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SOCIAL AND ENVIRONMENTAL SUSTAINABILITY IN LARGE-SCALE COASTAL ZONES: TAKING AN ISSUE-BASED APPROACH TO THE IMPLEMENTATION OF THE PRINCE WILLIAM SOUND SUSTAINABLE HUMAN USE FRAMEWORK

DALE J. BLAHNA,* AARON POE,† COURTNEY BROWN,‡
CLARE M. RYAN,§ AND H. RANDY GIMBLETT¶

*US Forest Service, Pacific Northwest Research Station, Seattle, WA, USA
†US Fish & Wildlife Service, Anchorage, AK, USA
‡US Fish & Wildlife Service, Kihei, HI, USA
§School of Environmental and Forest Sciences, University of Washington, Seattle, WA, USA
¶School of Natural Resources and Environment, University of Arizona, Tucson, AZ, USA

Following the grounding of the Exxon Valdez in 1989, a sustainable human use framework (human use framework) for Prince William Sound (PWS), AK was developed by the Chugach National Forest after concerns emerged about the social and environmental impacts of expanding human use due to cleanup activities and increased recreation visitation. A practical, issue-based process was used to develop an implementation strategy for integrating the complex social and ecological data contained in the human use framework and for making specific management and monitoring recommendations. The issue-based process is more of a bottom-up approach to planning compared to typical top-down planning approaches that seek to impose or replicate system-wide environmental conditions as criteria for selecting management and monitoring practices. The implementation strategy includes management guidance for protecting "keystone" recreation experiences while simultaneously protecting social and ecological values of PWS. It also includes practical social and ecological monitoring recommendations that can be used to inform an adaptive management strategy for continued management of sustainable human uses. The issue-based process serves as a model for other coastal zone areas struggling to balance increasing human use and recreation with conservation and environmental protection goals.

Key words: Tourism; Conservation planning; Commercial use allocation strategies; Recreation use zoning strategies; Partnerships; Socioecological systems; Keystone experiences

Address correspondence to Dale J. Blahna, US Forest Service, Pacific Northwest Research Station 400 N. 34th St., Suite 201, Seattle, WA 98103, USA. Tel: 206-732-7833; E-mail: dblahna@fs.fed.us

Introduction

Managing landscapes for increasing human use of undeveloped coastal areas while simultaneously protecting sensitive ecological conditions and unique social experiences appears to be an intractable environmental planning problem. Yet this is the essence of sustainable use—to manage and even encourage human uses of landscapes while protecting essential environmental and social conditions for future generations (Keough & Blahna, 2006; USDA Forest Service, 2010). However, many planners and environmental advocates consider human use and environmental protection to be incompatible goals. In this article we describe a practical process for developing a strategy for implementing a management framework for Prince William Sound (PWS), Alaska—a remote and sensitive coastal zone area that has experienced a dramatic increase in national attention and recreation visitation (A. Poe & Gimblett, 2017). The process we describe is applicable to any marine or terrestrial ecosystem where nature-based recreation and tourism present conservation concerns.

Background: Prince William Sound

When the Exxon Valdez oil tanker ran aground on Bligh Reef in 1989, 11 million gallons of oil spilled into the cold and ecologically fragile waters of PWS (Fig. 1). Media images of the spill were dramatic, as dozens of iconic wildlife species like sea otters, bald eagles, harbor seals, seabirds, and even orcas were seen dying while covered in oil. Human communities and activities were also affected as the spill impacted fishing, boating, wildlife viewing, and many traditional uses and subsistence activities that defined the region and supported its residents.

In the wake of the spill, Exxon commissioned five large-scale, long-term research studies of the spill's impacts and recovery efforts. These studies included both "injured resources" like wildlife habitat and water quality, and "human services" like commercial fishing, subsistence harvesting, recreation, and tourism. There were studies of injured species and habitats, recreation use patterns and visitor expectations, recreation–wildlife conflicts, commercial recreation visitors and guides, existing

