

Integrating soundscapes into National Park Service planning

By Vicki McCusker and Kerri Cahill

SOUND ADDS A RICHNESS TO experiencing our national parks that sight alone cannot provide: elk bugling in the cool autumn air of Great Sand Dunes National Park, waterfalls thundering in Yosemite Valley, the quiet hush of Haleakala Crater, muskets and artillery firing at Gettysburg National Military Park. The acoustic component or soundscape of any setting is the audio equivalent of a landscape, viewshed, or watershed and comprises all the sound conditions in a given environment, including human-caused and natural sounds. Acoustic resources that fall under NPS management include wildlife, waterfalls, wind, rain, and historical and cultural sounds.

Natural sounds are increasingly recognized as an important component of resource conditions and visitor opportunities in national parks because, as a growing body of research suggests, human-caused noise can be disruptive to natural ecological processes and visitor experiences. Noise impacts the acoustic environment much as smog affects the visual environment because it reduces the auditory horizon for both visitors and wildlife. In many cases, hearing is the only option for experiencing certain aspects of our environment, such as wildlife that can be heard at much greater distances than they can be seen. However, a healthy soundscape is not limited to the sounds of nature. Human sounds have an appropriate place in the outdoors. Cultural and historical sounds, such as the sounds of the working cattle ranch at Grant-Kohrs Ranch National Historic Site, and the church bell at Mission San Juan, San Antonio Missions National Historical Park, are important components of many national park units.

Despite their importance, soundscapes are often overlooked or impacts to this resource are understated in NPS planning and decision-making processes. For example, rationalizations include that the developed area already has noise impacts so adding more will not make much difference; this is an urban area so soundscapes are not an issue; or the area is so impacted there is no natural soundscape.

Another factor influencing management and policy decisions is that soundscape as a resource is a relatively new topic. As a result, there is a shorter history associated with policy and court decisions. In addition, many of the existing general acoustic research and policy decisions of other federal agencies, such as the Federal Aviation Administration (FAA), have been focused on urban areas and community annoyance, not on areas that are representative of national park units or on issues related to visitor experience. However, recent court decisions have implications for soundscape management. In September 2009, a federal judge issued a preliminary injunction against oil and gas well drilling at Baca National Wildlife Refuge

(Colorado) that hinged in part on sound monitoring data collected by the Natural Sounds Program in adjacent Great Sand Dunes National Park (Streater 2009). The plaintiffs maintained that the soundscape at the refuge would be ruined by the noise from oil and gas wells. The judge cited that the refuge had a large expanse of undeveloped land with a significant “sense of place and quiet” (Gable 2009).

Establishing desired conditions and setting indicators and standards for soundscapes in planning documents give soundscape management additional political strength especially when external sources of noise threaten park soundscapes. The general management plan for Great Sand Dunes National Park includes desired conditions for soundscapes. This will be important as the previously mentioned lawsuit moves forward, since it confirms the level of protection for soundscapes that would need to be addressed by the U.S. Fish and Wildlife Service if oil and gas drilling in Baca National Wildlife Refuge is pursued. Another example is contained in FAA guidance (FAA 2007) on supplemental noise analyses for airport improvement

