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Implementing Principles of Sustainable Recreation: A Case Study of the Entiat Ranger District

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Cover: Larch Lakes viewed from the Garland Peak Trail in the Glacier Peaks Wilderness Area. Photo by Kate Galambos.

Abstract

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Staff on the Entiat Ranger District of the Okanogan-Wenatchee National Forest in Washington state partnered with researchers to develop a strategy to improve the sustainability of the district's recreation program. The need to pursue a sustainable recreation strategy came about in response to a series of severe wildfires that damaged recreation infrastructure and altered natural resource conditions. Concurrent to those wildfires was continued limited funding for infrastructure maintenance and recreation management. Researchers worked with Entiat Ranger District staff to develop and implement social and biophysical assessments of recreation interests and recreation resource conditions. The assessments informed a sustainable recreation strategy document that included site-specific and districtwide recommendations. This work was guided by national and regional U.S. Department of Agriculture Forest Service frameworks for sustainable recreation planning, and we incorporated the concept of resilience. This report describes the development of a sustainable recreation strategy for the Entiat Ranger District, which can serve as an example for other units in developing a sustainable recreation plan at a local level.

Keywords: Sustainable recreation, planning, wildfire, social assessment, trail assessment.

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Introduction

Recreation managers in the U.S. Department of Agriculture Forest Service face reduced budgets, increased visitation, and costly recreation infrastructure backlogs. In addition, across the Western United States, increased frequency and severity of wildfires have led to significant damage to recreation infrastructure and, in some cases, their closure. This report presents a case study of how the Entiat Ranger District (the district, hereafter) of the Okanogan-Wenatchee National Forest in central Washington applied principles of sustainability and resilience to identify recreation priorities in this wildfire-dependent landscape. Informed by the Forest Service planning document, *Connecting People with America's Great Outdoors: A Framework for Sustainable Recreation* (agency sustainable recreation framework) (USDA FS 2010), the Entiat Sustainable Recreation Strategy (Entiat Strategy) used public engagement methods and field evaluations to develop site-specific and districtwide recommendations for establishment and maintenance of recreation infrastructure over the coming decades.

In 2019, ranger district staff partnered with a research team from Western Washington University and the Forest Service Pacific Northwest Research Station to assess recreation resources on the district and develop a strategy document to pursue improved recreation sustainability. The resulting Entiat Strategy (Galambos 2020, Galambos et al. 2020) showcases how sustainability principles can be adapted from broad planning guidelines and applied on a local scale. Although the products from this work did not constitute formal planning documents, they did provide information essential for prioritizing recommended recreation facility improvements or closures. The outcomes from this effort also illustrate the limitations of sustainable planning guidance to meet the needs of current recreation planning within the Forest Service. We describe the process used to develop the Entiat Strategy and the associated recommendations, which can serve as an example of how planners can prioritize provision of the facilities and opportunities most desired by the public, while recognizing budgetary realities and the need for environmental protection.

Evolving Realities for Forest Service Recreation Investment

Over the past decade or more, recreation use has steadily increased on Forest Service lands (fig. 1). Concurrent to that increase has been a general decline in spending for maintenance or expansion of recreation resources. The Recreation, Heritage, and Wilderness account, which covers recreation spending for the Forest Service, has decreased by 23 percent since 2001 (Watkins 2019). In the enacted fiscal year 2019 budget, $260 million was appropriated to the Recreation, Heritage and Wilderness account (USDA FS 2019a). That budget allocation paled in

comparison to the estimated $5.5 billion in deferred maintenance, which includes improvements to existing trails, roads, and facilities (USDA FS 2019a). One outcome from declining internal budgets is increased reliance on volunteers and community partners to help maintain recreation sites. Nearly 70 percent of Forest Service recreation sites are maintained or enhanced in some way by volunteers (USDA FS 2019a).

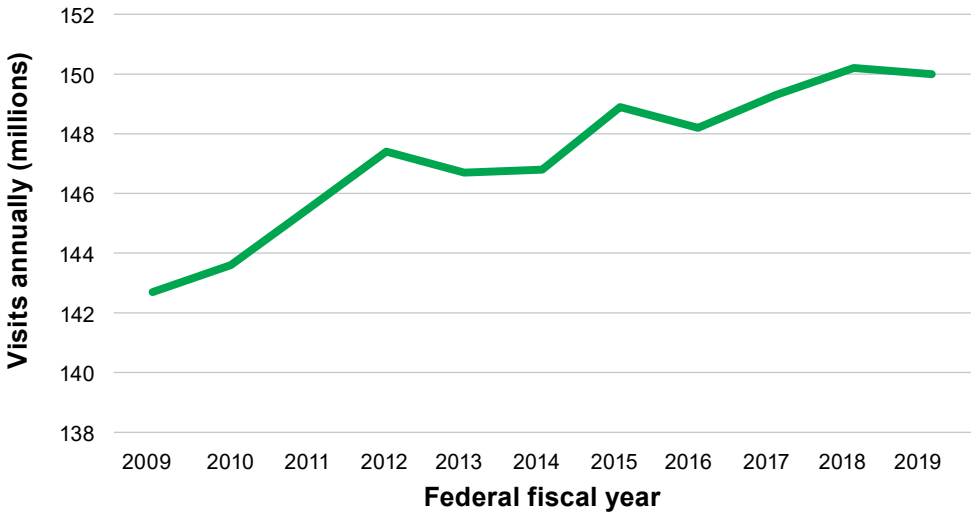

Figure 1—Visits to national forests between 2005 and 2019. Data source: National Visitor Use Monitoring Results (USDA FS, n.d.).