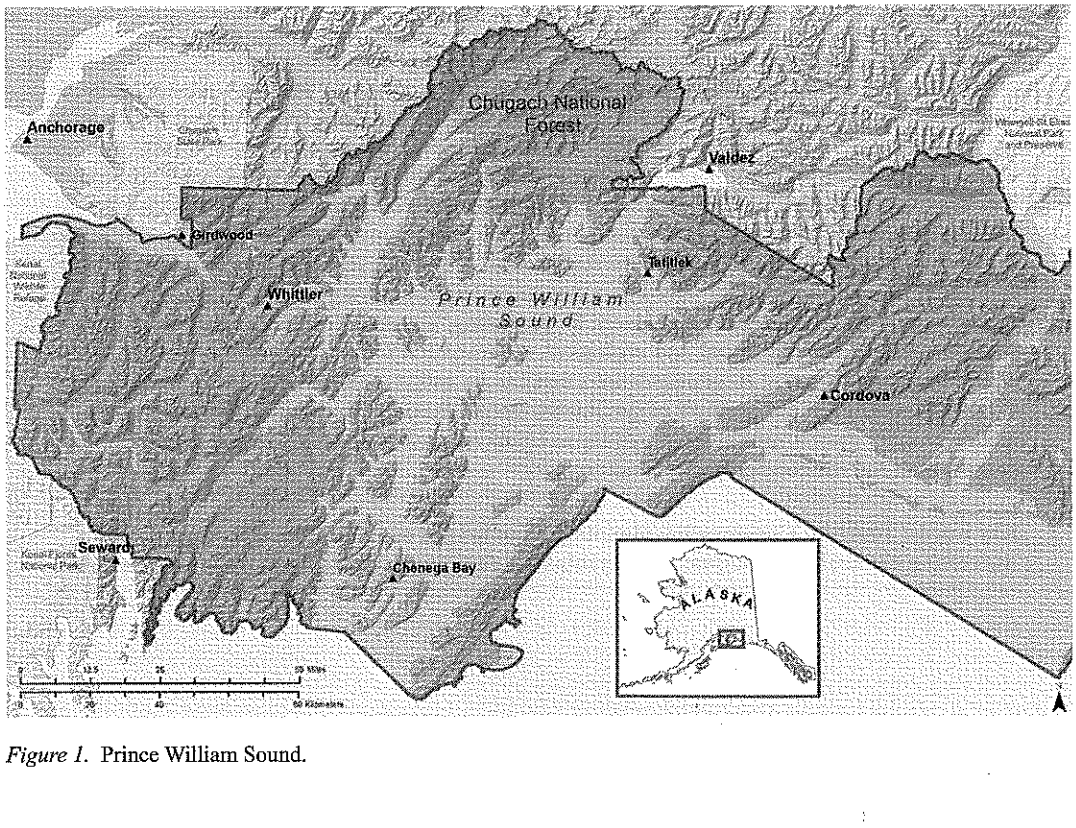

Figure 1. Prince William Sound.

and changing regional social norms, and household subsistence harvesting activities (A. Poe & Gimblett, 2017). Because 80% of the land abutting the waters of the Sound is managed by the US Forest Service (USFS) of the US Department of Agriculture, the Chugach National Forest (CNF) had administrative responsibility for the Exxon studies. The CNF had also collected data on wildlife habitat, vegetation, and visitor use as part of their own forest planning process. Many of the CNF studies also included stakeholder engagement and coordination with the Alaska State agencies, tribes, and other organizations.

An unexpected secondary outcome of the spill was an increase in recreation visitors. Alaska residents, environmental activists and sportsmen, and many other concerned people flocked to PWS to view the damage and help with cleanup activities (Poe, Gimblett, & Blahna, 2017). Many returned later to recreate in PWS. Visitation increases also resulted from the completion of a road and traffic tunnel from Girdwood to Whittier in 2000; it connected PWS with the Anchorage area, the most populous part of the state. Before the tunnel, the only access from outside the region was by boat and aircraft. By 2006, approximately 235,000 vehicles used the Whittier tunnel and there were 907,000 visitors to the Sound.

In 2006, the CNF secured support from other Federal Trustees to pursue a research program to compile, collect, and synthesize human use data as well as species and habitat distribution information in PWS. This program ran from 2007 to 2010 and was named PWS framework (www.tinyurl.com/PWSFramework). Although the PWS framework was largely a research and monitoring program, it also had the goal of identifying strategies and partnerships with communities and stakeholders to manage for and support sustainable human use into the future. To address this goal, in 2009 the CNF formed an advisory group of scientists, managers, and planners to identify a process in which the data from the PWS framework, along with several other state and federal data sources, could be used to develop a sustainable human use framework (human use framework) for Prince William Sound (A. Poe & Gimblett 2017).

In this article we describe a strategy to implement the PWS human use framework. The implementation strategy provides specific guidance to operationalize the human use framework. The process we used illustrates how managers can synthesize complex, multidisciplinary data sources and develop practical management and monitoring strategies to meet what are often characterized as contradictory goals: accommodating increasing recreation and tourism use while protecting social conditions and reducing environmental impacts.

Existing Guidance

Both the PWS framework and the PWS human use framework provide optional guidance for the US Forest Service and other land management agencies. That is, they are not formally mandated or required by law. However, in order to encourage formal adoption of the results in the CNF's next national forest plan, both frameworks were built off of existing management policies and the current national forest plan (USDA Forest Service, 2002). For example, the geographical units used in the national forest plan were also used in the PWS framework and the human use framework.[1] The general vision for the human use framework was also derived from the national forest plan, which states that the PWS region will be: "managed primarily to maintain the wild character of this area and its unique wildlife. Human access will remain almost exclusively by boat or aircraft with the exceptions of the road accessed portals of Whittier and Valdez" (USDA Forest Service, 2002, p. 3-16). Although this statement provides a broad vision for preserving wilderness values and primitive recreation experiences, there were few visitor management strategies for PWS in the forest plan, and those provided were inconsistent throughout the region. For example, there were two recreation carrying capacity analyses, one for the west side and one for the east side of PWS, but they were developed using different methodologies and came to contradictory conclusions about visitor management. Furthermore, there is no mention in the forest plan of local or Native Alaska communities, outfitters, or guides, or recreation use benefits. And finally, there is no mention in the forest plan of human use occurring in saltwater regions even though this is where the vast majority of private recreation and commercial activities take place.

Additional guidance for the PWS human use framework also came from the national office of the USFS, which recently adopted a sustainable recreation framework (SRF) for the agency. The SRF includes many laudable recreation management goals such as using partnerships, multistakeholder collaboration, integrating social and environmental science, and using multiple analysis scales (USDA Forest Service, 2010). This is to be accomplished while encouraging visitation and protecting the environment and unique recreational experiences. However, the SRF contains very little specific guidance on how to meet these lofty goals.

With increasing use levels and minimal guidance over the last 15 years, there was a pressing need for new management direction for sustainability issues unique to PWS. As such, the human use framework implementation strategy described in this article can be viewed as a pilot study of a practical process for managing for sustainable recreation and tourism on public lands and in large-scale coastal zones.

The Study: An Implementation Strategy for the PWS Human Use Framework

The implementation strategy was based on three general goals: 1) sustain or increase human use opportunities for future generations; 2) decrease the biophysical and social impacts of current and future uses; and 3) implement management and monitoring actions that are affordable and practical with existing resources and partners.

