

## Understanding and Preserving Quiet Areas

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### ABSTRACT

The title of this session raises three questions: what is a quiet area; how can it be protected or restored; and is there public interest in understanding, identifying, restoring and preserving quiet areas? If we ask the average person if there is too much noise, most would likely answer in the affirmative. But what is a quiet area, to whom, and in what context? This paper explores the implications of the three questions by examining results of sociological, psychological and acoustics studies and offers possible answers. The term Quiet Area suggests that it is not an area without sounds. Because there can be sounds, are some preferred to others so that restoration or protection is practical by preserving the desirable while reducing or eliminating the undesirable? Over the past decades, the efforts to quiet some types of sounds (e.g. those from transportation) have been a result of public complaints and legal actions that resulted in regulations defining and limiting noise. But is there the public interest, or even widespread awareness of the value of quiet areas? Public pressure for noise control has been an emotion driven response. Is there a means for raising a similar emotional awareness of the desirability of restoring or preserving quiet areas?

### 1. INTRODUCTION

The unstated assumption of “preservation of quiet areas” is that these areas have value. Shepherd *et al*<sup>1</sup> used the WHO Quality of Life questionnaire<sup>2</sup> and found most quality of life measures decreased with increasing annoyance with noise. More importantly perhaps, research finds time spent with natural surroundings improves our ability to think<sup>3</sup> and a brief literature search will reveal many studies verifying the health benefits that can be derived from time spent viewing or being in nature; Maller, *et al*<sup>4</sup> provides a readily accessible review of much of this literature.

This paper proposes a pragmatic approach to identifying, restoring and preserving quiet areas. The identification and qualitative and quantitative description of quiet areas can be extremely complex since what constitutes a quiet area, and what could improve it are in the end subjective judgments. Rather than trying to develop a fully detailed quiet area description and analysis method, the proposed approach looks to using surveyed opinions and treating restoration as a step-wise application of proven noise control tools and methods. In other words, we look to Schultz’ concept of using simplified inclusive measures of attitudes revealed by surveys (as he used expressions of annoyance<sup>5</sup>) to identify quiet areas and their sound source components that are most in need of quieting. This approach through surveying is similar to, though a simplification of, a method suggested previously.<sup>6</sup>

## **2. WHAT IS A QUIET AREA?**

The European Noise Directive equates “quiet” to “undisturbed.” It defines “quiet area in open country” to mean “an area ... that is undisturbed by noise from traffic, industry or recreational activities”<sup>7</sup>. Hence, what constitutes a quiet area is basically a subjective judgment.

One would expect that the nature and understanding of “quiet areas” is different for city areas, regional or state parks, and National Parks. By proposing the use of surveyed opinions to first identify “quiet areas” and then to rank-order the contributing sound components of the areas, we intend to skip troublesome efforts to classify these different types of areas. We propose a broader definition where quiet area is defined by users and by authorities responsible for managing those areas.

## **3. IDENTIFYING QUIET AREAS IS A LOCAL DECISION**

The first step is to survey both the managing authority and users or potential users. For each type of park (city, regional, or National) the challenge would be to identify the population to be surveyed and the method of surveying. Once identified, a questionnaire could be developed including at least basic questions similar to: In what areas of the city / town have you felt a sense of quiet, tranquility or relaxation? In what areas do you think such qualities could be provided / restored? An inexpensive simplification of this surveying approach would be for the managing authority simply to identify quiet areas based on management objectives.

## **4. PROTECTING / RESTORING QUIET AREAS IS FOCUSED NOISE CONTROL**

The next three steps would first identify which quiet areas are most in need of restoration or preservation. Then for those areas so identified, the second step would determine the sound sources most important for making an area a quiet one and for those degrading a quiet area. Finally, the third step is to identify the appropriate preservation / restoration actions. For those needing preservation, a method for tracking their status would be appropriate – repeat surveys, for example, or some type of noise monitoring. (Preservation will not be discussed at length here, since it will vary depending on the nature, extent, management authority, and other factors unique to the area.) For those areas needing restoration, proven noise control tools would be applied.

