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Research note: Quick assessment of recreation use and experience in the immediate aftermath of wildfire in a desert river canyon

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ABSTRACT

There is limited research on recreationists' responses to changes in resource conditions after wildfire. Existing studies often rely on presenting visitors with hypothetical wildfire scenarios or simulated changes in conditions. We completed a quick assessment of recreation visitation and visitor experience in the months immediately following an actual high-severity wildfire within a popular river canyon in Oregon, USA. We also explored the influence of wildfire on the recreation plans of campers. We found that recreation use dropped sharply in the immediate aftermath of the wildfire, but rebounded to long-term averages within months. In addition, visitors reported the burned landscape had little influence on their recreation experience. Forty-five percent of campers reported having changed a planned camping trip within the prior two years because of smoke or wildfire. Nearly half of respondents reported that potential for wildfire would be a factor in where they planned to camp in the future.

Management implications: Our findings are consistent with other studies in showing that visitation losses do happen after wildfire but are short-lived and may differ between day and overnight users.· Although visitors were often saddened to see the burned landscape, their recreation experiences and satisfaction appeared largely unchanged.· Distributing up-to-date information about conditions at recreation destinations may be useful for potential visitors concerned about smoke and wildfire.· Recreationists substitute between recreation destinations or seasons to avid wildfire or smoke. Managers may do well to prepare for receiving visitors displaced by wildfire or smoke and having more visitors outside primary recreation seasons

1. Introduction

There has been limited research on recreation visitor response to wildfire (McCaffrey, Toman, Stidham, & Shindler, 2013). Further, few of the studies that do exist focus on visitor responses to actual recently-burned landscapes (although some notable exceptions are Englin, Boxall, Chakraborty, & Watson, 1999, Schroeder & Schneider, 2010, Borrie, McCool, & Whitmore, 2006, Brown, Rosenberger, Kline, Hall, & Needham, 2008, and Kim & Jakus, 2019). Rather, the bulk of the literature in this area has necessarily relied on visitor statements about their anticipated behavior in response to hypothetical wildfire events (e.g., Sanchez, Baerenklau, & Gonzalaz-Caban, 2016). Much of that research has focused on the economic losses (and benefits) that accrue to recreationists because wildfire has altered landscape conditions (see Bawa, 2017) rather than visitor perceptions of burned areas and the influence on recreation experience. Further, there have been no studies we identified that focus on recreation behavior within river canyons recently burned in wildfire. We aim to begin to fill this gap by assessing visitor response in the months immediately following a high-severity wildfire.

In this paper we 1) report the results of a quick assessment of recreation use and visitor perceptions in the immediate aftermath of a high-severity wildfire in a popular river canyon within Oregon, USA and 2) begin to explore how wildfires and wildfire smoke may influence camper planning.

2. The Substation wildfire and Deschutes River canyon

The Substation Fire started in the late afternoon of July 17, 2018 outside the small city of The Dalles, Oregon. Driven by strong winds, the fire spread rapidly east and south across cured wheat fields; by nightfall it had progressed more than 24 km, reaching the canyon of the Deschutes River. In subsequent days, the wildfire moved north and south along both sides of the Deschutes River. The northern progression