In addition to reduced investment in recreation infrastructure, Forest Service lands have been facing increasingly severe and frequent wildfires (Dombeck et al. 2004). This trend in wildfire behavior is a consequence of historic suppression policy, a growing wildland-urban interface, and climate change (Agee 1993, Dombeck et al. 2004, Wilson 2014). Since 1960, three of the top five years with the greatest number of acres burned by wildfire occurred in the 2010-2020 decade (Hoover and Hanson 2020). As a result of these more frequent, larger fires, the Forest Service has been adjusting annual budgets to devote more resources to fire management. In 1995, the wildfire budget made up 16 percent of the total budget (USDA FS 2015), but by 2019 it had increased to 49 percent (Hoover 2019):

Annual Forest Service budget	**1995**	**2019**
	Percent	
National Forest System	58	32
Wildland fire management	16	49
Land acquisition	8	5
Capital improvements/maintenance	8	7
State and private forestry	7	6
Forest and rangeland research	3	5

As the share of the Forest Service budget committed to wildfire has increased, the share devoted to other activities within the National Forest System has decreased. Facing budget realities, recreation managers are forced to be more strategic in allocating resource investment to make their smaller budgets effective.

The Forest Service also faces a legacy of aging infrastructure. Many trails, sites, and roads were built during times of greater budgets, more staff, and fewer recreation visits. Groups such as the Civilian Conservation Corps built countless recreation sites to support growing recreation demand by Americans who were gaining more disposable income and leisure time; many of these sites still serve visitors today (Wilson 2014). Much of this infrastructure is long overdue for maintenance and upgrades. As of 2015, the Forest Service had a backlog of projects estimated to require $5.1 billion in spending (USDA FS 2015). Many of these projects have been identified for 30 to 50 years. An overall reduction in budget allocations to the deferred maintenance program has forced the agency to shift projects from deferred maintenance to capital improvements spending. This shift reduces the capacity to invest in capital improvements, which includes trail, road, and facilities maintenance. Delayed maintenance can result in unsafe, or reduced, recreation opportunities for visitors.

Review of Forest Service Guidance for Sustainable Recreation Planning

Sustainable planning came into prominence in the 1980s as a holistic approach to environmental problems that incorporates fiscal, ecological, and social equity considerations (Brundtland 1987). The Forest Service defines sustainability as "the capability to meet the needs of the present generation without compromising the future" (USDA FS 2012). To meet these needs, sustainable planning generally focuses on environmental, social, and economic principles. The 2010 agency sustainable recreation framework (USDA FS 2010) provides guiding principles, goals, and areas of focus in providing for sustainable recreation. In 2016, the Forest Service Pacific Northwest Region (where the Entiat Ranger District is located) used the agency sustainable recreation framework, along with other foundational initiatives, to inform a complementary planning guide that outlines desired outcomes, critical success factors, necessary conditions, actions, and steps for implementing sustainable recreation at the forest level (USDA FS 2016).

The agency sustainable recreation framework (USDA FS 2010) provides guidance for localized planning but no direct instructions on how to implement sustainable recreation planning at the local level. In that context, regional-level Forest Service offices have provided a variety of guides for sustainable recreation planning and have been given the flexibility to determine appropriate sustainable recreation strategies specific for their settings (Selin 2017). Ultimately, however,

the regional-level documents still lack benchmarks, guidance, or implementation actions for achieving sustainable recreation at the local level (Selin 2017).

Cerveny et al.'s (2020b: 10) definition of sustainable recreation management provides more detail than prior agency definitions: "the provision of desirable outdoor opportunities for all people, in a way that supports ecosystems, contributes to healthy communities, promotes equitable economies, respects culture and traditions, and develops stewardship values now and for future generations." This definition is forward looking and requires agencies to anticipate future needs and problems with flexible and innovative metrics and tools that are able to adapt to changing conditions (Cerveny et al. 2020b). However, focusing solely on sustaining recreational experiences and environmental conditions is not fully adequate. As discussed above, much of the Forest Service infrastructure was built nearly a century ago in an entirely different environmental, social, and financial context. It is not possible, or reasonable, to maintain this infrastructure at the same levels as before. Furthermore, climate change, different administrative and political agendas, and diversifying demographics are creating dynamic conditions that require more than sustainable management of what currently exists.

Incorporating the Concept of Resilience Into Sustainable Recreation Planning

The approach used to develop the Entiat Strategy expands the vision of sustainability by incorporating the concept of resilience (fig. 2). Resilience was initially described by Holling (1973: 14) as the "measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables." Later definitions of resilience have come to recognize the interconnectedness of social and ecological systems. Thus, the definition of resilience has been expanded to the "capacity of a system to absorb disturbance and reorganize while undergoing change so as to retain essentially the same function, structure, identity, and feedbacks" (Walker et al. 2004: 5). In the Entiat Strategy, we focused on the concept of institutional resilience, which Stern and Baird (2015: 1) described as institutions that are "able to adapt to shocks in ways that preserve their general functions, even as their form may change." Our inclusion of resilience concepts required that we draw on "diverse knowledge, skills, abilities, viewpoints, and relationships to learn, adapt, innovate, and transform in the face of disturbance" (Stern and Baird 2015: 1). As shocks and disturbances, such as budget cuts and wildfire, alter managers' abilities to sustain recreation opportunities and adapt to changes, managers must invest, and divest, in resources in strategic ways to meet recreation demands over the long term (Cerveny et al. 2020a, 2020b).

