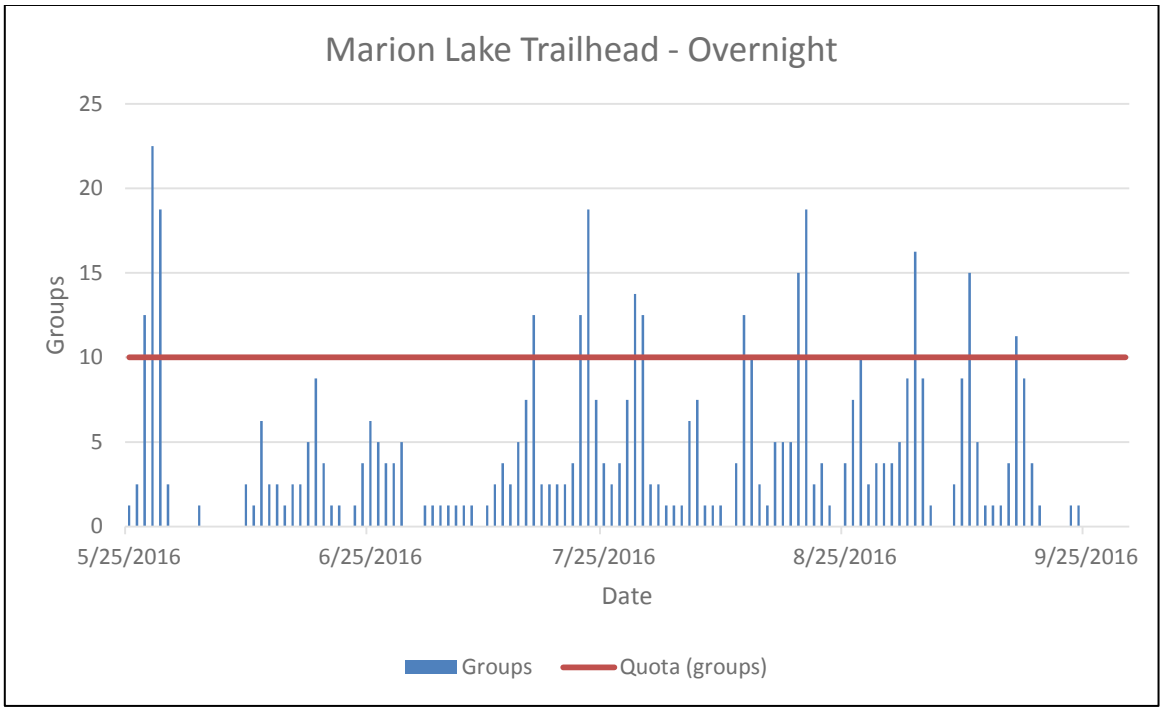
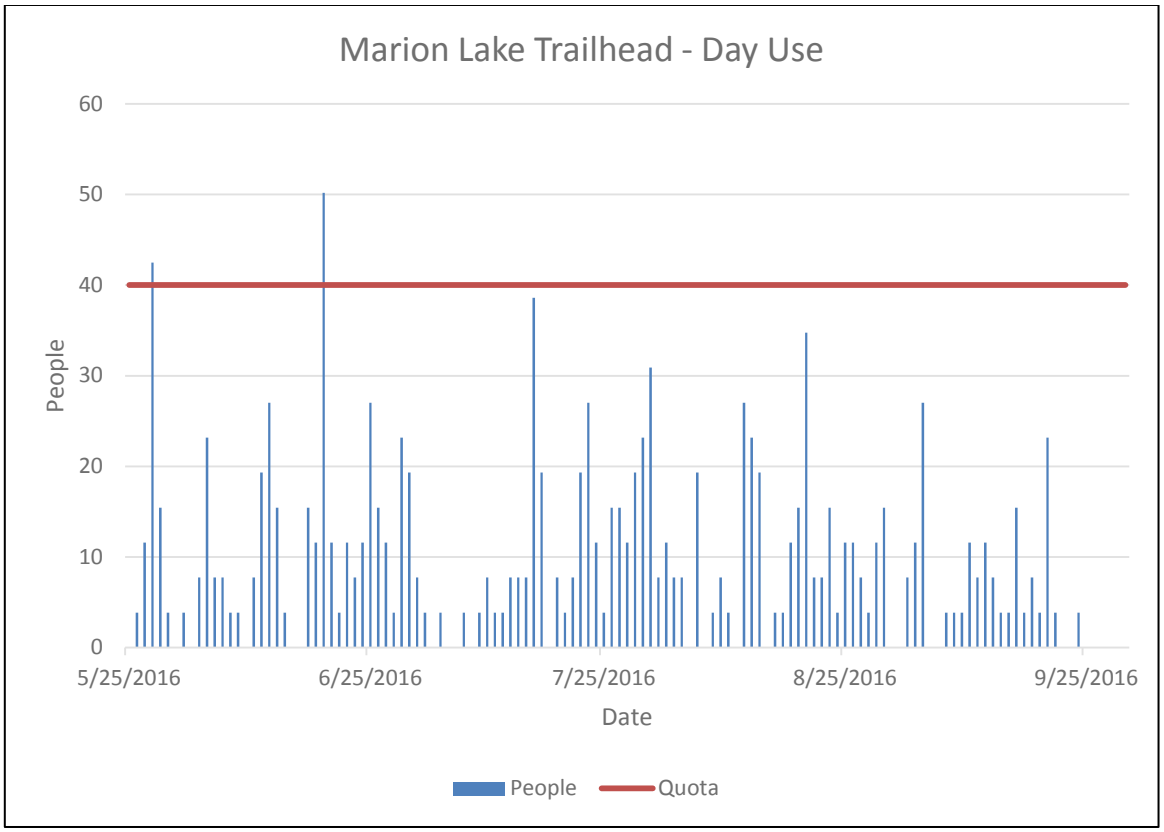
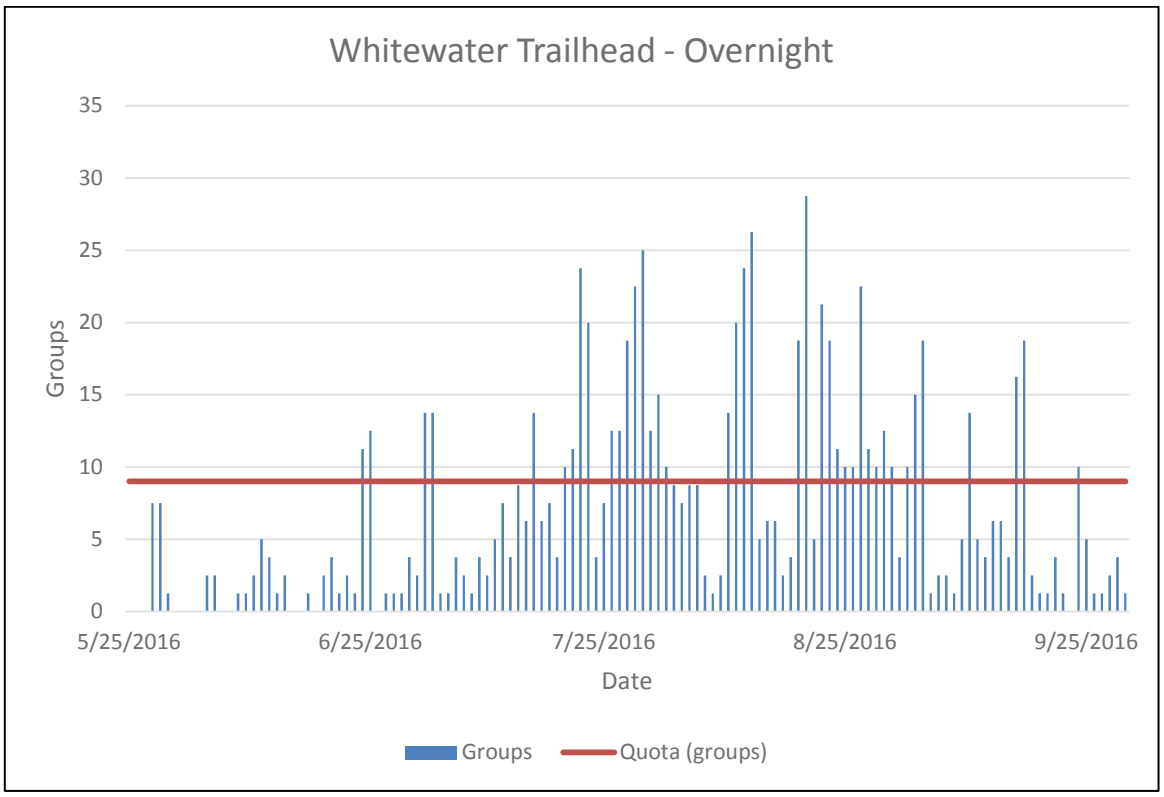


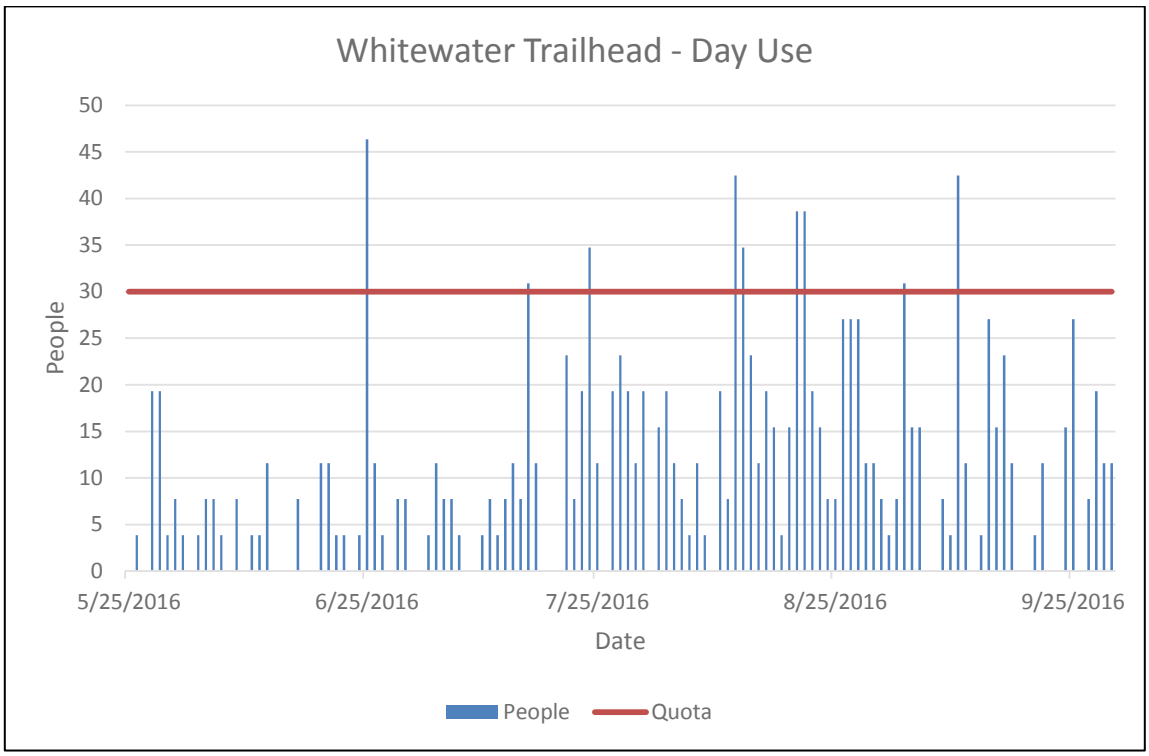
Figure C-4: Three Sisters (east) camping zones

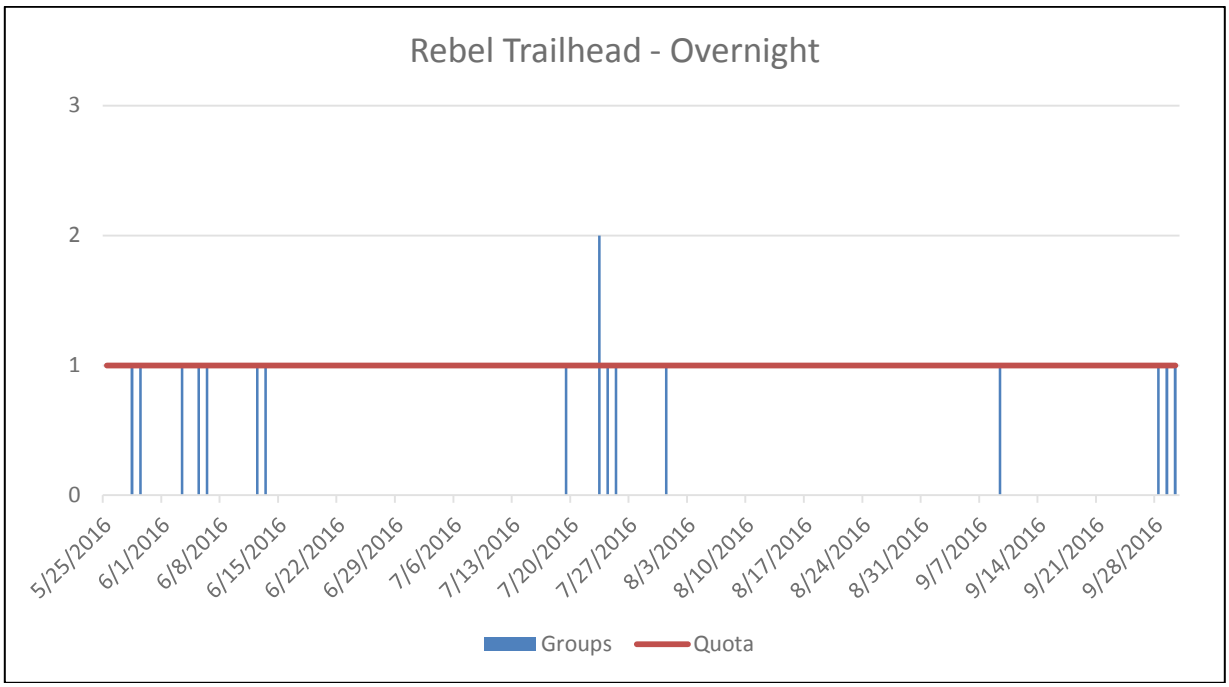
The following charts represent the number of overnight groups (which can be up to 12 people) or day use individual people that visited the wilderness at particular trailheads in 2016, as well as the proposed quota on the number of groups or individuals for that trailhead. This demonstrates how often use exceeded, met, or fell below the sustainable use level in 2016, the highest use year so far.