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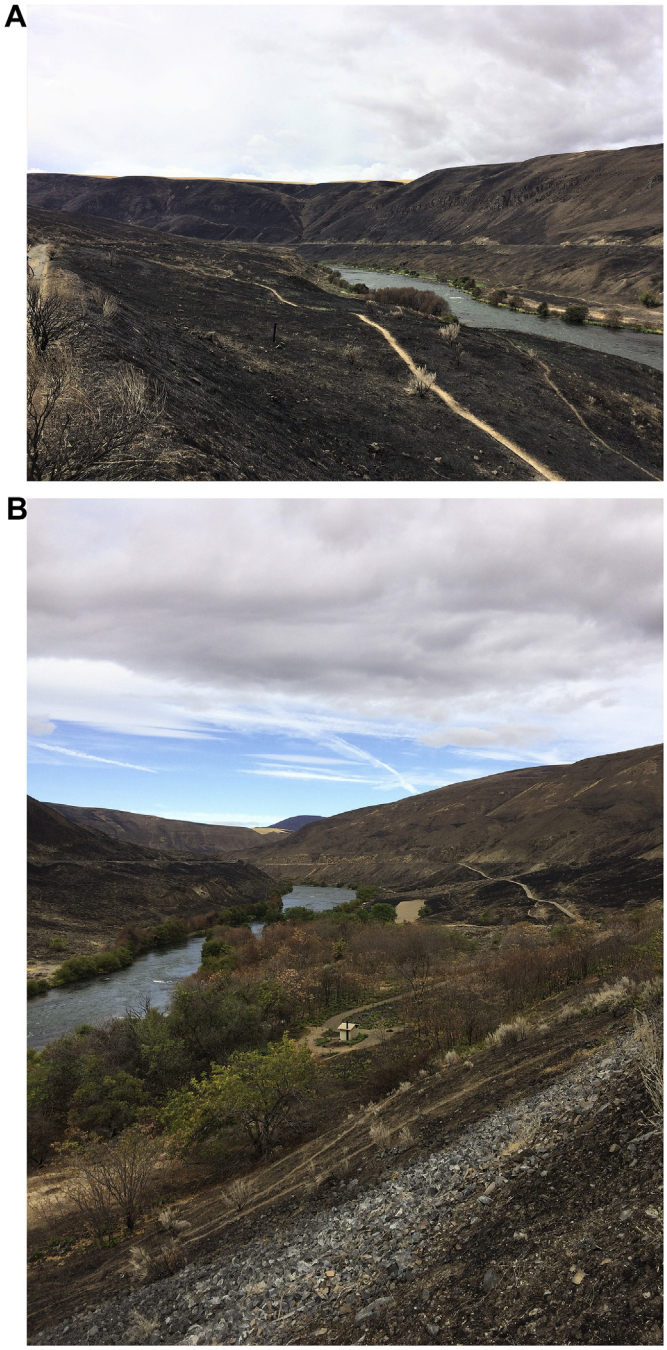

Fig. 1. Landscape conditions approximately 1 km (a) and 5 km (b) upriver of Deschutes River SRA on September 22, 2018. Photo credit: corresponding author.

of the Substation Fire was stopped just south of the mouth of the Deschutes River. At the river mouth, the campground and developed recreation facilities of the Deschutes River State Recreation Area (Deschutes River SRA) are on the east side of the river and the boat launch site, Heritage Landing, is on the west side. Both recreation facilities are managed by Oregon Parks and Recreation Department (OPRD). The southward progression of the Substation Fire passed through primitive recreation areas along the Deschutes River, burning towards the town of Maupin, Oregon.

Vegetation within the Deschutes River canyon consists primarily of desert shrubs and plants with some small to mid-size trees in areas along the river, in side canyons, and near water sources. In general, the shrub and small plant surface vegetation within the river canyon was consumed in the Substation Fire (Fig. 1). Damage to trees within the canyon ranged from complete consumption to no visible damage (primarily along the river). The camping areas and recreation infrastructure in the core of Deschutes River SRA and Heritage Landing were unburned. However, the burned area is readily evident from both locations.

Public lands within the river canyon, south of Deschutes River SRA and Heritage Landing, are managed by the U.S. federal agency Bureau of Land Management (BLM) and the Oregon Department of Fish and Wildlife (ODFW). Privately-owned lands within the canyon are primarily used for cattle grazing. Deschutes River SRA is the primary access point for those hiking, biking, and participating in land-based recreation between river's mouth (at Deschutes River SRA) to trail's end, 38 km upriver. The burned landscape extends upriver to nearly all places that one could easily reach on a day hike or day bicycle ride. Heritage Landing is the primary put-in/take-out for those traveling up the Deschutes River in motorized boats and the primary take-out for those descending the lower 38 km of Deschutes River in non-motorized boats. Deschutes River SRA and Heritage Landing are easily-accessible recreation sites located near an interstate and several state highways.

The Deschutes River SRA and Heritage Landing were both closed to the public beginning on July 18, 2018 during fire suppression. The Deschutes River SRA was reopened for recreation on July 23, 2018, although many of the lands upriver remained closed to public access for a few additional days. Heritage Landing reopened for recreational boat loading and unloading on July 20, 2018 and the Deschutes River itself was open to recreation on July 21, 2018.

