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**DETERMINING THE ACCEPTABILITY OF RECREATIONAL IMPACTS:
AN APPLICATION OF THE OUTDOOR RECREATION OPPORTUNITY SPECTRUM**

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ABSTRACT--Impacts from recreational activities on wildlands are of increasing concern to resource managers and recreationists. Determining the acceptable level of recreation impacts is difficult because there are no absolute standards of acceptability. In this paper the Outdoor Recreation Opportunity Spectrum is used to describe the role recreation impacts play in defining recreation opportunities. Noise is used as a case example.

INTRODUCTION

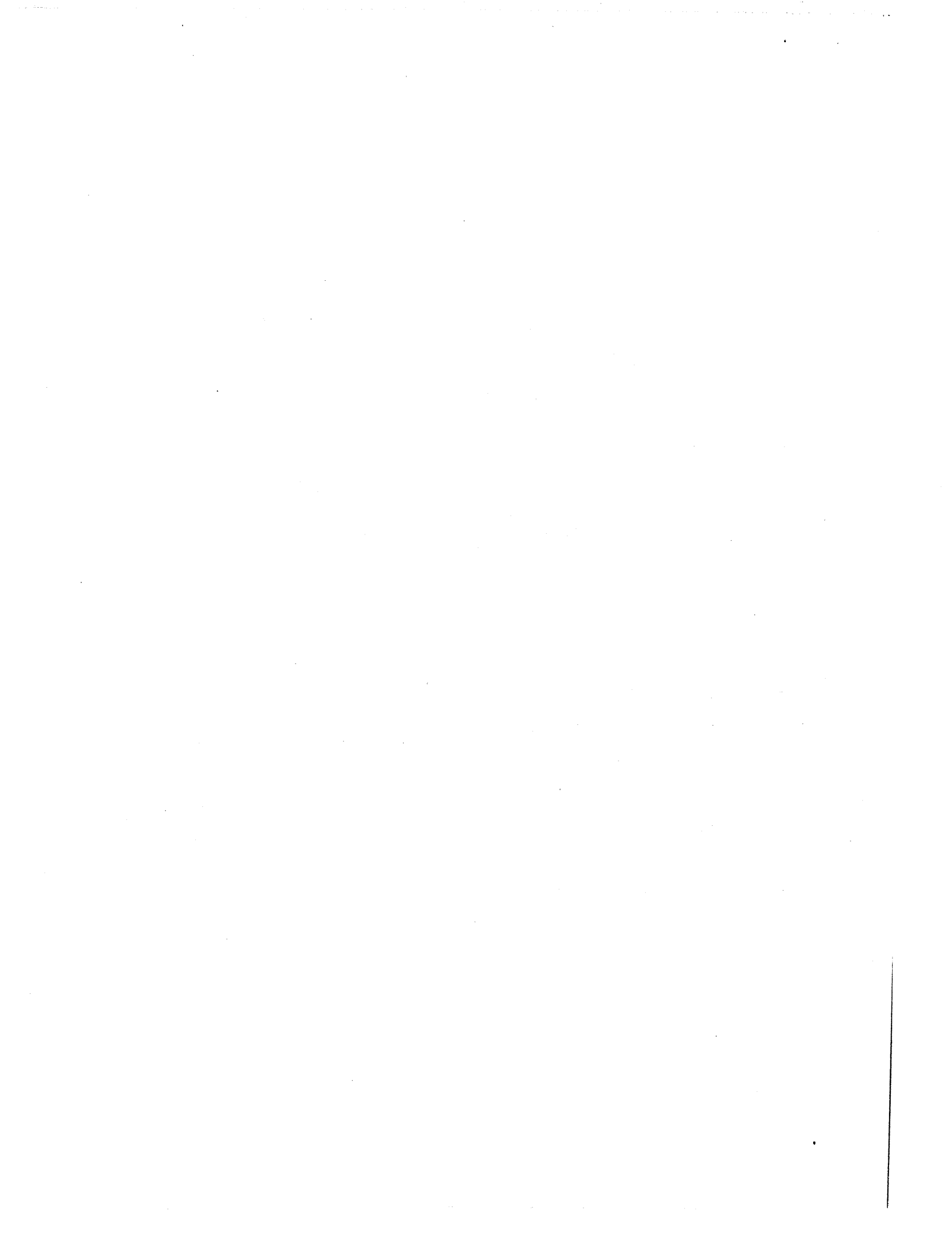
Throughout the United States, increasing numbers of people are going into wildlands in search of outdoor recreation. Growth in recreation whether in highly developed and intensively used forest campgrounds or in wilderness has brought with it an increasing concern about associated impacts. Managers, users, and researchers alike have become increasingly conscious of the potential adverse consequences of recreation use on vegetation, soil, water, wildlife, and other resources (for specific examples, see Downing and Clark, and Christensen et al. elsewhere in the proceedings).

