

Visitor Preferences for Managing Wilderness Recreation after Wildfire

Ryan N.K. Brown, Randall S. Rosenberger, Jeffrey D. Kline, Troy E. Hall, and Mark D. Needham

ABSTRACT

The 2003 Bear Butte and Booth (B&B) Fires burned much of the Mount Jefferson Wilderness in the Deschutes and Willamette National Forests, Oregon. A question for managers is how best to manage recreation in fire-affected areas in ways that minimize adverse impacts on visitor experiences and the recovering landscape. To help address this question, we used onsite surveys ($n = 221$) asking visitors in the Mount Jefferson Wilderness about their past use and postfire changes in use and their preferences for managing recreation after fires. Results indicated that recreation use declined after the fires, but declines were less than those after recent policy and management decisions such as the Recreation Fee Demonstration Program. Visitor preferences for managing postfire recreation were mixed. Some visitors supported little or no management, some preferred access and use restrictions coupled with camping regulations, and some preferred either access and use restrictions or camping regulations alone.

Keywords: wildland fire, recreation, wilderness management, public forest values

During the summer of 2003, the Bear Butte and Booth (B&B) Fires Complex burned substantial areas of federal, state, native, and private lands in Oregon. Approximately 40,000 ac burned within the Mount Jefferson Wilderness, potentially affecting outdoor recreation opportunities provided there for years to come. Wildland fires inspire many questions about how best to manage forests after fire. Outside of wilderness areas, manage-

ment might include evaluating the role of timber salvage and the potential for increased congestion at recreation sites unaffected by fire owing to postfire displacement of visitors from affected sites. Within wilderness areas, management might focus on controlling invasive plant species, rehabilitating human disturbed sites to mitigate erosion, and monitoring and studying affected plant and wildlife communities. Federal land management agencies generally agree that

fire has played a longstanding role in creating desired qualities of naturalness that people seek in wilderness, but these same agencies continue efforts to extinguish many fires (Parsons 2001). Current fire management plans for only 85 of the 405 national forest wilderness areas in the United States allow fires to burn within wilderness boundaries and most fires in these areas are suppressed anyway (Miller 2003). Choices that policymakers and managers make regarding wild-fire are influenced by social, economic, and political realities. Many people do not favor knowing that fires can burn our most natural and valued places (Kneeshaw et al. 2004b). For these reasons, land management agencies must take advantage of opportunities when they arise to engage the public in wild-land fire policy and management decision-making both before and after fires burn.

Although impacts of wildland fire on recreation generally fade over time (Englin et al. 1996), they can increase or decrease visitation in response to changing forest conditions during postfire recovery (Englin et

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al. 2001, Loomis et al. 2001, Hesseln et al. 2003). Postfire recreation use can differ by activity and location and depends on initial forest conditions, fire characteristics, and timing of fires (e.g., Kline 2004). In wilderness areas postfire recreation likely fluctuates over time in response to changing forest conditions. Immediately after fire, recreation use may decline substantially in response to access restrictions and damage to infrastructure such as roads, trails, and parking lots. Wilderness managers may expect lower visitation for several years because characteristics that once attracted visitors might be significantly altered. Many visitors, for instance, may be deterred by the burned landscape and choose to recreate elsewhere. Other visitors, however, may be attracted to burned areas to witness both the initial destruction and the natural landscape processes that occur after fire (Englin et al. 2001, Loomis et al. 2001). Some of these visitors may even return periodically to investigate the extent of postfire recovery over time. As burned landscapes recover, visitation may continue to decline as any novelty in the burn fades and recovering undergrowth and dead trees provide little or no shade. Over time and as larger trees return managers might expect visitation to return to prefire levels.

Understanding changes in visitation is important because recreation impacts can compound wildfire effects. Biophysical impacts, such as trampling and erosion, may cause additional disturbance of soil and vegetation. Social impacts, such as visitor displacement, may increase visitation elsewhere and place greater pressure on recreation resources that may be unaffected by fire but already overburdened with excessive use. Monitoring actual visitation trends after wildfire and understanding who visitors are and how they perceive and respond to postfire recreation management options can help managers anticipate and plan for implications of potential changes, develop options that visitors are likely to accept, and meet broader public objectives regarding wilderness management and resource protection (Kneeshaw et al. 2004b; Winter et al. 2004). Visitors can be heterogeneous in their perceptions of recreation and its management, and managers should accommodate and incorporate this diversity of beliefs and expectations in forest planning and management (e.g., Shindler and Shelby 1993, Vaske et al. 1996, and Harshaw et al. 2006). Managers also need to understand situational factors

that contribute to a particular management option being viewed favorably or unfavorably by diverse subgroups of visitors (Kneeshaw et al. 2004a, 2004b).