3. Methods

The Oregon Parks and Recreation Department has an ongoing recreation monitoring program that includes counts of recreation use and surveys of recreation visitors (e.g., Bergerson, 2015). Counts of recreation use at individual units is typically done with permanent traffic counters, nightly counts of occupied campsites, and reports from visitor reservation systems. Day use recreation to the Deschutes River SRA and Heritage Landing is estimated using vehicle counts from a permanent traffic counter and associated calibration parameters to account for number of people per vehicle. Overnight use recreation estimates are developed from reservation and occupancy counts and calibration parameters for people per party. Day use recreation counts are maintained separately for the Deschutes River SRA and Heritage Landing. We compared monthly counts of day and overnight recreation use for July through December 2018 to the corresponding monthly averages for the prior 10 years.

Day and overnight visitors to select OPRD units are surveyed under the existing monitoring system using unit-specific survey instruments that incorporate a core set of questions used across all units. Day use visitors are surveyed by OPRD volunteers in on-site visitor intercepts; overnight visitors are surveyed using an identical survey instrument provided via an online platform. Overnight visitors are contacted at the email address they provide to the OPRD campsite reservation system. The vast majority of the campsites in the OPRD system are reserveable and most campers make reservations. Day and overnight visitors to the Deschutes River SRA were surveyed as part of standard OPRD recreation monitoring in summer 2015.

As the Substation Fire was nearing containment, OPRD developed a post-fire survey instrument that contained some key questions from the 2015 survey plus additional questions about how 1) the burned landscape from the Substation Fire influenced the visitor's recreation experience and 2) wildfire and smoke influenced planning for camping. Campground visitors with reservations for arrival between July 23, 2018 and September 16, 2018 (from the day of re-opening to 9-weeks post-fire) were contacted after their stay and invited to take the online, post-fire, visitor survey. Those with completed reservations between July 23 and August 19 received their first survey invitation on August

Table 1
Sample sizes and response rates for pre- and post-wildfire surveys.

	Initial contacts	Completed surveys (*n*)	Response rate (%)
2015 Day Users	293	222	76
2015 Overnight Users	692	392	57
2018 Overnight Users	872	360	41

22. Those with completed reservations between August 20 and September 16 received their first survey invitation on September 24. The invitation process followed the same multi-contact protocols used in the standard OPRD recreation monitoring program (see Bergerson, 2015 for a description of protocols). Resources were not available to survey day visitors or drop-in campers in this quick assessment. Sample sizes and response rates for these surveys are shown in Table 1.

4. Results

4.1. Recreation counts

In the first six months of 2018 (before the wildfire), monthly recreation counts at Deschutes River SRA and Heritage Landing were greater than the monthly averages seen in the prior 10-years (Fig. 2). Further, there was more day and overnight recreation use at the Deschutes River SRA in the first six months of 2018 than had been seen for the same period in the prior 18 years. For Heritage Landing, the recreation use seen in the first six months of 2018 was greater than that seen in any of the prior 18 years except 2015.

The record 2018 pace of day use recreation at Deschutes River SRA and Heritage Landing ended with the Substation Fire. Recreation use was below average in the immediate aftermath of the Substation Fire and then approached, or slightly surpassed long-term average use levels in the late fall and early winter months. Day use recreation counts at Deschutes River SRA in August through November were statistically significantly lower than the counts observed for those months in the prior 10 years (Table 2). For Heritage Landing, a similar pattern was observed in August, September, and October.

Compared to day use, the changes in overnight use at Deschutes River SRA after the Substation Fire were minor. For electrical hookup sites, visits were statistically significantly lower than 10-year averages only in September (Table 2). For primitive sites, use was below the 10-year average in August and then returned to near average through October, after which the sites were closed for the season.

4.2. Camper characteristics

The characteristics of overnight visits and visitors in the 2018 post-fire sample were consistent with those found in the prior 2015 sample. Overnight users in both sample years were more frequently male with slightly more men in the sample in 2018 (Table 3). Day users (in the 2015 sample) were evenly split between women and men. The greater share of men in the 2018 overnight user sample traces to a greater number of anglers in that sample. The vast majority of overnight users in both sample years were over 30 years of age; the most frequently reported age was in the 60s. Although the age distribution of our overnight user sample was consistent between 2018 and 2015, these overnight users are older than the general population of campers across Oregon, as estimated from data collected as part of Oregon's 2017 Statewide Comprehensive Outdoor Recreation Plan (Bergerson, 2018). Day users in the 2015 sample were generally younger than their overnight user counterparts. The vast majority of day and overnight users in all samples have household incomes over $30,000 per year; more than 20% have household incomes over $110,000 per year. Overnight and day users were predominantly white.