Although there is a growing concern about recreation impacts, it is also clear that substantial disagreement surrounds what constitutes unacceptable impacts. The presentations and discussions at this conference clearly indicate that definitions of acceptability depend upon the values and expectations of the person making the judgment. Conflict in values seems unavoidable because so many Americans use our wildlands for so many diverse purposes.

In this paper we describe how the concept of the Outdoor Recreation Opportunity Spectrum (OROS) can be used in making judgments about the acceptability of recreational impacts. First, we will briefly describe the factors that help define recreation opportunities, followed by a discussion of the role which expectations play in a judgment of acceptability. In the last section of this paper, we show how the OROS framework can be applied to minimizing noise problems in recreation areas.

THE OUTDOOR RECREATION OPPORTUNITY SPECTRUM

The task of assessing potential consequences of a variety of recreational impacts begins with a definition of recreational opportunities. When considering outdoor recreation opportunities, people must make choices about the types of setting in which to recreate, the sorts of activities in which to engage, and the kinds of recreation experiences to seek. In this paper we focus on the setting in which recreation occurs. It is our belief that if recreationists have information describing the



factors which influence or define the range of possible settings, they will be in the best position to make choices in keeping with the experiences they desire to find. We define a recreation opportunity setting as the combination of social, physical, biological, and managerial conditions that give value to a place. Consequently, the role of values is central in understanding recreation. Different values producing different tastes, interests, and preferences lead to diverse demands for recreation opportunities that array themselves along a continuum or range. We and others (for example, Driver and Brown 1978 and Brown et al. 1978), have found this continuum useful for dealing with a wide range of value-related management issues such as carrying capacity, depreciative behavior, and recreation impacts. We refer to this continuum as the Outdoor Recreation Opportunity Spectrum (OROS). It is distinguished by varying conditions ranging from modern and developed to primitive and undeveloped, or as Nash (1973) succinctly phrased it, "from the paved to the primeval."

To make practical order out of this, we have broken the OROS down into six factors (setting attributes) which influence recreation behavior and have management significance. A more detailed description of these six factors may be found in Clark and Stankey (manuscript in preparation). These factors include:

1. **Access** into and within the area, the level of difficulty associated with access, and the permitted means of conveyance.
2. **Other non-recreation resources uses** (timber, mining, etc.). The extent to which they are compatible with various outdoor recreation activities.
3. **On-site management** -- the extent, apparentness, and complexity of modification, including the use of exotic vegetation, landscaping, traffic barriers, facilities (tables, toilets, water supplies) and others.
4. **Social interaction** -- the relative intensity of use per-unit area, including the level of intergroup contact and the space requirements associated with different opportunities.
5. **Level of regimentation** -- the nature, extent, and level of control over recreation use exercised by management.

6. **Level of visitor impacts** acceptable in different opportunities.

Each of these factors is characterized by a range of conditions. For example, access ranges from areas where mechanical access on wide, paved highways is appropriate and in keeping with the opportunity provided, to areas where no trails exist and only foot travel is permitted. Similarly, the level of social interaction varies from where high-density use is present (as well as appropriate and expected, such as in some modern campgrounds) to places where maximum solitude occurs. The point is, these conditions by any single or absolute standard of appropriateness; rather, the appropriateness varies along the spectrum. Well-developed roads and large numbers of people with frequent contact between parties are not appropriate in wilderness, yet they can be very appropriate in places like beach areas near an urban area and highly developed campgrounds.