We examined recreation visitation in Oregon's Mount Jefferson Wilderness after the 2003 B&B Fires. Our objectives were to (1) identify any initial changes in visitation after these fires, (2) measure visitors' preferences for postfire recreation management options, and (3) examine the extent to which management preferences are related to visitors' recreation experiences and socioeconomic and demographic characteristics. We identified changes in visitation by examining data from trailhead visitor permits. We measured visitors' preferences for postfire recreation management options using a survey of visitors exiting major trailheads of this wilderness area. We examined the extent to which management preferences are related to visitors' recreation experiences and socioeconomic and demographic characteristics by conducting factor and cluster analyses on preference ratings and testing for statistically significant differences in visitors' experiences and characteristics across visitor clusters.

The Study Area

The B&B Fires Complex formed from the combining of the Booth and Bear Butte Fires, which both began on Aug. 19, 2003 and joined on Sept. 4, 2003. These fires burned approximately 90,000 ac of the Willamette and Deschutes National Forests, Warm Springs Indian Reservation, and state and private lands in Oregon. Approximately 40,000 burned ac were within the Mount Jefferson Wilderness, affecting trails, viewpoints, and campsites along the crest of the Cascade Mountains (US Forest Service 2005). The fires burned in a mosaic pattern, burning some areas intensely and leaving little but charred remains and sterilized soil, while burning less intensely in other areas leaving larger trees alive. These fires missed many small "islands" within burned areas. Both fires were caused by lightning, which ignited fires that "slept" until low humidity and high temperatures prompted a flare-up. Suppression costs totaled almost \$39 billion, 33 mi of fire line were constructed, and 13 structures were destroyed.

Some fire affected areas within the Mount Jefferson Wilderness had been heavily used by day hikers, backpackers, climbers, and horse campers before the fires. These popular areas might now offer a dif-

ferent kind of experience for many users. Of particular interest to forest managers is how landscape changes from wildfire might influence recreation use and visitor behavior. Two primary concerns are (1) potential recreation impacts in recovering burned areas resulting from soil erosion along trails and at campsites, disruption of vegetative regrowth, and introduction of invasive species; and (2) displacement of wilderness visitors from fire-affected areas to other sites causing increased congestion and impacts elsewhere. Addressing either of these concerns has implications for the other. Restricting recreation access or activities in burned areas, for instance, could help prevent further disturbance of soil and vegetation but increase visitation and related impacts in unburned areas. Options for managing recreation after the B&B Fires likely will influence recreation experiences that visitors can expect. Questions such as "what changes would be most preferable" and "what types of management options would be most acceptable" are important for managers to consider after a wildland fire.

Visitation and Survey Data

We examined changes in visitation at the Mount Jefferson Wilderness before and after the B&B Fires and visitors' preferences for postfire recreation management. Our data were obtained from two sources: (1) trailhead visitor permits and (2) onsite surveys of visitors administered at major trailheads. We gathered visitation data from self-issued permits required of visitors for entry into all wilderness areas of the Willamette National Forest since 1991. Permits included information about party size, numbers of horses and dogs, and number of nights camping at specific locations. We gathered permit data for the Mount Jefferson Wilderness and select trailheads of nearby Three Sisters and Mount Washington Wilderness areas for which complete data were available. Willamette National Forest records indicated that all data had been adjusted for permit compliance. Permit data suggest how recreation use and visitation might have changed after the B&B Fires relative to overall trends since 1991.

We also administered an onsite exit survey of visitors during the summer of 2005 at trailheads leading to burned areas of the Mount Jefferson Wilderness. Visitation at this wilderness in 2005 was estimated at 6,600 people. We targeted summer visitors entering via high-use trailheads leading to

the southwestern portion of the Mount Jefferson Wilderness within and surrounding the Eight Lakes Basin. We selected this area because it typifies the mosaic pattern found throughout burned areas of the western portion of the Mount Jefferson Wilderness. We administered the survey only in the summer, missing individuals visiting in other seasons. The summer survey did, however, target visitors during the period of greatest congestion and potential impact. Although the survey did not sample prefire visitors, information gained from postfire visitors can be used to guide management decisions of interest to that targeted group. In total, 284 visitors were approached onsite and 221 completed the survey, yielding a 78% response rate.