More than 60% of overnight user respondents in the 2018 and 2015 samples had visited Deschutes River SRA in the prior 12 months. Most respondents had visited Deschutes River SRA between 1 and 4 times, inclusive, in the prior year. About 2/3 of overnight user respondents in each sample lived in Oregon; another approximately 21% lived in the neighboring states of Washington or Idaho. Among the Oregon residents, overnight survey respondents in both sample years were most frequently from the Portland area (about 2 h travel), the western Columbia River Gorge region (up to 1.5 h travel), and central Oregon (up to 3 h travel).

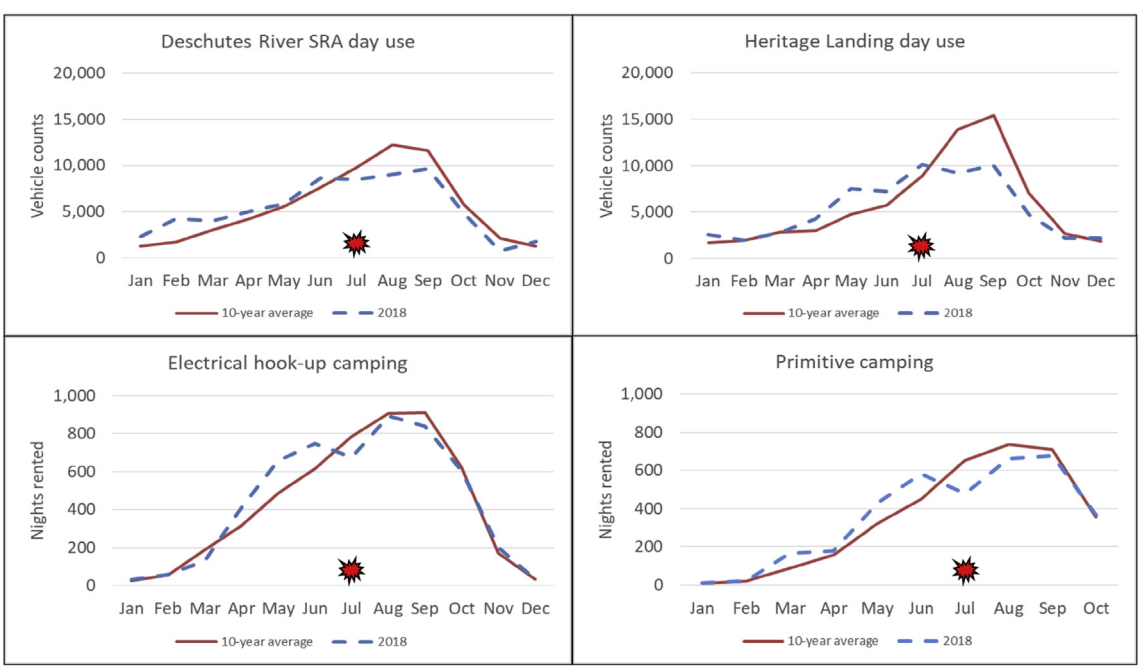

Fig. 2. Monthly recreation use in 2018 and prior 10-year average for Deschutes River State Recreation Area (SRA) and Heritage Landing.

Table 2
Day and overnight use after the 2018 Substation Fire and prior 10-year averages.

		July	August	September	October	November	December
Day use traffic counts–Deschutes River SRA	2018	8471	9,007[c]	9,683[c]	4,834[a]	738[c]	1754
	Prior 10-year average	9761	12,22[c]	11,637[c]	5768 [a]	2,128[c]	1255
Day use traffic counts–Heritage Landing	2018	10,119	9,179[c]	10,077[b]	4,707[b]	2236	2180
	Prior 10-year average	8921	13,895[c]	15,442[b]	7,058[b]	2661	1878
RV overnight nights–Deschutes River SRA	2018	676	892	837[c]	603	199	36
	Prior 10-year average	783	904	910[c]	625	168	32
Primitive overnight nights–Deschutes River SRA	2018	478	661[b]	679	366	Closed	Closed
	Prior 10-year average	652	735[b]	709	357	25	9

a = p-value < 0.10, *b* = p-value < 0.05, *c* = p-value < 0.01.
Note: We do not report the results of t-tests for July when the units were closed for part of the month and counters were likely influenced by fire suppression traffic.