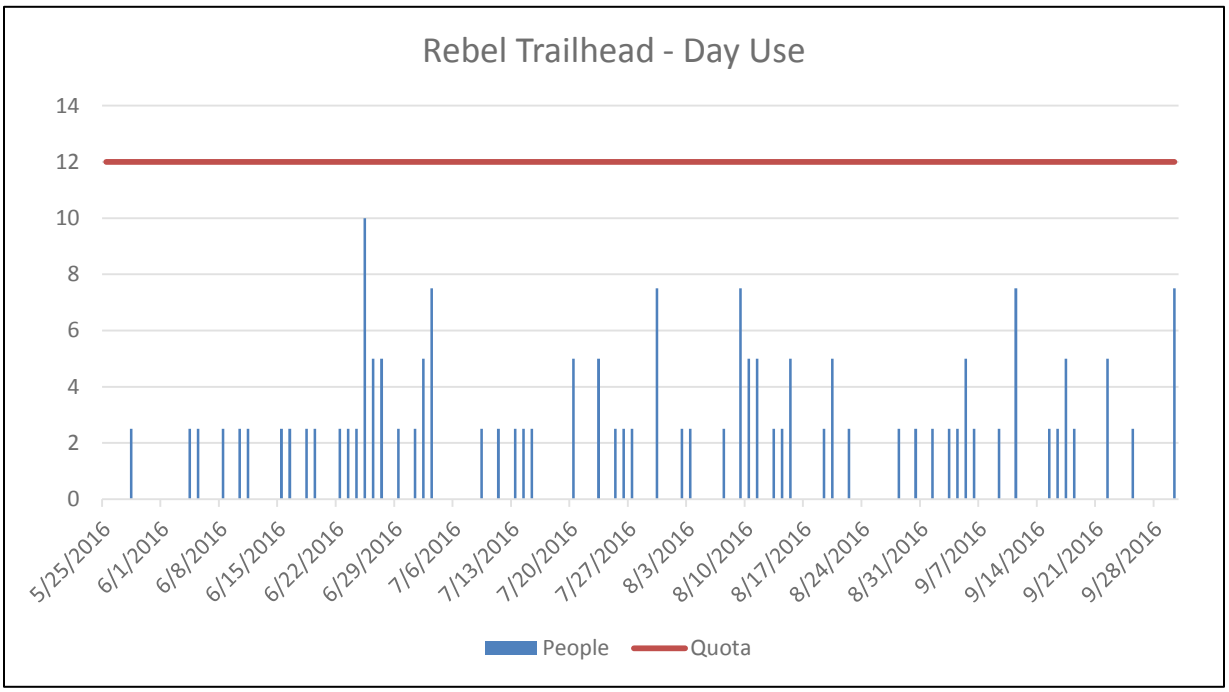


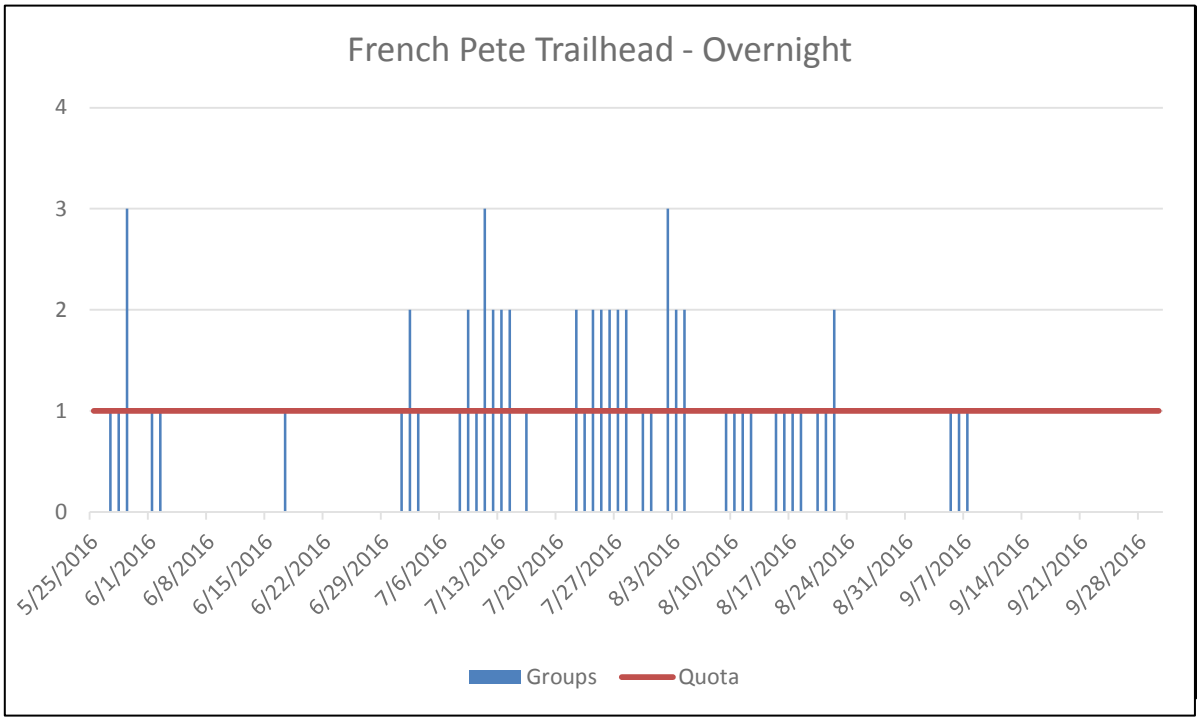


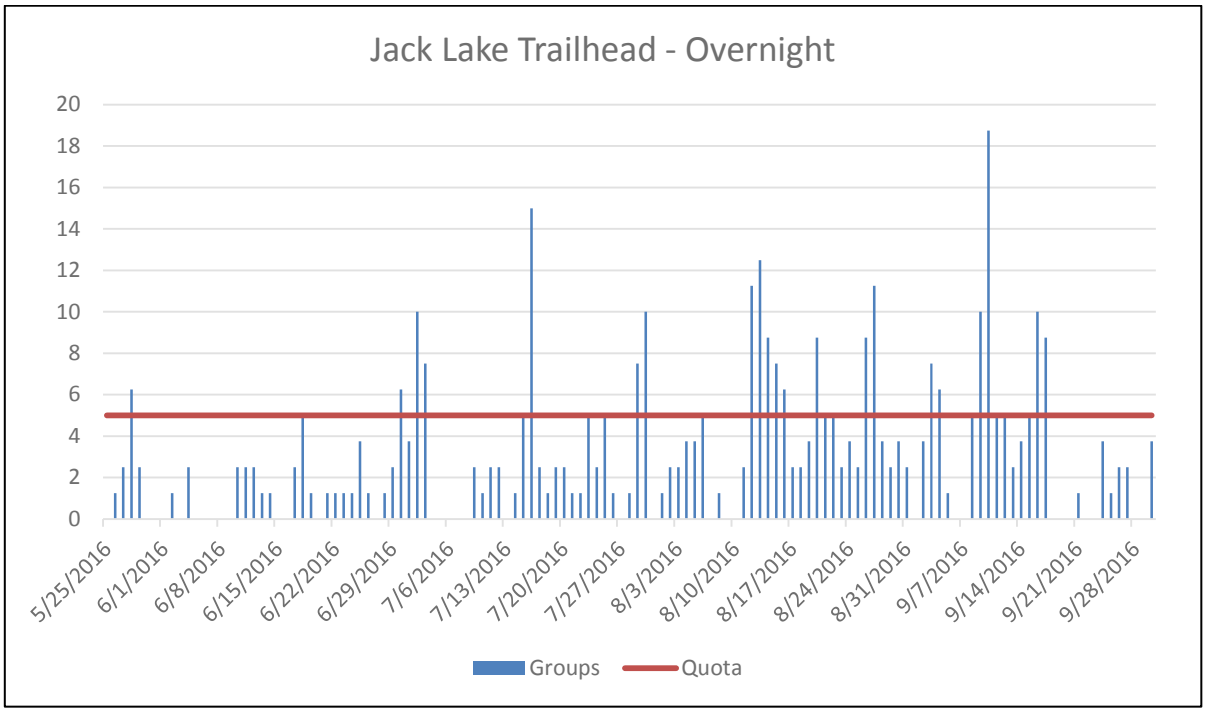

Whitewater Trailhead - Overnight
35
30
25
20
15
10
5
0
Groups
5/25/2016
6/25/2016
7/25/2016
8/25/2016
9/25/2016
Date
Groups
Quota (groups)

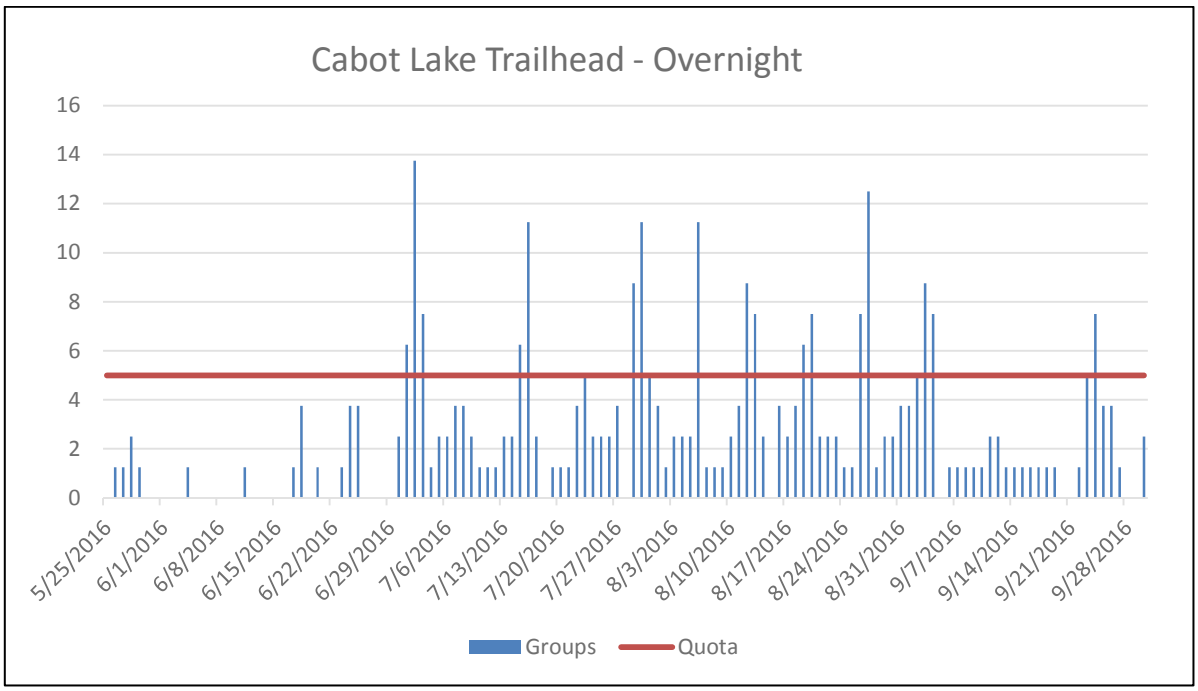

Whitewater Trailhead - Day Use
50
45
40
35
30
25
20
15
10
5
0
People
5/25/2016
6/25/2016
7/25/2016
8/25/2016
9/25/2016
Date
People
Quota

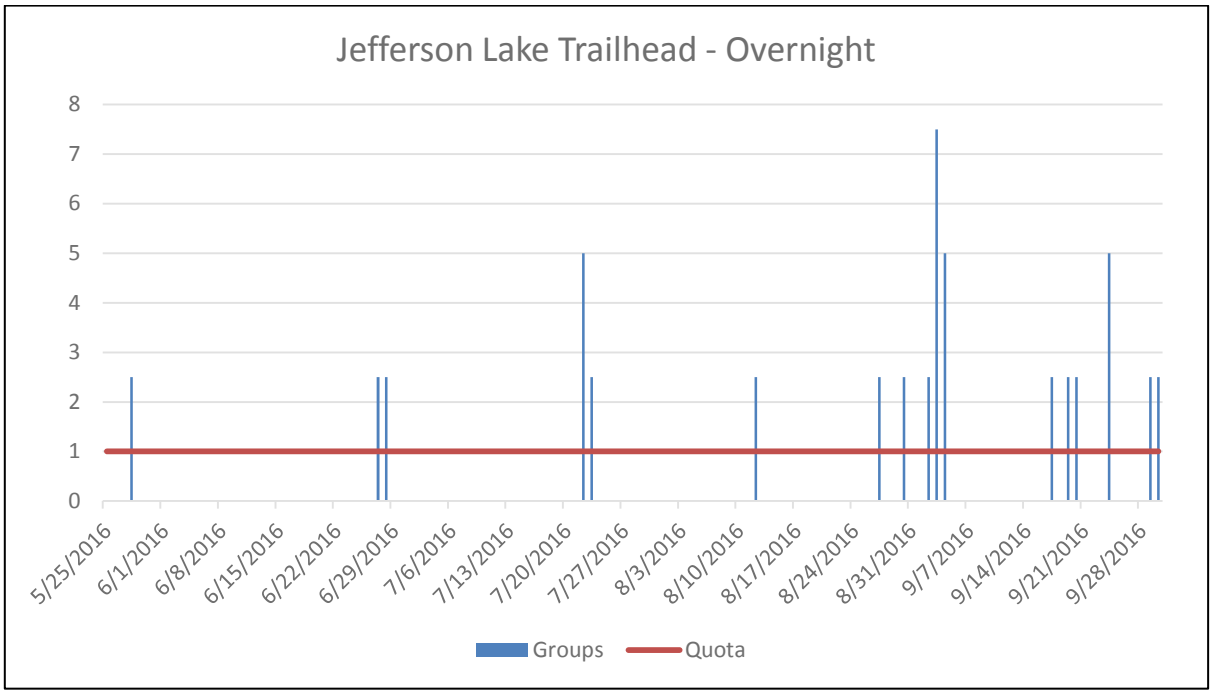

Rebel Trailhead - Overnight
3
2
1
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota

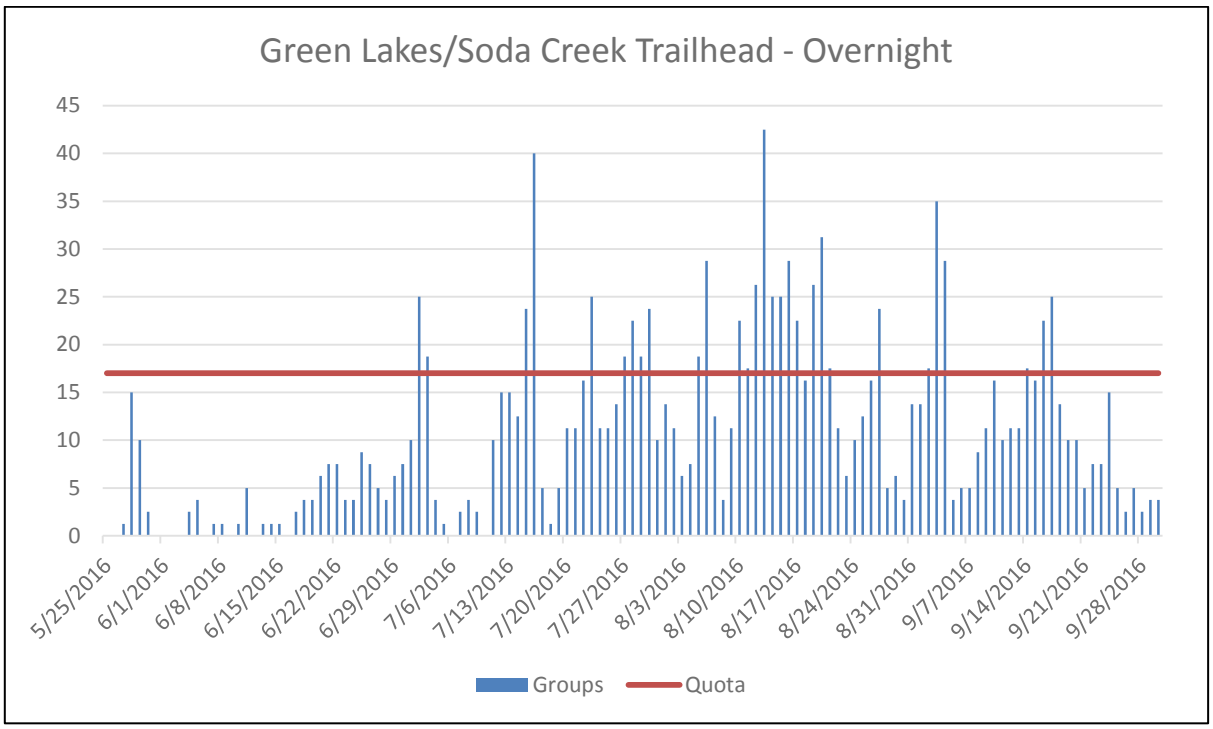

Rebel Trailhead - Day Use
14
12
10
8
6
4
2
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota

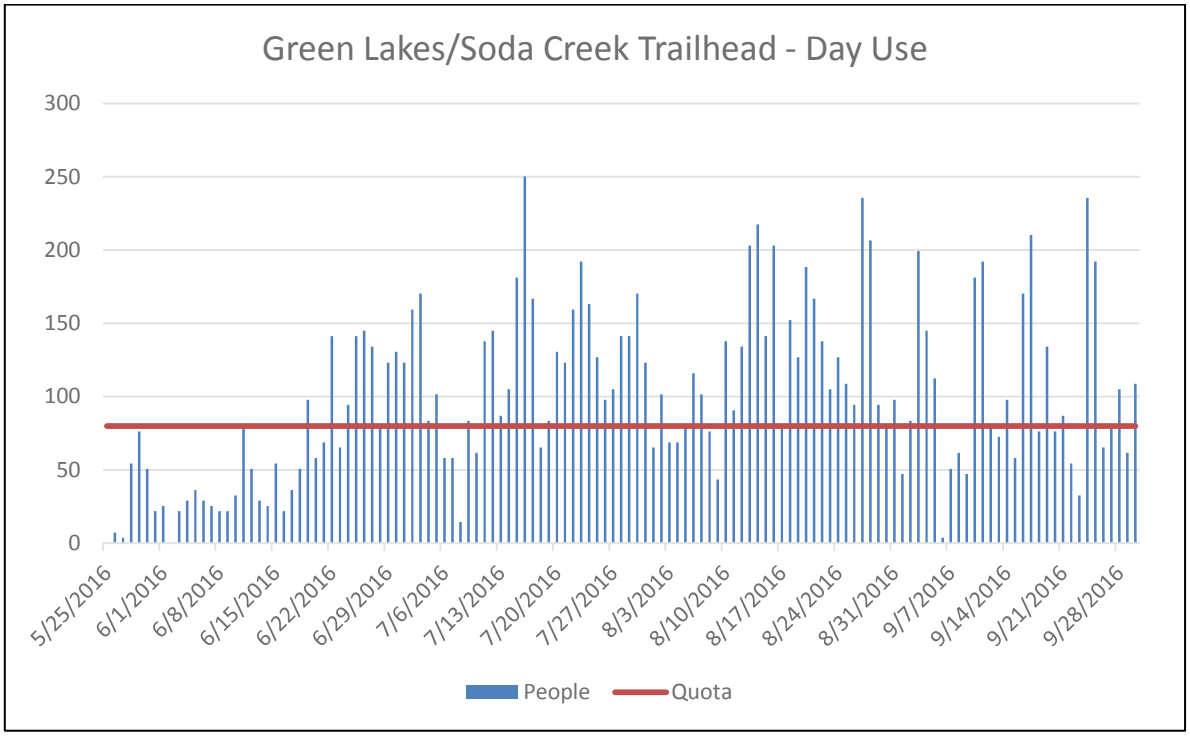

French Pete Trailhead - Overnight
4
3
2
1
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota

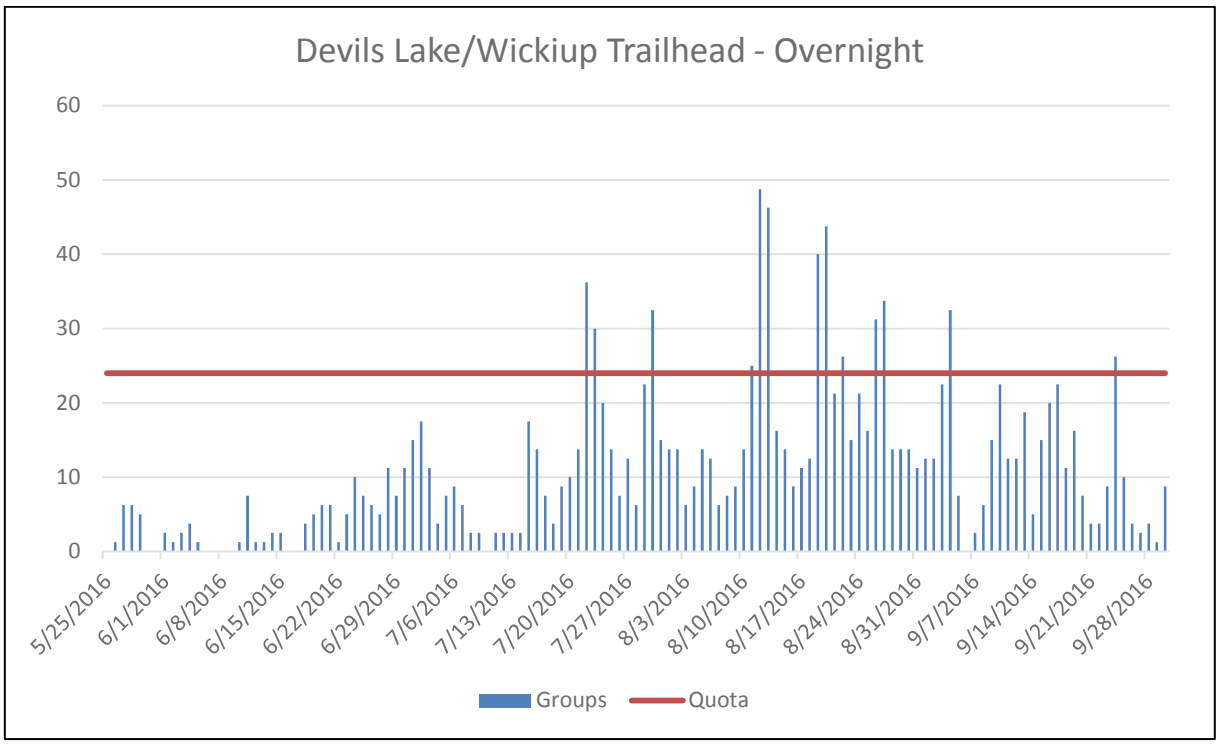

Jack Lake Trailhead - Overnight
20
18
16
14
12
10
8
6
4
2
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Cabot Lake Trailhead - Overnight
16
14
12
10
8
6
4
2
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Jefferson Lake Trailhead - Overnight
8
7
6
5
4
3
2
1
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Green Lakes/Soda Creek Trailhead - Overnight
45
40
35
30
25
20
15
10
5
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Green Lakes/Soda Creek Trailhead - Day Use
300
250
200
150
100
50
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota


Devils Lake/Wickiup Trailhead - Overnight
60
50
40
30
20
10
0
5/25/2016
6/1/2016
6/8/2016
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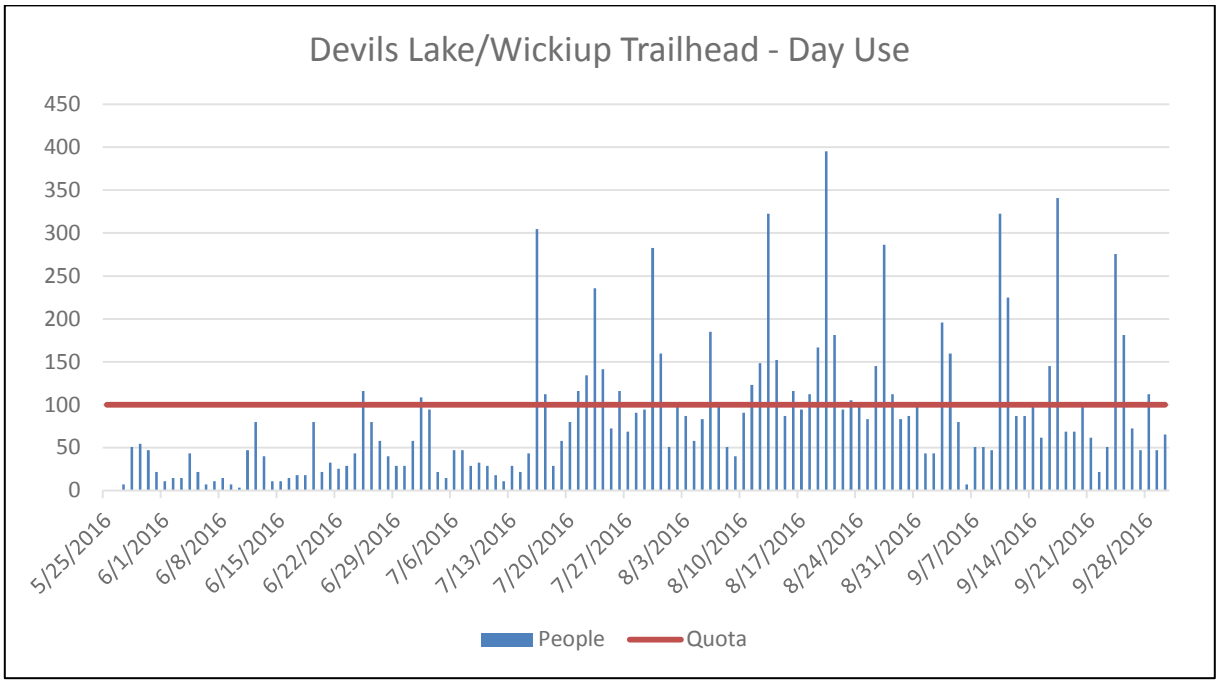
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Devils Lake/Wickiup Trailhead - Day Use
450
400
350
300
250
200
150
100
50
0
5/25/2016
6/1/2016
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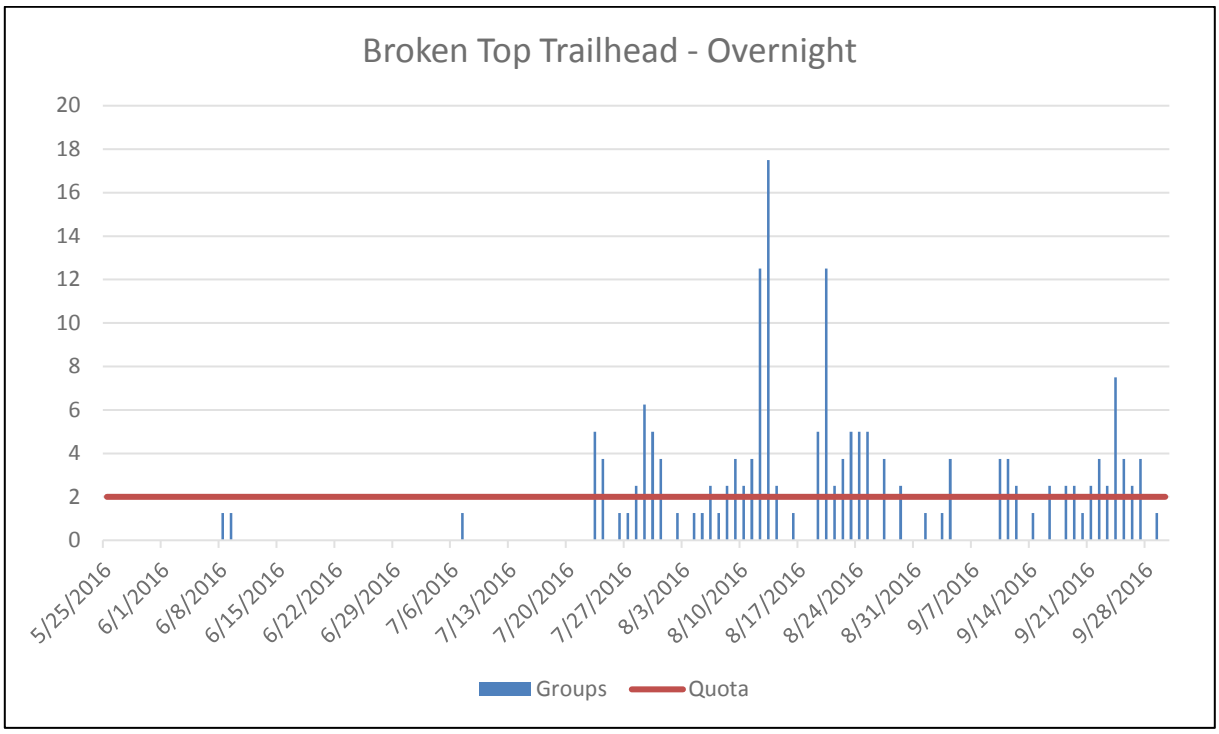
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota


Broken Top Trailhead - Overnight
20
18
16
14
12
10
8
6
4
2
0
5/25/2016
6/1/2016
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6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
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8/24/2016
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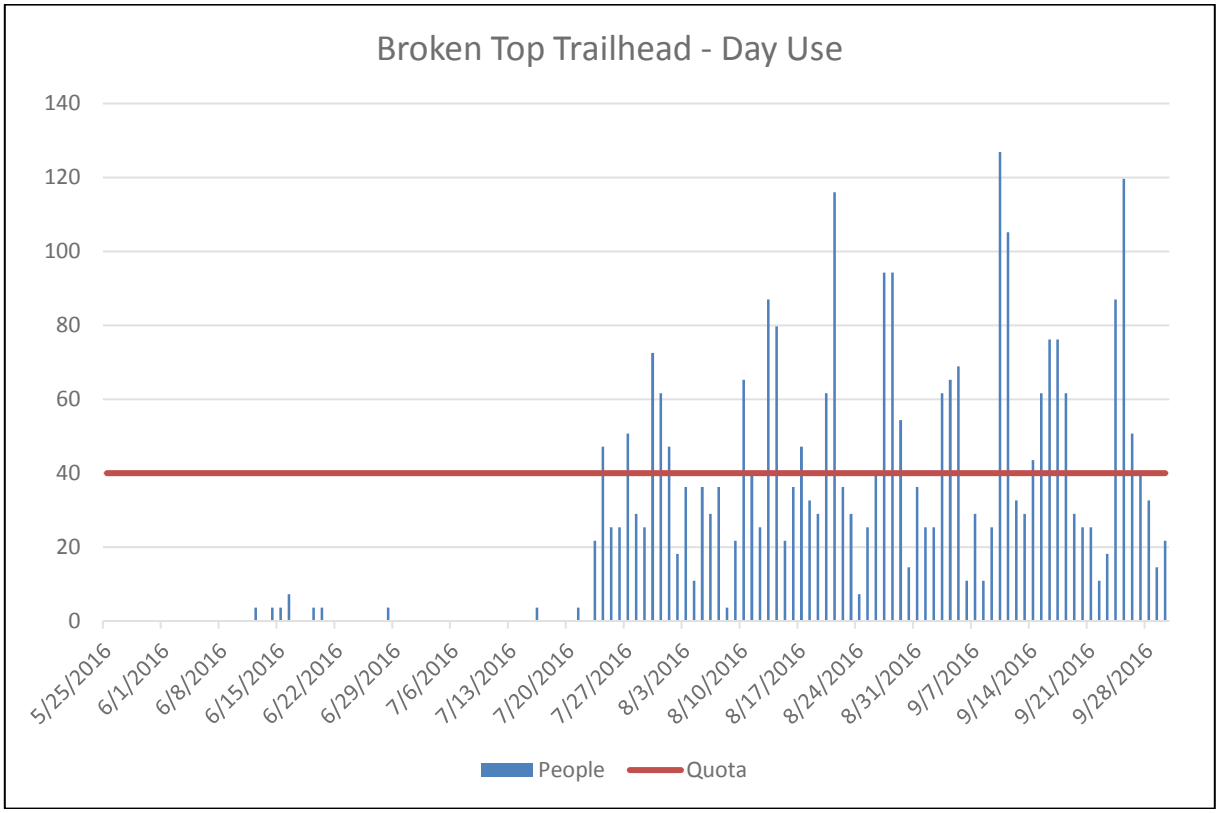
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Broken Top Trailhead - Day Use
140
120
100
80
60
40
20
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
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6/29/2016
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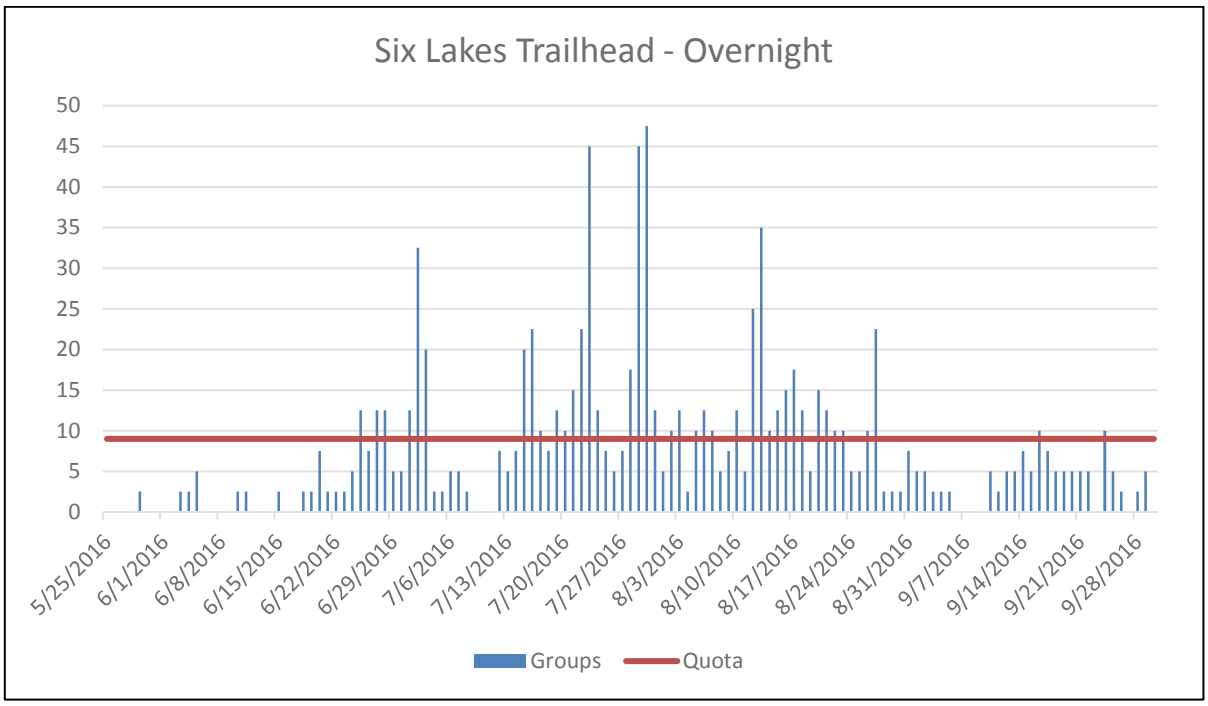
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota


Six Lakes Trailhead - Overnight
50
45
40
35
30
25
20
15
10
5
0
5/25/2016
6/1/2016
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6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
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8/24/2016
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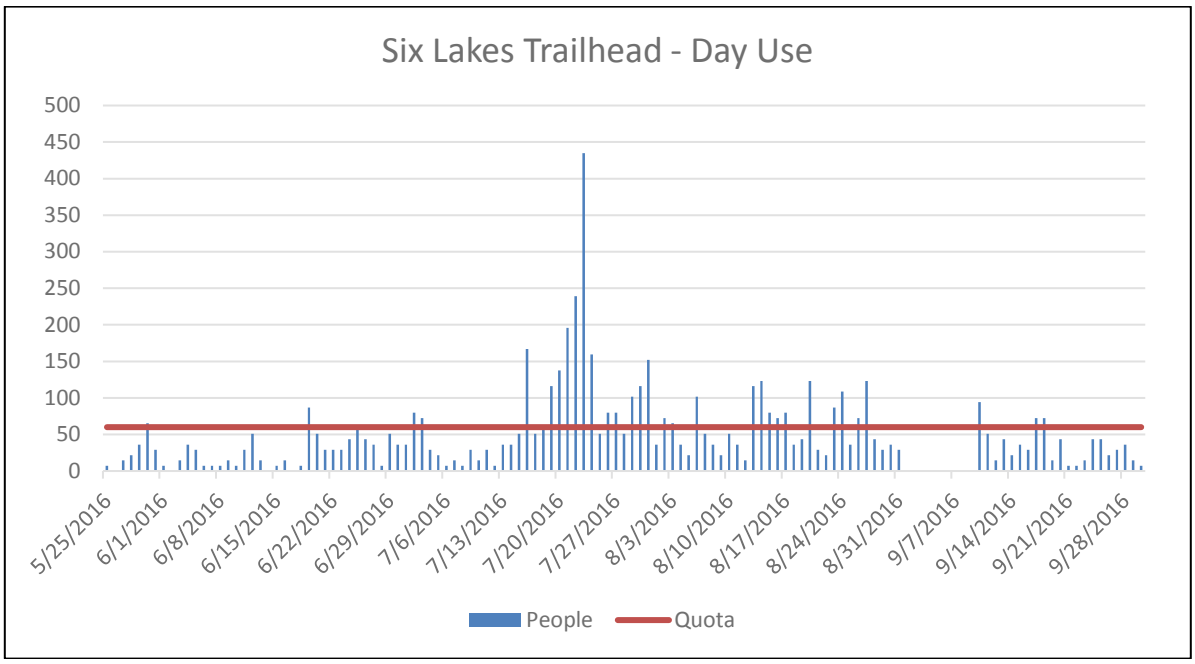
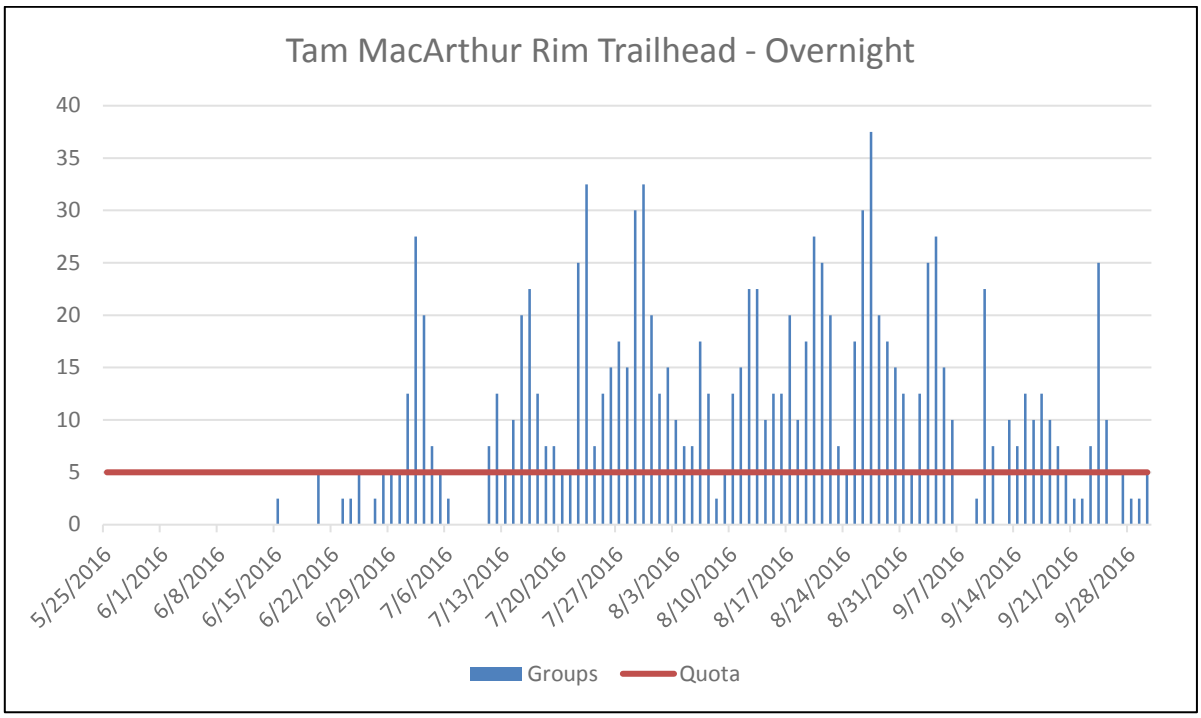
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Six Lakes Trailhead - Day Use
500
450
400
350
300
250
200
150
100
50
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota


Tam MacArthur Rim Trailhead - Overnight
40
35
30
25
20
15
10
5
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
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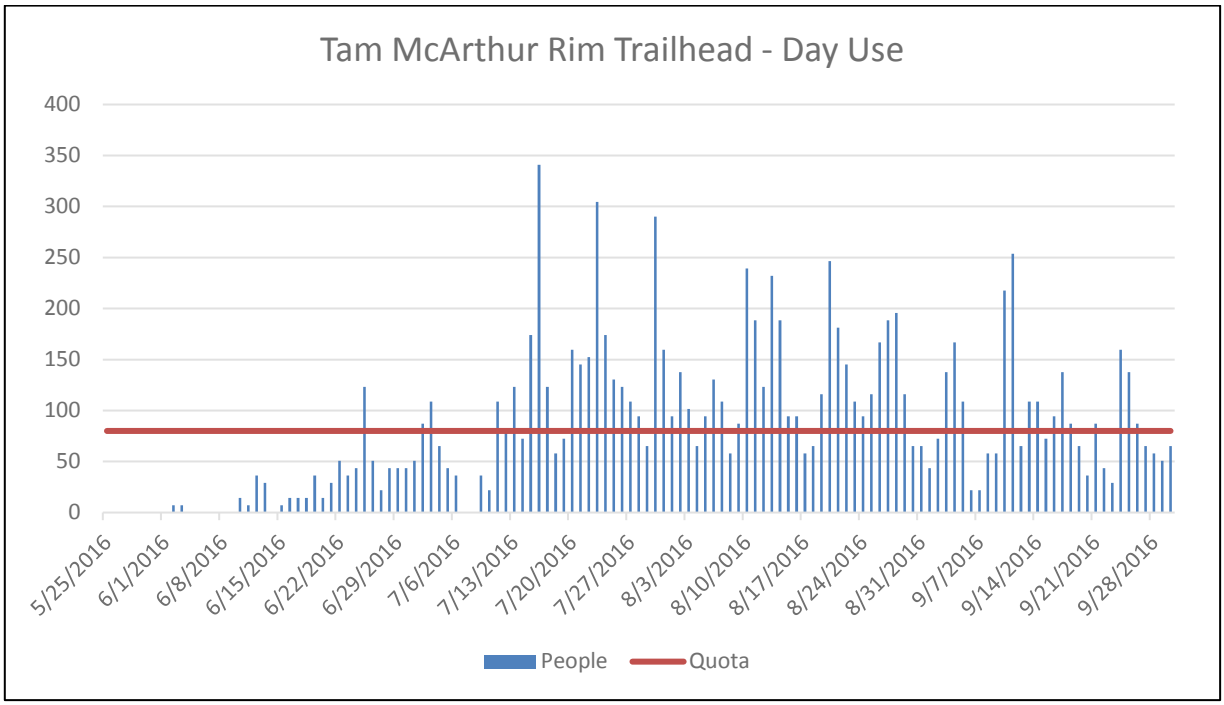
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Tam McArthur Rim Trailhead - Day Use
400
350
300
250
200
150
100
50
0
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6/8/2016
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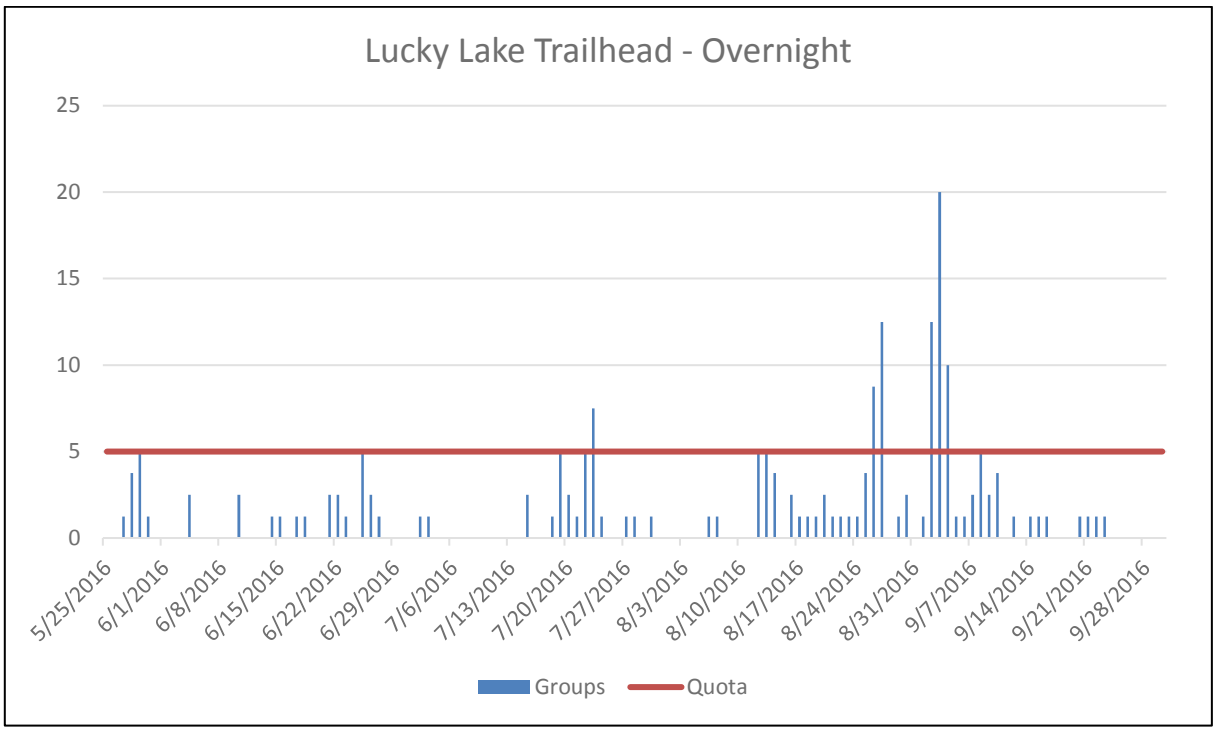
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota


Lucky Lake Trailhead - Overnight
25
20
15
10
5
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
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6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
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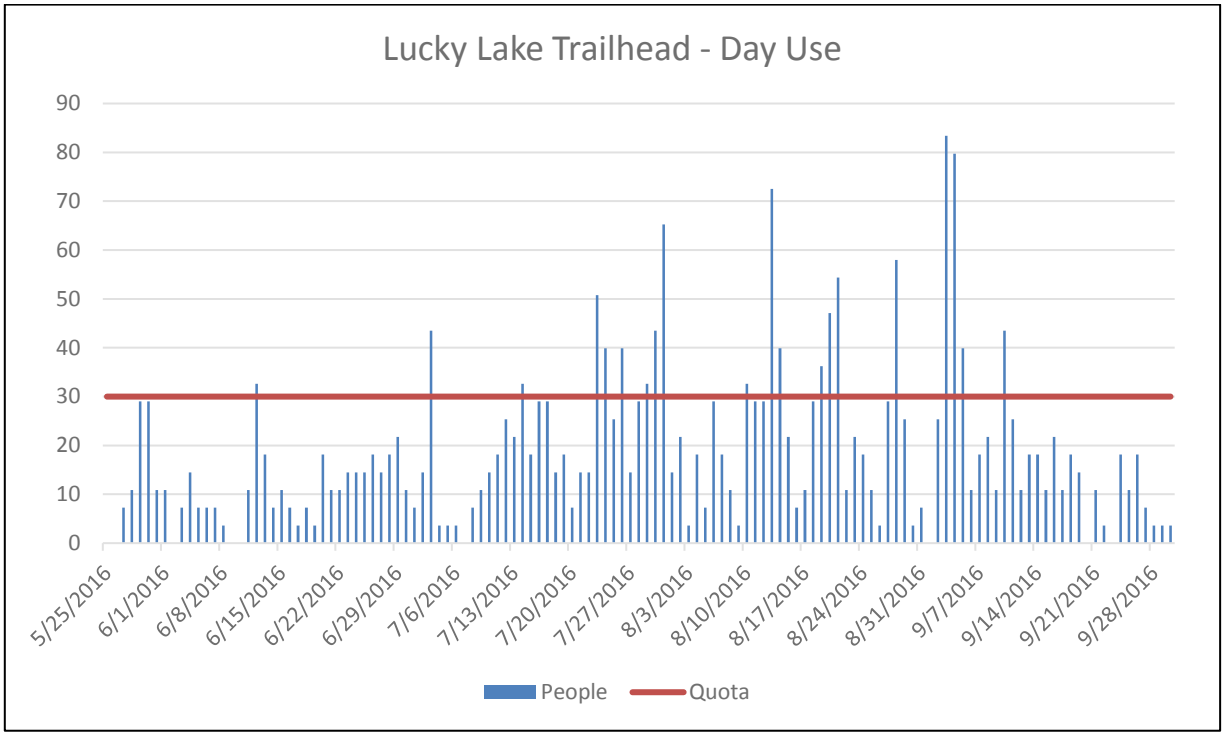
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Lucky Lake Trailhead - Day Use
90
80
70
60
50
40
30
20
10
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
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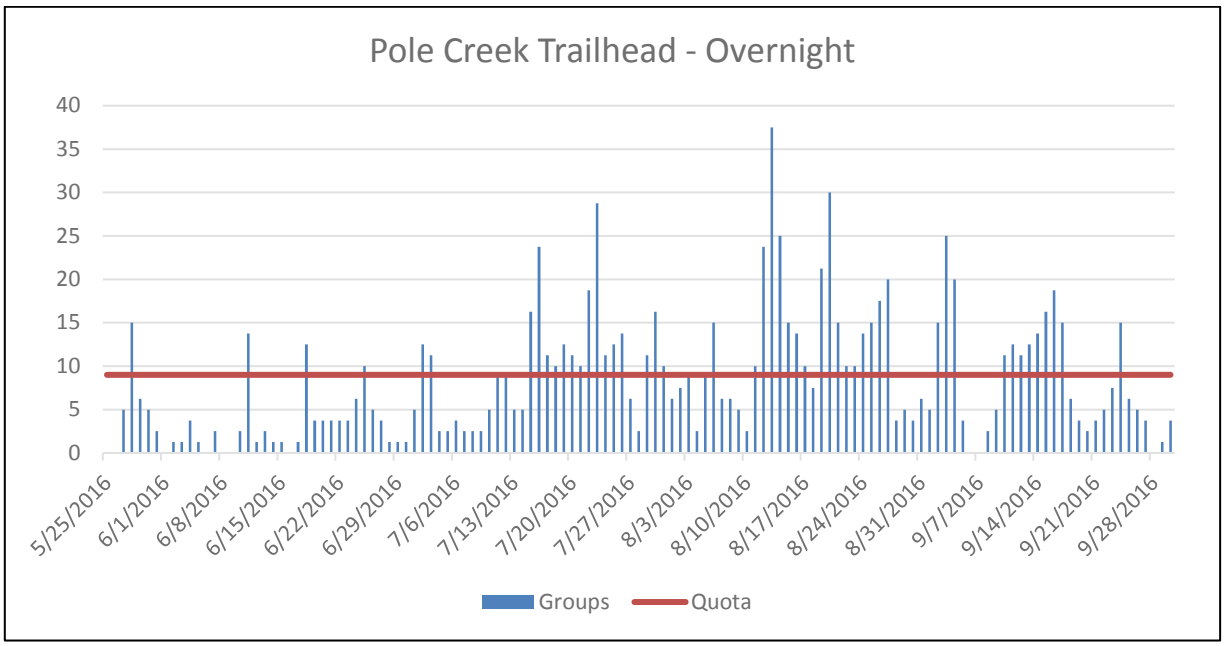
9/14/2016
9/21/2016
9/28/2016
People
Quota


Pole Creek Trailhead - Overnight
40
35
30
25
20
15
10
5
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
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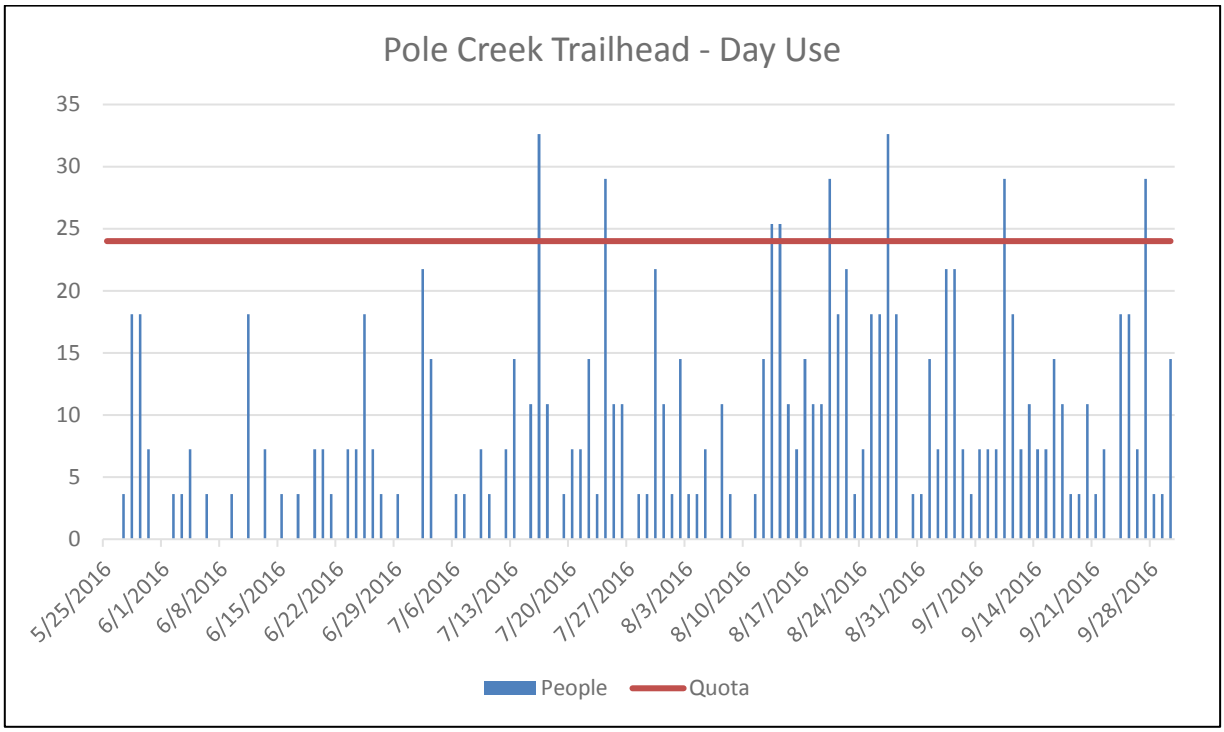
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Pole Creek Trailhead - Day Use
35
30
25
20
15
10
5
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
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6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
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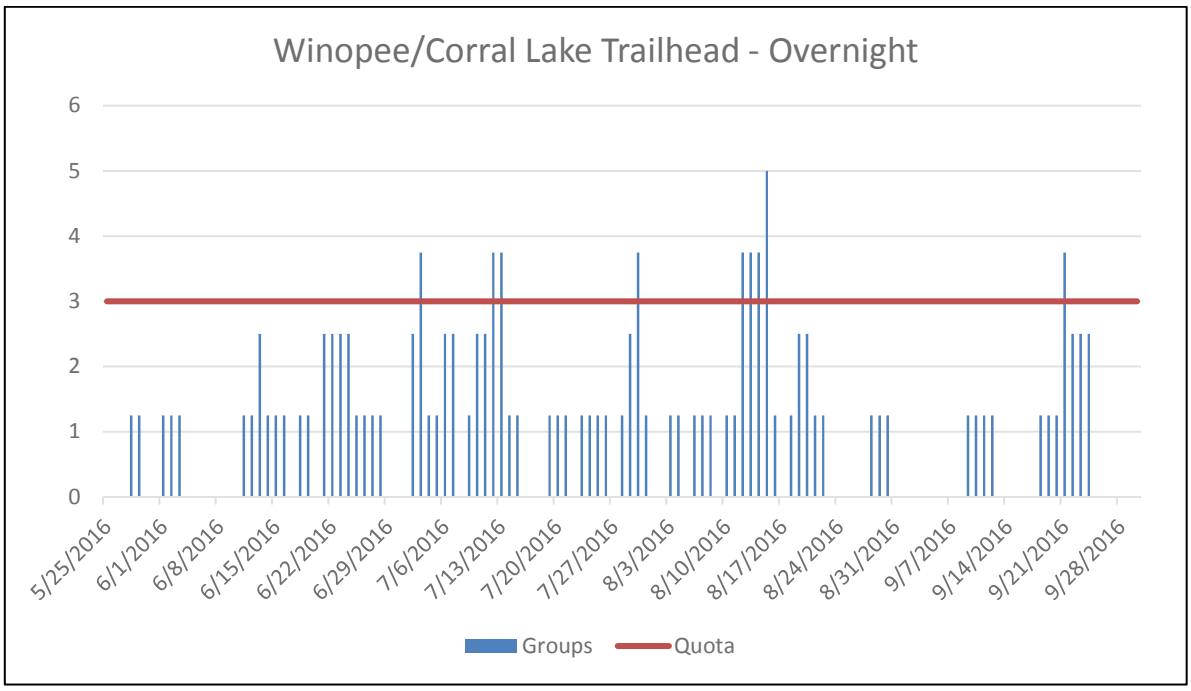
9/14/2016
9/21/2016
9/28/2016
People
Quota


Winopee/Corral Lake Trailhead - Overnight
6
5
4
3
2
1
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
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8/24/2016
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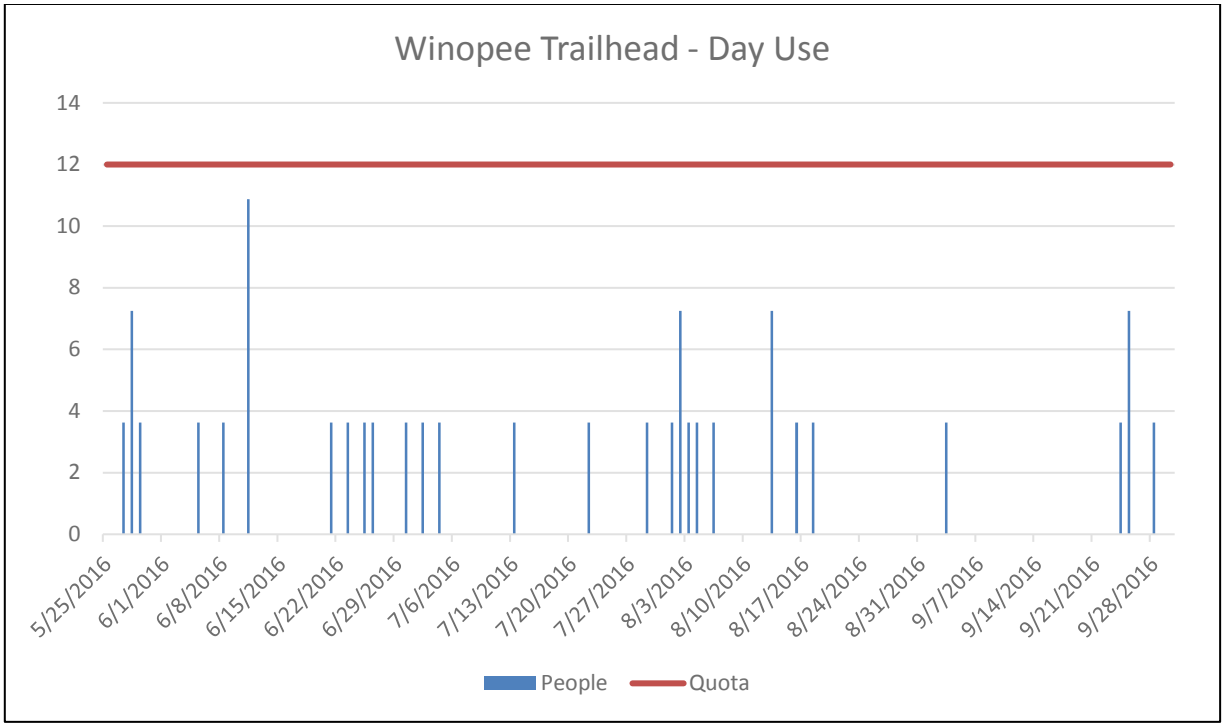
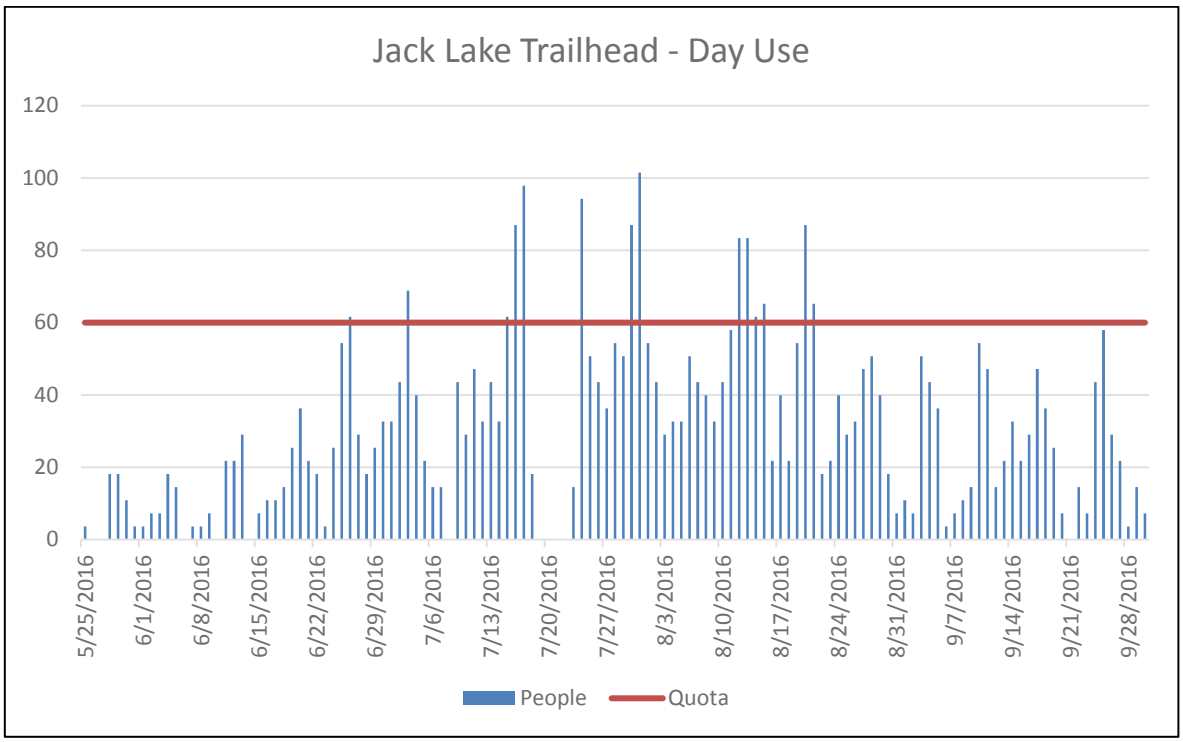
9/7/2016
9/14/2016
9/21/2016
9/28/2016
Groups
Quota


