

Developing a Wilderness Character Monitoring Protocol for the Otis Pike Fire Island High Dune Wilderness, a Federal Wilderness within Sixty Miles of New York City

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Introduction

THE OTIS PIKE FIRE ISLAND HIGH DUNE WILDERNESS LIES COMPLETELY WITHIN FIRE ISLAND National Seashore (FINS) on the south shore of Long Island, New York. It contains a variety of barrier island habitats, in relatively natural condition, within 60 miles of New York City. It is the only federally designated wilderness area in the State of New York, and is one of the smallest wilderness areas managed by the National Park Service (NPS), approximately 1,380 acres. To preserve and assess wilderness character in this relatively small and dynamic site from year to year, an interdisciplinary team at FINS developed a wilderness character monitoring protocol.

This article will discuss the development of this protocol for the Otis Pike Fire Island High Dune Wilderness. The framework 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. Monitoring programs and databases already established by FINS staff were utilized as much as possible for measurements such as visitor use reports and data collected for natural resource monitoring programs. In addition, night sky was identified by the team as a new measure needed to properly assess an indicator within the solitude wilderness character quality. The entire process of developing a wilderness character protocol helped FINS staff view the Otis Pike Fire Island High Dune Wilderness holistically, and reflect on best management practices for preserving wilderness character, as mandated in the 1964 Wilderness Act. This protocol will provide other NPS units with an example of how FINS staff interpreted wilderness character for this particular wilderness and may, ultimately, expand our understanding of wilderness stewardship.

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The Wilderness Act of 1964 states the role of resource stewards is to manage wilderness in order to preserve wilderness character. However, how do we know whether we are following legal mandates and rightfully preserving it? An interagency team was created to address this question. A conceptual framework to monitor wilderness character was set forth in the team's publication, "Keeping it Wild" (Landres et al. 2008a). This publication defines wilderness character by its four qualities (as defined in the Wilderness Act of 1964), with each quality having relevant indicators and measures which can be quantitatively assessed. The four qualities of wilderness character are: *untrammelled*, where wilderness is essentially unhindered and free from modern human control or manipulation; *natural*, when wilderness ecological systems are substantially free from the effect of modern civilization; *undeveloped*, when wilderness is essentially without permanent improvements or modern human occupation; *outstanding opportunities for solitude or a primitive and unconfined type of recreation* exist, so wilderness provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including the values of inspiration, and physical and mental challenge.

All wilderness areas, regardless of size, location, or any other feature, are unified by this statutory definition of wilderness. Given the practicable assessment tools in this protocol, NPS managers can now tailor this conceptual framework to evaluate short and long term trends in wilderness character. An interdisciplinary team at Fire Island National Seashore (FINS) used the "Keeping it Wild" framework to develop indicators and measures to produce a wilderness character monitoring protocol specific to the Otis Pike Fire Island High Dune Wilderness.

Otis Pike Fire Island High Dune Wilderness

Congress established the Otis Pike Fire Island High Dune Wilderness within FINS on the south shore of Long Island, New York, in 1980. 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 located at the toe of the primary dune, which is ever-changing, due to the dynamic nature of the barrier island and the beach-dune system.

Process of choosing indicators and measures

Our team consisted of two biologists, and one park ranger (visitor and resource protection). Choosing indicators and representative measures was the most challenging part of the entire process. It first involved a number of discussions between the primary team members, which spanned over a year. We then held a meeting with park management where we shared our ideas, and asked whether they felt the measures we chose adequately represented our wilderness. All comments and suggestions received during this meeting were considered, and agreed-upon measures were then incorporated into the final version of this protocol, to be signed by the park superintendent.

We first eliminated indicators and measures in Landres et al. (2008a) which were not applicable to our site. For example, there was an indicator for 'inholdings' within the undeveloped quality. This was removed from our protocol because there are currently no inholdings within the Otis Pike Fire Island High Dune Wilderness. We considered the remaining indicators, and discussed the example measures provided for each quality. We summarized and evaluated existing quantitative measures taken within the wilderness through routine monitoring and management actions, the sources of the information, and discussed whether we could utilize them for particular qualities within our framework. Finally, we went through each quality and identified data gaps, or areas for which a measure should be created.