Fire Effects on Recreation Visitation

Our first objective was to identify any changes in visitation at the Mount Jefferson Wilderness after the B&B Fires. Our survey gathered information about visitors' characteristics, visitation patterns, and experiences in this area before and after these fires. Most respondents (70%) did not change the frequency with which they visited the Mount Jefferson Wilderness since the B&B Fires. Twenty-three percent of respondents reported that their visitation decreased and 7% reported that their visitation increased. Given that visitation levels were self-reported by respondents still visiting the area after the fires, our data did not reveal how many visitors may not have returned because of these fires. Information was unavailable to contact individuals who previously came to the area but no longer visit. Among the 23% of respondents who reported a decrease in their visits, over one-half (56%) cited the B&B Fires as a reason for visiting less often. Among respondents who increased their visitation, only a few cited these fires as a reason for visiting more often.

Despite a 23% reduction in self-reported visitation (over one-half attributed to the B&B Fires), overall visitor satisfaction remained high. Median satisfaction reported by respondents was 8 on a scale from 1 "not satisfied" to 9 "extremely satisfied," but this could reflect in part that visitors self-selected the area because they enjoy it despite the fires. This finding is consistent, however, with high overall satisfaction reported in wilderness areas generally (e.g., Love and Watson 1992 and Manning 1999).

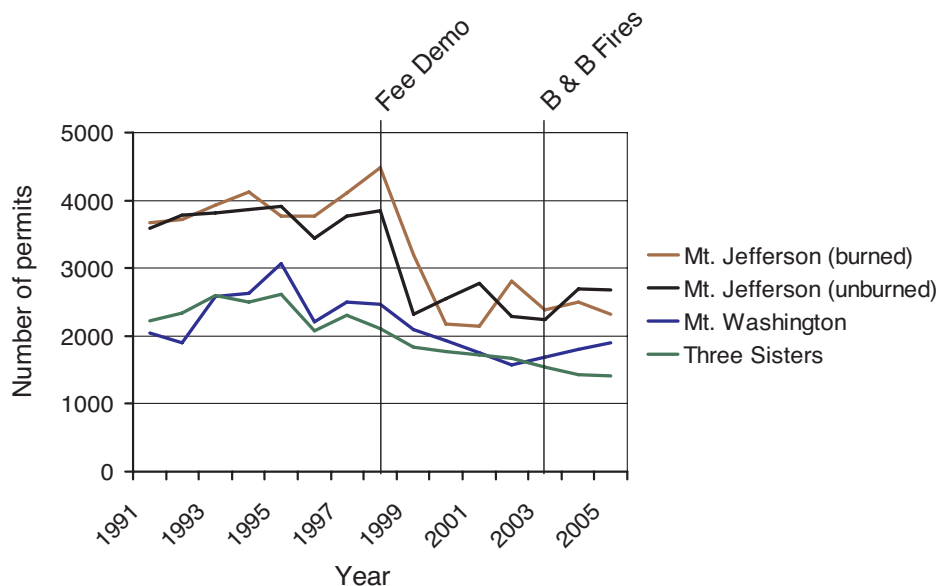


Figure 1. Number of parking permits issued for the Mount Jefferson (burned and unburned) Wilderness area, and select trailheads of the Mount Washington and Three Sisters Wilderness areas with Fee Demo and the B&B Fires.

Effects of the B&B Fires on visitation also must be examined in the context of overall trends for the Mount Jefferson Wilderness and similar areas nearby. Permit data indicated that visitation levels for the Mount Jefferson, Mount Washington, and Three Sisters Wilderness areas declined since the mid-1990s (Figure 1). After the B&B Fires, however, visitation for all three areas remained relatively stable with only slight fluctuations from year to year. Permit data for individual trailheads showed that postfire declines in visitation at the Mount Jefferson Wilderness arose largely from lower visitation in burned areas, whereas visitation to unburned areas actually increased slightly. Before these fires, burned and unburned areas typically received relatively equal visitation. The proportion of visitors who were day users versus overnight campers remained about the same after the fires as before.