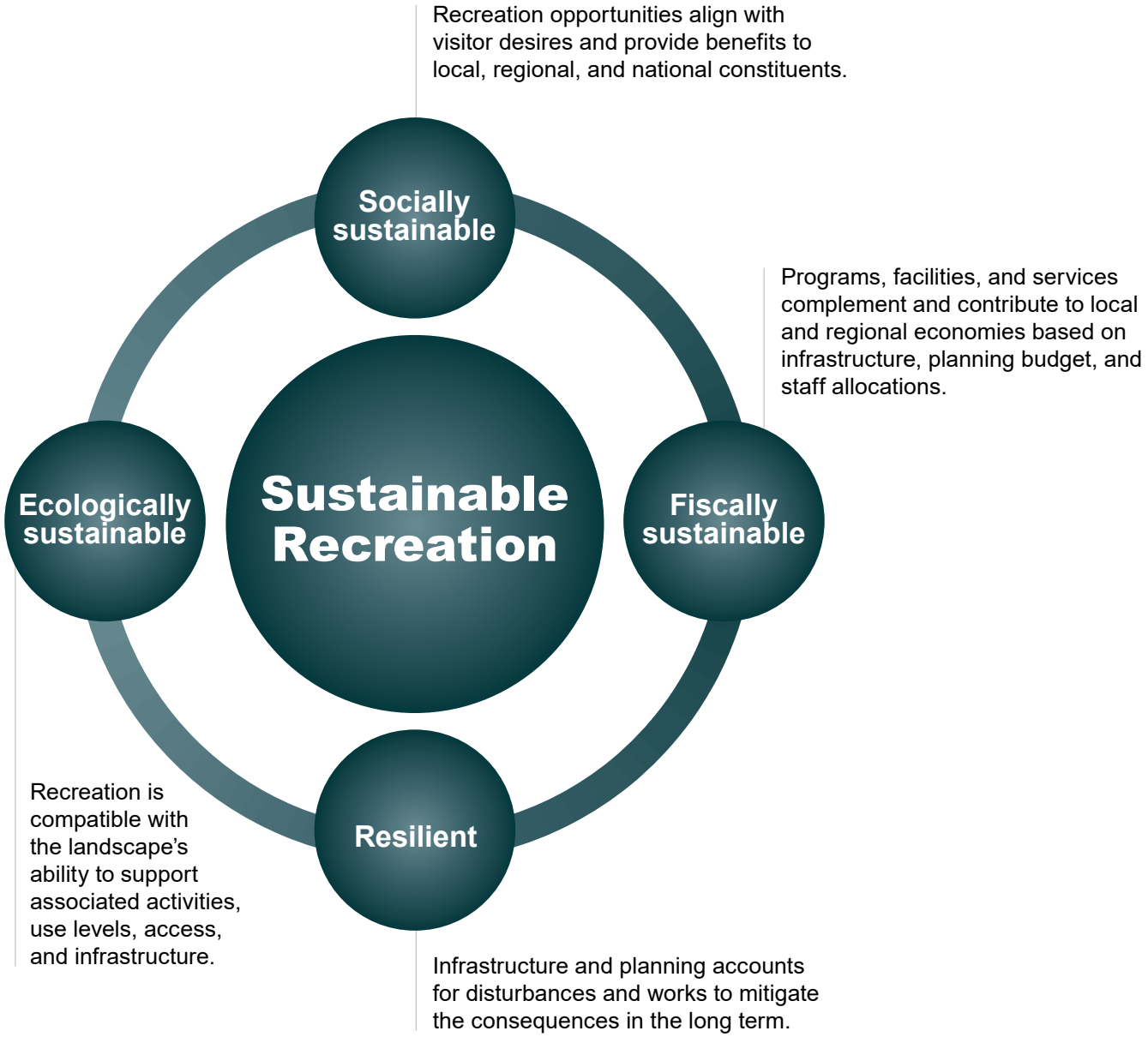

Figure 2—The four components of sustainable recreation used to develop the Entiat Ranger District sustainable recreation strategy.

Examples of Other Forest-Level Sustainable Recreation Strategies

We identified several sustainable recreation strategies completed at the forest level to serve as examples to inform the Entiat Strategy. In North Carolina, the Nantahala and Pisgah National Forests developed a sustainable nonmotorized trail strategy (USDA FS 2013). The strategy provides recommendations for investing in current trails based on identified definitions of social, environmental, and financial sustainability. For example, a trail was deemed socially unsustainable if "the trail is not being used, has overgrown or fallen into disrepair, and has no volunteers willing to perform maintenance." These specific definitions allow managers to use the document regularly to inform decision making.

In Idaho, the Idaho Panhandle National Forest's sustainable recreation plan focuses on guiding future management decisions, integrating and prioritizing program needs and work, aligning infrastructure to complement the forests' goals, monitoring implementation and effectiveness of actions, and accessing funding sources and organizational structure (USDA FS 2019b). The plan seeks to ensure that the Idaho Panhandle National Forest provides quality settings and opportunities while protecting natural resources from overuse. In doing so, the plan recognizes that "not every amenity or opportunity can be provided on every acre or administrative zone, instead opportunities will be provided and managed where they can be done sustainably" (USDA FS 2019b: 2).

In Washington state, the Gifford Pinchot National Forest applied the Forest Service Pacific Northwest Region and the agency sustainable recreation framework principles to draft the 6-year Recreation Site Analysis and Program of Work (USDA FS 2019c). These documents outline the current state of recreation infrastructure in the Gifford Pinchot National Forest and make recommendations for management priorities based on a sustainability score. This planning document was a direct response to the regional and agency frameworks and highlights how these frameworks were translated into an action-based strategy. In completing their planning effort, Gifford Pinchot National Forest staff acknowledged that the forest will not invest in what it cannot maintain and underscored the importance of recreation managers saying "no" to unsustainable projects.

Background and General Framework for the Entiat Strategy

In 2019, the Entiat Ranger District in the Okanogan-Wenatchee National Forest received funding from the Washington State Recreation and Conservation Office to develop a sustainable recreation strategy. The purpose of the proposed strategy was to guide on-the-ground management decisions by incorporating social, environmental, fiscal, and resiliency priorities most relevant to the 272,101-acre ranger district. Although the strategy described in this case study is specific to the district, its methods and approach are applicable elsewhere.

The district hosts hiking trails, campgrounds, backcountry access, and some of the most technical and vast motorized trails available in Washington. A portion of the Glacier Peak Wilderness falls within the district. Frequent wildfires have shaped the natural resource conditions in the Entiat Valley, and many of the forests and natural resource systems in the district are dependent on these wildfires. However, over the past decade, the district has experienced uncharacteristically frequent and severe wildfires that have damaged recreational facilities. In 2015, much of the western portion of the district (the upper valley) was closed to recreation because of hazardous conditions from potential landslides and falling

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Hiking toward Cow Creek Meadows on the Cow Creek trail in the Okanogan-Wenatchee National Forest.

trees in the wake of the Wolverine Fire of that year. The upper valley portion of the district reopened in the spring of 2017 only to then face the Cougar Creek Fire in 2018 (see Galambos et al. 2020 for a full description of recent disturbances and closures). The pattern of more frequent and uncharacteristically severe wildfire is expected to continue with climate change. Ultimately, managing recreation in a fire-dependent landscape with limited staff and fiscal resources necessitates prioritizing recreation opportunities.