The following are examples of existing measures being taken within our wilderness that we included in the framework. Park biologists annually collect data on the abundance and productivity of threatened and endangered species, most notably for the federally threatened piping

plover (*Charadrius melodius*) and seabeach amaranth (*Amaranthus pumilus*). The abundance of these two species is a part of the measures included within the indicator, “Plant and Animal Communities” within the natural quality. The NPS Northeast Coastal Barrier Island Network’s Inventory and Monitoring program identified salt marsh sediment elevation change as a vital sign for long-term monitoring (NPS 2011). Currently there are several sampling points within the wilderness. This change is measured by sediment erosion tables. This is one of two measures within the indicator, ‘biophysical processes’ within the natural quality (Table 1). Lastly, park rangers investigate and document unauthorized uses of motor vehicles, motorized equipment, or mechanical transport via case incident reports (form 10-343). This is one of three measures within this particular indicator for the undeveloped quality (Table 1).

Utilizing existing measures as much as possible was important in developing this tool because it is cost effective, and does not add too much to park staff workload. This increases the likelihood of managers using this tool into the future. However, new measures and baselines that we felt were important to our wilderness, such as night sky (i.e., something that would be diminished by light pollution) were also identified and developed. Many visitors experience our wilderness by primitive backcountry camping. On a barrier island the night sky is in full view, and considered an important part of the visitor’s experience.

The overall strategy for measuring wilderness character at each site is to: choose a set of measures from those that are relevant, cost-effective, and tied to preserving wilderness character; periodically collect data to assess trends; and use these trends to assess and report on changes in wilderness character (Landres et al. 2008a). The framework allows flexibility for each agency and individual wilderness to monitor the specific measures most representative of their site. For our purposes, all four qualities are represented, and considered equally important.

The final product

A wilderness character monitoring framework was developed which includes several indicators and measures for each quality (Table 1). It was decided by the team and park management that this framework holistically represented the Otis Pike Fire Island High Dune Wilderness, and will be used as a tool to assess wilderness character from year to year. The first year of monitoring will act as a baseline for wilderness character, and measures for the current year will always be compared to the previous year. This will be accomplished using the trend worksheet to assess whether wilderness character is improving (denoted by a +1 or an ascending arrow), degrading (-1 or a descending arrow), or is stable (0 or double arrow) overall, checking each measure, indicator, and quality. Trends can be determined by simply adding the rankings. All measures are equally weighted, allowing for an evaluation of change, but not the magnitude of that change.

How will managers use this protocol?

Evaluating trends allows wilderness managers to see the impacts of management decisions on wilderness character. Managers can evaluate trends on a small scale or large scale, from an individual measure within one of the qualities, to overall wilderness character across all four qualities. Identifying which measures are “degrading,” or a -1 trend, will highlight areas in which management decisions may need to be altered. The protocol is a tool, and should remain flexible so that it can be amended as changes occur, to more accurately reflect 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 non-native invasive plants will have an initial degrading effect on the untrammelled quality. However, if the number of invasive plants decreases, along with the number of actions taken to remove them, wilderness character for both the untrammelled and natural qualities will improve.