Table 3
Characteristics of respondents to the 2018 and 2015 overnight user surveys and the 2015 day user survey.

	2018 overnight users	2015 overnight users	2015 day users
	% of respondents		
Gender			
Female	34	43	50
Male	66	57	50
Age			
Less than 20 years old	0	< 1	3
20–29 years	5	8	20
30–39 years	11	14	16
40–49 years	13	21	15
50–59 years	20	21	20
60–69 years	36	31	20
70–79 years	15	5	5
80 + years old	0	0	1
Household income (before taxes)			
Less than $10,000	2	< 1	5
$10,000 – $29,999	3	5	9
$30,000 – $49,999	11	13	15
$50,000 – $69,999	18	15	13
$70,000 – $89,999	17	21	9
$90,000 – $109,999	16	13	17
$110,000 – $129,999	9	12	11
$130,000 – $149,999	7	8	9
$150,000 – $169,999	5	5	2
$170,000 or more	12	9	11
Ethnicity			
White (Caucasian)	92	90	87
Asian	2	2	5
Hispanic/Latino	1	2	3
Other	2	1	2
American Indian or Alaskan Native	1	1	2
Native Hawaiian or Pacific Islander	1	3	1
Black/African American	1	1	< 1

4.3. Recreation visitor experience

Camping and fishing were the most commonly-reported primary recreation activities of overnight users during their stay at Deschutes River SRA in both sample years. The 2018 sample included a slightly greater share of anglers than the 2015 sample. That is probably because the sampling period in 2018 was centered around the traditional late summer/early fall steelhead fishing season (these anglers often camp at the Deschutes River SRA and shore fish or moor their boat nearby). Hiking/walking and swimming/wading were the next most common primary activities of overnight users in both sample years.

The average length of stay for those staying overnight at Deschutes River SRA was slightly longer in 2018 (3.0 nights) compared to 2015 (2.5 nights) (t = 3.017, p-value < 0.01). However, if anglers (who tend to have longer stays) are excluded from both sample years, average length of stay drops to about 2 nights for respondents in both sample years (median length of stay is also 2 nights).

The role of the Deschutes River SRA in visitors' trips was also consistent between survey years. In both years, about 60% of the overnight visitors to Deschutes River SRA stated that recreating at the SRA was the primary reason for their trip away from home. An additional 1/3 of visitors, indicated that their primary recreation destination was somewhere other than Deschutes River SRA. Several survey respondents in both samples noted in responses to open-ended survey questions that they were traveling for recreation elsewhere and found Deschutes River SRA a convenient rest-over place.

4.4. Visitor satisfaction

The presence of the burned landscape did not appear to reduce overnight visitor satisfaction generally or their satisfaction specifically with the condition of the natural environment. The vast majority of overnight visitors to the Deschutes River SRA reported they were "very satisfied" (46%) or "satisfied" (43%) with their overall experience during their present trip. Similar shares of respondents reported they were "very satisfied" or "satisfied" with the natural environment at Deschutes River SRA. These ratings of satisfaction from 2018 are not meaningfully or statistically different from those found in 2015.

We examined satisfaction ratings of 2018 overnight users engaged in the three self-reported primary recreation activities for which we had more than 30 respondents (fishing—131 respondents, camping—117 respondents, hiking—32 respondents). Those with the primary activity of hiking reported satisfaction ratings overall and with the natural environment consistent with that of other respondents (Table 4). Anglers and campers, both reported higher rates of being "very dissatisfied" overall compared to other respondents. The satisfaction with the natural environment of both anglers and campers was consistent with that reported by other respondents. We believe these lower overall satisfaction ratings are unrelated to the burned landscape. Angler dissatisfaction with their overall experience very likely traces to a temporary closure of the recreational fishery (not directly related to the Substation Fire) at the height of the steelhead run and late summer fishing period that coincided with our 2018 sampling. For campers, responses to an open-ended question included statements about dissatisfaction with train noise (a common complaint at this campground), campsite proximity to one another, and rules enforcement. There were no open-ended comments related to the burned-area made by campers.