The Entiat Strategy includes a prioritization of recreation infrastructure for investment that meets specific guidelines related to environmental, fiscal, and social sustainability and resilience (Galambos et al. 2020). The Entiat Strategy avoids proposing maintenance of the status quo. Rather, it includes site-specific and districtwide recommendations for investment and divestment in recreation infrastructure. The objective of this approach is to direct resources to the infrastructure and facilities that should and can be sustained based on public priorities, staff input, budget realities, and ecosystem function. Although the Entiat Strategy is forward looking, the process was designed to be readily updated as future conditions evolve.

Conversations with district staff and review of the sustainability literature and current Forest Service sustainability plans, policies, and documents led to the establishment of five goals that provide a frame for the Entiat Strategy:

1. Provide recreation opportunities that are accessible to current and future visitors.
2. Create a resilient natural, cultural, and scenic environment that supports recreation for future generations.
3. Partner with public and private groups to ensure safe and quality recreation opportunities that consider evolving visitor interests.
4. Implement shared stewardship to ensure sustainable decisions, sound investments, and accountability in all recreation planning.
5. Communicate with the public and partners effectively to support long-term relationships, decision making, and resilience.

Assessment of Social and Ecological Conditions

The Entiat Strategy was guided by social science data obtained through community engagement, ecological data collected via field evaluation, and institutional knowledge provided by Forest Service staff. Social science data were collected through interviews, an online survey, an online interactive ArcGIS® StoryMap℠,[1] and public meetings. The ecological data were collected through onsite visits by the research team to trails and sites across the district. Institutional knowledge was captured through staff workshops and one-on-one interactions with the district staff. We used both qualitative and quantitative methods in our data collection. Below is an overview of our data collection methods (see Galambos et al. 2020 for a more detailed description).

[1] The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

Social data—

Researchers collected social data related to visitor values, needs, and preferences to inform social sustainability priorities. Information was first collected through interviews, then public meetings, and lastly from surveys. This sequence of information collection methods allowed researchers to refine methods after each stage in preparation of the next method (Tashakkori and Teddlie 2003, Teddlie and Yu 2007). Additionally, using a mix of methods allowed the researchers to triangulate results (and therefore affirm or question a result of one method based on the results of another) and offset weaknesses in one method with the strengths of the other methods (Bryman 2006).

Interviews—

We conducted key informant interviews in spring/summer 2019 with stakeholders that were identified by the local Forest Service recreation manager. Those stakeholders then suggested additional interviewees from the community. Our 25 interviewees represented environmental nonprofits, local government agencies, recreation interest groups, local business owners, and retired district staff who reside locally:

Category	Organization
Government	Chelan County Natural Resources, U.S. Forest Service fire management, City of Entiat, U.S. Bureau of Land Management, Washington Department of Natural Resources, Chelan County Public Utility District, LINK Transit
Community recreation groups	Lake Wenatchee Recreation Club, North Central Washington Hispanic Chamber of Commerce, Entiat Chamber of Commerce, Access Entiat, Evergreen Mountain Bike, Pacific Northwest Overland, Washington State Snowmobile Association and Boondockers Club, Chumstick Wildfire Stewardship Coalition, TREAD, Entiat Valley Horse Club
Individuals	Retired U.S. Forest Service staff, off-highway vehicle riders, cross-country ski and snowshoe advocates, Entiat residents
Nonprofits	Washington Trails Association, Team Naturaleza, Chelan-Douglas Land Trust, Trout Unlimited
Businesses	Icicle Outfitters, Ardenvoir Store, Creative Design Studio

The participants were asked about their connection to the district and its recreation opportunities, and their advice to managers (see Galambos et al. 2020). These questions allowed researchers to probe participants about management of recreation resources in the district and how its staff could manage resources in a sustainable and resilient manner. These interviews provided context about the district and its recreation opportunities and challenges.

Several themes emerged in the interviews: the district as a "hidden gem," the role of the Forest Service, multiple-use versus single-use trails, recommendations

for trail maintenance, recreation site closures or additions, and wildfire. Often, each theme received both affirming and opposing views (table 1). These themes informed the activities developed for the public meetings.

Table 1—Examples of two major themes and statements from interviews

Major theme	Statement
Entiat Ranger District is a hidden gem among more popular recreation areas	**Affirming**
	Less visited than nearby recreation areas like Leavenworth and Chelan [paraphrased].
	"(The Entiat Ranger District) is a well-kept secret."
	"We joke that if you're not from here, you need a guide to use the Entiat trails."
	Opposing
	Need more advertising for the Entiat Ranger District to bring tourism dollars to greater region [paraphrased].
	Need more people to visit Entiat to remove pressure from neighboring areas like The Enchantments [paraphrased].
Community desire to keep all trails maintained and open	**Affirming**
	More trails mean less concentrated use (damage) to each [paraphrased].
	Keep roads open and maintained as well [paraphrased].
	Trails and campgrounds represent a taxpayer investment; therefore, they should be accessible to taxpayers [paraphrased].
	Opposing
	Supportive of closing areas for the purpose of restoration [paraphrased].

Public meetings—

Researchers and Forest Service staff hosted two open-house public meetings in October 2019: one in Entiat, Washington, and one in Wenatchee, Washington. Agency communications staff advertised the meetings through email, social media, websites, and paper fliers posted at local businesses. Twenty-five people attended the Entiat meeting, and 10 attended the Wenatchee meeting. The goals for both meetings were to collect insights and perspectives from attendees, determine the level of support for the major themes that resulted from stakeholder interviews, and inform the participants about the planning process and encourage them to participate in the interactive StoryMap and online survey.