Given the data examined, effects of the B&B Fires on recreation visitation at the Mount Jefferson Wilderness appear to be minimal relative to prevailing downward trends over the past 10 years. Although it is conceivable that we may see greater fire effects on future visitation, the lack of a substantial effect is not necessarily surprising given past research. For example, interviews with visitors in the Bob Marshall Wilderness one year after the 1988 Gates Park Fire indicated that visitation had been affected little by that fire because those wilderness visitors

placed more emphasis on remoteness and naturalness in their recreation choices (Love and Watson 1992). It is conceivable that similar recreation preferences motivate postfire Mount Jefferson Wilderness visitors, but we were unable to confirm this from the data examined.

Recently, dramatic changes in visitation at the Mount Jefferson Wilderness may coincide not with the B&B Fires, but with changes in wilderness recreation management. In 1995, recreation use limits were implemented for a portion of this wilderness area and coincided with immediate reductions in visitation to newly restricted areas and increased visitation at several high-use destinations not subject to the new restrictions. Declines in visitation that coincided with the 1998 implementation of the Trail Park Pass under the Recreation Fee Demonstration ("Fee Demo") Program were even more dramatic (Figure 1). Visitors were required to purchase a pass to park at all trailheads leading into Mount Jefferson and other wilderness areas. Previously, visitors were allowed to park for free. Visitation declined precipitously in the Mount Jefferson Wilderness in 1999 and 2000 and remained relatively low until the B&B Fires. This trend suggests that recreation choices of Mount Jefferson Wilderness visitors have been influenced less by fire than by management actions that restricted access through mandate or price.

Visitor Preferences for Postfire Management

Our second objective was to examine visitor preferences for postfire recreation management in fire-affected areas. Our survey asked respondents the extent to which they opposed or supported several possible options for managing postfire recreation impacts. These options were based on the Willamette National Forest Land and Resource Management Plan (US Forest Service 1990) for addressing recreation impacts in wilderness areas. We measured responses on 5-point scales from -2 “strongly oppose” to $+2$ “strongly support.”

Several proposed options for managing recreation at the Mount Jefferson Wilderness after the B&B Fires received strong support among respondents (Figure 2). On average, respondents preferred options that were educational, informational, and involved ecological protection such as educating visitors on “leave no trace” and revegetating impacted areas. These findings are consistent with previous research showing that recreationists tend to prefer strategies aimed at visitor education and managing biophysical resources (Manning 1999, Cole and Hall 2005). Respondents also reacted positively to hardening campsites and regulating camping and campfires by implementing designated sites, although day users were slightly more supportive of these options than campers. On average, limiting group size and closing specific campsites and trails in areas of particular ecological concern were supported. Least preferred options involved restricting activities (e.g., banning campfires) or access by limiting the number of visitors at highly or seldom-used areas, allowing day use only, or closing areas altogether. Respondents generally supported restrictions on stock use, but opposed restrictions on dogs.

These mean preference ratings for postfire management options only tell part of the story. Recreationists typically are heterogeneous, exhibiting a range of preferences (Manning 1999). Given diversity among recreationists, researchers have emphasized the importance of differentiating users into meaningful homogeneous subgroups (Vaske et al. 1996). Our third objective was to examine the extent to which visitors’ preferences for postfire management were related to their experiences and sociodemographic characteristics. We conducted exploratory factor and cluster analyses of visitors’ prefer-

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|--|
| Educate visitors on "Leave No Trace" wilderness camping techniques [1.55 (0.69)] |
| Re-vegetate impacted areas; post signs to inform visitors of site restoration strategies [1.07 (0.94)] |
| Restrict stock use in or near areas of ecological concern [0.79 (1.22)] |
| Allow campfires in designated campsites (marked with wooden posts) only [0.56 (1.31)] |
| Close campsites for re-vegetation [0.37 (1.16)] |
| Promote use of 'hardened' sites (campsites that are resistant to additional impacts) [0.28 (1.12)] |
| Reduce accessibility (close trails) to specific areas of ecological concern [0.22 (1.28)] |
| Allow camping in designated campsites (marked with wooden posts) only [0.12 (1.34)] |
| Further limit group size (current size limit: 12) [0.11 (1.16)] |
| Restrict number of visitors to highly used areas [-0.15 (1.19)] |
| Restrict dogs in or near areas of high visitor use and restrict specific uses [-0.29 (1.30)] |
| Ban campfires [-0.72 (1.20)] |
| Restrict number of visitors to seldom used areas [-0.77 (1.03)] |
| Close entire area to all recreation use until it is restored to wilderness conditions [-1.41 (0.93)] |
| Allow day use only [-1.45 (0.84)] |