### **A. Rank order quiet areas for possible protection or restoration**

For the areas identified through the general management / user surveys, Section 3, above, additional surveys could rank-order the quiet areas. Both Mace<sup>8</sup> and Benfield<sup>9</sup> have had success with subjects rating park scenes using multiple attributes related to positive or negative affects (subjective feelings) such as annoyance, appropriateness, naturalness, serenity, solitude, tranquility. In both studies, tranquility and solitude appear to be the most sensitive to changing sound levels and to the type of source. (Benfield tested responses to the sounds of voices, road traffic and air traffic.)

Other research has used tranquility alone as a human judgment of different scenes combined with soundscapes.<sup>10,11</sup> One research found that average judgments of tranquility (from zero, not at all tranquil, to 10, most tranquil) correlate well with the two objective measures of 1) equivalent sound level (during the judgment) and 2) percent of the scene that would be judged as “natural.”<sup>12</sup>

Figure 1 summarizes the ratings for eleven scenes.<sup>11</sup> Note that the ratings were done for the combined scene and associated soundscape.<sup>a</sup> Though the results with the standard deviations suggest that adjacent ratings may not be significantly different, a trend is still evident; enough so that we suggest it is sufficient to attempt rank-ordering a group of quiet areas with this type of survey of opinions of tranquility.

The follow-on action for the managing authority is to decide which areas need preservation (i.e., some type of regular monitoring) and which need restoration. This action will require field work to determine the types of sources heard, the relative subjective loudness of each, users and intensity of use, where and when surveys might be conducted. For simplicity, these observations can probably be done without sound level measurements, and will permit development of a sense for which areas are most important to preserve and which need and are amenable to restoration. The following two sub-sections address the two steps of restoration: rank ordering the sound sources to determine those most in need of reduction; application of proven noise control tools to the highest priority sources.

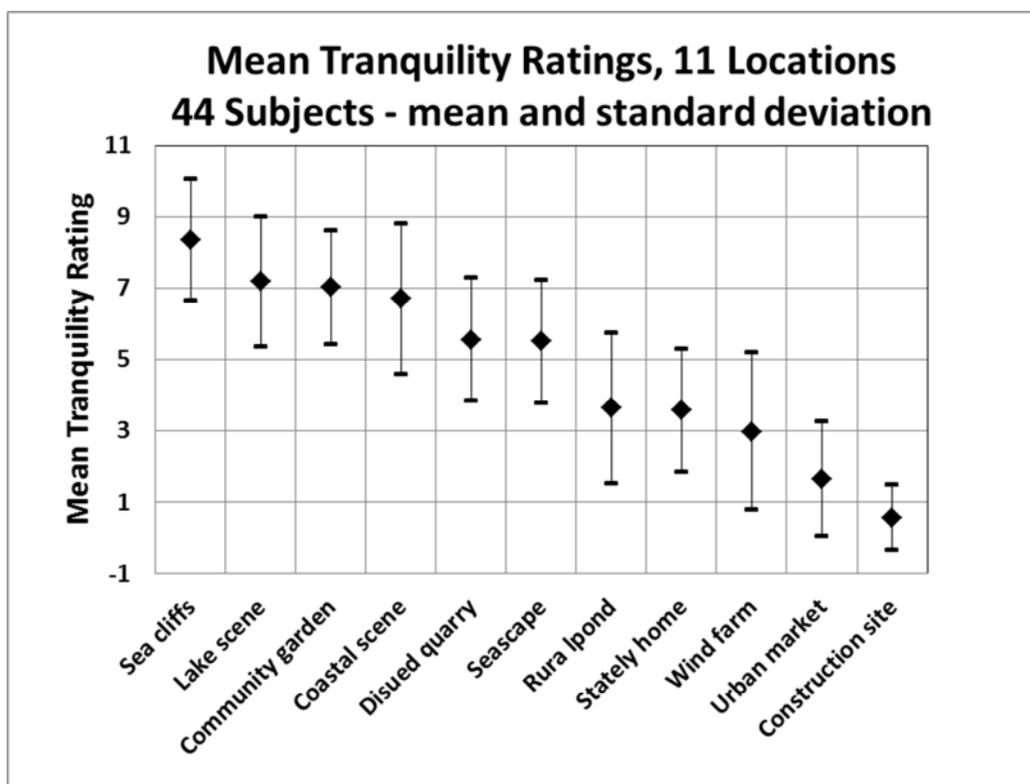


Figure 1 Tranquility Ratings of Eleven Different Scenes, from Pheasant<sup>11</sup>