At the meetings, after a brief group session that provided background and directions, participants provided input at four activity stations:

Station	Activity
Current recreation locations and activities	Mark on the map locations where you recreate and the types of activities you do there.
Future recreation opportunities	Mark on the map new recreation opportunities you would like to see in the future and areas you would like to see restored.
Major recreation values	Show which statements you agree with (green dots) and disagree with (red dots). Add statements that are missing.
Opportunities for collaboration	Provide input on what the community needs from the Forest Service and what the Forest Service needs from the community.

Researchers were available at each station to provide instruction and facilitate discussion among attendees. The goal of the participatory activities was to elicit information about where attendees recreate, the types of activities they engage in, and where they would like to see recreation opportunities added or restored. A total of 50 unique places were identified on the maps provided, along with 19 different activities. The data collected from the open-house stations were combined with similar data collected in the online survey and the online StoryMap to create the popularity ranking used in calculating the final trail score (see below).

***StoryMap*—**The primary online communication and data collection tool for the Entiat Strategy was an ArcGIS StoryMap. A StoryMap is an online presentation tool that incorporates text, maps, and images to guide readers through a narrative. The StoryMap was published in the spring of 2019, concurrent with a Forest Service press release about the effort, as a communication method and for public engagement. An interactive map was added to the StoryMap in the fall of 2019 to collect specific data on recreation use on the district. Participants used the interactive map to identify trails and sites in the district that were important to them and to answer three questions with each corresponding point. The three questions mimicked those used to identify recreation activities and locations at the public meetings and a question from the online survey (see below). A total of 98 points were placed on the map corresponding to 50 unique locations.

***Online survey*—**The final social data collection method was an online survey distributed in November/December 2019. Recreation use on the district is light and dispersed on trail and road networks rather than focused in specific developed recreation sites. Traditional in-person visitor-intercept approaches were unlikely to generate a reasonable number of survey respondents for the purposes of this study. Thus, an online survey was deemed more appropriate for reaching a broader group of individuals.

The 21-question survey covered topics related to current recreation use (e.g., activities and locations of interest), barriers to recreation, attitudes regarding the purpose or desired outcomes of recreation, and participant demographics (see Galambos et al. 2020). The questions were selected from the Interagency Generic Clearance for Federal Land Management Agencies Collaborative Visitor Feedback Surveys on Recreation and Transportation Related Programs and Systems[2] with some minor edits to fit the context. That question set was developed as a tool for federal land management agencies to use in collecting information about recreation from the public, and it includes hundreds of survey questions covering a variety of topics. We received input on topic selection and question wording from district recreation staff.

Potential respondents were identified from three sources. First was the list of stakeholders from the initial interviews, along with any additional contacts recommended by stakeholders, which resulted in 53 contacts. Second was a list of contacts collected by researchers during field evaluations through in-person intercepts. During the ecological data collection (see below), researchers contacted nearly every adult they encountered to collect visitor contact information for a later survey follow-up. In addition, postcards left on car windshields at trailheads and notices posted on information kiosks provided a link to a project website where visitors could contribute their contact information. We collected 47 in-person contact cards, and 64 individuals gave their contact information through the online link. The third source used was a list of interested persons maintained by the Okanogan-Wenatchee National Forest. That list included 338 individuals who had previously indicated an interest in events and updates in Chelan County, where the district is located.

Using methods outlined by Dillman et. al (2014), we sent the survey to 502 individuals over 5 weeks. The survey concluded with 161 completed surveys, for a response rate of 32 percent. Forty percent of survey respondents had been visiting the district for more than 20 years, and 40 percent visited the district four or more times per year. Respondents were most frequently male (66 percent), white (89 percent), over age 55 (55 percent), and English speakers (93 percent). Nearly 15 percent of respondents had a second home in Chelan County. Responses to the online survey provided data for the trail/site popularity rankings and site-specific and districtwide recommendations.

These combined social science methods provided both qualitative and quantitative data about user preferences, needs, and values regarding recreation in the district. The sequence of the social data methods allowed researchers to inform subsequent methods with the results of the previous. Furthermore, the variety

[2] See http://volpe-public-lands.s3-website-us-east-1.amazonaws.com/flma_lrtp_cvts/cvts.htm. (14 April 2022).

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Cow Creek Meadows surrounded by evidence of wildfire.

of methods broadened the scope of participants and provided the opportunity to compare the individual finding from each source.

Ecological conditions—

The physical conditions of recreation resources were assessed via systematic evaluation. Trails and campgrounds were evaluated for general conditions, damage, and recreation obstacles, such as downed trees or missing bridges. The trail data were collected using tablets with ArcGIS spatial software (specifically, ArcGIS® Survey123 and ArcGIS® Collector), while the campground data were recorded on paper and later digitized.

With nearly 200 miles of trail in the district, researchers relied on district staff to prioritize trail evaluations based on visitor use and management issues. The researchers collected feature data by hiking 24 trails over the course of 10 weeks during July and August in 2019 and 2020. The evaluations produced nearly 2,000 Global Positioning System points of feature information along with written,

mile-by-mile accounts of each trail evaluated. Much like the social data, these trail evaluations combined qualitative (i.e., descriptive trail summaries) and quantitative methods to produce a full picture of conditions.

Evaluation criteria were based on the literature, expected features, and institutional knowledge from district staff. For the field evaluations, researchers developed a custom evaluation method focused on maintenance features present on the trail at the time of the study. The researchers chose not to use the established Trail Assessment and Condition Surveys (TRACS)[3] approach because of its focus on highly technical trail features such as design cross slope and design turns, among others. Those features would not adequately aid managers in prioritizing trail maintenance in the district. Rather, we created a similar evaluation method, with the assistance of district staff, that focused more specifically on recreation maintenance features present on the district. Our evaluation incorporated 21 maintenance features representing a range of complexity/cost to address:

Least (1)	(2)	(3)	Most (4)
Blackened vegetation	Unimproved crossing	Fall line slope	Erosion
Wet area	Obstacle	Insufficient signage	
Washboards	Scenic vista	Washout	
Trail braiding	Cut switchback	Overgrown vegetation	
Snag	Culvert	Trenching	
Potential hazard	Improved crossing	Concrete trellis	
	Improved steps		
	User trail		

Institutional knowledge—

The research team relied on district staff expertise throughout the project, and their institutional knowledge was especially important in characterizing the amount of expected resource investment needed to implement potential site improvements. During a workshop, 10 Okanogan-Wenatchee National Forest staff members representing various specialties ranked the 21 recreation maintenance features used in the field evaluation by expected complexity and cost to improve or repair. For example, workshop participants believed that addressing "erosion" was more costly than "insufficient signage," and it was thus ranked higher.