Sustaining Human Uses

Ever since the publication of *Our Common Future* by the World Commission on Environment and Development (1987), approaches to "sustainable development" have been applied and debated in thousands of articles and reports. Sustainability has been identified as the primary goal in many rural community development plans, but also for a vast array of settings ranging from wilderness and protected area management to urban and industrial development. Indeed, sustainability principles evolving from themes identified in *Our Common Future* have dominated planning and academic discussions for 30 years. There are even professional societies, university degree programs, and entire journals dedicated to sustainability concepts. But sustainability is an inherently wicked problem (Allen & Gould, 1986). That is, decisions of what activities and uses to sustain, where, and whose values get precedent (e.g., bear hunting or bear viewing) require *value* judgements; empirical data only provide supporting input. However, more common today are planning processes that tend to elevate system condition data in importance and they become the focus of planners' concern, which skips over the first and most important questions about what *should* be sustained.

The term "human uses" was used in the development of the human use framework to signify that it is not just traditional recreation and tourism activities (e.g., boating, kayaking, and camping) that need to be considered, but also other traditional uses and economic-oriented activities that may be less discretionary than standard recreation activities, but are still defining characteristics of PWS. Alaska Native tribal activities and sacred sites; outfitter and guide activities; subsistence hunting, fishing, and gathering; and other human uses of PWS were included in the human use framework (see A. Poe & Gimblett 2017). These activities are not considered "recreation" in park and protected area planning, and yet, they are also not considered "natural" processes by ecologists, so they often fall outside the scope of landscape planning or only addressed as a reaction to conflict or when required by law.

Decreasing Impacts

However, encouraging human use is not sustainable if it causes detrimental impacts to physical or social environmental conditions. We rejected the common assumption in conservation planning that human use and environmental protection are incompatible. This assumption often leads to management actions that focus on closing or limiting human activities in high use areas. This orientation clearly does not sustain existing levels of human uses (by limiting them) and can paradoxically *increase* environmental and social impacts of people if use is shifted from higher to lower use areas (Hammit & Cole, 1998; McCool & Cole, 2001). Furthermore, spreading the number of visitors out evenly homogenizes the recreational experience throughout the region and reduces the "spectrum" of recreation

opportunities and experiences that may be sustained (Blahna & Reiter, 2001; Schreyer, 1985). Yet, these are the types of recommendations that come from region-wide recreation carrying capacity analyses such as those for PWS found in the CNF forest plan (USDA Forest Service, 2002). The PWS human use framework uses a zoning approach that encourages 1) increasing use in higher visitor use areas and hardening those places to reduce physical impacts, 2) limiting or not encouraging use in low use zones to protect pristine environmental conditions and solitude experiences that are the most sensitive to visitor contacts, and 3) closing a few environmentally or culturally threatened or sensitive areas. This strategy allows for increasing general use levels while actually reducing cultural and biological impacts throughout the entire PWS region.

Practical Management and Monitoring

Sustainable use is a legitimate planning goal only if outcomes are monitored and management is adapted over time to assure there is no decline in environmental or social conditions beyond sustainable levels (Allan & Stankey, 2009). This criterion can be very difficult to estimate accurately and has led to many complex and data-driven planning models that are often difficult and time consuming to apply in practice. Like many large-scale conservation planning efforts, the PWS human use framework contained many more policy and management implications than could feasibly be applied, and they were located throughout 400 pages of research, monitoring, and public engagement documentation (A. Poe & Gimblett 2017).

There are few existing recreation analysis tools that can help identify practical management and monitoring actions. The Limits of Acceptable Change (US Forest Service), Visitor Experience and Resource Planning (US National Park Service), and Visitor Impact Model (US Fish and Wildlife Service) are rarely used today (Cerveny, Blahna, Stern, & Mortimer, 2011). The "problems" they address focus on a narrow range of traditional recreation activities such as hiking and camping, and they focus on negative aspects of recreation like impacts, crowding, and conflicts. They do not address commercial recreation, importance of tribal values and lifestyle activities, subsistence and personal use harvesting, or potential contributions of recreation and tourism to community well-being and socio-ecological system resilience (McCool, 2013).

To address the larger-scale and more comprehensive social and environmental characteristics and needs of PWS, we used an issue-based approach to develop the implementation strategy for the human use framework. Major social and environmental sustainability problems or conflicts related to human uses of PWS were identified and framed as specific issues (Bardwell, 1991; Blahna & Yonts-Shepard, 1990; Clark & Stankey, 2006). The issues then helped us to focus specific data and public engagement needs and opportunities that were the basis for the recommendations of the implementation strategy. For each issue, practical management actions were recommended that clearly addressed the primary human use sustainability problems in a more socially or environmentally sustainable direction compared to current management.

Process for Developing the Implementation Strategy

The process we used to develop a strategy for implementing the PWS human use framework was loosely based on the traditional rational planning process that has dominated landscape planning since the 1970s. The general steps of rational planning are: 1) identify the problem, 2) establish goals and preferences, 3) identify alternatives for meeting the goals and preferences, 4) compare consequences of alternatives, 5) choose best alternatives for meeting goals, and 6) implement selected alternatives (Williams & Blahna, 2007). Theoretically, planners move relatively rapidly through the first three steps and focus on the analysis of consequences of alternatives and the selection and implementation of management actions to implement the preferred alternative. However, through the years agency planning guidelines and models have become large and complex, resulting in plans that take years to develop, focus on the biophysical environment, and are difficult to implement, monitor, and revise (Allan & Stankey, 2009; Endter-Wada, Blahna, Krannich, & Brunson, 1998; Lee, 1993). Planning has become a series of intermittent activities that occur about once every 10 or 20 years, with rare updates in between, rather than

a continuous process of planning, monitoring, and adaptive management.