A recreation opportunity setting is the result of a specific combination of these factors in a particular location. The setting may also include a variety of other natural features (scenery, landscape, wildlife, mountains, lakes for example). Alternative combinations of the factors lead to different types of opportunity settings which give recreationists many options from which to choose, in keeping with the experience they desire. Considerations about appropriate criteria to apply for any one of the factors are largely judgmental; there are seldom any absolute standards. But use of the OROS in making decisions about opportunity settings forces one to make all conditions explicit, which should maximize the possibility for all recreationists to find the types of opportunities they desire.

DEFINING ACCEPTABLE VISITOR IMPACTS

Factor 6, visitor impacts, is an aspect of the OROS that is especially critical in recreation management. Recreation activities can disturb soil stability, vegetation, wildlife, water, scenery, and the natural quietness of many outdoor environments. In many cases in the past, the management response has been for example, to regulate, restrict, or prohibit use (or the type of equipment), harden sites or install protective facilities. But the meaning of these management changes is often unclear to recreationists. Such actions may have con-

sequences as disruptive of recreation opportunities and recreationists' experiences as do the impacts they are meant to control.

The assumption implicit in management actions to minimize or eliminate impacts from recreation activities is that the impacts are unacceptable. What has not been adequately resolved, however, is what, in fact, defines acceptability and to whom. It often appears that while impacts of varying degrees are expected and acceptable in other resource uses (for example, timber management, mining, grazing), a "no impact" standard has been prescribed for the management of many outdoor recreation opportunities (Burch 1970). But a no impact philosophy may be impossible without drastic reductions in use in many areas.

In considering what constitutes appropriate or inappropriate impact, it is helpful to distinguish between the magnitude of the impact and its importance. Magnitude refers to the quantitative aspects of the phenomenon under study such as its frequency and extent. Magnitude can be measured reliably by independent observers and there will be typically little disagreement about these measurements. Often however, an ex post facto approach to establishing magnitude is required and is typically less reliable.

Importance, on the other hand, reflects the value one assigns to some phenomenon such as sound, water pollution, soil compaction. Importance will vary among individuals and over space and time. For example, two individuals observing the same impact with predetermined magnitude can differ greatly in the importance they assign to that impact, a difference reflecting their personal value system and expectations. The role which values and expectations play in defining the importance of recreation impacts (or any other type of impact for that matter) is described below.

Our view of the world around us is shaped by deeply imbedded orientations that we call values. Values provide an estimation of the worth of some object to an individual or in a particular situation (Andrews and Waits 1978). Although values often are not explicitly recognized, they form the base from which we develop our concepts of what is right and wrong, appropriate and inappropriate, acceptable and unacceptable. Many of these notions "go without saying," that is, we don't really stop and think about them, where they come from, or what they imply, because they are general and, in a sense,

vague, they are difficult to change. In general, we tend to seek out and accept those things that we perceive as consistent with our particular values.

In addition, we choose to do things and go to places likely to meet our expectations. These expectations are a function not only of the values we hold, but also of our experience and knowledge. These expectations will influence what people define as acceptable or unacceptable actions on the part of others. Expectations are formed by many factors which are either internal or external to the individual. These include the influence of family and/or friends, the media, schools, available information, personal values, personal experience in similar situations, and the norms (informal rules) which govern appropriate actions in a particular place.

People have expectations regarding what they will find in any particular location. And, in a specific situation, people will judge the importance of impacts based on those expectations. The judgment has two possible outcomes: Either the impact in this context is acceptable and does not detract from their satisfaction; or the impact in this context is unacceptable and may lead to a decline in user satisfaction and, perhaps, a decision not to return to that location in the future. A given individual may judge the same impact acceptable in one situation but unacceptable in another--the judgment depends on the context within which the impact occurs.