**B. Determine “desirability” of all component sounds**

As suggested above, the concept of “annoyance” as reported by social surveys has been used rather successfully to summarize the multiple adverse effects of various noise sources on people<sup>5,13</sup> and to set guidelines for noise exposure limits. Similarly, there should be a simplifying workable subjective judgment of a quiet area’s soundscape components. For example, some evaluations of National Parks have successfully asked visitors to rate sounds on a scale of -4

<sup>a</sup> These ratings were accomplished using binaural recordings and simultaneously recorded videos of the scenes. Other research conducted by Watts, *et al*<sup>12</sup> and others<sup>8</sup> have validated the transferability of these types of affect judgments from field to laboratory.

(very annoying) to +4 (very pleasing).<sup>14</sup> The approach suggested here focuses on understanding the importance of the quiet area sound sources by rating them on a scale of “desirableness.”

Different methods have been tried for describing soundscapes with acoustic metrics,<sup>15</sup> or with verbal descriptions of soundscapes and sources.<sup>16,17</sup> These methods tend to rate the total soundscape and often use either a subjective evaluation or a physical description (e.g., use of sound quality metrics<sup>15</sup>). However, in order to provide information useful for decision making and for application of traditional noise control methods, contributors to the soundscape, both the desirable and undesirable, need to be identified.

One method to collect this information is simply to survey users of the quiet area to identify the sounds they hear and ask them to rate each one. A possible rating scale would be one of desirability, ranging from -4 (extremely undesirable) to +4 (extremely desirable). Intermediate semantic ratings could be: very, moderately, slightly, and neither undesirable nor desirable. Figure 2 shows hypothetical results from a survey of quiet area users and readily distinguishes among the sounds people like and those they don't. The plotted values are cumulative, moving from undesirable on the left to desirable on the right. The more rapidly the cumulative value increases, the less desirable is the sound. Bird song is desirable for most people, while road traffic is undesirable for most. For example, almost 60% of those surveyed consider road traffic an undesirable noise source, while virtually none consider bird song undesirable.