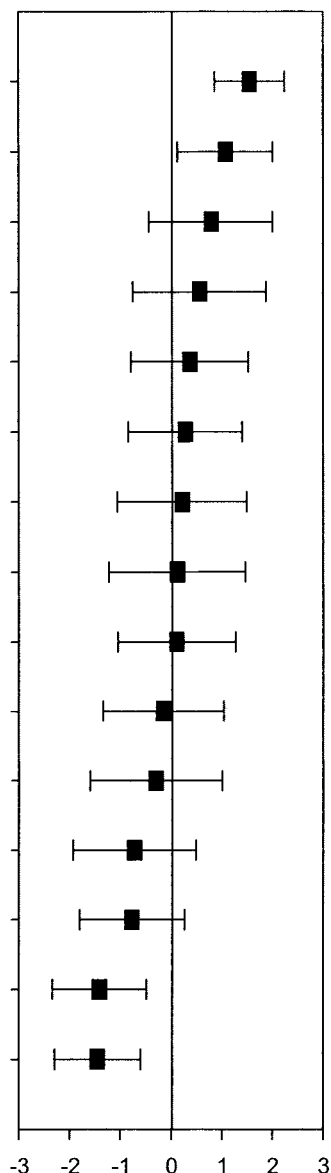


Figure 2. Mean and SD (in parentheses) of respondent ratings of postfire management options, with -2 = strongly oppose, -1 = oppose, 0 = neutral, 1 = support, and 2 = strongly support.

ences for postfire management options to classify respondents into more homogeneous groups. Principal components factor analysis with varimax rotation identified three underlying factors that reasonably characterized most management options presented to respondents: (1) “restrict access,” (2) “regulate camping,” and (3) “restrict activity” (Table 1). Five variables reported in Figure 2 were removed from the factor extraction because of limited reliability measured by Cronbach’s alpha. Given that factor analysis provides a means to explain variation among data via latent factors in the data, it is not surprising that four of the excluded variables did not help explain variation among the other variables. These

variables included those that most people agreed on (i.e., two most strongly supported and two most strongly opposed). The fifth variable (“promote use of hardened sites”) was removed from the “regulate camping” factor strictly on statistical consistency grounds.

The three factors that were extracted explained 63% of variation in the data. “Restrict access,” with a Cronbach’s alpha reliability coefficient of 0.79, included management options that proposed various access restrictions such as closing trails, limiting party size, and restricting use in both seldom and highly used areas. Although this factor explained the most variation (26%) of the three extracted factors, it was comprised of

those variables with low means and high standard deviations (Figure 2). This means that there was greater disagreement among respondents regarding these management options. “Regulate camping” was the second factor extracted, with a Cronbach’s alpha of 0.80 and explaining 18% of the total variation in the data. Management options for the “regulate camping” factor proposed limiting camping to designated areas and mandating use of campfire rings. Options for this factor had relatively low means and high standard deviations (Figure 2), suggesting some disagreement among respondents. The third factor extracted was “restrict activity” and included management options that proposed restrictions on specific activities such as prohibiting campfires and restricting stock use and dogs; it explained approximately 18% of variation and had a Cronbach’s alpha of 0.64. Respondents were in greater agreement regarding their support/opposition toward these options.

A series of K-means cluster analyses was performed on these factors ranging from two to seven clusters. The four-group solution provided the best fit for the data. To validate this solution, data were randomly sorted and a cluster analysis was conducted after each of three random sorts. All of these additional cluster analyses supported the four-group solution. Assigning descriptive labels, the four respondent clusters were (1) a “pro-management” group (36%) who generally supported all management options, (2) a “prorestriction” group (21%) who supported restricting access and activities but opposed mandating the use of campfire rings and designated campsites, (3) an “antirestriction” group (22%) who supported mandating the use of campfire rings and designated campsites but opposed restricting access and activities, and (4) an “antimanagement” group (21%) who generally opposed all management options (Table 2). Respondents were somewhat equally distributed among these identified clusters.