Integration of Social and Ecological Data

The social and ecological data were integrated via a joint ranking process. For the social data, researchers created an index to rank trails and sites based on the frequency each was identified in the mapping exercises during the open houses,

[3] See http://www.fs.usda.gov/managing-land/trails/trail-management-tools/tracs. (14 April 2022).

on the interactive StoryMap, and in the online survey. Based on the frequency of mention, trails and sites were placed into four popularity classifications: mentioned, somewhat popular, popular, and most popular. Popularity classification breakpoints were assigned based on the interquartile breakpoints of mentions across all the trails within geographic zones in the district (described below). This approach assumes the mentions in our process were positive (e.g., "I hike here") and that those sites identified most frequently were indeed the most popular. This ranking method provided a tangible way to incorporate social sustainability, which for our purposes was defined in part as providing recreation resources that align with visitor interests and desires.

To incorporate the environmental and financial sustainability principles, we created another ranking system that utilized the ecological data. Each trail was given a score based on the number of maintenance features (needs) found and their associated index score for repair (see "Institutional knowledge" above). The resulting trail score was a weighted ranking:

$$Trail\ score = \frac{\sum_{i=0}^{n} feature\ index_{j}}{n}$$

where *feature index* is the ranking of attribute *j* for feature *i*, and *n* is the total number of maintenance features considered. In this case, trails with higher scores were less financially and environmentally sustainable in their current condition. To repair, restore, or replace these trails would require the greatest investment. This approach facilitated translating the ecological data into a prioritization system based on the principles of environmental and financial sustainability.

The final step in our analysis was to create a final trail score that combined the ecological data trail score above with the user popularity ranking from the social data (fig. 3). The result of this combination was a quantitative index that translated multiple data types into a score that managers can use to prioritize infrastructure maintenance according to sustainability principles and resilience.

Figure 3—Calculation of the final trail score, which managers can use to prioritize infrastructure maintenance according to sustainability principles and resilience.

Overview of the Development of Entiat Strategy Recommendations

The site-specific recommendations for investment reported in the Entiat Strategy are based on the priority ranking developed from the social and ecological data. The districtwide recommendations are drawn from the broad themes identified in the social data and developed in the context of the overall goals for sustainable recreation.

Site-specific recommendations—
Site-specific recommendations in the Entiat Strategy are presented for specific geographic zones within the district. This approach acknowledges the range of recreation opportunities provided and prioritizes a spectrum of opportunities within each geographic zone. Within the district, the landscape settings and level of recreation infrastructure development is such that each zone represents different types of recreation and landscape settings. The district's four geographic zones are described below, showing a range of land use and ecological characteristics:

Geographic zone	Characteristics
Lower valley	Human-developed land mixed with temperate-boreal grassland/shrub, semidesert grassland/shrub, and temperate-boreal forest/woodland
Middle valley	Some human development mixed with semidesert scrub and grassland, temperate and boreal forest/woodland
Upper valley, nonwilderness	Dense temperate-boreal forest/woodland with evidence of burn
Glacier Peak Wilderness	Rugged, temperate-boreal forest/woodland with glacier-covered peaks, alpine lakes, and evidence of burn

In other places where the landscape does not lend itself to establishing discrete zones with unique landscape and infrastructure characteristics, it may be more appropriate to incorporate the Recreation Opportunity Spectrum classification or other land use allocation systems into the prioritization process.

Within zones, trails were prioritized for investment based on their final trail scores. For example, in the Lower Valley, the Lower Mad River Trail is ranked as the top priority (table 2). The high current conditions score (or trail score) for that trail reflects the trail's poor and dangerous condition. Despite that, the trail is a favorite among users and was classified with a "most popular" rating. Improving the conditions of this trail likely requires significant financial investments, but the public's desire to use this trail is high. Tyee Ridge Trail is also ranked as "most popular." However, the trail score is very low, meaning the trail's current conditions do not require extensive repair investments. Thus, Tyee Ridge Trail does not represent a current funding priority. When trails had similar ecological conditions,

Table 2—Example final trail scores for the Lower Valley, Entiat Ranger District

Trail name and number	Class[a]	Trail score[b]	Popularity[c]	Final trail score[d]
Billy Ridge Trail, 1413	3	12	1	12
Blue Creek Trail, 1426	3	10	2	20
Lower Mad River Trail, 1409	3	13	4	52
Tyee Ridge Trail, 1415	3	3	4	12

[a] Forest Service trail classification system ranging from 1, minimally developed to 5, fully developed.

[b] An index based on the field evaluation data ranging from 3, minimal infrastructure issues to 15, maximum infrastructure issues.

[c] An index based on the frequency of mention of the trail/site among social data sources ranging from 1, infrequent mention to 4, frequent mention.

[d] Trail score (i.e., current condition) multiplied by user popularity.

such as the Blue Creek and Billy Ridge Trails, the popularity ratings help to identify priority. Of those two trails, Blue Creek could be viewed as the priority because it is more popular among users.

Campground infrastructure and environmental conditions were also evaluated by zone. Recommendations were made to replace aging or damaged picnic tables and other campsite amenities with fire-resistant materials, to close or move sites located too close to the Entiat River, and to identify volunteer opportunities for campground maintenance and restoration.

In the Entiat Strategy, our site-specific recommendations also include information on environmental conditions and social interest; the type of resources (fiscal and human) required for site improvement; opportunities for volunteer assistance; and in some cases, new revenue-generating possibilities (e.g., yurt and fire lookout rentals). Although our site-specific recommendations were made in the context of prioritizing work under typical annual budget allocations, they can also serve to identify priority investments for focused budget investments, such as the Great American Outdoors Act [Public Law 116–152. 116th Cong. § (4 August 2020)].

