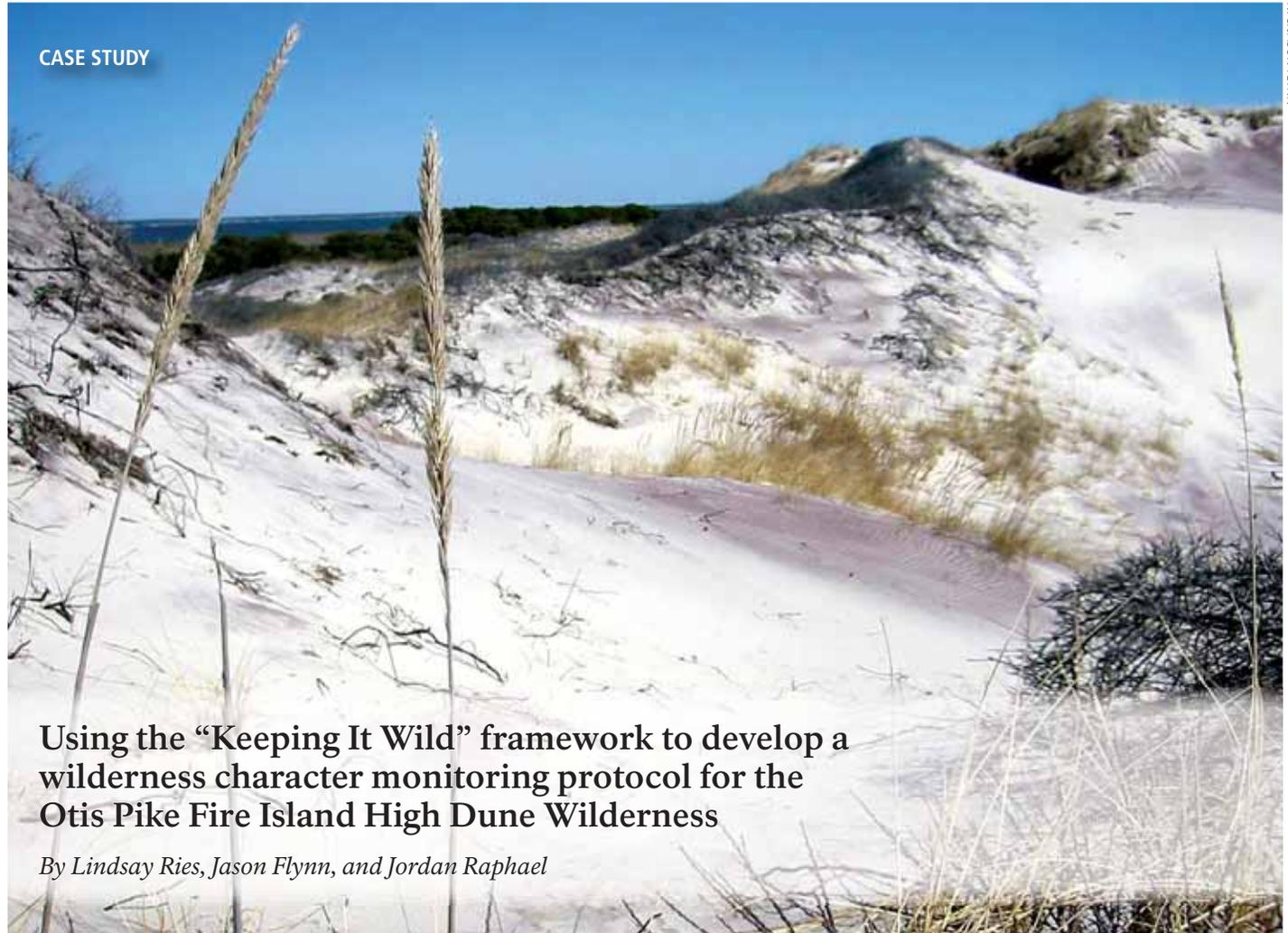


CASE STUDY

Using the “Keeping It Wild” framework to develop a wilderness character monitoring protocol for the Otis Pike Fire Island High Dune Wilderness

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NPS/JASON FLYNN

THE OTIS PIKE FIRE ISLAND HIGH DUNE WILDERNESS WAS established by the Congress within the boundaries of Fire Island National Seashore, New York, in 1980 (fig. 1). Early park management documents cited the Wilderness Act of 1964 and the need to “preserve wilderness character”; however, more than 30 years later, park staff still lacks an effective means to evaluate how well wilderness character is being preserved. Fire Island National Seashore needed a way to monitor and evaluate the effects of visitation, ecological change, and management actions on this small, urban, proximate, dynamic barrier island wilderness.