Respondent clusters significantly differed by many of respondents’ characteristics (Table 3) but not by many attributes of respondents’ wilderness visits (Table 4). Our relatively small sample size ($n = 221$), while being well within an acceptable margin of error ($\pm 6\%$; Salant and Dillman 1994), nevertheless, can lead to insignificance in many tests of statistical differences. Therefore, we also calculated effect size statistics such as Cramer’s V and eta (η), which are influenced less by sample size. These effect

Table 1. Factor and reliability analyses of visitor support for management options.

| Management options | Factor loadings | | |
|---|-----------------|------------------|-------------------|
| | Restrict access | Regulate camping | Restrict activity |
| Close campsites for revegetation | 0.78 | 0.01 | 0.25 |
| Restrict number of visitors to highly used areas | 0.73 | 0.15 | 0.18 |
| Further limit group size (current size limit: 12) | 0.73 | 0.21 | 0.16 |
| Reduce accessibility (close trails) to specific areas of ecological concern | 0.65 | 0.26 | 0.20 |
| Restrict number of visitors to seldom-used areas | 0.54 | 0.44 | 0.01 |
| Allow campfires in designated campsites (marked with wooden posts) only | 0.11 | 0.88 | 0.13 |
| Allow camping in designated campsites (marked with wooden posts) only | 0.30 | 0.83 | 0.16 |
| Restrict dogs in or near areas of high visitor use and restrict specific uses | 0.16 | 0.12 | 0.80 |
| Ban campfires | 0.09 | 0.18 | 0.71 |
| Restrict stock use in or near areas of ecological concern | 0.35 | -0.01 | 0.65 |
| Eigenvalue | 2.64 | 1.85 | 1.78 |
| Percent variation explained | 26.43 | 18.45 | 17.83 |
| Cronbach alpha reliability coefficient | 0.79 | 0.80 | 0.64 |

Note: Management options coded on a 5-point scale of $-2 =$ strongly oppose, $-1 =$ oppose, $0 =$ neutral, $1 =$ support, and $2 =$ strongly support. Total variance explained across all three factors equals 63%.

Table 2. Respondent groups based on preferences for postfire management options.

| Cluster group | Percent | Mean factor scores | | |
|-----------------|---------|--------------------|------------------|-------------------|
| | | Restrict access | Regulate camping | Restrict activity |
| Promanagement | 36 | 0.53 | 1.34 | 0.61 |
| Prorestriction | 21 | 0.16 | -0.54 | 0.46 |
| Antirestriction | 22 | -0.21 | 1.02 | -0.82 |
| Antimanagement | 21 | -1.04 | -1.19 | -0.98 |

Note: Mean factor scores coded on a 5-point scale of $-2 =$ strongly oppose, $-1 =$ oppose, $0 =$ neutral, $1 =$ support, and $2 =$ strongly support.

size statistics then can be compared using guidelines suggested by Cohen (1988) and Vaske et al. (2002). Guidelines categorize effect size measures into three levels. Cohen (1988), for instance, labeled effect sizes as either “small,” “medium,” or “large,” whereas Vaske et al. (2002) labeled them “minimal,” “typical,” and “substantial” based on effect size statistics of 0.10, 0.30, and 0.50, respectively. Effect sizes in Tables 3 and 4, therefore, averaged approximately 0.20, suggesting that they are measuring relatively “medium” or “typical” strength in differences among clusters.

Previous research has found differences in support for forest management among individuals with varying socioeconomic and demographic characteristics (e.g., Vaske et al. 2001). Differences also have been found among wilderness user groups in their preferences for particular management actions including at Mount Jefferson Wilderness (Shindler and Shelby 1993). In our study, we found that changes in self-reported visi-

tation ($\chi^2 = 6.98$; $df = 6$, $P = 0.323$) and satisfaction ($F = 2.61$; $df = 3, 112$; $P = 0.06$) after the B&B Fires were not statistically different among the four cluster groups. Other characteristics, however, did vary among the four cluster groups identified.

The promanagement group was comprised more highly of urban, female, and college-educated individuals (Table 3). Urban residence, female gender, and educational attainment often are associated with biocentric views toward nature, and these individuals often are likely to support public land management strategies intended to protect species and natural processes (e.g., Steel et al. 1994, Manning 1999, Vaske et al. 2001, Borrie et al. 2002, and Manfredo et al. 2003). We found in our study that almost one-half of the promanagement group accessed the Mount Jefferson Wilderness via the heavily burned Pacific Crest Trail, but reported relatively low declines in satisfaction. Only 14% of this group reported less

Table 3. Characteristics of respondents in each cluster group.