In addition, people's expectations may be either realistic or unrealistic for a particular situation. Realistic expectations are based on accurate knowledge of the purpose of an area and the norms operating there. Expectations may change as one gains new information and experiences. Generally, we might expect to find that people with greater experience in an area would have more realistic and strongly held expectations than the novice.

Fortunately, the relative importance people attach to impacts does not vary randomly along the OROS. That is, people who choose a particular type of opportunity (modern or primitive, for example) probably hold somewhat similar notions of what is appropriate and in keeping with these kinds of places. Some of these notions become widely and strongly held norms that govern behavior and set standards of appropriateness and acceptability in a specific

opportunity setting far more effectively than any agency-promulgated rule ever will. In other cases, it is less clear what specific criteria are appropriate, acceptable, or expected. Here our estimates must be tentative and open to revision.

The challenges are then to (1) set standards on acceptable impact levels for recreation areas, taking expectations into account along with other spectrum factors and concerns such as other resource values and long term goals for the area; (2) provide adequate information about what one will find there so that users can make choices about where to go in keeping with their preferences and expectations; and (3) manage and monitor the activities and impacts to ensure that the situation doesn't change inadvertently, thereby adversely affecting the quality of the recreation environment.

We can illustrate the relative nature of impacts by considering the issue of noise in recreation areas--or more correctly, sound. Sound is a physical phenomenon susceptible to accurate measurement. Thus, the magnitude of sound can be assessed using the physical model outlined by Harrison elsewhere in these proceedings. But "noise" is an interpretation that the magnitude of the sound (such as those listed below) has reached unacceptable levels; and no absolute standards define this level, with the possible exception of the threshold of pain, a condition generally not present in recreation areas. Yet, recreationists' complaints about noise are familiar to most managers; and there are clearly some common, albeit not universally shared notions, as to what constitutes noise in certain settings.

In the following discussion, we offer an example of how managers can use the OROS to integrate the data supplied by Harrison's physical prediction model, so as to keep sound within acceptable levels in recreation areas. The approach we describe is based on state-of-the-art judgments from the best knowledge available (from research and management experience) at the present time. Additional research will be necessary to determine how well the concepts we present fit reality.

Some potential sound sources in recreation environments are as follows:

Mechanical

Vehicles (autos, trucks, motorcycles)

Airplanes, helicopters
Other motors (chain saws, generators)

Non-mechanical

Human
Voices (talking, singing, yelling)
Camp tending (clanging dishes, wood chopping)

Domestic animals (stock, pets)

Other (radios, gun shots, musical instruments)

Noise Impacts--an Example

Noise in recreation areas is a concern to managers and users alike (Dailey and Redman 1975). The rejection of noise is characteristic in all types of recreation areas--noise is as inappropriate in a modern campground as it is in a remote wilderness. The difficult problem, however, is that one individual's definition of noise may not be another's. Furthermore, definitions of noise are a function of more than just decibel level; some types of sounds constitute noise (that is, inappropriate sound) regardless of the magnitude. Even the faint sound of a machine might constitute noise in a wilderness. In a developed, modern campground the same sound might not be noticed.

Noise is a characterization of sound in a particular context or setting. The appropriateness of a sound depends upon expectations for a particular setting (although we recognize one's expectations may themselves be inappropriate or unrealistic). Consequently, standards regarding the loudness, frequency, or duration of the sound, or the type of sound that exists, may be inappropriate if they ignore the setting. Therefore, standards for appropriate sound levels in recreation environments should be established only in terms of specified situations.

The concepts of magnitude, importance, and the OROS provide a useful framework in determining when sound becomes noise in recreation areas. Present technology allows us to determine the magnitude (how loud different sounds are at various distances and across different terrain). The physical model developed by Harrison is an application of this technology. The physical model provides valuable data because it informs managers about the physical consequences of sound sources under a variety of conditions and the distances required to buffer one area

from another. Determining the importance of these sounds, however, is not as easy. We offer the following approach as a way to utilize the opportunity spectrum in this task.