An interdisciplinary team at the national seashore used the “Keeping It Wild” conceptual framework to develop indicators and measures to produce a wilderness character monitoring protocol (Landres et al. 2008a). All wilderness areas, regardless of size, location, or any other feature, are unified by the statutory definition of wilderness, and each quality has relevant indicators and quantitative measures that can be used to evaluate wilderness character trends (Wilderness Act). The framework allows flex-

Figure 1. The Otis Pike Fire Island High Dune Wilderness is the only federally designated wilderness in New York State and, at 1,380 acres (559 ha), is the smallest wilderness area managed by the National Park Service. The wilderness contains a variety of dynamic barrier island habitats in relatively natural condition within 60 miles of New York City. The northern boundary extends along the Great South Bay at mean high water and is characterized by an extensive salt marsh. The southern boundary is legislatively defined as “the toe of the primary dune,” and is ever changing because of the dynamic nature of the beach-dune system.

ibility for each agency and individual wilderness areas to monitor the specific measures most representative of their site.

Choosing indicators and measures

The team consisted of two park biologists and one visitor and resource protection ranger, all of whom have individually monitored particular conditions in the Otis Pike Fire Island High Dune Wilderness. The plan was to establish baselines and use existing relevant monitoring activities to develop a holistic

approach to monitoring wilderness character at our site. The team began by reviewing the example indicators for each quality in the interagency monitoring framework (Landres et al. 2008b) and eliminating indicators that were not applicable to the site. For each quality we then considered the remaining indicators and discussed possible measures. These discussions led the team to create new indicators and measures not mentioned in the Landres et al. report (2008b) that fit within the park's own unique wilderness character.

Choosing indicators and representative measures was the most challenging part of the process. The team summarized existing data sources and quantitative measures already used in the wilderness through routine monitoring and management actions. We then discussed whether we could use these metrics for particular qualities within our framework. There were many data sources for our site, with most of our data available from different divisions at Fire Island National Seashore as well as the NPS Inventory and Monitoring Northeast Coastal and Barrier Network (NCBN). Within the boundaries of the wilderness area, park staff monitors and manages for threatened and endangered species, vegetation (native and nonnative invasive species), mosquito-borne diseases, white-tailed deer (density surveys), backcountry camping, visitation (visitor use reports), legislatively authorized waterfowl hunting, adjacent off-road vehicle use, and law enforcement incidents (fig. 2). In addition, ecologists with the Northeast Coastal and Barrier Network have identified several vital signs for long-term monitoring (NCBN 2011). For example, the network implemented monitoring in the wilderness area to evaluate changes in salt-marsh vegetation community structure and it will be continued in the future.

After summarizing all existing monitoring measures in Otis Pike Fire Island High Dune Wilderness, we had to decide which ones were relevant to and representative of the character of our wilderness and which should be included in the protocol. We decided to include those that were part of the park's base programs or long-term monitoring plan rather than other short-term and research efforts.

After identifying existing and relevant measures, we went through each quality and identified data gaps or areas for which a measure should be created. For example, a night sky monitoring program (to measure light pollution) was developed for our site. Park management agreed with the team that experiencing night sky during primitive backcountry camping is an important part of visitors' wilderness experience. We included as many relevant indicators and subsequent measures as possible to fully represent each quality (table 1, page 52).

Abstract

This article discusses wilderness character protocol development for the Otis Pike Fire Island High Dune Wilderness, located within 60 miles of New York City and the smallest wilderness unit administered by the National Park Service. We used the "Keeping It Wild" framework (Landres et al. 2008a), which is based on the four qualities of wilderness character: untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreation. Several indicators and subsequent quantitative measures were chosen for each quality based on the needs and conditions of this particular wilderness area using existing monitoring programs and databases as much as possible. The process of developing a wilderness character monitoring protocol helped staff view wilderness holistically and reflect on best management practices for preserving wilderness character as mandated in the 1964 Wilderness Act. This case study provides other wilderness areas administered by the National Park Service (NPS) with an example of how one team interpreted wilderness character for their site and, ultimately, expanded their understanding of wilderness stewardship.