To address the pitfalls of traditional rational planning, and better address modern recreation and tourism sustainability needs, we developed a four-step issue-based process for writing an implementation strategy for the PWS human use framework (Fig. 2). Below is a description of each step, including an example of one detailed issue analysis (step 3), which is the heart of the process.[2]

Step 1. Identification of "Keystone" Recreation Experiences. The first step of the process was to identify the key recreational experiences that need to be sustained. A keystone experience was defined as "a relatively specific and popular visitor activity that is unique to the area, and a primary visitor attraction, rather than something people do as they travel to some other destination" (A. Poe, Brown, Blahna, & Ryan, 2017). In the context of this effort these types of recreation experiences rely on the wild character of a region like PWS—thus making it a special place for visitors. This was not meant to limit the human uses that would be addressed by the framework; consideration of all human activities that were related to the issues were included in the process. The dotted lines from step 1 (identification of keystone experiences) to steps 2 (issue identification) and 3b (sustainability objectives) signify that the keystone experiences did not drive the remaining steps of the process, but were considered in the decisions made in those two steps of the implementation strategy (Fig. 2). This was a way to ensure that the implementation of the human use strategy did not result in the degradation of key recreation experiences that help make PWS a special place.

The purpose of identifying keystone experiences was to address an existing need identified in the literature and managers' concerns about protecting unique experiences that could be lost forever if not managed sustainably at the few locations where they exist. We called them keystone experiences because we concluded many other recreation activities in PWS (e.g., boating, kayaking, fishing, wildlife viewing) were dependent on these experiences, similar to a keystone wildlife species in an ecosystem. Loss of keystone species (and similarly the keystone experiences) has an outsized impact on other species (and experiences) and a negative ripple effect throughout the system.

Four keystone experiences were identified for PWS: tidewater glacier day trip, overnight tidewater glacier and solitude, big game hunting, and wildlife watching (Table 1). The keystone experiences were derived from research data (Itami, Gimblett, & Poe, 2017; A. Poe, Gimblett, & Itami, 2017), an analysis of commercially permitted recreation activities (C. B. Poe & Greenwood, 2017), and manager judgement that they were important for meeting the

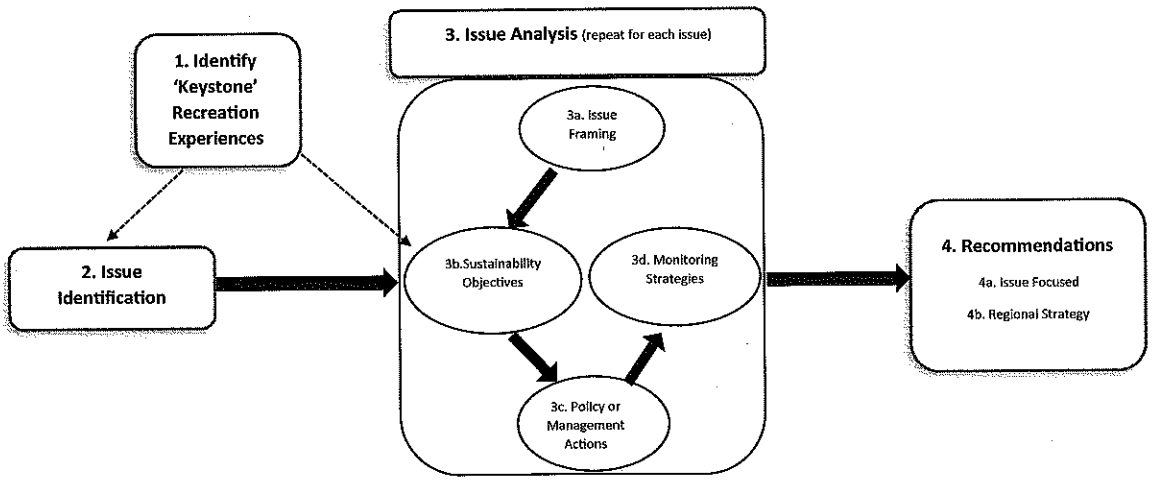

Figure 2. Process for developing Prince William Sound sustainable human use framework.

PWS vision to "maintain the wild character of the area and its unique wildlife." Up-close and personal experiences with glaciers are dramatic attractions to PWS for both day users from Whittier or Valdez and overnight visitors who had a particular interest in solitude during their stay. And although big game hunting and wildlife watching are not rare activities in South Central AK, the size, remoteness, and distinctive wildlife and natural features of PWS help create unique experiences for visitors from outside the region. For example, bear hunters in the eastern part of PWS have expectations for seeing no other hunters for several days or even weeks, and some even feel "crowded" if they simply see evidence of another human, such as a week-old footprint on a beach (Itami et al., 2017)!

Step 2. Issue Identification. To focus the implementation strategy, CNF managers and the human use framework science advisory group identified five planning issues (Table 2). Issues were defined as specific environmental or social problems or conflicts related to sustainability of human uses in the Sound. The interaction of data and manager judgement is key for issue identification; the data indicated some issues managers thought important were not major problems (e.g., recreation–wildlife conflicts), and mangers were aware of some issues that were based on public concerns or agency policy that were not evident in monitoring data (e.g., Alaska Native heritage sites and conflicts) (Suring & Poe, 2017). Other criteria used to identify the issues were managers' perceptions of the level of threat and their ability to determine the cause of the issue, and the agency or their partners' ability to implement actions to address the issue. There had to be a manageable number of issues (three to nine were recommended), and each issue worded or described very specifically so that the effectiveness of management strategies could be evaluated (Bardwell, 1991; Blahna & Yonts-Shepard, 1990; Clark & Stankey, 2006).