We assume that most people would prefer to have a relatively quiet environment, whether they favor modern or primitive recreation opportunities. But, we also assume that people expect that opportunities towards the modern end will have a greater variety of human-related sounds than opportunities toward the primitive end. The OROS framework suggests that a variety of human-related sounds are not only consistent with opportunities towards the modern end of the spectrum, but that they are acceptable (and perhaps not even noticeable!) to most people who prefer those opportunities. Following is a proposed typology of appropriateness for sounds in recreation areas for four types of recreation opportunities. The labels used (e.g., modern, semi-modern) are arbitrary. Other labels, such as urban, rural, natural, could be used depending on individual preference.

Modern. "Noisy" relative to the full range of recreation opportunities. A variety of both mechanical and nonmechanical sounds are acceptable at levels close to that found in urban residential environments. The sounds may be of long duration, occur frequently, and occasionally be heard during late hours of the night. Sounds are acceptable well beyond the source.

Semi-modern. May have the same sound sources as in modern opportunity areas; the loudness, frequency and duration of the sounds are noticeably less. Sound impacts are occasionally evident beyond the general area of their source.

Semi-primitive. Have primarily natural sounds. Human-related sounds are less frequent than in the semi-modern category, last for a shorter period of time, and are infrequent during the night. Sound impacts are generally confined to the general area of their source.

Primitive. Generally free from human-related sounds; the primary sounds are natural background sounds such as wind or water. Both mechanical and non-mechanical sounds are inappropriate in the most primitive opportunity areas. Sounds do not extend beyond the immediate area of their source.

Even though the presence of a variety of sounds may be acceptable, there are norms or standards regarding the duration, frequency, and timing of such sounds. For some "modern opportunities," for example, the sound of a chainsaw or motorcycle may be entirely appropriate. But either sound can be too long or occur too often or at the wrong time. That is, hearing a motorcycle or chainsaw may not be bothersome during the day, but if they occur outside your tent at 11:00 p.m. they're noise! At the primitive end of the spectrum, however, even the faintest sound of a chainsaw or motorcycle at any time will probably be defined as noise and be a serious disruption of the recreation experience. Sounds, then, only become noise according to the criterion of appropriateness within a specified opportunity, rather than at any absolute level. Figure 1 combines the characteristics of sound sources (frequency of occurrence, loudness, and duration) and the four opportunity types in a hypothetical relationship.

The following example should be helpful in demonstrating how one might evaluate sound impacts in recreation areas. For illustrative purposes, we use U.S. Environmental Protection Agency standards for urban residential noise as a baseline (see Harrison elsewhere in these proceedings). We have suggested how standards for four possible recreation opportunity types might be established (see Figure 2). For example, one might propose that for "modern opportunities", standards for mechanical and non-mechanical sounds would be the same as regular urban residential standards. However, for "semi-primitive opportunities," the standard for mechanical sounds (largely inappropriate in such a setting) would shrink to 10% of the urban baseline, while non-mechanical sounds would be 40% of that same baseline. In primitive settings, at least ideally, mechanical sounds would be non-existent and non-mechanical would perhaps be no more than 10%. Table 1 summarizes the characteristics of acceptable sounds across the four opportunity types.

To determine whether a sound from a specific source will affect a receiver in a particular recreation opportunity setting, the following steps are suggested. The procedure can be used to evaluate both existing and potential source and receiver locations.

1. Define the recreation management objectives for the area in question in terms

Figure 1. An hypothesized relationship of appropriate sound source characteristics and the opportunity spectrum