Key words

Fire Island National Seashore, monitoring, Otis Pike Fire Island High Dune Wilderness, wilderness, wilderness character

Evaluating trends

Once the measures were identified, the team established a method to rank, summarize, and assess trends in wilderness character. Landres et al. (2009) discuss how to synthesize data, and we used this information in developing our wilderness character trend worksheet. For example, the decrease in acreage of invasive plant species, a measure of the "plant and animal species and communities" indicator under the natural quality, would cause an increase in wilderness character (table 2, page 53). The first year of monitoring acts as a baseline for wilderness character so subsequent measures are compared with the previous year. In this way we can assess whether wilderness character is improving (+1 or ↑), degrading (−1 or ↓), or stable (0 or ↕) overall and, for each measure, indicator and quality (table 2). Trends can be discerned by simply adding the rankings. All our measures are equally weighted, allowing for an evaluation of change but not for the magnitude of that change. Once the protocol is established we can start looking at long-term trend analyses of wilderness character on a temporal basis.

Evaluating trends allows wilderness managers to see the impacts of management decisions, visitation, and ecological change on wilderness character. Managers can evaluate trends on a small or large scale, from an individual measure within one of the qualities to overall wilderness character across all four qualities. Identifying which measures show a "degrading" or −1 trend will highlight areas in which management decisions may need to be altered.



Figure 2. Park staff annually monitors threatened and endangered species, such as piping plovers (above left) and seabeach amaranth (above center). Nonnative invasive species such as Japanese black pine (above right) are also monitored and controlled. Data from ongoing natural resource management monitoring programs (map) will be used for the indicator, “plant and animal species and communities,” within the natural quality of wilderness character.

The protocol is a tool and should remain flexible so that it can be amended as changes occur to more accurately represent wilderness character of the site in the future.

Interestingly, management activities can have a degrading effect on wilderness character in the short term but have a positive long-term effect. For example, the action of removing nonnative inva-

Table 1. Final wilderness character monitoring framework developed for the Otis Pike Fire Island High Dune Wilderness

Quality	Indicator	Measures	Trend
Untrammeled Wilderness is essentially unhindered and free from modern human control or manipulation	Actions authorized by Fire Island National Seashore that manipulate the biophysical environment	Number of actions to manage plants, animals, pathogens, soil, water or fire Number of natural fire starts that receive a suppression response	↑ in number of actions = ↓ in wilderness character ↑ in number of actions = ↓ in wilderness character
	Actions not authorized by the NPS-FIIS that manipulate the biophysical environment	Number of unauthorized actions by other federal or state agencies, citizen groups, or individuals that manipulate plants, animals, pathogens, soil, water, or fire	↑ in number of actions = ↓ in wilderness character
	Natural Wilderness ecological systems are substantially free from the effect of modern civilization	Plant and animal species and communities	Number of native species that are listed as threatened and endangered, sensitive, or of concern Abundance of native species that are listed as threatened and endangered, sensitive, or of concern Number of nonnative invasive species Acreage of nonnative invasive species
	Physical resources	Ozone air pollution based on concentrations of N100 episodic and W126 chronic ozone exposure affecting sensitive plants Extent and magnitude of change in water quality	↑ in ozone = ↓ in wilderness character ↑ in wilderness quality measurements = ↓ in wilderness character
	Biophysical resources	Forest health Salt-marsh elevation	↑ in acreage = ↓ in wilderness character ↑ in elevation = ↑ in wilderness character
Undeveloped Wilderness is essentially without permanent improvements or modern human occupation	Nonrecreational structures, installations, and developments	Number of authorized physical developments Number of unauthorized (user-created) physical developments	↑ in number = ↓ in wilderness character ↑ in number = ↓ in wilderness character
	Use of motor vehicles, motorized equipment, or mechanical transport	Number of administrative and nonemergency use of motor vehicles, motorized equipment, or mechanical transport Number of emergency use of motor vehicles, motorized equipment, or mechanical transport Number of motor vehicle, motorized equipment, or mechanical transport use not authorized by NPS-FIIS	↑ in number = ↓ in wilderness character ↑ in number = ↓ in wilderness character ↑ in number = ↓ in wilderness character
	Removal of remnants that remain in the wilderness from past occupation	Number of actions to remove remnants	↑ in number = ↑ in wilderness character
	Solitude or Primitive and Unconfined Recreation Wilderness provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge	Remoteness from sights and sounds of people inside wilderness Remoteness from occupied and modified areas outside the wilderness Facilities that decrease self-reliant recreation User trail development Management restrictions on visitor behavior	Amount of visitor use Number of areas negatively affected by camping Number of actions taken that affect travel routes inside the wilderness Area of wilderness affected by access or travel routes that are adjacent to the wilderness Night sky visibility averaged over the wilderness Number of agency-provided recreation facilities Number of actions taken to mitigate user trails Number of visitor use restrictions

Note: Based on concepts discussed in Landres et al. 2008a and 2008b.