Winopee Trailhead - Day Use
14
12
10
8
6
4
2
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota


Jack Lake Trailhead - Day Use
120
100
80
60
40
20
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
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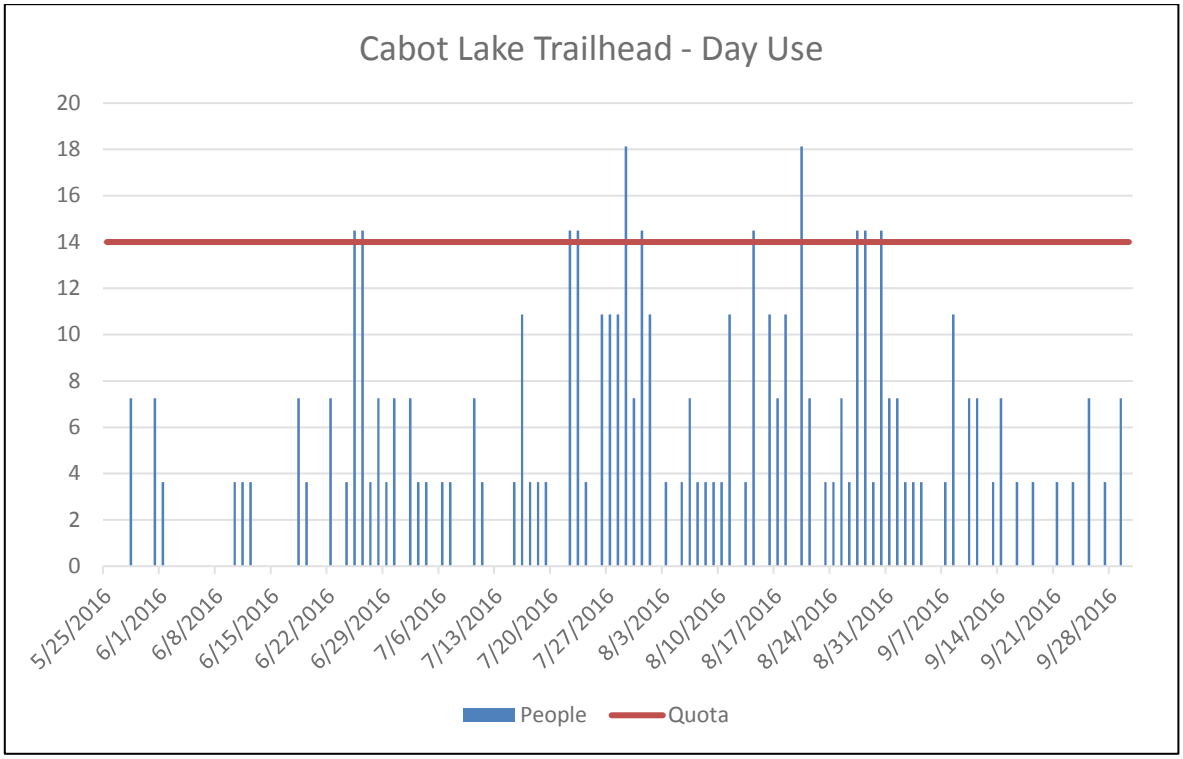
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota


Cabot Lake Trailhead - Day Use
20
18
16
14
12
10
8
6
4
2
0
5/25/2016
6/1/2016
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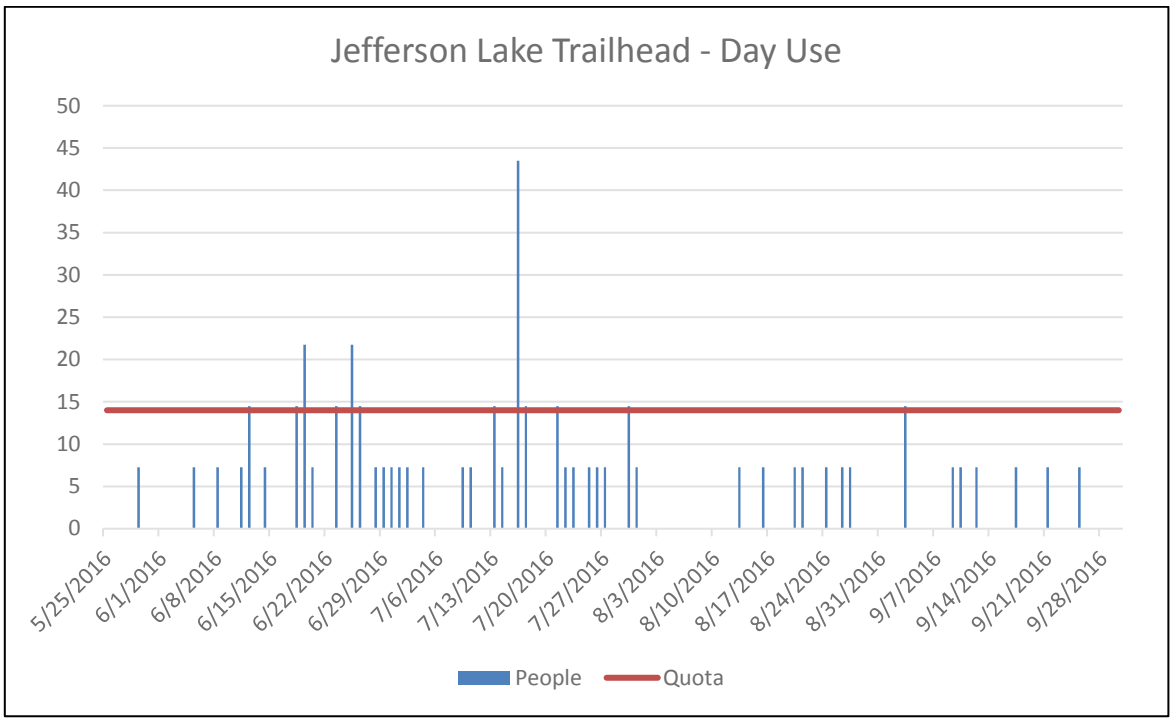
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota


Jefferson Lake Trailhead - Day Use
50
45
40
35
30
25
20
15
10
5
0
5/25/2016
6/1/2016
6/8/2016
6/15/2016
6/22/2016
6/29/2016
7/6/2016
7/13/2016
7/20/2016
7/27/2016
8/3/2016
8/10/2016
8/17/2016
8/24/2016
8/31/2016
9/7/2016
9/14/2016
9/21/2016
9/28/2016
People
Quota

Appendix D - Monitoring and Adaptive Management

Introduction

This appendix describes the types of monitoring that occur within the wilderness areas, the way adjustments may be made to the selected alternative based on monitoring results, and lays out an implementation framework.

Monitoring

The proposed visitor use management system is data-driven and adaptive which requires long-term monitoring of the central Cascades wilderness areas. Monitoring will be completed under a variety of methods. Some of the monitoring shown in Table D-1 is required and completed on a regular basis, other monitoring is done as needed and when funding is available. Results of various monitoring efforts will provide data towards adaptive management decisions, the need for other management actions outside the scope of this project's adaptive management toolbox; and how wilderness character is changing over time.

Table D-1: Monitoring Programs within Wilderness Areas

Data Source	Indicators	Monitoring Guidelines
Trailhead Permit Registration	# visitors # groups # dogs # stock length of stay	Permit numbers are compiled annually.
Wilderness Ranger Patrol Logs	Trail encounters Trash/human waste Structures Permit compliance Fire rings Tree damage Motorized/mechanical intrusions Oversize groups	Numbers for each category are compiled annually.
Solitude Monitoring	Encounters in High/Moderate Priority Zones	Solitude Monitoring Plan (Hall draft)
Campsite Inventory	# campsites campsite impact rating recovery	Campsite inventory conducted every 5-10 years.
User-trail Inventory	Miles and condition class of user trails	Social trail inventory conducted every 5-10 years.
Wilderness Character Monitoring	Baseline described in Wilderness Character Narratives provide setting for future measurement of wilderness character.	

Adaptive Management

Management actions authorized in the Central Cascades Wilderness Strategies Project will be evaluated for effectiveness and adapted to optimize the achievement of wilderness objectives. The goal of adaptive management is to be able to modify the limited-entry system as needed if there are unexpected results or monitoring shows a need to respond to growing use or degradation of conditions.

Adaptive management actions include adjustments to visitor use management through limited entry permits in the five wilderness areas. Other actions, such as those listed in the Forest Plan but not authorized in this project, are not precluded by this adaptive management plan and may be used in replacement of the actions described here. The need for additional analysis for actions outside the adaptive management actions would be determined on a case by case basis (i.e. monitoring data can also be used as a learning tool to help inform future management decisions not covered in this plan).

Table D-2: Adaptive Management Toolbox

Potential Adaptive Management Actions Available	
Day Use	Lower daily quota limit if monitoring demonstrates issues related to resource damage, crowding, safety, and visitor experiences continue after 2 years of managing to the initial daily quota and if reducing the number of visitors is expected to improve conditions.
	Adjust quota upwards if trends demonstrate that all objectives are improved and sustainable into the future or if monitoring demonstrates that the visitor use objective can be higher.
	Incorporate additional trailhead(s) into the limited-entry permit system if monitoring demonstrates unsustainable increases in use after 2 years of managing the initial system.
Over-night Use	Adjust number of overnight camping permits available at for a trailhead
	Adjust number of camping reservations available in a zone
	Require visitors to carry wag bags
	Add zones to the reservation requirement
	Implement regulated campsite setbacks from streams and lakes
	Implement designated campsites

Other Management Actions

The actions described in this plan do not preclude any additional actions, not yet identified to be implemented in addition to, or in replacement of, the actions described in the Adaptive Management Toolbox, as long as they are consistent with the Deschutes and Willamette NF's LRMP direction. There is a list of actions that are approved under the Forest Plans for managing visitor use when conditions exceed forest plan standards (Deschutes LRMP M6-25; Willamette LRMP MA-1-29;

MA-1-30). The level of NEPA analysis needed to support any of these management actions would be determined on a case-by-case basis.

Implementation

The Wilderness Working Group (WWG) will serve as the implementation team for the project. The WWG will convene annually to review the monitoring data, identify issues, and determine trends. This review will provide the basis for whether management actions are needed and whether or not they fall within the adaptive management toolbox (Table D-2). Before adjusting management actions, the Forest will ensure the probable cause of the issue has been identified.

A public stakeholder group will be created to initially review and provide feedback on the first year of implementation. The group will meet annually or biannually thereafter to provide feedback on the Forest Service suggested adaptive management actions.

Rationale for implementing adaptive management actions will be documented in an annual operating plan. This documentation will form the basis for updating, initiating, or rescinding Forest orders.

Appendix E – Wilderness Character Analysis Tables

The following tables display how various components impact the four main qualities of wilderness character. This analysis is summarized in the body of the EA.

Table E1: Alternative 1 - No Action Alternative						
Component Of Analysis	Quality of Wilderness Character Affected *Primary quality Affected	Mount Jefferson	Mt. Washington	Three Sisters	Diamond Peak	Waldo
Visitor interactions with wildlife	*Natural	Interactions will continue to increase as use increases. Displacement of visitors into remote places may result in increased interactions with wildlife as people search for areas of the wilderness with more solitude. Popular areas will receive more use during popular times and wildlife will habituate, become attracted to people, or be disturbed, all of which negatively affect the natural quality of wilderness. Compared to Alternatives 2, 3, 4 and 5, the no action alternative involves the least temporal and spatial displacement of people within the wilderness, resulting in less pressure on wildlife at remote places and during the week than the other alternatives in the short run. In the long run, as use increases, this alternative will have the most impact of all the alternatives, because other alternatives limit the amount of recreational use.			Interactions will continue to increase as use increases. Though displacement into remote places may result in increased interactions with wildlife as people search for places with more solitude, the magnitude of this effect is expected to be less than in the other wildernesses, due to the remote and less popular attributes of Diamond Peak and Waldo Lake Wildernesses. This will result in Alt. 1 being the best alternative for Diamond and Waldo in the short run. In the long run, Alt. 1 will be more impactful than Alt. 2, 4 and 5 to wildlife due to unfettered access and population growth causing displacement. Alt. 1 will be less impactful than Alt. 3 in the short and long run due to immediate and then continued displacement from backpackers and some day users as people search for alternative locations to recreate following the implementation of permits in the three busiest wilderness areas.	
Spread of invasive plants	*Natural	Continued possibility of weed spread and/or introduction to new places as people are displaced. Compared to Alternatives 2, 3, 4 and 5,			Introductions of invasive species will continue to increase as use increases. Though displacement into remote places may result in increased spread	

		the no action alternative involves the least amount of temporal and spatial displacement of people within the wilderness, resulting in less pressure at remote places and during the week than the other alternatives in the short run. In the long run, as use increases wilderness-wide, this alternative will have the most impact of all the alternatives.	as people search for areas with more solitude, the magnitude of this effect is expected to be less than in the other wildernesses, due to the remote and less popular nature of Diamond Peak and Waldo Lake Wildernesses. This will result in the Alt. 1 being the best alternative for Diamond and Waldo in the short run. In the long run, Alt. 1 will be more impactful than Alt. 2, 4 and 5 to wildlife. Alt. 1 will be less impactful than Alt. 3 in the long run.
Visitor Impacts on campsites, lunch spots, and other recreation sites	*Natural, Undeveloped, Primitive and unconfined	As use increases impacts to vegetation at campsites and lunch spots will continue to increase, primarily at sites that are moderately to lightly impacted at present. Heavily used sites are unlikely to further deteriorate as there is a curvilinear affect from trampling on vegetation; at first, sites change, and vegetation diminishes, rapidly, but after time, popular spots harden resulting in less impact at the margin. As people are displaced from continued growth at popular areas, new impacts will appear throughout the wilderness. These effects will be greater in the long run than the short run. This Alt. has the most impact in the long run.	Vegetation loss at campsites and other recreation sites will continue to increase as use increases. Though displacement into remote places may result in increased site proliferation as people search for areas of the wilderness with more solitude, the magnitude of this effect is expected to be less than in the other three wildernesses, due to the remote and less popular nature of Diamond Peak and Waldo Lake wildernesses. Though more impactful than alternatives 2, 4 and 5 to ground vegetation, the no Alt 1. should be less impactful than Alt. 3.
User Created Trails	*Natural, undeveloped, primitive and unconfined	User created trails will continue to proliferate more than under any other alternative. Though new trails are unlikely to form in the most popular areas (those areas are saturated with trails), existing trails are likely to continue to degrade as use increases. New trails are likely to appear in remote and less used areas as use increases.	User created trails will continue to proliferate. Though displacement into remote places may result in increased user trail proliferation as people search for areas of the wilderness with more solitude, the magnitude of this effect is expected to be less than in the other three wildernesses, due to the remote and less popular nature of Diamond Peak and Waldo Lake wildernesses. Though more impactful than Alts. 2, 4 and 5, the Alt 1. should be less impactful than Alt. 3.