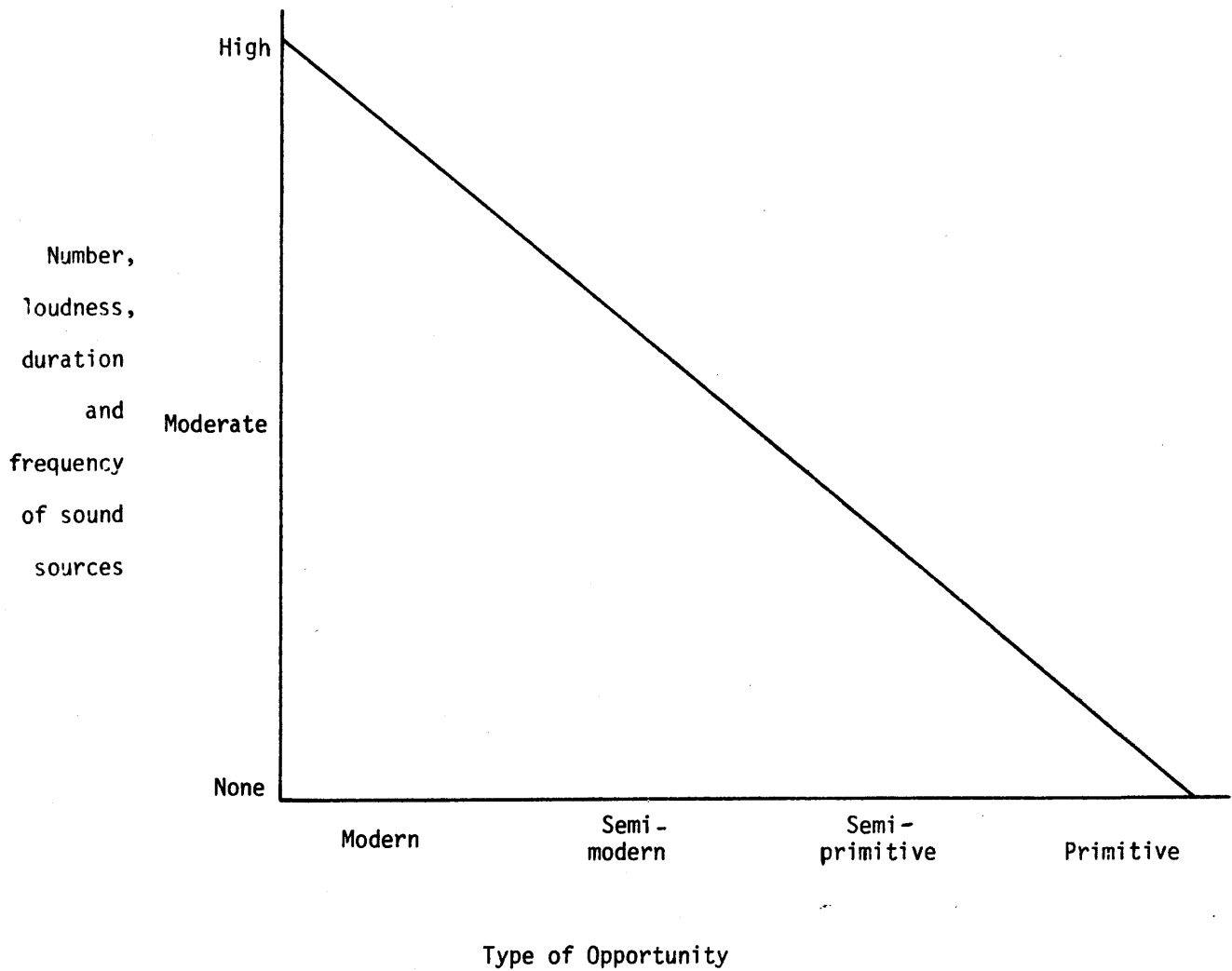


Figure 2. Acceptable level of sounds (hypothetical)