Table 2. Example of wilderness character trend worksheet for evaluating natural quality

Indicator	Measure	Previous Year	Current Year	Trend in Measure	Trend in Indicator	Trend in Quality
1. Plant and animal species and communities	1a. Number of listed species	5	5	↓	↑	↑
	1b. Abundance of listed species	25	20	↓		
	1c. Number of invasive species	5	6	↑		
	1d. Acreage of invasive species	1.3	1.1	↑		
2. Physical resources	2a. Ozone (ppm)	0.060	0.055	↑	↑	
	2b. Water quality	50	48	↑		
3. Biophysical resources	3a. Forest health	0	0	↓	↓	
	3b. Salt Marsh Elevation	2.5	2.1	↓		

Note: Each measure is ranked based on the previous year (see ranking column for "Natural" in table 1). Each trend measure is simply added to each indicator to ultimately provide a trend for the quality.

sive plants such as Japanese black pine (*Pinus thunbergii*) will have an initial degrading effect on untrammled quality. However, if the total acreage of nonnative invasive plants decreases along with the number of actions taken to remove them, wilderness character for both the untrammled and natural qualities will improve (table 1). Unfortunately, degradation may also occur in cases over which the park has no control. For example, a law enforcement or emergency incident requiring mechanical devices to aid in life safety may negatively affect wilderness qualities.

Suggestions for protocol development

We learned a great deal in developing this protocol and would like to share our challenges to help other managers develop wilderness character monitoring protocols of their own. Our three main suggestions are to (1) hire a temporary employee to assist with developing and organizing the protocol, (2) use existing data and monitoring programs, and (3) form a wilderness committee within your park. Our park was able to develop a protocol using existing staff; however, the process proved to be lengthy and took more than two years. Dedicated temporary staff assigned to work with the team would expedite the process. Such a person could assist with establishing baseline inventories, identifying data sources for each measure, and creating a database to store the wilderness character monitoring data. Employing existing measures to the greatest possible extent was important for developing this tool. Although a few additional measures were created, the process is cost-effective and does not place an additional workload on park staff. We focused on measures that would be collected or monitored in the future by park staff, the Northeast Coastal and Barrier Network, or another governmental agency. Finally, a wilderness committee with all park divisions represented can make a clear plan with roles and responsibilities for collecting, submitting, and analyzing specific measures. Having a committee in addition to a

working team helps ensure that the wilderness character monitoring protocol can still be followed and continued into the future in the face of staff turnover and budget constraints.

References

Landres, P., C. Barns, J. D. Dennis, T. Devine, P. Geissler, C. S. McCasland, L. Merigliano, J. Seastrand, and R. Swain. 2008a. Keeping It Wild: An interagency strategy to monitor trends in wilderness character across the National Wilderness Preservation System. General Technical Report RMRS-GTR-212. U.S. Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado, USA.

Landres, P., M. B. Hennessy, K. Schlenker, D. N. Cole, and S. Boutcher. 2008b. Applying the concept of wilderness character to national forest planning, monitoring, and management. General Technical Report: RMRS-GTR-217WWW. U.S. Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado, USA.

Landres, P., S. Boutcher, T. Blett, D. Bumpus, T. Carlson, D. Cole, L. Dean, T. Hall, C. Hardy, A. Leach, A. Mebane, L. Merigliano, S. Rinehart, and P. Wright. 2009. Technical guide for monitoring selected conditions related to wilderness character. General Technical Report WO-80. U.S. Forest Service, Washington, D.C., USA.

Northeast Coastal and Barrier Network (NCBN). 2011. Vital signs: Salt marsh elevation. Web site. National Park Service, Inventory and Monitoring Program, Fort Collins, Colorado, USA. Accessed 2 December 2011 at <http://science.nature.nps.gov/im/units/ncbn/vs/saltelevation.aspx>.

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