Quality	Indicator	Measures	Ranking
Untrammeled- Wilderness is essentially unhindered and free from modern human control or manipulation	<ul style="list-style-type: none"> ▪ Actions authorized by the NPS-FIIS that manipulate the biophysical environment 	<ol style="list-style-type: none"> 1) Number of actions to manage plants, animals, pathogens, soil, water or fire 2) Number of natural fire starts that receive a suppression response 	<ul style="list-style-type: none"> ▪ ↑ in # of actions = ↓ in WC ▪ ↑ in # of actions = ↓ in WC
	<ul style="list-style-type: none"> ▪ Actions NOT authorized by the NPS-FIIS that manipulate the biophysical environment 	<ol style="list-style-type: none"> 1. Number of unauthorized actions by other Federal or State agencies, citizen groups, or individuals that manipulate plants, animals, pathogens, soil, water, or fire 	<ol style="list-style-type: none"> a) ↑ in # of actions = ↓ in WC
Natural- Wilderness ecological systems are substantially free from the effect of modern civilization	a) Plant and animal species and communities	<ol style="list-style-type: none"> a) Number of indigenous species that are listed as threatened and endangered, sensitive or of concern b) Abundance of indigenous species that are listed as threatened and endangered, sensitive or of concern c) Number of invasive non-indigenous species d) Acreage of invasive non-indigenous species 	<ol style="list-style-type: none"> a) ↑ in # = ↑ in WC b) ↑ in abundance = ↑ in WC c) ↑ in # = ↓ in WC d) ↑ in acreage = ↓ in WC
	b) Physical resources	<ol style="list-style-type: none"> a) Ozone air pollution based on concentrations of N100 episodic and W126 chronic ozone exposure affecting sensitive plants b) Extent and magnitude of change in water quality 	<ol style="list-style-type: none"> a) ↑ in ozone = ↓ in WC b) ↑ in WQ measurements = ↓ in WC
	c) Biophysical resources	<ol style="list-style-type: none"> 1. Forest Health 2. Salt Marsh Surface Elevation Tables (SETs) 	<ol style="list-style-type: none"> a) ↑ in acreage = ↓ in WC b) ↑ in elevation = ↓ in WC
Undeveloped- Wilderness is essentially without permanent improvements or modern human occupation	<ul style="list-style-type: none"> ▪ Non-recreational structures, installations, and developments 	<ol style="list-style-type: none"> 1) Number of authorized physical developments 2) Number of unauthorized (user-created) physical developments 	<ul style="list-style-type: none"> ▪ ↑ in # = ↓ in WC ▪ ↑ in # = ↓ in WC
	<ul style="list-style-type: none"> ▪ Use of motor vehicles, motorized equipment, or mechanical transport 	<ol style="list-style-type: none"> 1. Number of administrative and non-emergency use of motor vehicles, motorized equipment, or mechanical transport 2. Number of emergency use of motor vehicles, motorized equipment, or mechanical transport 3. Number of motor vehicle, motorized equipment, or mechanical transport use NOT authorized by NPS-FIIS. 	<ol style="list-style-type: none"> a) ↑ in # = ↓ in WC b) ↑ in # = ↓ in WC c) ↑ in # = ↓ in WC
	<ul style="list-style-type: none"> ▪ Removal of remnants which remain in the Wilderness from past occupation 	<ol style="list-style-type: none"> a) Number of actions to remove remnants 	<ol style="list-style-type: none"> a) ↑ in # = ↑ in WC

Table 1. The final Wilderness Character Monitoring Framework developed for the Otis Pike Fire Island High Dune Wilderness. This framework was based on the concepts provided by Landres et al. (2008a and 2008b).

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	<ul style="list-style-type: none"> ▪ Remoteness from sights and sounds of people inside Wilderness 	1) Amount of visitor use 2) Number of areas negatively affected by camping 3) Number of actions taken that affect travel routes inside the Wilderness	<ul style="list-style-type: none"> ▪ ↑ in visitor use = ↓ in WC ▪ ↑ in # of actions = ↓ in WC ▪ ↑ in # of actions = ↓ in WC
	<ul style="list-style-type: none"> ▪ Remoteness from occupied and modified areas outside the Wilderness 	1. Area of wilderness affected by access or travel routes that are adjacent to the Wilderness 2. Night sky visibility averaged over the Wilderness	a) ↑ of people = ↓ in WC b) ↑ in light pollution = ↓ in WC
	<ul style="list-style-type: none"> ▪ Facilities that decrease self-reliant recreation 	a) Number of agency-provided recreation facilities	a) ↑ in # = ↓ in WC
	<ul style="list-style-type: none"> ▪ User trail development 	a) Number of actions taken to mitigate user trails	a) ↑ in # of actions = ↓ in WC
	<ul style="list-style-type: none"> ▪ Management restrictions on visitor behavior 	a) Number of visitor-use restrictions	1. ↑ in # of restrictions = ↓ in WC

Table 1 (continued).

Degradation may also occur in unfortunate cases over which the park has no control. For example, a law enforcement or emergency incident requiring mechanical devices to rescue people may negatively affect wilderness qualities.

Future suggestions for parks

We learned a great deal in developing this framework, and would like to share our challenges to help other managers develop wilderness character monitoring protocols of their own. Our site was able to develop these on our own, but the process proved to be lengthy, and took over two years to develop. Additional staff dedicated solely to this project could be of great use. This could be achieved by bringing on an intern for three months to help with finalizing the protocols, creating the baseline inventories, clearly identifying all data sources for each measure, assigning positions and divisions responsible for providing the specific measures (with a timeline), and creating a database to house and store all the collected wilderness character monitoring data. The database, with clearly spelled out standard operating plan, is an extremely helpful tool. This ensures that the wilderness character monitoring protocol can still be followed and continued into the future, in the face of staff turnover and budget constraints.

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