Districtwide recommendations—

The districtwide recommendations in the Entiat Strategy are informed by the social data and agency policy, and they support the overarching goals for sustainable recreation on the district. Each districtwide recommendation aims to address one or more Entiat Strategy goals. For example, the recommendation, "identify locations for frontcountry trails based on environmental suitability," corresponds to Entiat Strategy goals two and three. Districtwide recommendations are organized into three categories: management, communication, and volunteers/partnerships; they are further divided into short- and long-term actions (table 3). Identified in the social data findings as key themes, these categories reflect public sentiment regarding how the district can best provide and maintain sustainable recreation opportunities that are both realistic and resilient into the future.

Table 3—Districtwide short- and long-term recommendations for the Entiat Ranger District

Key themes and timeframe	Activity	Corresponding strategy goal(s)
Management		
Short term	Replace trail signs where current signs are missing or unclear with signs that include mileage and Spanish translation	1
	Implement trail maintenance plan that prioritizes trails of high public interest and low infrastructure improvement needs	1, 2
	Develop protocol to share with all contractors that outlines minimum sustainability practices/principles for infrastructure improvements or replacements	2
Long term	Complete winter travel management plan	2, 4
	Complete travel management plan	2, 4
	Identify locations for frontcountry trails based on environmental suitability	2, 3
	Decommission trails of low public interest and high infrastructure improvement needs	2
	Investigate new revenue generation opportunities (e.g., fire lookout and yurt rentals)	1
Communication		
Short term	Communicate the results of the Entiat Sustainable Recreation Strategy	5
	Add periodic updates to the StoryMap	5
	Engage with multicultural partner groups, such as Team Naturaleza and Latino Outdoors Washington	3
Long term	Create an online dashboard for trail maintenance updates and post on StoryMap	5
	Distribute quarterly newsletter to inform the public of current issues, needs, and events in the Entiat Ranger District	5
	Develop a communication plan	5
	Enhance Forest Service presence/education efforts	3, 5
Volunteer/partnerships		
Short term	Formalize volunteer agreements	3
	Conduct annual volunteer chainsaw training	3
	Compile tools for trail maintenance in lending toolshed to support volunteer work	3
	Identify annual trail projects appropriate for volunteer groups	3
Long term	Establish volunteer/partnership coordinator position	2, 3
	Formalize shared stewardship agreements with other land managers	4
	Broaden volunteer base to include groups beyond recreation interests	3

Connections to national sustainable recreation goals—
The 10 focus areas of the agency framework for sustainable recreation provide a context for sustainable recreation planning (USDA FS 2010). The Entiat Strategy provides unique insights into how to align local planning strategies with each of the 10 focus areas; these insights are summarized below.

***Restore and adapt recreation settings*—**The Entiat Strategy includes recommendations that used recreation infrastructure evaluations to analyze the current recreation settings and plan for the future. Those evaluations informed

the final trail score, which managers can use to plan trail and site restoration, infrastructure additions, and closures where appropriate.

***Implement green operations*—**The agency framework for sustainable recreation focuses on aligning operations with "green" policy to reduce the environmental footprint of recreation operations. Because the Entiat Strategy was not focused on internal operations, it did not outline recommendations for day-to-day management. However, the results of the ecological trail score can be used to reduce the environmental footprint of the district if managers prioritize projects based on current conditions. Investing in restoration and maintenance can reduce the environmental footprint of users by creating more resilient infrastructure.

***Enhance communities*—**The Entiat Strategy represents a place-based recreation planning model that incorporates input from residents, the general public, and stakeholders from local and regional recreation groups, tourism, non-profits, and government entities. This feedback informed the strategy's goals and recommendations.

***Invest in special places*—**The agency framework for sustainable recreation focuses on special places that are scenic or historic. These concepts are value-based and therefore subjective. For the Entiat Strategy, special places were defined by those who participated in interviews, the online survey, and the public meetings. While some places may not be formally defined as scenic or historic, it is fair to say that those special places identified by respondents are just as meaningful to district recreationists as formally defined scenic or historic places.

***Forge strategic partnerships*—**Central to the Entiat Strategy recommendations are the needs, values, and interests of community members who participated in the data collection phase. The methods used (i.e., interviews, online survey, and public meetings) served to strengthen existing partnerships and build new ones. All participants were asked about their interest in partnering with the Forest Service to improve recreation offerings. These informal conversations provided a foundation for building future partnerships and strengthening existing relationships.

***Promote citizen stewardship*—**The participatory methods used to engage the public in strategy development promoted citizen stewardship by providing opportunities for dialog between Forest Service staff and the public. The open-house public meetings were particularly useful for promoting stewardship. In that setting, Forest Service staff were able to communicate their needs, offer gratitude for the support they already had, and stimulate discussion about new ways of including citizen stewards. At the same time, community members were able to learn more about ongoing management and planning efforts and get excited about available recreation opportunities.

Kate Galambos

The meadows around Larch Lakes provide a scenic destination for backpackers.

Know our visitors, community stakeholders, and other recreation providers— Interviews and public meetings provided avenues for district staff to get to know visitors, stakeholders, and other recreation providers. However, because interviews were conducted by researchers alone, the district staff did not meet or speak with interviewees. Instead, they received the aggregated results of these confidential interviews. The public meetings provided better opportunities for district staff to meet directly with the community. Despite our use of multiple approaches, we still likely failed to reach all groups of current and potential users. For example, even though Hispanic and Latino individuals comprise a meaningful portion of the local population, very few individuals who identified as Hispanic or Latino participated in our participatory mixed methods.

Provide the right information—The participatory methods required external communication with the public to gather input on strategy goals and recommendations. The interactive StoryMap provided a key resource for project

updates and communication. Through the StoryMap, the Forest Service was able to provide information to the public and receive public comments. Also, the StoryMap format could be used to provide project updates and news specific to the district.