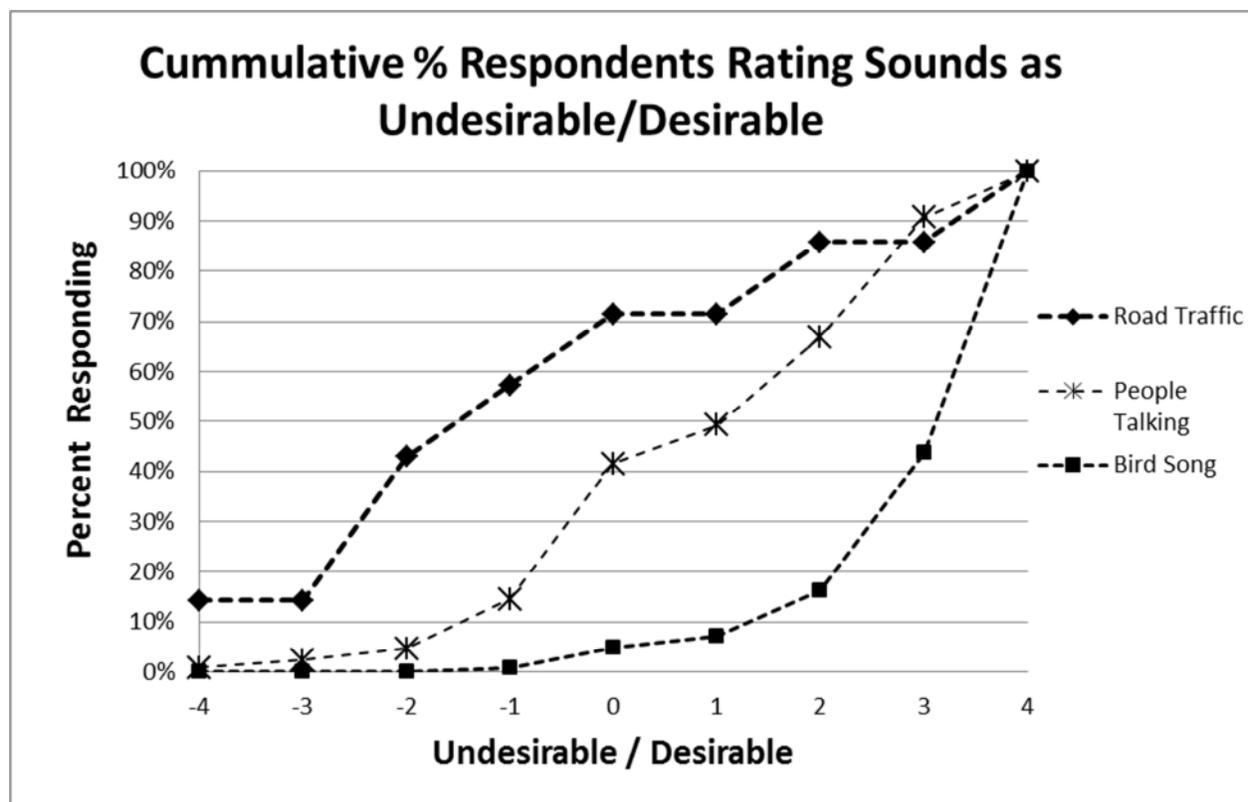


Figure 2 Hypothetical user ratings of three sounds in a selected quiet area: Extremely Undesirable to Extremely Desirable

### C. Apply proven noise control tools

Over the past several decades, effective tools for noise control have been developed: noise barriers, source quieting, changes in operating procedure, procurement of quiet equipment, and

modeling to estimate the noise reduction effects. The appropriate tools and methods could be applied to the sound source of greatest concern; i.e., those least desirable. This section discusses general considerations that will determine ease of application.

We also note what may be one of the most significant impediments to restoration and preservation: absence of any supporting laws or regulations that provide authority and criteria.

**1. Begin with the sound sources that are easily identified and measured**

Undesirable sources that are easily heard and measured, will be those most easily addressed. Assuming these sources are the usual transportation and/or industrial types of sources, noise control consultants / acousticians are well able to find solutions and judge acoustic and technological feasibility for reducing their sound levels.

**2. Addressing sound sources not easily measured**

In situations where several sound sources are judged equivalent in level, intrusiveness and are equally undesirable, control becomes more difficult. A combination of measurement, modeling and good professional judgment may be required.

In situations where the undesirable source(s) is (are) audible, but located some long distance from the quiet area, feasible solutions may be limited.

**3. Determining how much noise control to pursue may be complicated**

In most cases, the undesirable noise levels may be well below those levels commonly addressed by laws and regulations. Though noise control experts should be equipped to judge technical feasibility, and practicality of implementation, deciding how much noise levels should be reduced to be effective falls more in the policy arena than in the technical one.

Ideally, the approach to determining effectiveness would begin with the collection of data similar to that presented hypothetically in Figure 3. This figure depicts a “traffic sound level” that each user experienced as she / he recorded the rating. (The specific sound level metric would likely be chosen for the specific source and time period, probably an equivalent level.)

