

Starting From Scratch: 8 Step Program for Soundscape Management Planning and Acoustic Data Collection

Date: April 2004

INTRODUCTION

Many park units have no acoustic data, and only a vague idea about dealing with acoustic issues through planning. Other documents in this series go into planning processes and acoustic procedures in detail. This particular document is intended for those who just need to find a starting point. The list presented below is a sequence of actions that can be taken to initiate soundscape management planning and data collection from scratch. The first two steps are critical, and should not be omitted in favor of any data collection effort. Planning and data collection are shown to be iterative and interdependent activities. Funds may not be available for any comprehensive data collection effort or for development of a plan. Therefore, the first three steps are relatively low-cost and low intensity, but they are necessary for building a program and attracting funds to implement it. The remaining steps are progressively higher in intensity and require greater levels of funding in order to implement them. Not all of these acoustic measurement steps must be taken. It is recommended, however, that once acoustic data is purposefully collected, the final two steps be undertaken: complete a soundscape management plan (SMP), and then continue to monitor the resource. Following a brief discussion of each step, a table is provided to show estimated implementation costs.

8 STEP PROGRAM

Step 1. Initial planning and preparing for data collection (Initiate SMP)

Initial planning consists of defining soundscape objectives, building a programmatic action plan (strategy) or structure for data collection, identifying adaptive management standards by management zone, and making determinations about appropriate and inappropriate sources of sound. "Acoustic zones" and monitoring sites for useful data collection are identified from a variety of resource overlays as well as infrastructure and management area maps. NSP staff can facilitate this process for an interdisciplinary team drawn from park staff. This would be a 2-4 day process, involving only staff time and NSP travel.

Step 2. Collect point data on sound sources, temporal and qualitative characteristics –through attended logging

With a minimal amount of training, and the use of a form provided by NSP, park staff can perform this step using guidance from step 1. Cost involves primarily staff time and travel. Staff would sample at sites identified to be representative of acoustic zones and patterns of use relative to noise sources. Use of a programmed electronic "palm pilot" device could replace the paper form for a minor additional cost and make it easier to collect and download data for evaluation.

Step 3. Minimal measurement. Implement Step 2 (attended logging) and add short-term, high-quality digital recordings

In addition to Step 2, collect short-term (1-2 hours), high-quality digital recordings to capture sound sources and associated sound levels (sound levels can be obtained through post-processing digital recordings). With enough sampling, this step represents provides an initial soundscape inventory that is sufficient to begin the development of a soundscape management plan. Use of a recording system¹ minimizes or eliminates the need for in situ identification of sound sources. Sound sources can be identified later in the lab when processing data.

Step 4. Low Measurement. Collect digital recordings for 1-7 days in primary habitat of park or in location of specific interest or management issue

High-quality, digital recordings¹ provide decibel data in great detail (narrow and wide band data) as well as the ability to identify the sources of sound associated with specific decibel data. Adding 1/3 octave band data (or even finer detail acoustic data) allows managers to refine metrics that are highly useful and significant in soundscape management planning (see step 7).

Step 5. Medium Measurement. Collect digital recordings for season(s) of interest (30-45 days/season) in primary habitats of park or in locations of specific interest

Long-term, high-quality recordings¹ provide an archival record of park soundscapes, and may prove invaluable in future years. Additionally, long-term, high-quality recordings provide a wealth of biological information that is useful in many areas of resource management (for example, monitoring bird populations).

Step 6. High Measurement: A measurement approach for a full year in 2-4 primary habitats

High-quality, long-term, digital recordings¹ primary habitats/acoustic zones in park, and/or specific location(s) of interest for one year.

Step 7. Construct objective standards and thresholds; define monitoring program and actions to be taken when standards are not met (Complete SMP).

In conjunction with determinations made in Step 1, develop a soundscape inventory, with the use of metrics that are most suitable in light of park objectives, issues and sound sources, allows a science-based policy decision on what sound standards are to be applied. The experience of measuring the soundscape allows management to define an effective monitoring program using meaningful standards linked to park objectives. With this structure, it is possible to determine when certain activities or sound sources become inconsistent with park management objectives. In this event, the park should immediately implement some identified actions that will allow objectives to be met, at least in the short term.

Costs to perform this step revolve around the development and implementation of a plan through a NEPA decision-making process.

Step 8. Perform monitoring and feedback functions, report, refine and adapt.

The soundscape management plan should include, as stated in step 7, a monitoring program. The program should be specific to locations for data collection, methods, equipment, and duration as well as timing. The plan should also specify reporting requirements. This step actually implements the plan requirements. Management should be prepared to use the information collected and reported to validate standards and methods, to test assumptions, and to verify that desired results are being obtained from actions that were taken to eliminate or mitigate impacts.

¹ **Note for all recording systems: Add low noise microphone to any of recording instrumentation**

This would entail a substantial increase in cost, both in terms of equipment and specialized field work. Many areas in many parks are, at most times, quieter than can be measured using a standard system and microphone. Unless a low noise microphone system is used, the data for a park will need to be interpreted or represented through a model (an additional cost for analysis) when sound levels are below the equipment measurement threshold. This introduces uncertainties and externalities that could become significant in parks that are dealing with controversial sources of sound such as overflights, snowmobiles, PWCs, or other OHVs. Low-noise microphones are expensive initially, and they require much more intensive effort for field use.

Cost Details

| Step | Approach | Time | Recorders | Cost Estimate: | Comment |
|---------------|--|-------------|------------------|------------------------|---|
| 2 | Attended logging | 1-24 Hours | 0 | 0 (staff time only) | Serves two purposes: identify major noise sources; educate park staff regarding noise. |
| 3 | Minimal measurement | 1-24 Hours | 1 | \$2,500 | A measurement for a specific need or special issue, or an effort to acquire basic acoustic data, however limited. |
| 4 | Low Measurement | 1 week | 1 | \$5,000-\$10,000 | A measurement approach focusing on a single season in the primary habitat of the park. |
| 5 | Medium Measurement | 3 months | 2 | \$45,000-\$80,000 | A measurement approach focusing on at least one season and two primary habitats. |
| 6 | High Measurement | 12 months | 2-4 | \$120,000-\$260,000 | A measurement approach for a full year in two to four primary habitats. |
| | | | | | |
| Note 1 | Add special measurement equipment when recording | | | Add \$5000 per monitor | Low-noise microphone, preamp, power supply; adds \$5000 to system costs plus additional cost in field time. |

Note 2 Cost estimates do not include travel costs.

Note 3 Acoustic studies in national parks should collect and report acoustic data listed below. These standards for data collection and reporting are provided for planning purposes. There may be situations where the standards do not apply, and in these situations, any deviation should be thoroughly documented and rationale explained.

- High-quality digital recording for entire sample period.
- Recommended minimum recordings standards: 16 bit/22050 Hz; Signal to Noise: >90 dB; Dynamic Range: >90 dB; Total Harmonic Distortion: <0.01%
- Percent-time human-caused sounds audible, by hour (based on adequate sample scheme)
- Identification of sources of sounds, natural and human-caused, by hour (based on adequate sample scheme)
- Identify periods with and without human-caused sounds (Appropriate Noise Only interval) for at least one 24-hour period per season.
- Report in standard NPS publication format.
- Acoustic data will be provided to NPS in standard NPS/Volpe Acoustic Database structure.