Step 3. Issue Analysis. The heart of the implementation strategy process was issue analysis. Data sources for this part of the analysis came from visitor use and social and environmental impact studies conducted in PWS since the grounding of the Exxon Valdez. CNF mapping data, recreation literature, and manager judgement were also used to conduct the issue analysis.[3] Issue analysis has four substeps that are conducted for each issue: issue framing, identify sustainability objectives, recommend policy or management actions, and identify

Table 1
"Keystone" Recreation Experiences of Prince William Sound

Recreation Experience	Description
Tidewater glacier day trip	Visiting tidewater glaciers is a primary goal for many day trip visitors out of Whittier or Valdez and provides a unique experience with a relatively short time commitment. This experience is only available within one day's travel distance from Whittier or Valdez, and as a result these areas typically receive a relatively high amount of vessel traffic.
Overnight tidewater glacier and solitude	The opportunity to camp or anchor overnight in the vicinity of a tidewater glacier is a key experience sought by kayakers and recreational boaters. An integral component of this experience, particularly for kayakers, is a complementary feeling of relative solitude. The noise and wakes emitted by motorized vessels have negative impacts on feelings of solitude, especially in the perception of kayakers. Of primary concern is the availability of adequate campsites and overnight anchorages and the level of vessel activity within an area.
Big game hunting	Hunting is a key experience for many users of PWS. During spring and fall months this group represents the majority of recreation use. This group seeks areas with plentiful game, has a preference for reduced overall competition from other hunters, and also desires areas with reduced overall use and opportunities for solitude.
Wildlife watching	PWS provides opportunities to view rare and distinctive wildlife (e.g., grizzly bears, walruses, sea otters, humpback whales, and orcas), especially for visitors from outside of Alaska.

Source: A Poe, Brown et al. (2017).

Table 2
Issue Statements and Objectives Used to Organize Prince William Sound Human Use Framework

Issue Statements	Objectives
Reduce degradation at culturally sensitive sites	Decrease overall visitor use at the identified culturally sensitive shoreline sites beginning with those at greatest risk for degradation. Collaborate with Alaska Native entities to decrease overall visitor use in nine sites that directly overlap with historic or culturally sensitive areas, and 49 inventoried campsites adjacent to privately owned Alaska Native lands.
Protect solitude opportunities in tidewater glacier areas	Manage certain areas *explicitly* to prevent the loss of solitude and preserve low density visitor opportunities—to retain solitude experiences. Promote day use at tidewater glacier areas where solitude is already unlikely, in order to limit dispersion of visitor use into tidewater glacier areas with greater potential for solitude. In areas identified as having likely or potential solitude, management should avoid the development of facilities such as permanent camps, cabins, group sites, and trails unless they are specifically employed to concentrate use and promote solitude within the broader area.
Maintain large-scale, regional solitude opportunities	Explicitly plan for protecting large regions of solitude so that these regions do not disappear incrementally through site-by-site decision-making processes. Concentrate use in high- and medium-use areas to avoid spreading use into low-use areas. Large regions where visitor use is not encouraged allow for the maintenance of diversity in recreation user experiences and offer opportunities for individuals in search of highly solitude-oriented experiences with very low contact levels. They also provide an area where a greater focus can be given to ecological values.
Assess and collaboratively manage big game hunting	Increase understanding of hunting practices in PWS for three specialized groups: subsistence/local sport hunters, commercial sport hunters, and sport hunters from outside the Sound communities; who all have different motivations, expectations, and norms. Engage hunter user groups to better understand use patterns and hunter expectations. Develop a code of practice with the hunting community that considers the expectations of all hunter user groups. Create a partnership between Alaska Department of Fish and Game and the CNF with the aim of promoting both sustainable harvest and quality recreation hunter experiences. Specific activities: 1) identify areas of high hunting use and concentrate other types of uses in different locations during hunting seasons to avoid potential conflicts between these user groups; 2) increase awareness of the timing and locations of hunting use within other recreation user groups; 3) identify areas with high likely hunter competition for key species and attempt to balance use between guided and private hunters in those areas; 4) conduct assessment of hunting behavioral norms to identify potential causes of conflict; and 5) provide training for commercial operators in local hunting norms.
Develop comprehensive commercial outfitter guide-use allocation	Develop a plan for sustainable growth of outfitter and guide opportunities during the summer months, with a consistent and transparent commercial permit allocation process for charter and kayak outfitters and guides for peak summer months. Develop the process collaboratively and based on current human use data. Base special use permit allocation on a combination of existing total-use thresholds (high, medium, low), key recreation experiences, and availability of anchorages and campsites as well as the presence of other commercial activity. Standardize use reporting, data entry, and summaries to feed into monitoring efforts, allowing permit allocations that can be revisited as needed.

Source: A Poe, Brown et al. (2017).

practical monitoring strategies (steps 3a to 3d in Fig. 2).

Issue framing (step 3a) was simply a descriptive characterization of the problem that needed to be addressed (Bardwell, 1991; Clark & Stankey 2006). This included the geographic distribution and seasonality of the issue, effects on potentially sensitive resources, and the social science and stakeholder assessment efforts. In this way, rather than trying to use all of the potentially important environmental, social, and economic data that was available, the issues were used to carefully select the data that were most directly relevant for the

implementation strategy, and the relevant scale of analysis was based on each issue, not a generic analysis scale that was expected to fit all issues.

Sustainability objectives (step 3b) were statements of the desired outcomes of policy or management actions (Table 2). As noted above, these were not necessarily rigorous quantifiable measures of final ecosystem conditions or endpoints; they were relatively general, but still measurable statements, that would indicate an issue was being addressed in a more socially or environmentally sustainable way than existing management. In this way, the objectives represented desired future *directions* for management (e.g., increase visitor use or reduce size of impact area) that can be easily observed and monitored over time, rather than environmental or social *conditions* that are very specific targets and require detailed study and analysis to document (e.g., restore 80% of ground cover of site A with native vegetation).

Policy or management actions (step 3c) were specific recommendations for agency actions that would address the objectives for each issue. A triage type of analysis was conducted to compare effectiveness of potential management actions with likely social and environmental outcomes. In an effort to make the framework as practical as possible, we focused on management actions that were under the control of local state and federal managers and, to the extent possible, recommended specific sites or zones where the actions could be applied. Three different scales of analysis (following the CNF forest plan) were used: individual sites, 522 "general management areas" representing individual bays or groups of islands, and 31 landscape-level "analysis areas," which are complexes of bays/islands and include multiple watersheds (C. B. Poe & Greenwood, 2017). For example, limiting boaters at certain popular glacier viewing sites would not reduce the demand for the spectacular opportunities, but rather shift visitors to other sites and general management areas, which would be reflected in the analysis area scale.