Trash and Vandalism	Natural, undeveloped, *primitive and unconfined recreation	Impacts from trash and vandalism will increase more than any other alternative, as unlike campsites, trash and vandalism have a tendency to increase linearly with use. These impacts will increase both in currently popular areas and in any areas that received use displaced from popular areas. Though education can help mitigate these impacts, education will continue under all alternatives.	Trash and vandalism will continue to increase. Though displacement into remote places may result in increased impacts as people search for areas of the wilderness with more solitude, the magnitude of this effect is expected to be less than in the other three wildernesses, due to the remote and less popular nature of Diamond Peak and Waldo Lake wildernesses. Though more impactful than Alts. 2, 4 and 5, the Alt. 1 should be less impactful than Alt. 3.
Human Waste	Undeveloped, *primitive and unconfined	Impacts from Human and pet waste will continue to increase more than under any other alternative. All other things being equal, human and pet waste should increase linearly with the overall number of human visitors.	Human and pet waste will continue to increase. Though displacement into remote places may result in increased impacts as people search for areas of the wilderness with more solitude, the magnitude of this effect is expected to be less than in the other wildernesses, due to the remote and less popular nature of Diamond Peak and Waldo Lake wildernesses. Though more impactful than Alts. 2, 4 and 5, Alt. 1 alternative should be less impactful than Alt. 3.
Travel Restrictions within the wilderness	*Primitive and unconfined recreation	Second highest level of freedom of travel within the wilderness. This alternative restricts travel within the Obsidian and Pamelia limited entry areas, which is more impactful than Alt. 2.	
Use Restrictions	*Primitive and unconfined recreation	Least amount of use restrictions, resulting in highest opportunity for spontaneity in all 5 wilderness areas	
Signs	Undeveloped, *primitive and unconfined recreation	This will be the second best alternative for limiting signs in the 5 wilderness areas. Alt 2 will involve fewer signs in the wilderness than Alt 1, due to the elimination of the Pamelia and Obsidian limited entry areas in Alt 2.	
Cultural Resources	*Other Values of Wilderness	Cultural resources will be generally more exposed to theft than under any other alternative, though the Obsidian Limited Entry will be more protected in this alternative than Alt 2.	Cultural resource damage will continue to increase. Though displacement into remote places may result in increased exposure of cultural resources to theft as people search for areas of the wilderness with more solitude, The

			magnitude of this effect is expected to be less than in the other three wildernesses due to the remote and less popular nature of Diamond Peak and Waldo Lake wildernesses. Though more impactful than Alts 2, 4 and 5, Alt 1 should be less impactful than Alt 3.
Solitude	*Solitude	As use increases, there will be a continued erosion of solitude throughout the wilderness, more than under any other alternative. Though low use areas are not likely to change in the short run, this alternative is the worst of all for solitude in the long run.	Solitude will continue to decrease as use increases. Though displacement into remote places may result in increased impacts as people search for areas of the wilderness with more solitude, the magnitude of this effect is expected to be less than in the other three wildernesses due to the remote and less popular nature of Diamond Peak and Waldo Lake wildernesses, Though more impactful than Alts 2, 4 and 5, Alt 1 should be less impactful than Alt 3.

Table E2: Alternative 2 – Overnight limited entry for all 5 wilderness areas controlled by daily trailhead quotas. No overnight zone quotas. Day use restrictions (daily trailhead quotas) at 29 trailheads in Three Sisters, 15 in Mount Jefferson, 2 in Mount Washington.

Component Of Analysis	Quality of Wilderness Character Affected *Primary quality Affected	Mount Jefferson	Mt. Washington	Three Sisters	Diamond Peak	Waldo
Visitor interactions with wildlife	*Natural	Alt 2 will be an improvement over Alt 1, as there will be fewer interactions with wildlife. Also, this will be an improvement over Alt 3 and 4 due to less day use displacement, though this effect will be very minimal. Alt 2 will differ from Alt 5 because, in Alt 2, people are more free to travel across			Improvement over the Alt 1. Also improvement over Alt. 3 due to inclusion of a quota for overnight use. There may be some displacement of day use resulting from the popular trailheads that have use limits, but it will be minimal due to long travel distances to trailheads. Low use areas will continue to receive low levels of use, and visitor interactions with wildlife in those areas are unlikely to change.	

		the landscape as they want, resulting in a travel pattern that more closely resembles the current travel pattern. Though managers will be able to raise and lower trailhead quotas to encourage spatial displacement within the wilderness, it is likely that Alt 2 will continue to resulting in high use in traditionally popular areas and continued low use in less popular areas. That stated, wildlife may be impacted more in Alt 2 than Alt 1 in the near future due to the immediate spatial displacement of use into traditionally less used areas and temporal displacement resulting in more visitors during traditionally less desirable days of the week. This short term impact is less under this alternative than Alt 3, 4 and 5. In the long run, wildlife in traditionally less used areas may have fewer interactions with visitors under this alternative than any other.	
Spread of invasive plants	*Natural	Alt 2 is an improvement over Alt 1. Alt 2 will differ from Alt. 3 and 4 due to less day use displacement, though this effect will be very minimal. It will differ from Alt. 5 because people will likely continue to observe similar travel patterns under Alt 2 resulting in high use in traditionally popular zones and continued low use in less popular areas. Because of this, invasive plants are less likely to spread to new areas under this alternative than others.	Improvement Alt 1. Also improvement over Alt. 3 due to inclusion of quota for overnight use. There may be some displacement of day use, but it will be minimal due to long travel distances to trailheads. Therefore, invasive plants are less likely to spread than under other alternatives???.

Visitor Impacts on campsite and lunch spots	*Natural, Undeveloped, Primitive and unconfined	Alt 2 will be an improvement over Alt 1. It will also be an improvement over Alt. 3 and 4 due to less day use displacement, though this effect will be very minimal. Alt. 2 will differ from Alt. 3, 4 and 5 because people will likely continue to exhibit similar travel patterns as they have in the past, resulting in high use in traditionally popular areas and continued low use in less popular areas, which may result in less campsite proliferation in remote, traditionally less used, areas.	Improvement over Alt 1. Also improvement over Alt. 3 due to inclusion of quota for overnight use. There may be some displacement of day use resulting in impacts to lake shores and lunch spots, but it will be minimal due to long travel distances to trailheads.
User Created Trails	*Natural, undeveloped, primitive and unconfined	Improvement over Alt 1. Also an improvement over Alt. 3 and 4 due to less day use displacement, though this effect will be very minimal. Will differ from Alternative 3, 4 and 5 because people may create new routes to gain access to highly desirable destinations from the traditionally less used trailheads that have available quotas. This could result in non-traditional travel patterns to gain access to traditionally used areas, though the effect is expected to be minimal due to long distances from low-use trailheads to popular destinations.	Improvement over Alt 1. Also improvement over Alt. 3 due to inclusion of quota for overnight use. There may be some displacement of day use, but it will be minimal due to long travel distances to trailheads; day users tend to stay on system trails, so displacement is unlikely to lead to new user trails (?)
Trash and Vandalism	Natural, undeveloped, *primitive and unconfined recreation	Improvement Alt 1. Also an improvement over Alt 3 and 4 due to less day use displacement, though this effect will be very minimal. May differ from Alt. 3, 4 and 5 slightly in that trash and vandalism will be more concentrated in traditionally high use	Improvement over Alt 1. Also improvement over Alt. 3 due to inclusion of quota for overnight use. There may be some displacement of day use, but it will be minimal due to long travel distances to trailheads. Trash and vandalism will be more of a concern with displacement than other factors such as invasive plants, user created trails and impacts to lunch and campsites, because trash is assumed to increase linearly with use levels.

		areas. Because of this effect, Alt. 2 may result in less trash in remote areas of the wilderness compared to all other alternatives.	
Human Waste	Undeveloped, *primitive and unconfined	Improvement over Alt 1. Also Alt 2 is possibly a small improvement over Alt 3 and 4 due to more day use restrictions and, therefore, less potential displacement, though this effect will be very minimal. May differ from Alt. 3, 4 slightly in that Human Waste will be more concentrated in traditionally high use areas. Because of this effect, Alt. 2 may result in less human waste in remote areas of the wilderness compared to Alt 3, 4, and 5, though spreading out human waste is probably a net positive.	Improvement Alt 1. Also improvement over Alt. 3 due to inclusion of quota for overnight use. There may be some displacement of day use, but it will be minimal due to long travel distances to trailheads. Human waste will be more of a concern with displacement than other factors
Travel Restrictions within the wilderness	*Primitive and unconfined recreation	This is an improvement over all action alternatives as it allows permit holders to travel unrestricted through the wilderness. Alt 2 does away with the Obsidian and Pamelia limited entry areas and results in even less control over people's travel within the wilderness than Alt 1.	No change from Alt 1, 3, or 4, as there would be no restriction on people's travel once they enter wilderness. This will be an improvement over Alt. 5, which will impose daily quotas for overnight use zones.
Use Restrictions	*Primitive and unconfined recreation	This is a retrogression from Alt 1 and will result in less spontaneity in trip planning and less choice of which trails to visit as a result of restricting access to the wilderness. Alt 2 has the most trails with daily day use quotas of all alternatives.	This is a retrogression from Alt 1 for overnight use. It is an improvement over Alt 5 as it does not include day use restrictions.

Signs	Undeveloped, *primitive and unconfined recreation	This alternative will result in the fewest signs in the wilderness due to the dismantling of the Obsidian and Pamelia limited entry areas.	No change from no action alternative, as well as Alt 3 and 4. This will be an improvement from Alt 5, as there will be less need for signs than under Alt 5
Cultural Resources	*Other Values of Wilderness	This alternative will result in fewer impacts overall to cultural resources compared to Alt 1, but may result in overall higher impacts at the Obsidian Cliffs area than any other Alternative, as there would be no overnight zone quota for it. (Although trailhead quotas would be in place for Obsidian Trailhead, overnight use within the zone might increase due to through hikers.)	Improvement over Alt 1. Also improvement over Alt. 3 due to inclusion of quota for overnight use. There may be some displacement of day use, but it will be minimal due to long travel distances to trailheads.
Solitude	*Solitude	In the short run, this alternative will have more impacts in areas that were not traditionally used than Alt 1, due to displacement of people who can't get permits to popular trails being displaced to less popular trails, resulting in, potentially, increased encounters in remote areas. In the long run, Alt 2 will likely result in an improvement compared to Alt 1 because the quotas will cap use. Alt 2 may be an improvement over Alts 3 and 4 due to more day use restrictions. It will differ from Alts 3 and 4 in that popular areas are likely to have more issues with solitude under this alternative due to the unrestricted travel for backpackers in the wilderness (compared to Alt 3, 4 and 5). Additionally, this alternative will likely result in slightly more solitude in less traditionally used areas of the	Slight improvement over Alt 1. Also a minor improvement over Alt 3 due to inclusion of quota for overnight use. There may be some displacement of day use, but it will be minimal due to travel distances.

		wilderness than Alts 3 and 4 due to the lack of overnight zones.	

Table E3: Alternative 3 – Daily Trailhead quotas for overnight use. Most popular overnight zones have daily quotas. Day use restricted at 12 trailheads in Three Sisters, 7 in Mount Jefferson. Excludes any day use or overnight actions in Diamond and Waldo

Component Of Analysis	Quality of Wilderness Character Affected *Primary quality Affected	Mount Jefferson	Mt. Washington	Three Sisters	Diamond Peak	Waldo
Visitor interactions with wildlife	*Natural	Improvement with fewer interactions compared to Alt 1. This will differ from Alt. 5 in that fewer zones will have overnight quotas in Alt 3, resulting in more traditional patterns of use at destinations. This may result in less use being displaced to traditionally unused areas than Alt. 5 and similar use to Alts 2 and 4. There may be the potential for more potential impacts from day use under this alternative than under Alts 2, 4 and 5 due to the lack of restrictions (See Key issues section).			This alternative is more likely to impact wildlife in the near future than Alt 1 due to displacement from people who are unable to go backpacking or hiking in the more popular wilderness areas. Additionally, this alternative is more likely to impact wildlife than Alts 2, 4 and 5 due to the displacement of visitors from the other three wildernesses, particularly overnight visitors. In the long run, this alternative will involve the most displacement as use increases and more visitors are displaced from the three more popular wilderness areas. This effect will be worst during peak season when people are unable to get backpacking and day hiking permits for the other wilderness areas. This alternative is the worst for	

			Diamond Peak and Waldo Lake in the short and long term.
Spread of invasive plants	*Natural	Improvement from Alt 1 due to fewer people traveling in the wilderness, and therefore less likelihood of spreading weeds. This will differ from Alt 5 in that there will be fewer zones with camping quotas in Alt 3, resulting in more traditional use patterns. This may result in less use of traditionally unused areas than Alt 5 and therefore less likelihood of spreading invasive plants to traditionally less used areas, similar to Alts 2 and 4. Alt 3 may have more impacts from day use displacement than under Alts 2, 4 and 5 due to less day use restrictions.	More likely to spread invasive plants in the near future than all other alternatives due to displacement of visitors from the other three wildernesses, particularly overnight visitors.
Visitor Impacts on campsite and lunch spots	*Natural, Undeveloped, Primitive and unconfined	Improvement from Alt 1 due to less people at peak times in the wilderness, and therefore less likelihood of campsite proliferation. This will differ from Alt. 5 in that fewer zones will have overnight quotas In Alt 3, resulting in a more traditional use patterns. This may result in less use of traditionally unused areas than Alt 5 and therefore less campsite proliferation than Alt 5, similar to Alts 2 and 4. There may be more potential impacts on lunch spots from day use displacement from this alternative than Alts 2, 4 and 5. This will differ from Alt 2 in that it will result in potentially less proliferation at popular areas due to the key camping zones being turned on. Alt 3 may result in slightly more camping in traditionally less used areas than Alt 2 due to additional permit restrictions in popular camping zones.	More likely to result in the proliferation of campsites than any other alternative due to displacement of visitors from the other three wildernesses, particularly overnight visitors.
User Created Trails	*Natural, undeveloped, primitive and unconfined	Improvement over Alt 1. Though a potential retrogression from Alts 2, 4 and 5 due to displacement of day use, this will be a minimal effect. Alt. 3 may be an improvement from Alt. 2	More likely to create impacts from new user created trails than all other alternatives due to displacement of visitors from the other three wildernesses, particularly overnight visitors.

		as there will be less interest in creating new routes due the need to secure an overnight reservation for the most popular zones.	
Trash and Vandalism	Natural, undeveloped, *primitive and unconfined recreation	Improvement over Alt 1. Potential retrogression compared to Alts. 2, 4 and 5 due to less day use restrictions, though this effect will be very minimal.	More likely to create new impacts from trash and vandalism than all other alternatives due to displacement of visitors from the other three wildernesses, particularly overnight visitors.
Human Waste	Undeveloped, *primitive and unconfined	Improvement over Alt 1. Slight retrogression from Alts 2, 4 and 5 due to more day use displacement, though this effect will be very minimal.	More likely to create new impacts from human waste than all other alternatives due to displacement of visitors from the other three wildernesses, particularly overnight visitors.
Travel Restrictions within the wilderness	*Primitive and unconfined recreation	This will result in a slight retrogression from the Alt 1 in that it has quotas for some overnight use zones, though it is a large improvement over Alt. 5 which establishes quotas for overnight use in all zones. How about compared to Alt 2 and 4?	No change from alternatives 1, 2 and 4. Less restrictive than, 5.
Use Restrictions	*Primitive and unconfined recreation	This is a retrogression from the Alt 1 and will result in less spontaneity in trip planning as a result of establishing overnight quotas for both zones and trailheads, as well as day use quotas for 19 trails. This effect is not as large as Alts 2, 4 and 5 due to less day use restrictions.	No change from alternative 1. Less restrictive than Alt 2, 4, 5.
Signs	Undeveloped, *primitive and unconfined recreation	This alternative is a slight retrogression from Alt 1 in that it will require more signs at the entrance to zones that have quotas. It is a large improvement over Alt 5, which will require many more signs to mark the entry into each quota zone.	No change from no action alternative, as well as Alt 3 and 4. This will be an improvement from Alt 5, as there will be less need for signs than under Alt 5.
Cultural Resources	*Other Values of Wilderness	This is an improvement over Alt 1 and Alt 2 because it protects the Obsidian Cliffs cultural site through a quota on overnight use. It may result in more issues than Alts 2, 4 and 5 in some areas due to day use displacement.	More impact than all other alternatives due to displacement of visitors, particularly overnight visitors from the other three wildernesses.
Solitude	*Solitude	In the short run, this alternative will have more impacts in areas that were not traditionally used	Potential increase impact from all other alternatives due to displacement of visitors,

		than Alt 1, because some use will be displaced from currently popular areas to previously lower use areas, though this impact would be less for this alternative than Alt 5. However, it will result in an improvement in the long run due to caps on use. This alternative may be a slight retrogression over Alts 2, 4 and 5 due to less day use restrictions. It will differ from Alt 2 in that popular areas will see an improvement to solitude, while some less popular areas will see a decrease in solitude.	particularly overnight visitors from the other three wildernesses.