***Develop a sustainable financial foundation*—**Field evaluations of trails and campgrounds provided information on current resource conditions. These evaluations identified the type of improvements necessary for trails and campgrounds, and they can inform estimations of needed costs for resource improvements versus the benefits realized. Beyond that, information garnered from these evaluations could be used by district recreation managers to evaluate the likely complexity of projects in the context of decision making about the use of volunteer groups and allocation of district staff time.

***Develop our workforce*—**The goals of the Entiat Strategy addressed the need to develop the internal Forest Service workforce. A specific recommendation in the Entiat Strategy is to establish a volunteer coordinator position on the district to support partnerships with stewardship groups.

Resilience capacity—

The Entiat Strategy expands the traditional components of sustainable planning by adding a resilience component (fig. 2). Incorporating resilience further enables researchers to recognize the roles of natural disturbances and financial limitations in influencing district recreation sustainability. Traditional sustainability thinking focuses on preserving the current recreation resources for the future through design, research, and environmental, fiscal, and social policies (Selin 2017). That traditional thinking assumes that recreation resources can and should be preserved at their same level into the future. In the context of the district, it is not feasible to recommend that all infrastructure be maintained. To do so would ignore the financial limitations of the district that were not present when much of the infrastructure was built. Beyond financial limitations, present-day disturbance patterns that are more frequent and severe pose a more significant challenge to maintaining recreation infrastructure compared to that experienced in the early to mid-1900s when district trails, campgrounds, and roads were constructed.

To address the realities of wildfire and reduced recreation budgets, the Entiat Strategy incorporates resilience capacity to mitigate the consequences of known disturbances in the long term (Ahern 2013). For example, recommendations include specific details such as using fire-resistant wood or steel to construct major infrastructure. The Entiat Strategy also recommends identifying new sources of funding and strengthening partnerships with volunteer groups to offset reduced recreation budgets. Finally, the Entiat Strategy acknowledges the inability of district staff to successfully manage and maintain all recreation opportunities to the same

capacity of managers in the 20th century. Rather than attempt to stretch resources thinly across the district, the Entiat Strategy includes recommendations that focus attention on highest priority infrastructure while recognizing the wisdom in "doing less with less" rather than "doing more with less" (Cerveny et al. 2020b: 34).

Supplemental Sustainable Recreation Planning Products

Beyond the Entiat Strategy document itself, three additional products were developed to support sustainable recreation planning on the district and serve as guides for planning elsewhere:

Product	Description
Summary document	A two-page, high-level summary of the Entiat Strategy recommendations.
Recreation facilities report	A report detailing mile-by-mile trail features/conditions and used to supplement Geographic Information System (GIS) data. It also includes site-by-site campground evaluations that list the status of picnic tables, grill/fire pits, bathrooms, and all other campground infrastructure.
Recreation facilities evaluation and survey intercept guide	A guide created prior to field evaluations to train research assistants on how to collect field condition data and speak with users about the survey in the district.

The summary document provides a high-level overview of the Entiat Strategy and its goals and recommendations. It is targeted to agency and partner leadership and external stakeholders. The facilities report, coupled with the Entiat Strategy document, provides detailed summaries of existing infrastructure and its condition, as well as recommendations on potential future management actions. The district can use these recommendations and summaries to prioritize trail and campground maintenance, and to inform future decision making for new recreation opportunities or to justify closures for rehabilitation purposes. The district can also use the information to support internal funding requests and external grant applications, or to identify opportunities for investment when new internal funding opportunities arise. The recreation facilities evaluation and survey intercept guide describes the methods used in our ecological evaluation procedures and can be used to replicate this process in the district in the future; it may also serve as a resource to others undertaking sustainable recreation planning.

The Entiat Sustainable Recreation Strategy as a Roadmap

The complexities facing recreation management in the district are far from unique. Recreation managers across the country face similar issues related to increased recreation demand, diminishing financial resources, and a changing climate (USDA FS 2010). Through its components, the Entiat Strategy purposefully addresses the 10 focus areas of the agency framework for sustainable recreation:

Focus area identified in the Forest Service Framework for Sustainable Recreation	Corresponding Entiat Strategy component
Restore and adapt recreation settings	Field evaluations
Implement green operations	Final trail score
Enhance communities	Participatory mixed methods (social data)
Invest in special places	Participatory mixed methods (social data)
Forge strategic partnerships	Participatory mixed methods (social data)
Promote citizen stewardship	Participatory mixed methods (social data)
Know our visitors, community stakeholders, and other recreation providers	Interviews and public meetings
Provide the right information	Participatory mixed methods (social data), strategy goals
Develop a sustainable financial foundation	Field evaluation, strategy goals
Develop our workforce	Strategy goals

The Entiat Strategy used a mixed-methods approach to address sustainability principles and incorporate resiliency planning to develop action-based recommendations for specific recreation sites and the district as a whole. We found that using sequential participatory mixed methods allowed the data to be compared among sources. Themes or responses that were common across all methods could be prioritized over those that appeared only within one collection method. This was especially important as a tool to utilize qualitative data, such as recreation use patterns, in a quantitative way. In addition to the more traditional participatory approaches used here, novel methods that incorporate social media data could also be used to gather information on the popularity or use of specific recreation resources.

In addition to operationalizing the goals from the Forest Service *Framework for Sustainable Recreation*, the Entiat Strategy incorporated recognition of resilience capacity. Guided by resilience theory, the Entiat Strategy recommends actions to improve the capacity of the district to be resilient to disturbances, including fire, and severe budget limitations. The inclusion of resilience concepts allowed us to look beyond the status quo and plan for a future likely to include increased natural disturbance and continued budgetary and staffing limitations. There is an increased

and renewed focus on sustainable recreation in the Forest Service (Cerveny et al. 2020a, 2020b). The Entiat Strategy process can serve as an example for other Forest Service units to develop sustainable recreation strategies.

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Metric Equivalents

When you know:	Multiply by:	To find:
Acres	0.405	Hectares
Miles	1.609	Kilometers

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