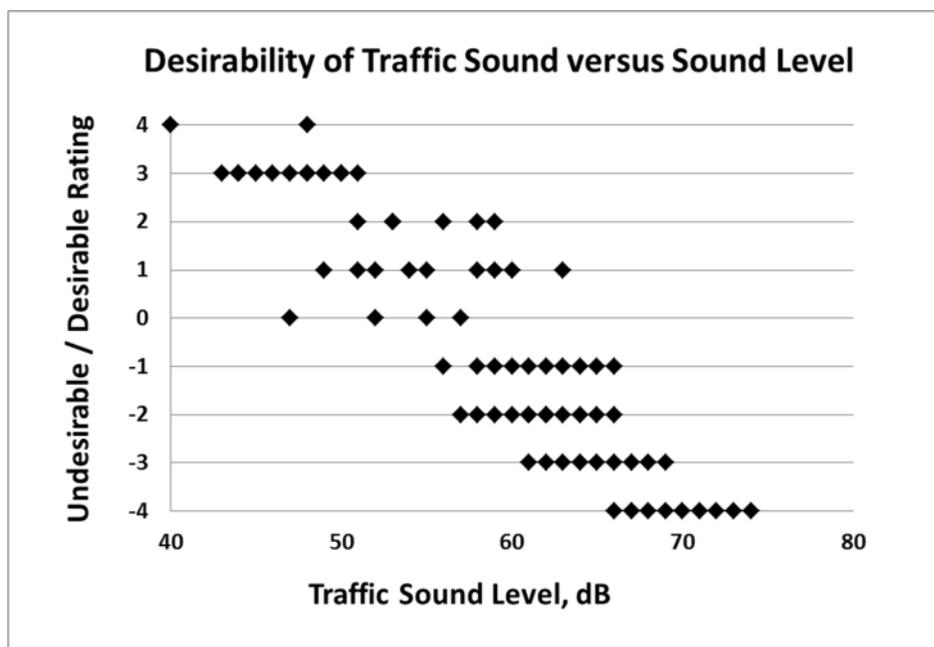


Figure 3 User ratings of traffic sound desirability as a function of the traffic “sound level” during a specified user time

A desirable sound level goal could be defined in terms of limiting the percent of users finding the source undesirable. In Figure 3, a goal of reducing all traffic sound levels below about 55 dB appears to insure that a very low percent of users would find the sound undesirable.

Several significant roadblocks may limit all noise control actions. First, acquisition of Figure 3 type data may be difficult and costly. For National Parks, a technique was developed using continuous logging of sources heard by a trained observer during simultaneous continuous sound level monitoring and surveys of visitors.<sup>18</sup> This method quantified the sound level each respondent could have heard and associated the level with the visitor's reported annoyance. This approach proved successful when quantifying dominant noise sources, but isolation of the levels produced by quieter sources is likely to be imprecise.

There will be real costs associated with any control. Who is to shoulder these costs? Will noise control affect the operations of the sound source and result in costs to the operator? Costs will depend on the noise control goal.

There will probably be no accepted or legally supported noise control goals. Without goals, costs cannot be determined. The potentials for conflict are significant.

## 5. PROMOTING / PRESERVING IMPLIES RAISING AWARENESS

It is public awareness and expression of that awareness through complaints and occasional legal action that has largely motivated federal, state, local and industry efforts to limit noise. Does that level of awareness exist to create a demand for quiet areas? Promotion could begin merely by the publicity that would invariably result from making the various suggested surveys. Various personal experiences and readings convince this author that a great number of people do desire opportunities for quiet. A column by Pico Iyer, "The Joy of Quiet," published in the New York Times Sunday Review was allegedly the most emailed article on the day it appeared.<sup>19</sup> There seems to be a general consensus, that modern life and technology place so many demands on our attention that escaping these distractions is widely desired, if not always acted upon. Raising awareness through the surveys, through published articles and other publicity is likely to bring positive public responses and, one hopes, political support for action.

## 6. CONCLUSIONS

The concept of quiet areas is being explored extensively in academic studies, primarily in Europe and Asia. The results of these studies suggest that there are relatively simple methods for eliciting human judgments of the sounds and of the quiet areas and that the judgments should be consistent across populations. This paper proposes to ask users or potential users of those areas to make subjective judgments about desirability and then use these judgments to identify quiet areas, those most in need of management actions, and application of proven techniques to preserve and / or restore those areas.

## ACKNOWLEDGEMENTS

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