| Characteristics | Entire sample | Cluster groups | | | | χ^2 | V |
|--|---------------|----------------|----------------|-----------------|----------------|--------------------|------|
| | | Promanagement | Prorestriction | Antirestriction | Antimanagement | | |
| Gender (% female) | 36 | 47 | 24 | 42 | 20 | 11.95 ^a | 0.24 |
| Education (% bachelors degree or more) | 64 | 81 | 75 | 45 | 42 | 27.58 ^a | 0.37 |
| Residence (% live in urban area) | 90 | 95 | 93 | 84 | 83 | 5.74 ^b | 0.17 |
| Stock use (% participating) | 8 | 8 | 2 | 15 | 7 | 5.39 | 0.16 |
| Camping (% participating) | 53 | 44 | 54 | 64 | 54 | 5.01 | 0.13 |

^a Statistical significance at 1%.

^b Statistical significance at 5%.

Table 4. Attributes of respondents' visit for each cluster group.

| Attributes | Entire sample | Cluster groups | | | | F | η |
|---|---------------|----------------|----------------|-----------------|----------------|-------------------|--------|
| | | Promanagement | Prorestriction | Antirestriction | Antimanagement | | |
| Number of people in party | 3.5 | 3.1 | 3.6 | 3.8 | 3.7 | 0.54 | 0.09 |
| Perceived crowding ^a | 2.2 | 2.4 | 2.1 | 2.0 | 1.8 | 1.89 | 0.16 |
| Number of parties camping nearby ^b | 1.3 | 1.4 | 0.7 | 2.5 | 1.0 | 5.67 ^c | 0.37 |
| Number of other parties encountered | 5.9 | 6.2 | 5.5 | 6.7 | 4.8 | 2.43 | 0.18 |
| Time within sight/sound of other parties | 11.2 | 12.5 | 8.0 | 13.8 | 9.5 | 0.88 | 0.11 |

^a Coded on 9-point scale from 1 = not at all crowded to 9 = extremely crowded.

^b Based on proportion of sample that camped.

^c Statistical significance at 1%.

frequent visitation since the B&B Fires compared with 22% for the entire sample. The promanagement group was comprised of more day users than campers, relatively few stock users (Table 3), and tended to travel in smaller parties (Table 4). The tendency of promanagement respondents to support management options of all types may arise, in part, from their relatively low participation in activities that are most typically restricted (e.g., camping and stock use).

The prorestriction group shared some characteristics with the promanagement group such as a high proportion of urban and college-educated individuals (Table 3). The prorestriction group, however, generally opposed mandating the use of campfire rings and designated campsites but supported restricting access and activities. This group consisted mostly of hikers, more of whom were campers than day users. In addition, this group had the lowest proportion of stock users among groups. Prorestriction respondents, on average, reported relatively few encounters with other parties (Table 4) but did not perceive crowding any differently than other cluster groups. Characteristics of the prorestriction group suggested that these individuals experienced more solitude in their recreation experiences and were willing to accept more restrictions on access to maintain these experiences.

The antirestriction group supported designating campsites and allowing camp-

fires in approved fire rings but opposed restricting access and activities. This group was comprised of the highest proportion of campers (64%) relative to other groups (Table 3). Nearly one-half (43%) of this group exited the Mount Jefferson Wilderness via the Duffy Lake trailhead, which has designated campsites. Antirestriction respondents, on average, reported more encounters compared with other groups. This group also reported spending a greater percentage of time within sight and sound of others and camping near greater numbers of other parties but perceived similar levels of crowding as respondents in other groups (Table 4). Antirestriction respondents likely had a higher tolerance for encountering other visitors than respondents in groups such as the prorestriction group. It also is possible that camping at strategically located sites increased the perception of solitude for antirestriction respondents despite greater time spent in sight and sound of other visitors. Moreover, previous research suggests that designation of wilderness campsites can be perceived positively by visitors (Brunson and Shelby 1990, Farrell et al. 2001). Our results suggest that antirestriction visitors may support designating campsites for specific amenities provided, such as fire rings and level ground for tents. They may prefer improved infrastructure to accommodate more visitors instead of access or activity restrictions, perceiving infrastructure as a less

invasive form of management that provides desirable amenities.