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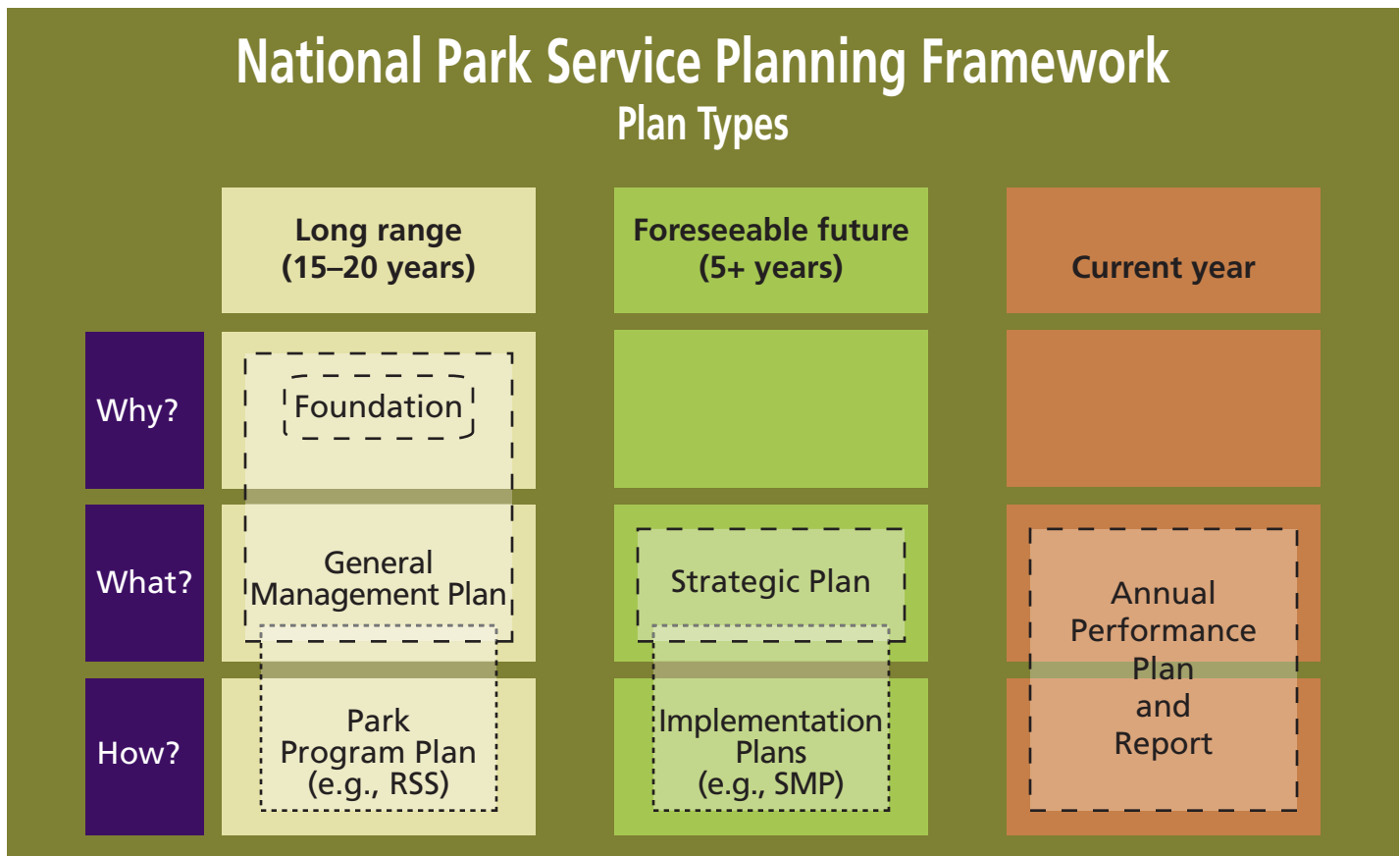


Figure 1. NPS planning framework: Plan types (adapted from NPS 2008).

projects. The guidance directs analysts to review approved park management plans to confirm how the park is managed for visitor use, resource conservation, and wildlife protection in order to identify sensitive locations in the vicinity of the project that may require further analysis.

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ment planning fits in the context of the NPS planning framework. It also identifies some of the research/issues that need to be addressed to assist in the development of management strategies and to ensure that park managers and policy makers have sufficient information to preserve, restore, and enhance soundscapes in accordance with *NPS Management Policies* 4.9.

Figure 1 and the supporting discussion illustrate the NPS planning framework and how soundscapes fit into this framework.

Long-range planning

Foundation statements provide the basis for planning and management of a park unit by articulating its core mission. A foundation statement includes identification of a park's purpose, which is the

specific reason(s) for its establishment. A park's significance is also identified, which includes statements of why, within a national context, the park's resources and values warrant national park designation. Another aspect of the foundation statement is identifying the resources and values that are "fundamental" to supporting the park's purpose and significance (NPS 2008). Protection of soundscape values is often part of the park's purpose or significance. In these cases, soundscape-related resources and values are also identified as fundamental and may be characterized as exemplifying "serenity," "a contemplative environment," and "natural sound conditions," or promoting "solemn appreciation."

General management plans provide the broadest direction for those resource conditions and visitor experiences that should

exist in order to best fulfill the purpose and significance of the park and support its fundamental resources and values (NPS 2008). Importantly, a general management plan should meaningfully describe the qualitative desired conditions for soundscapes, and how those desired conditions may vary by management zone within the park. For example, a recent general management plan included desired conditions for the soundscape in various management zones. Following is an example excerpted from this plan for two park management zones.