Table E4: Alternative 4 - Trailhead quotas for overnight use in all wilderness areas. Most popular overnight zones have daily quotas. Day use restricted at 18 trailheads in the Three Sisters, 10 trailheads in Mount Jefferson and 1 trailhead in Mt. Wash.

Component Of Analysis	Quality of Wilderness Character Affected *Primary quality Affected	Mount Jefferson	Mt. Washington	Three Sisters	Diamond Peak	Waldo
Visitor interactions with wildlife	*Natural	Improvement, due to fewer interactions compared with Alt 1. This will differ from Alt. 5 in that there will be fewer zones with overnight quotas, resulting in more traditional use patterns. This may result in less use of traditionally unused areas than Alt. 5 and similar overnight(?) use to Alts 2 and 3. There may be more potential impacts from day use displacement from this alternative than under Alts 2 and 5.			Though there is a net improvement under this alternative compared to the Alts 1 and 3, it is likely that Diamond and Waldo will still see some displacement of day use from the other three wildernesses; however, this is unlikely to be substantial, due to the distance of trailheads from population centers	
Spread of invasive plants	*Natural	Improvement from Alt 1due to fewer people traveling in the wilderness, and therefore less likelihood of spreading weeds. Similar to Alt. 3, Alt. 4 will differ from Alt. 5 in that there will be			Though there is a net improvement under this alternative compared to the Alts 1 and 3, it is likely that Diamond and Waldo will still see some displacement of day use from the other three	

		fewer zones with overnight quotas, resulting in more traditional use patterns. This may result in less use of traditionally unused areas than Alt. 5 and therefore less spread of invasive plants. There may be more potential impacts from day use displacement from this alternative than under Alts 2 and 5.	wildernesses; however, this is unlikely to be substantial, due to the distance of trailheads from population centers
Visitor Impacts on campsite and lunch spots	*Natural, Undeveloped, Primitive and unconfined	Improvement from the Alt 1 due to fewer people traveling in the wilderness, and therefore less likelihood of campsite proliferation. This will differ from Alt. 5 in that there will be fewer zones with overnight quotas, resulting in a more traditional use patterns. This may result in less use of traditionally unused areas than Alt. 5 and therefore less campsite proliferation than Alt. 5. There may be more potential impacts from day use displacement from this alternative than Alts 2 and 5, though it will be an improvement from Alt. 3. This alternative will differ from Alt. 2 in that it will result in potentially less proliferation and better recovery of campsites in the most popular areas where zones have camping quotas, but it may result in slightly more camping in traditionally less used areas than Alt 2 would.	Though there is a net improvement under this alternative compared to the Alts 1 and 3, it is likely that Diamond and Waldo will still see some displacement of day use from the other three wildernesses; however, this is unlikely to be substantial, due to the distance of trailheads from population centers. Also, increased day use on trails in these areas is unlikely to result in additional impacts at campsites.
User Created Trails	*Natural, undeveloped, primitive and unconfined	Improvement over Alt 1. Though a potential retrogression from Alts 2 and 5 due to displacement of day use, this is expected to be a minimal effect. Alt 4 should be an improvement from Alt 2 as there will be less interest in creating new routes to destinations, due to the use quotas in overnight zones	Though there is a net improvement under this alternative compared to the Alts 1 and 3, it is likely that Diamond and Waldo will still see some displacement of day use from the other three wildernesses; however, this is unlikely to be substantial, due to the distance of trailheads from population centers. Displaced day use is unlikely to lead to the development of new social trails.
Trash and Vandalism	Natural, undeveloped, *primitive and	This will be an improvement over Alt 1. Though the effect is expected to be minimal, Alt 4 may be	Though there is a net improvement under this alternative compared to the Alts 1 and 3, it is likely that Diamond and Waldo will still see some

	unconfined recreation	a slight retrogression compared to Alts 2 and 5 due to more day use displacement.	displacement of day use from the other three wildernesses; however, this is unlikely to be substantial, due to the distance of trailheads from population centers.
Human Waste	Undeveloped, *primitive and unconfined	This will be an improvement over Alt 1. Though the effect is expected to be very minimal, Alt 4 may be a slight retrogression compared to Alts 2 and 5 due to more day use displacement.	Though there is a net improvement under this alternative compared to the Alts 1 and 3, it is likely that Diamond and Waldo will still see some displacement of day use from the other three wildernesses; however, this is unlikely to be substantial, due to the distance of trailheads from population centers.
Travel Restrictions within the wilderness	*Primitive and unconfined recreation	This will result in a slight retrogression from Alt 1 in that it adds quotas for overnight use zones, though it is a large improvement over Alt 5, which restricts overnight use in all zones.	No change from Alt 1. Same as alternative 2, though not as restrictive as alternative 5.
Use Restrictions	*Primitive and unconfined recreation	This is a retrogression from Alt 1 and will result in less spontaneity as a result of restricting access to the wilderness. This effect is not as large as under Alts 2 and 5, though it is larger than under Alt 3.	Will restrict use more than the Alts 1 and 3. Will be similar to Alt. 2 and 5.
Signs	Undeveloped, *primitive and unconfined recreation	This alternative is a slight retrogression from Alt 1 in that it will require more signs at the entrance to the camping zones that have quotas. It is a large improvement over Alt 5, which will require many more signs (at entry into all zones).	No change from Alts 1 or 3. This will be an improvement from Alt 5, as there will be less need for signs.
Cultural Resources	*Other Values of Wilderness	This is an improvement over the Alts 1, 2 and 33. It may result in more issues than Alt. 5 due to day use displacement.	Less impact than Alt. 3. Although there are potential displacement impact from day users, that is unlikely to be significant.
Solitude	*Solitude	In the short run, Alt 4 will have more impacts in areas that were not traditionally used than Alt 1; however, it will result in an improvement in the long run. It will differ from Alt 2 in that popular areas will see an improvement to solitude relative to currently peak use times, while some less popular areas will see a decrease in solitude if use is displaced to them. This alternative may result in	Slight improvement over Alt 1 and a major improvement over Alt 3 due to inclusion of quotas for overnight use at trailheads. There may be some displacement of day use, but this is unlikely to be substantial, due to the distance of trailheads from population centers. Reference Displacement Tables.

		an increase in visitation to remote areas compared to Alt 1 due to the effect of displacement of backpackers obtaining permits from trailheads that were historically less used, though this impact would be less for Alt 4 than Alt 5.	

Table E5: Alternative 5 – Zone Quota for overnight use in all areas (but no overnight trailhead quotas), day use quotas at all trailheads in all wilderness areas.

Component Of Analysis	Quality of Wilderness Character Affected *Primary quality Affected	Mount Jefferson	Mt. Washington	Three Sisters	Diamond Peak	Waldo
Visitor interactions with wildlife	*Natural	In the short run, this alternative may impact remote areas more than any other alternative due to the requirement that overnight users stay in particular zones resulting in use patterns that are significantly different than past use, though in the long run it should be an improvement from Alt. 1 due to caps on use. This will differ from Alt. 2 in that visitors will obtain permits to camp in traditionally less used areas when popular areas are full, resulting in more displacement of people to areas that did not historically receive as much use. Alt. 5 is likely to result in fewer interactions than the other alternatives in historically popular areas (because use will be reduced in those areas) and more interactions in areas that were not used as frequently in the past (because use will be displaced to them). This factor has a similar effect as Alts 3 and 4, though somewhat less because of the number of zones with overnight quotas. Day use will be controlled in all areas, resulting in the best condition of all alternatives with respect to day use impacts. New wildlife interactions in historically less visited areas may have a larger impact to wildlife than decreasing interactions in already popular areas, resulting in Alt. 5 being less desirable overall than Alt. 2, 3 and 4.				
Spread of invasive plants	*Natural	Improvement due to fewer impacts than Alt 1. This will differ from Alt. 2 in that it will require people to stay in traditionally less used areas resulting in some potential displacement of people to areas that did not historically receive as much use, which will result in less weed vectors in historically popular areas and more weed vectors in areas that were not used as frequently in the past. This factor has a similar				

		effect as Alts 3 and 4, though less than Alt. 2 due to overnight quotas in some zones. Day use will be controlled in all areas, resulting in the best condition of all alternatives with respect to day use impacts.
Visitor Impacts on campsite and lunch spots	*Natural, Undeveloped, Primitive and unconfined	Improvement due to fewer impacts than under Alt 1. This will differ from Alt 2 in that it will require people to stay in traditionally less used areas resulting in some potential displacement of people to areas that did not historically receive as much use, which will result in less likelihood of campsite proliferation in historically popular areas and more likelihood of campsite proliferation in areas that were not used as frequently in the past. This factor has a similar effect compared with Alts 3 and 4, though less so due to overnight quotas in some zones. Day use will be controlled in all areas resulting in the best condition of all alternatives with respect to day use impacts.
User Created Trails	*Natural, undeveloped, primitive and unconfined	Improvement due to fewer impacts than Alt 1. Though it is unlikely to be of any significance to the proliferation of user created trails, Alt. 5 differs from Alt. 2 in that it will require people to stay in traditionally less used areas resulting in some potential displacement of people to areas that did not historically receive as much use, which may result in less likelihood of new user create trails in historically popular areas and more likelihood of user created trails in areas that were not used as frequently in the past. Alt. 5 will also require people to travel through any zones for which they are unable to obtain a permit. This may result in new routes connecting the (currently) less popular zones that have more availability. This effect would be similar to Alts 3 and 4, though somewhat less due to quotas for popular zones in Alts 3 and 4. Day use will be controlled in all areas, resulting in the best condition of all alternatives with respect to day use impacts.
Trash and Vandalism	Natural, undeveloped, *primitive and unconfined recreation	Alternative 5 will be an improvement over all other alternatives in reducing impacts from trash and vandalism, because the total number of available permits is the most restricted (?).
Human Waste	Undeveloped, *primitive and unconfined	Alternative 5 will be an improvement over all other alternatives in reducing impacts from human waste, because the total number of available permits is the most restricted (?). It will also result in human waste being more spread out across the wilderness, which is likely a net positive.
Travel Restrictions within the wilderness	*Primitive and unconfined recreation	This alternative will have the most detrimental effect to the freedom of travel. Day use will be controlled by quotas, which will not affect the freedom of day users to travel within the wilderness. However, overnight userswill be restricted to camping in particular zones, requiring pre-planning and eliminating access to desirable zones of the wilderness for overnight use unless the visitor can obtain a permit. This will negatively affect visitor spontaneity within the wilderness.
Use Restrictions	*Primitive and unconfined recreation	This alternative will be the most detrimental of all alternatives in restricting use, as it restricts use for all day and overnight use. This will negatively affect spontaneity of visitors wanting a wilderness

		experience without prior planning. It also reduces access to the most popular locations, even for visitors who do plan in advance.
Signs	Undeveloped, *primitive and unconfined recreation	This alternative will be the most detrimental of all alternatives in terms of needing signs within the wilderness. If enforcement becomes an issue, signs delineating zones will need to be placed in the wilderness where trails intersect with zone boundaries.
Cultural Resources	*Other Values of Wilderness	This alternative will be the largest improvement to protecting cultural resources of any of the alternatives, as it will limit day and overnight use in all areas.
Solitude	*Solitude	In the short run, this alternative will have more adverse impacts in areas that were not traditionally used than Alt 1, because use will be displaced from very popular trails and destinations. However it will result in an improvement in the long run because of caps on use. The implementation of zones should allow people more solitude on the whole by forcing them to spread out throughout the wilderness. This alternative is the best alternative for solitude of all 5.

Table E6: Impact Rating by Alternative											
Alternative 1 - No Action Alternative				**Alternative 2**		**Alternative 3**		**Alternative 4**		**Alternative 5**	
Component Of Analysis	Quality of Wilderness Character Affected *Primary quality Affected	Mount Jefferson Mt. Washington Three Sisters	Diamond Peak Waldo	Mount Jefferson Mt. Washington Three Sisters	Diamond Peak Waldo	Mount Jefferson Mt. Washington Three Sisters	Diamond Peak Waldo	Mount Jefferson Mt. Washington Three Sisters	Diamond Peak Waldo	Mount Jefferson Mt. Washington Three Sisters	Diamond Peak Waldo
Visitor interactions with wildlife	*Natural	-5	-3	5	3	4	-5	4	3	1	1
Spread of invasive plants	*Natural	-5	-3	4	3	4	-5	4	3	4	4
Visitor Impacts on vegetation at campsite and lunch spots	*Natural, Undeveloped, Primitive and unconfined	-5	-3	4	3	4	-5	4	3	4	4
User Created Trails	*Natural, undeveloped, primitive and	-5	-3	3	3	4	-5	4	3	4	4

	unconfined										
Trash and Vandalism	Natural, undeveloped, *primitive and unconfined recreation	-5	-3	4	3	4	-5	4	3	5	5
Human Waste	Undeveloped, *primitive and unconfined	-5	-3	4	3	4	-5	4	3	5	5
Travel Restrictions within the wilderness	*Primitive and unconfined recreation	4	4	5	4	-1	4	-1	4	-5	-5
Use Restrictions	*Primitive and unconfined recreation	5	5	-4	-2	-2	5	-3	-2	-5	-5
Signs	Undeveloped, *primitive and unconfined recreation	4	4	5	4	-1	4	-1	4	-5	-5

Cultural Resources	*Other Values of Wilderness	-3	-3	-1	3	3	-5	4	3	5	5
Solitude	*Solitude	-5	-3	4	3	3	-5	4	3	5	5