Monitoring strategies (step 3d) were recommendations for future data collection that included both content (indicators or type of data) and process (how and by whom the data would be collected) guidelines. Monitoring is critical for implementing adaptive management (Allan & Stankey, 2009).[4] While monitoring requirements are often identified in landscape planning documents, they are rarely accomplished (except when legally required) because of lack of agency time, budget, and staffing. For the PWS human use framework implementation strategy, every attempt was made to recommend *practical* monitoring that was based on existing data or simple extensions of ongoing data collection efforts. For example, for most monitoring recommendations, data could be collected by existing ranger patrols or partners who conducted regular trips or patrols into PWS (e.g., outfitters and guides and Alaska Native groups who have a working history with the CNF).

Sample Issue Analysis: Reduce Degradation at Culturally Sensitive Sites

The entire issue analysis process (Fig. 2, step 3) was conducted for each of the five PWS framework issues listed in Table 2. To illustrate the issue analysis process, a summary of the first issue—reduce visitor impacts at culturally sensitive sites—is presented in Figure 3. Detailed descriptions of all five issues of the implementation strategy may be found in A. Poe, Blahna et al., 2017.

All of the monitoring activities for issue 1 are based on observational data that are easy to implement as part of regular management activities, outfitter permitting processes, and regular stakeholder meetings. The only additional effort is to develop standardized data forms for rangers to complete while they are in the field or during stakeholder meetings. The goal is to complete simple but comparable records over time (e.g., campsite use observations) so that management effectiveness can be judged, which provides the necessary evidence for adaptive management. If management actions are successful, then the issue can be dropped during the next round of sustainability planning. If not, then new management actions must be designed.

Step 4: Recommendations. The process generated two general types of recommendations: issue-focused recommendations and regional recommendations

Issue Framing (step 3a). Using GIS analysis of primitive coastal campsite locations and a study of human and vessel use levels (A. Poe, Gimblett, & Itami, 2017) and meetings with Alaska Native groups, nine primitive campsites were identified that directly overlapped with coastal heritage sites, and 49 campsites were found to be adjacent to private lands owned by Alaska Native corporations. Many of these sites were seen by tribes as having high sensitivity to recreation use because of existing artifacts or their cultural importance to tribes in the region.

Sustainability Objectives (step 3b). The management objectives for this issue were: 1) decrease overall visitor use at the identified culturally sensitive shoreline sites beginning with those at greatest risk for degradation, and 2) collaborate with Alaska Native entities to decrease overall visitor use in nine sites that directly overlap with historic or culturally sensitive areas, and 49 inventoried campsites adjacent to privately owned Alaska Native lands. These objectives are specific enough to help evaluate the effectiveness and practicality of potential management actions and monitoring activities.

Policy or Management Actions (step 3c). Using campsite location data, a campsite hardening analysis study (Fidel & Twardock, 2017), an analysis of sensitive resource areas (Fraver, 2017), and manager input, two specific management actions were identified: 1) restore campsites overlapping with heritage sites to natural conditions in order to reduce camping desirability at those sites in order to protect the cultural values, and 2) add or harden campsites that are near the decommissioned sites but far enough away to protect cultural integrity of the heritage sites. The purpose of the second set of actions is to a) absorb the camping activity days in order to retain current camping opportunities but in areas not conflicting with heritage sites, and b) reduce the potential environmental impacts likely to occur as visitors discover and create new campsites in areas near the closed sites. These actions should sustain overall camping opportunities, but shift existing demand to more culturally appropriate and environmentally sustainable locations. This action also requires collaboration with tribal members and better information flow to visitors to encourage use of the newly established and more sustainable sites.

Monitoring Strategies (step 3d). Four monitoring activities were identified for this issue. First, solicit annual reports of observed use levels at heritage sites from key informants (water taxi operators, outfitters and guides, and USFS law enforcement and backcountry rangers). Second, conduct annual visual site inspections by kayak rangers and Alaska Native partners using a new impact protocol. Third, USFS measures size of impacted areas and identifies signs of degradation at the targeted cultural sites during regular ranger patrols. Fourth, conduct periodic surveys of key stakeholders to assess whether use levels are perceived to have changed following implementation of the management actions.

Figure 3. Summary of issue 1: Reduce degradation at culturally sensitive sites.

that are more strategy oriented. Issue-focused recommendations (step 4a) are the specific policy and management actions and monitoring strategies that resulted from the issue analysis process described above (steps 3c and 3d). Examples of issue-focused recommendations for issue 1 are described in the sample issue analysis (Fig. 3). However, the implementation strategy also resulted in two additional strategic recommendations that cut across multiple issues and are broader in scope than issue-focused recommendations (step 4b). These strategic recommendations were used to guide the evaluation and selection of policy and management actions for all issues and to help inform the long-term implementation and future iterations of the PWS human use framework. The first strategic recommendation is based on underlying assumptions of the relationship between human recreation activities and environmental impacts of recreation and tourism. The second is based on the need to include the people who live, work, and play in PWS as full partners in implementing the human use framework.

Regional Strategy 1: Create Opportunity Zones That Include Visitor Experiences and Resource Protection. A traditional assumption of ecologists about visitors to natural areas is that they are "disturbance factors" or "anthropogenic stressors" (terms common in the conservation biology literature) to be managed primarily by limiting use especially in high use areas. Not only did we reject this assumption, we based the implementation strategy on the *opposite* assumption. That is, the best way to protect recreation opportunities, solitude experiences, and pristine environmental conditions was to encourage *increased* visitor use in existing high use and some medium use areas, and encourage *decreased* visitor use in existing low use and some socially and environmentally sensitive medium use areas. Although it sounds counterintuitive, it is an essential strategy to retain the "wild character" vision for the broader PWS landscape.