We asked respondents to the post-fire survey who self-identified as return visitors how their satisfaction with the natural environment on the present trip compared to their previous experience. Three-quarters of respondents stated their satisfaction with the natural environment at Deschutes River SRA was "about the same" as on their prior visit. About

Table 4
Satisfaction ratings by 2018 overnight users with self-reported primary activities of hiking, fishing, and camping.

Satisfaction….	Hikers		Anglers		Campers	
	Overall	Natural Environment	Overall	Natural Environment	Overall	Natural Environment
Very dissatisfied	3.1%	6.3%	7.6%	4.7%	4.7%	1.7%
Dissatisfied	3.1%	0.0%	1.5%	0.0%	0.0%	2.5%
Neither	12.5%	3.1%	6.1%	6.2%	6.2%	9.3%
Satisfied	37.5%	43.8%	38.2%	42.6%	42.6%	43.2%
Very satisfied	43.8%	46.9%	46.6%	46.5%	46.5%	43.2%
Sum	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Comparison to all other respondents	χ^2 = 3.099, P-value = 0.541	χ^2= 2.054, P-value = 0.726	χ^2= 9.827, P-value = 0.043	χ^2= 3.813, P-value 0.432	χ^2= 8.220, P-value = 0.084	χ^2= 7.31, P-value = 0.120

15% of respondents indicated they were "less satisfied than on the prior trip." However, slightly more than half of those "less satisfied" respondents were anglers who we believe were frustrated with the fishery closure.

4.5. Influence of the burned landscape on visitor experiences

The recreation experience of overnight campers at Deschutes River SRA appeared largely unaffected by the presence of the burned landscape (Table 5). Nearly half of respondents strongly disagreed with the statement "(the burned area) changed the recreation activities I was able to do; " an additional 13% of respondents disagreed with that statement. Further, a plurality of respondents (36%) neither agreed nor disagreed with the statement "(the burned area)" reduced my enjoyment on this visit." An additional 45% of respondents either disagreed or strongly disagreed with that statement. Respondents seemed interested in the burned area itself and optimistic about the recovery. A majority of respondents believed that the burned area was interesting to look at and large majorities believed new vegetation will be visible by next year and the burned area is temporary. Despite the muted effects on recreation experiences, 60% of respondents either agreed or strongly agreed with the statement "I was sad to see (the burned area)."

Hikers and campers answered the question "(The burned area) changed the recreation activities I was able to do" in patterns that were similar to other respondents. Conversely, Anglers were more likely than other respondents to disagree or strongly disagree that the burned area influenced their recreation activity choices (χ^2 = 10.122, p-value = 0.038). Our general finding above that the burned area did not strongly influence the recreation activity choices of users is robust to exclusion of anglers from our sample. If we exclude all the anglers from the sample, still only 16% of respondents agreed or strongly agreed that the burned area influenced the recreation activities they were able to do.

Anglers were more optimistic (70% strongly agreeing) than others that the burned area would have new vegetation next year (χ^2 = 15.156, p-value < 0.01). Campers, in comparison, were generally less optimistic (42% strongly agreeing) or non-committal (20% neither agreeing nor disagreeing) compared to others (χ^2 = 17.510, p-value < 0.01) that regrowth will happen soon. Those patterns in responses for both groups carried over to the statement "(the burned area) is temporary" (anglers: χ^2 = 9.751, p-value = 0.040; campers: χ^2= 12.705, p-value = 0.013). There were no unique response patterns by anglers, hikers, or campers to the other statements. Men were reticent to strongly agree that the burned area caused them sadness and were more likely than woman to be non-committal on the subject and to strongly disagree with the statement (χ^2 = 8.361, p-value = 0.079). Beyond sadness, men and women had similar response patterns for statements about the burned area.

4.6. Wildfire and smoke and planned camping trips

Respondents to the 2018 post-fire survey were asked how wildfire/wildfire smoke had influenced their planned camping trips to any location in the prior two years. Forty-five percent of respondents stated that wildfire or wildfire smoke had caused them to change a planned camping trip to any location in the prior two years (Table 6). When respondents had changed planned camping trips in the prior two years, they most commonly went somewhere other than originally planned. However, about 18% of respondents simply stayed home instead and an additional 11% stated they shortened their camping trip.