Soundscape desired condition for the sensitive resource zone: The natural soundscape is intact in this zone and is an integral part of the visitor experience. Natural sounds are occasionally mixed with sounds from human activity and visitor use. Noise disturbance of wildlife is minimal in this zone.

Soundscape desired condition for the historic immersion zone: Natural sounds are audible and enhance the visitor experience in this zone. Historically appropriate sounds also enhance the experience of this zone. The soundscape is affected by the developed landscape. During times of low visitation, including nighttime and off-peak times, the natural soundscape could predominate, with occasional noise-free intervals.

Park program plans

A resource stewardship strategy (RSS) is one type of program plan in the NPS planning framework and ideally would follow development of a park general management plan. The resource stewardship strategy provides quantitative indicators, target values, and long-term, comprehensive management strategies to achieve and maintain desired natural and cultural resource conditions over time. Indicators, target values, and corresponding manage-

ment strategies for soundscapes should be included in many park resource stewardship strategies. An example of an indicator and target value from a recent resource stewardship strategy follows.

Indicator: Occurrence of non-natural sounds as expressed by percentage time audible per day.

Target value: Non-natural sounds are audible less than 10% of the day in no more than 25% of the backcountry zone.

Implementation planning

Implementation plans provide direction on the specific actions that will be taken to achieve the desired conditions and comprehensive strategies outlined in the general management plan and program plans, respectively. These include soundscape management plans (SMP) and wilderness or backcountry plans. The implementation plans should contain specific soundscape-related management objectives and actions.

Example of soundscape objectives for a visitor services area:

- Natural sounds are audible and discernible, with common noise intrusions by visitors and park operations. Active intensive management is used to maximize noise-free intervals and limit the intensity and duration of noise intrusions.
- Noise levels that interfere with general conversation rarely¹ occur and are of limited duration except when caused by emergency services (sirens), search-

and-rescue operations (search-and-rescue aircraft), and park maintenance operations (road repairs, building maintenance).

- Sound levels that interfere with interpretive programs do not occur except when caused by emergency services and search-and-rescue operations (sirens, search-and-rescue aircraft).
- Sound levels that exceed thresholds for sleep interruption rarely¹ occur during late evening and nighttime hours.

Example of potential soundscape management actions:

- Continue operating the shuttle system and eventually phase out tour buses to reduce noise levels and eliminate the greatest source of park noise.
- Minimize noise generated by park management activities by strictly regulating NPS and concession administrative use of noise-producing machinery, including aircraft and motor vehicles.
- Noise will be a consideration when procuring and using park equipment. Prior to purchase, research will be conducted in regard to the best available technology and the quietest equipment will be identified.

Impact assessment and thresholds

Another important element that supports thoughtful decision making and is common to all types of plans is impact assessment and thresholds for National Environmental Policy Act documents. Impact analyses must take into consideration the context, intensity, and duration of potential impacts (NPS 2001). Impact methodology and thresholds for soundscapes help to assess the potential minor to major

¹ "Rarely" is quantified on a park-by-park basis, but might be less than 5%, for example.

Features

Table 1. Social science, resource, and management questions for soundscapes research

Social and resource questions	Management questions
What aspects of the natural or historical soundscape are most influential for visitor experience?	What suite of metrics will be most effective and efficient in providing information regarding intensity, context, and duration of noise impacts?
What aspects and combination of human-caused noise (type, frequency, duration, loudness) create the most impact on wildlife, visitor experience, and other park values?	Is there a common set of metrics or indicators for soundscapes, wildlife, and visitor experiences?
How much human-caused noise from specific sources is too much?	Is there a common set of metrics or indicators for different park settings?
What are visitors' expectations of soundscapes in different park environments, and how do we best evaluate consistency with these expectations? How do these expectations vary by type of visitor?	Which management strategies are most effective and efficient at minimizing human-caused impacts to the soundscape?
Specifically, what does "solitude" mean from a soundscapes perspective?	

impacts on soundscapes and related values resulting from management actions being considered in a park plan. Impact criteria and thresholds are park-specific and may be qualitative or quantitative depending on the type of plan. Impact thresholds in a general management plan would be qualitative because of the broad direction provided in the plan. Thresholds in an implementation plan could be quantitative and based upon metrics depending on the type of analysis being used, such as computer modeling of potential noise impacts from a specific source such as aircraft or motorized vehicles.