The vast majority of PWS was categorized as low use, so most of the region would be managed to meet the ideal of a pristine wilderness and solitude

experiences. And some medium use areas that have had relatively small increases in use compared to areas categorized as low use, can still approach a wilderness ideal if they do not see additional use increases. PWS recreation surveys showed that measures of satisfaction were high and perceptions of crowding were low throughout PWS (A. Poe, Gimblett, & Itami, 2017). This shows that the current diversity of opportunities is important and satisfying for most visitors; any attempt to shift from high to low use areas would homogenize the recreational experiences that are available, unnecessarily increase the environmental impact of moving use to low use areas, and not significantly increase visitor satisfaction. In fact, some visitors prefer having other people near them in the backcountry, such as campers in the high use tidewater glacier areas who felt safer with other visitors camping near them (A. Poe & Gimblett, 2017). Sustaining a *spectrum* of recreation opportunities is also part of the USFS's sustainable recreation framework (USDA Forest Service, 2010), so actions that may disperse recreation use more evenly throughout PWS would actually violate this goal. And protecting the ideal of "wild character" and solitude experiences, where visitors see no other people for days on end, suggests that use limits would be more appropriate in low use areas where that experience currently exists, rather than high use areas. This is the opposite of how carrying capacity is applied in many US national parks and recreation areas (c.f., Manning, 2013).

A zoning approach was developed that would retain this overall concept of relatively low use and natural conditions overall, but with specific zones identified where low, medium, and high use levels would be encouraged. This included methods for the CNF to encourage future visitors to recreate in higher use areas and some environmentally resilient medium use areas, while indirectly discouraging future use in low use and a few culturally or environmentally sensitive medium use areas. Specific management actions to implement the zoning approach included: increasing permits for outfitters and guides in high use areas but retain permit levels (or reduce them) in low use areas; publicizing recreation opportunities in high use areas but not low use areas; providing visitor information and campsite permits for use in previously impacted but resilient campsites; and working with regional partners and other agencies to encourage their uses and boating traffic in areas that already have high and medium levels of vessel traffic. Information and education recommendations that addressed multiple issues were also identified that would help increase visitor satisfaction. For example, pamphlets, guide training, and website postings were recommended to help visitors understand seasonal and geographic patterns of use so they could develop realistic expectations of the level of solitude to expect (A. Poe, Brown et al., 2017).

Regional Strategy 2: Implement Participatory Management That Includes Stakeholders in Management of Ecosystems. Another implication of the assumption that humans are ecological "disturbance factors" is that humans are not considered part of "natural" systems (Redman, 1999). However, this assumption is not valid in PWS, and probably most remote coastal zone areas. This reasoning is particularly flawed with regard to use by indigenous peoples; humans have been part of the PWS landscape since the glaciers retreated, literally, and there are no true natural conditions that would not include activities of the people native to the region for 15,000 years or more (Mann, 2005; Redman, 1999). US national parks, wilderness areas, wildlife refuges, and other protected areas still struggle to embrace humans as an integral part of ecosystems. Landscape area managers and agencies in the 21st century cannot afford to conceive of human use management as an "us versus them" enterprise, where we are the land management experts who simply develop plans to manage them (visitors, residents, and other stakeholders). The entities must be merged in a partnership of people who wish to sustain a place and maintain a connection to the landscape.

PWS is still very remote, recreation use levels are quite low compared to other coastal areas in the US (A. Poe, Gimblett, & Itami, 2017), and much of the upland region is designated wilderness. Even so, peoples' heritage, livelihoods, lifestyles, and even personal sense of self depend on access to, interaction with, and use of resources of PWS. Sustainability of the "wild character" vision for PWS depends on working together and embracing common goals. To this end, collaboration and partnerships are a key element of all five implementation strategy issues.

As currently written, the implementation strategy for the PWS human use framework still tends to be agency driven. Although it is important for lead agencies to initiate and have ongoing responsibility for coordinating such efforts, the potential for issue-based management depends on truly collaborative approaches (Keough & Blahna, 2006). Collaboration is not just an intensive form of traditional public involvement (e.g., more scoping meetings or agency workshops) but interactions where power sharing is the norm (Walker & Daniels, 1996). Although management agencies and Alaska Native corporations have formal decision authority in the PWS region, there are many ways that informal power sharing can be accomplished through joint decision-making forums and sharing implementation of management, data collection, and monitoring activities. Adaptive management responsibilities need to be shared among the many partners who have a stake in this very special place. As such, if the management recommendations are followed, the implementation strategy can also serve as a "critical first check on ensuring traditional use practices in Prince William Sound are not being displaced by increasing levels of recreation" (A. Poe & Gimblett, 2017, p. 126).

Conclusions

The sustainable recreation challenge, from a landscape management perspective, is to provide exceptional recreational opportunities while simultaneously protecting natural and cultural resources (Keough & Blahna, 2006). The implementation strategy for the PWS human use framework provides a specific set of recommendations for meeting social and environmental sustainability goals, by identifying and protecting keystone recreation experiences, identifying key human use issues, setting sustainability objectives, and identifying practical monitoring approaches at the regional, landscape, and site levels.

Rather than trying to describe the entirety of social and environmental conditions of the PWS landscape, looking for deviations from a hypothetical "natural range of variability," and then recommending "fixes" for the whole system, the issue-driven approach of the implementation strategy for the PWS human use framework provides guidance to repair specific holes in the environmental and social fabric of the system. It is more of a bottom-up approach, where the goal is correcting obvious and relevant problems first, with an ultimate goal of moving incrementally toward ecosystem-wide sustainability. Then issue-based planning managers can focus efforts on specific problems, determining the causal factors, and identifying the most appropriate management actions and practical monitoring strategies for addressing the problems. Because agencies do not have the resources to collect all data necessary to describe the structure and function of entire ecosystems, the grounding of the Exxon Valdez and the resulting data collection effort illustrated, in a perverse way, how a sustainability framework can be developed when environmental (injured resources) *and* social (human services) data exist and are organized in such a way that they focus on socioecological sustainability. It is the social science data that are often lacking in environmental planning efforts.