Those in our sample whose primary activity was fishing were less likely (35% of angler respondents) than others to have changed a planned camping trip in the prior two years (χ^2 = 7.083, p-value < 0.01). Rather than a systematic difference in how anglers deal with wildfire or smoke disruptions, the difference in prior trip disruption may trace simply to 1) anglers potentially taking fewer camping trips than other visitors and thus having fewer opportunities for trip disruption or 2) the prime fishing seasons in the region being outside the traditional summer fire season. Those in our sample whose primary activity was camping were more likely (51% of respondents) than others to have changed a planned camping trip (χ^2 = 3.740, p-value = 0.053). When changing a prior planned camping trip, anglers tended to more frequently camp at a different time or shorten their trip; campers tended to do an activity other than go camping or just stay home. Hikers reported rates of camping trip disruption from wildfire or smoke similar to that of other respondents.

Table 5
Perceptions about the burned area and the recreation experience.

About the burned area	Strongly disagree	Disagree	Neither	Agree	Strongly Agree	Sum
It changed the recreation activities I was able to do	47.7%	12.9%	26.1%	5.8%	7.4%	100.0%
It is interesting to look at	10.7%	8.1%	25.2%	30.1%	25.9%	100.0%
It reduced my enjoyment on this visit	33.2%	12.5%	35.8%	10.9%	7.7%	100.0%
It will have noticeable vegetation by next year	2.0%	1.0%	11.8%	28.0%	57.2%	100.0%
It is temporary	2.0%	1.3%	10.7%	22.7%	63.2%	100.0%
I was sad to see it	7.5%	4.6%	27.5%	22.9%	37.6%	100.0%

Table 6
The influence of wildfire on planned camping trips to any location.

	Presence of wildfires or smoke
Percent of respondents who changed planned trips in the prior two years	44.9%
Of those who changed a trip, percent who….	
Stayed home	18.3%
Shortened trip	11.1%
Went somewhere else	47.7%
Went at a different time	5.9%
Did something different	7.8%
None of these	9.2%
Sum	100.0%

4.7. The influence of potential wildfire and smoke on planning for future camping

This group of overnight campers generally indicated wildfire or smoke would not change their intention to participate in future camping trips, to any location (Table 7). However, a number of respondents did indicate that the potential for wildfire or smoke would influence their selection of where to camp. About 24% of respondents indicated that the potential presence of wildfire or wildfire smoke would have "a good deal" of influence on where they would plan to camp; 22% of respondents selected the adjacent response. Respondents most frequently stated that the potential for wildfire and wildfire smoke would have relatively little influence on the family or friends they would bring camping or the time of year they would plan to go camping.

5. Discussion

The patterns of post-fire change in recreation visits at our river corridor study site is consistent with what has been found in similar studies completed in other landscapes (Brown et al., 2008; Duffield, Neher, Patterson, & Deskins, 2013; Kim & Jakus, 2019; McCaffrey et al., 2013). This study provides further evidence that wildfire and burned landscapes have a fairly moderate, and likely short-lived, effect on visitation levels post-fire. At our study site, the change in day use recreation was more substantial than the change in overnight recreation, post-fire.

Although the loss (compared to past use patterns) in total number of overnight stays in the months after the wildfire was minor, there is some evidence of churn in who elected to visit in the immediate post-fire period. Data from the OPRD camping reservation system showed 630 new bookings made on or after July 23, 2018 (the day of re-opening) for camping between July 23 and August 31, 2018. That new booking rate compares to 251 cancellations received for the same period. Although the number of new bookings was more than double the number of cancellations, the cancelation rate of 45% for the immediate post-fire period was higher than the OPRD system-wide average of 25%. Unfortunately, we were unable to assess the role of the fire in visitors' decisions to cancel their reservation. Future research to explore who is, and is not, electing to visit burned landscapes would be beneficial to more fully understand visitor response to wildfire.

It is important to note that our sample of generally-satisfied campers does not include those who canceled their trip. Those canceling their reservations may very well have different sensitivities to burned landscapes than what we found in this on-site study. Ultimately, however, the muted effects of the burned landscape on visitor experience found in this arid landscape was consistent with the findings from other studies of visitors who completed a trip to a burned-area (Brown et al., 2008; Love & Watson, 1992, p. 7; Schroeder & Schneider, 2010).