Among the four groups, the antimanagement group was comprised of the largest proportion of visitors who were males, did not have a college education, and resided in rural areas (Table 3). Rural residents often question federal dominance over natural resource issues in favor of greater local control (Nie 1999). Our results suggest that the antimanagement group had characteristics of individuals with anthropocentric views on public land management. Anthropocentric views tend to be stronger among men, long-standing and older rural residents, and individuals possessing lower educational attainment (e.g., Steel et al. 1994 and Jones et al. 2003). Individuals with these views tend to favor personal freedom in their wilderness experiences. Perhaps antimanagement respondents in our study had little support for any of the management options because many of those options were perceived as restricting personal freedom.

Conclusions and Implications

Our results indicate that recreation visitation in the Mount Jefferson Wilderness has not dramatically changed after the B&B Fires of 2003. Permit data showed that after these fires, visitation remained relatively stable with only slight fluctuations from year to year. Displacement of visitors from the Mount Jefferson Wilderness to other nearby

areas also appears to have been minimal, because onsite surveys of visitors showed that over 70% of respondents did not change their visitation in response to these fires. Whether current levels of postfire visitation will continue after initial curiosity wanes and the area begins to recover remains uncertain. The relatively modest postfire changes in visitation observed so far in the Mount Jefferson Wilderness suggest that the B&B Fires may have had less impact on use levels in this wilderness area than management events such as implementation of the Recreation Fee Demonstration Program. If this initial finding holds over the next several years, managers, policymakers, and the public might take heart in knowing that for recreation in the Mount Jefferson Wilderness, large wildland fires such as the B&B Fires may not always cause devastating impacts to recreation use levels. Impacts of wildfire on recreation visitation may be relatively benign compared with effects from intentional changes in policy and management direction.

Given that our findings suggest that wildfire effects on recreation use levels may be relatively minimal compared with impacts from management and policy changes, it is important for managers to understand how visitors perceive and respond to management options. Our survey data showed that visitors' preferences for postfire recreation management in the Mount Jefferson Wilderness were varied. Visitors were somewhat equally distributed along a spectrum defined at the extremes by support or opposition to management options of all types but tended to support actions that would improve their own personal use. If representative of the larger population, it would appear from our data that area closures and use limits would receive near uniform opposition among Mount Jefferson visitors, whereas postfire management policies focusing on information, education, and ecological protection would receive broad support. After the B&B fires, Deschutes National Forest installed an interpretive display about the fires at a roadside overlook. Our results suggest that such displays likely are well-received by visitors, and could even focus on providing additional information pertaining to postfire recreation management. Similar educational campaigns could be used to inform visitors and influence their behaviors related to specific management concerns, such as minimizing camping and other use-related impacts (Watson et al. 1996, Man-

ning 1999). Wilderness recreation often facilitates the only direct contact that the public will have with wilderness management in general and wildfire in particular, thus informing lasting impressions of both. Postfire conditions should be viewed by managers as important opportunities to provide public education and outreach on the role of fire in wilderness ecosystems as well as the role of management in postfire recovery.

Our results also showed that other management strategies involving access restrictions, such as closing campsites, restricting users, and limiting group sizes, were more contentious among respondents, indicating potential challenges for managers. Cluster analysis revealed four relatively equal-sized subgroups of visitors that differed in their support for these types of management strategies. These subgroups also differed in attributes of their wilderness experience and their socioeconomic and demographic characteristics (e.g., gender and education). This suggests that no single combination of other types of management options besides education and ecological protection would be strongly supported by all visitors in the Mount Jefferson Wilderness. Widely differing or opposing views of postfire management sometimes could necessitate a mix of management strategies depending on site-specific circumstances and resource conditions. Knowing the extent to which visitors belong to different subgroups and support particular types of management options can help managers identify appropriate stakeholder groups that might be included in public land planning processes, estimate possible reactions to controversial management actions such as limiting access or restricting use, and identify target groups for other options such as additional education, outreach, and enforcement.

Future research is needed to address some of the limitations of this study. Longitudinal and/or panel studies (e.g., prefire and postfire), for instance, are necessary for examining preferences and behaviors of nonusers and visitors who may actually be displaced because of wildfires. Additional research is needed to explore how interactions between fire and landscape attributes might change the spatial distribution of visitors and quality of recreation opportunities available. Finally, our findings are limited to recreationists visiting the Mount Jefferson Wilderness after the B&B Fires. Results may not generalize to recreationists visiting this wilderness area or other regions after different

fires. The applicability of our findings to other geographical areas, recreation user groups, and wildland fires also remains a topic for empirical investigation.

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