Another key distinction of the human use framework was the specific process used to develop the implementation strategy. In the literature, the term framework is used very broadly and it often refers to causal or logic models that provide step-by-step direction for implementing research or management processes. In this study, the conclusion of the "framework" was a simple management implementation strategy that included a general set of objectives, management actions, and monitoring criteria to enhance social and environmental sustainability of human uses of PWS. This type of practical, issue-based implementation strategy also illustrates that meeting sustainable recreation goals will require new approaches to planning and management tools and concepts that were developed in the 1970s and 1980s.

Finally, and most important, the PWS human use framework was not designed as a final planning product or endpoint. It was not mandated by law or required by a specific agency policy. Rather, it was a synthesis of existing data and stakeholder input resulting from ongoing monitoring of "injured resources" and "human services" after the oil spill, and from recreation use surveys and public and stakeholder meetings. Most of the data and public input that was used in framing and addressing the issues in the implementation strategy had been collected over a period of about two decades before the human use framework was written. The issues

are guidelines going forward and they are all at different stages of data collection and stakeholder involvement. Thus, some issues contain very specific management recommendations and monitoring (e.g., heritage site degradation issue discussed above) while others are a synthesis of existing data with recommendations for the next steps of data needs and agency and stakeholder collaboration (e.g., big game hunting). We believe this better reflects the reality of landscape conservation; many different issues, at different stages of development, with different data and stakeholder collaboration needs. A recreation and tourism sustainability process *must* recognize this reality, rather than try to force large data collection, public involvement, and stakeholder collaboration efforts into a single designated "planning cycle." We believe this is also true of large landscape and coastal zone conservation management planning in general.

Learning From the Past, Looking to the Future

The practical process described here is relatively straightforward to apply and substantially less complicated than other recreation planning approaches. In the past several decades, landscape conservation planning processes have expanded to become highly detailed, data dependent efforts to replicate an idealized set of natural conditions that often treats humans as a secondary feature or a disturbance factor in the system. Many conservation plans are complex and implementing them can be difficult. They often sit on shelves and only vaguely inform future management actions; few are thoroughly monitored and lead to adaptive management. We believe this is due to a front-end loaded approach to conservation planning that focuses too heavily on environmental measurement and broad public scoping activities. An alternative approach is to identify and focus data collection and public engagement activities on a few key but manageable conservation or sustainability issues, conflicts, or problems (Blahna, Asah, & Deal, 2017), write an explicit implementation strategy, and continually address issues as they emerge in an ongoing, adaptive process.

Issue-based planning allows for more streamlined approaches to social and environmental sustainability. This first requires a general vision for the landscape. In the case of PWS, the vision was to retain the "wild character" (natural and remote social and environmental conditions) of the Sound, and protect keystone recreation activities that attract visitors from around the world. Then identify a few key issues that threaten the vision. Rather than amassing data and scoping input in a large and often abstract planning effort, the issues were used to develop an implementation strategy based simply on identifying general but measurable objectives, management actions, and monitoring. Partnerships were also targeted based on specific issues, and partners can help identify management and monitoring needs and also help with ongoing implementation of that framework.

Planning for sustainability of large-scale marine and terrestrial environments will not be effective if data inputs and monitoring requirements are too complicated, expensive, or unwieldy for managers and stakeholders to implement. And without a practical implementation and monitoring strategy, a vision of sustainability is nothing but a dream.

Notes

[1]Besides the national forest, Alaska Native-owned Corporations have primary ownership of the remaining lands along with the state of Alaska, which also manages the waters of PWS and waters adjoining the upland areas. Less than 1% of the upland zone is owned by private individuals.

[2]A detailed description of the process and full issue analysis can be found in A. Poe, Brown et al. (2017).

[3]Detailed studies and results that contributed to the issue analysis may be found in A. Poe and Gimblett (2017).

[4] Adaptive management is a process of comparing social and environmental conditions over time to see if management actions are actually meeting sustainability objectives (Allan & Stankey, 2009).

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Biographical Notes

Dale J. Blahna is a research social scientist with the US Forest Service, Pacific Northwest Research Station in Seattle, Washington. His research focuses on integrating social science in natural resource planning, outdoor recreation, and public engagement. In the last 10 years, he has also worked on motivations for volunteer civic environmental stewardship and people's perceptions of the importance of ecosystem services of national forests.

Aaron Poe specializes in natural resource management, helping agencies better understand risks to species and habitats as well as the value that these natural resources have for the communities who depend on them. In his current position as the Coordinator for the Aleutian and Bering Sea Islands Landscape Conservation Cooperative, he is focused on building partnerships between agency managers, tribes, researchers, industry, and communities.

Courtney Brown is a graduate of the M.S. program in NR Management and Human Dimensions at Utah State University. She worked for the Chugach National Forest in Alaska as a natural resource manager and social scientist conducting research at a landscape level. Courtney now works for US Fish & Wildlife Service in Hawaii focusing on connecting people to nature and engaging partners in conservation collaborations.

Clare M. Ryan is a natural resource policy specialist who studies how scientific information can be integrated into policy and management decisions, processes by which policies are made and implemented, and ways to foster collaboration and address environmental conflict. She spent several years as a scientist and manager at both the state and federal level and is currently on the faculty of the University of Washington's School of Environmental and Forest Sciences.

H. Randy Gimblett is a Professor at the School of Natural Resources and the Environment of the University of Arizona, Tucson, Arizona. He has been engaged in research work in studying human–landscape interactions and their associated conflicts and public policies related to protection of special environments and outdoor recreation experiences for over three decades.

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