There is some evidence from the literature that our findings for developed campers at the mouth of the river may not transfer to primitive campers upriver who may value different recreation site conditions. Primitive campers using upriver, undeveloped areas of the Deschutes River canyon indicated in prior research (Brunson & Shelby, 1990) that shade, screening between campsites, and being out of the sight/sound of others were among the most important campsite attributes. For many of the upriver, primitive campsites, the trees and large shrubs that would have provided those characteristics are gone for the present. Future study is needed to understand how the burned landscape affects the experience of primitive campers in the upriver landscape.

The consideration of alternative camping destinations by campers disrupted by wildfire and smoke in our sample is consistent with the "adaptive capacity" actions described by Holofsky, Warziniack, Peterson, and Ho (2017) in response to increased disturbance regimes and altered natural resource conditions under climate change. However, willingness to engage in substitution is likely not uniform across recreationists: those who are more committed to a recreation activity likely have greater willingness to go to substitute recreation sites or change trip timing than less committed recreationists who may just stay home (McCreary, Seekamp, Larson, Smith, & Davenport, 2019). Nonetheless, substitution has implications for public lands recreation managers, as Holofsky et al. (2017) note that recreationists' adaptability is likely not matched by public land managers who have limited ability to quickly adjust their recreation offerings and site capacity in the short term.

The potential for wildfire and smoke was reported by many of our respondents to be a factor in where to camp in the future. McCaffrey et al. (2013) note that individual perceptions of wildfire risk (in our case, risk to the recreation trip) are influenced by a number of perceptions and probability calculations unique to individuals that are somewhat influenced by prior experiences. Likely that probability calculation can also be influenced by information about current resource conditions available to recreationists. McCreary et al. (2019) found that recreationists most frequently attempted to cope with potential displacement from recreation resources because of climate-related resource conditions (e.g., low snow levels) by gathering information, such as weather forecasts, about conditions at the recreation resource. However, the authors found that search for information may also not be ubiquitous across visitors, with younger visitors and first-time visitors less likely to search out information about resource conditions than older visitors or more frequent visitors.

Table 7
How the potential for wildfires and wildfire smoke influences planning for future camping trips to any location.

	Not at all	2	3	4	A good deal	Sum
Reduce the likelihood you'll go camping	43.3%	17.0%	19.7%	12.1%	7.9%	100.0%
Aspect of camping						
Where you plan to go	24.1%	11.7%	18.1%	22.3%	23.8%	100.0%
The time of year for your trip	35.6%	13.9%	18.7%	17.2%	14.5%	100.0%
Family or friends you may bring	48.6%	11.9%	18.2%	9.1%	12.2%	100.0%

6. Conclusions and future research

This study offers additional, initial evidence that recreationists are generally resilient to the effects of wildfire. The steep reduction in use we observed in the immediate aftermath of the Substation Fire appeared to abate by the end of 2018. Furthermore, campers at Deschutes River SRA indicated that the burned landscape did not greatly alter their recreation experience or satisfaction. Ultimately, changes in recreation use levels and visitor experience post-wildfire may be relatively minor and short-lived.

We also found evidence that campers are incorporating the potential for wildfire and wildfire smoke into their decisions about where or when to go camping. Campers reported having changed or canceled camping plans in the last two years because of wildfire or smoke and also reported some intention to incorporate the potential for wildfire or smoke into their future camping plans. Increased avoidance of camping destinations that are perceived to have greater likelihood for wildfire or smoke could have meaningful recreation management and economic development implications for both the places that are deemed "risky" as well as the "safer" substitute destinations. Given that the observed loss in recreation visits in post-fire landscapes appears to be fairly minor, the potential loss in visits for a destination deemed "risky" for potential wildfire disruptions could ultimately be greater than any loss in visits after an actual wildfire.

Our knowledge of how recreationists respond to wildfire in recreation landscapes would likely be improved through more research using observed recreation behavior in the immediate aftermath of disturbance. The potential to use wildfire as a natural experiment in exploring visitor behavior was facilitated, in this case, by having an established recreation monitoring program in place that incorporates both recreation counts and surveys of visitors. Other key factors in the successful implementation of this quick assessment were 1) an established manager/researcher relationship, 2) existing survey instruments and protocols, and 3) continuous collection and recording of recreation counts in the OPRD recreation monitoring system.

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