To protect and restore important soundscape values in national parks, it is important that the National Park Service continue to progress toward comprehensive planning for soundscapes. This means that a careful examination of soundscapes should be addressed at all levels of planning, as we have outlined, and with enough detail and substance to provide meaningful management direction for the future. If the decision is made to dismiss soundscapes during a planning process, dismissal language that articulates the rationale for dismissal and, where appropriate, that highlights known issues can also support NPS efforts in working with other agencies regarding noise issues. The Governors Island General Management Plan (2009) dismissed soundscapes but

did so in a way that will support protection of soundscapes during the air tour management planning process currently under way (see sidebar).

Challenges and future research

In order to address the challenges of soundscape management and to better integrate the topic of soundscapes into the planning framework, more information and research are needed. Recent and emerging techniques in monitoring and use of additional metrics and visitor surveys support an increase in informed decision making regarding soundscapes.

However, important questions remain that should be the focus of future research to help park staff better understand, evaluate, and plan for the future of soundscapes in the national parks. Table 1 lists some of these questions.

How to get help with soundscape planning and impact assessment

The Natural Sounds Program can provide specialized technical assistance to parks, regional offices, and the Denver Service Center to integrate natural resource information into park foundation documents, general management plans, resource

Excerpt from Governors Island General Management Plan

Parts of Governors Island are places to enjoy fewer man-made sounds compared to the highly urban environments surrounding the island. Even though Governors Island National Monument was not established as a reprieve from urban life, many visitors remark that the island is an oasis from the noise, fumes, and general bustle of the surrounding city. Visitors can hear the water against the seawalls and the wind through the trees. At the writing of this GMP, the most intrusive and disruptive element is noise from helicopters which fly directly overhead and sometimes at quite low altitudes. The noise they generate often disrupts public programs and tours. The NPS, in cooperation with its on-island partners, will seek to have formal memoranda of agreement with the Federal Aviation Administration (FAA), the Eastern Region Helicopter Council, city and state agencies, as well as private operators, to control helicopter noise. (Chapter 1, page 26, Governors Island National Monument Final General Management Plan and environmental impact statement)

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stewardship strategies, and park-specific soundscape management plans. For example the Natural Sounds Program has participated in user-capacity workshops for Golden Gate National Recreation Area and also workshops for the City of Rocks National Reserve General Management Plan. There are several ways parks can get assistance but timing of requests is crucial:

- Technical assistance request at the start of or early in a planning process through the new Solution for Technical Assistance Requests (STAR) at <http://nrpcstar>, or an informal request made directly to the Natural Sounds Program.
- Natural Sounds Program review of internal draft general management plans. Note that the ability of the Natural Sounds Program to assist is limited at later stages in a planning process, particularly if monitoring is requested.
- New soundscapes forum on InsideNPS, <http://inside.nps.gov/forum/categories.cfm?catid=46>, for planners, scientists, and interpretation staff to discuss all aspects of soundscapes, including management policy, field monitoring, and education and outreach.

Conclusion

Soundscapes are a vital, sensitive cultural and ecosystem component of national park units. Therefore, consideration of soundscapes through all phases of the

planning process—from the foundation document to implementation plans—confirms the level of protection that the National Park Service accords soundscapes. It is key to working with other entities or agencies, such as the Federal Aviation Administration, whose policies or interests regarding noise impacts are different and often less protective than NPS policies and mandates. Also, the planning process helps educate future managers and the public about the importance of and resource protection needs associated with soundscapes.

The Natural Sounds Program has partnered with social scientists to conduct soundscape surveys in Muir Woods National Monument (Golden Gate National Recreation Area General Management Plan with Denver Service Center), Rocky Mountain National Park (transportation plan), and Haleakala and Hawai'i Volcanoes national parks (air tour management plans) to inform planning processes. The information gained from these research efforts is being used in current planning processes to support development of desired conditions and quantitative indicators and standards. Although more research is required to answer our questions, a growing body of information and experience now exists to support comprehensive soundscape management planning. The NPS Natural Sounds Program will continue to partner with social science and wildlife researchers and acoustic experts in the federal, academic, and private sectors to investigate these key questions and provide guidance for incorporating science into soundscape planning and management decisions.

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