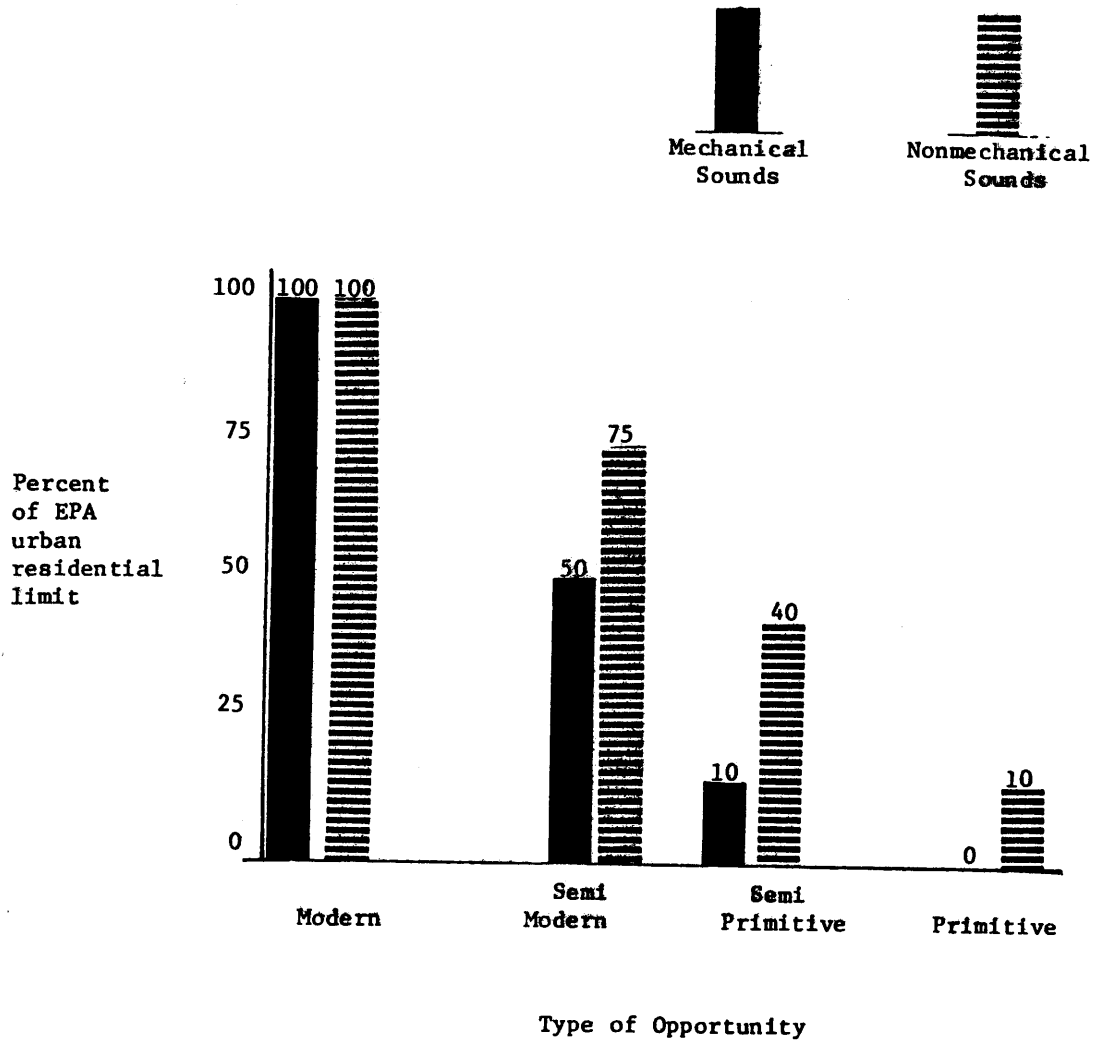


Table 1. Proposed characteristics of acceptable sounds as heard by other parties^{1/}

Opportunity	Type of sound	Loudness (% urban resident limit)	Frequency of occurrence	Duration
Modern	mechanical	100	very common	long during the day short at night
	nonmechanical	100	very common	long during the day short at night
Semi-modern	mechanical	50	common	short during the day and night
	nonmechanical	75	common	long during the day short at night
Semi-primitive	mechanical	10	infrequent	short during the day and night
	nonmechanical	40	common	short during the day and night
Primitive	mechanical	0	never (ideally)	N/A
	nonmechanical	10	infrequent	short during the day (on trails only)

^{1/} These relative limits are used for illustrative purposes only and are based on state-of-the-art judgments including past research and management experiences.

of the recreation opportunity spectrum (that is, determine the opportunity type--modern, semi-modern, semi-primitive or primitive--for which the area is to be managed). Once this decision has been made, standards specifying acceptable sound levels must be developed, such as shown in our Table 1.

2. Identify existing or potential locations of sound sources and receiver locations. Figure 3 shows a schematic drawing relating examples of sound source and receiver locations to opportunity settings.

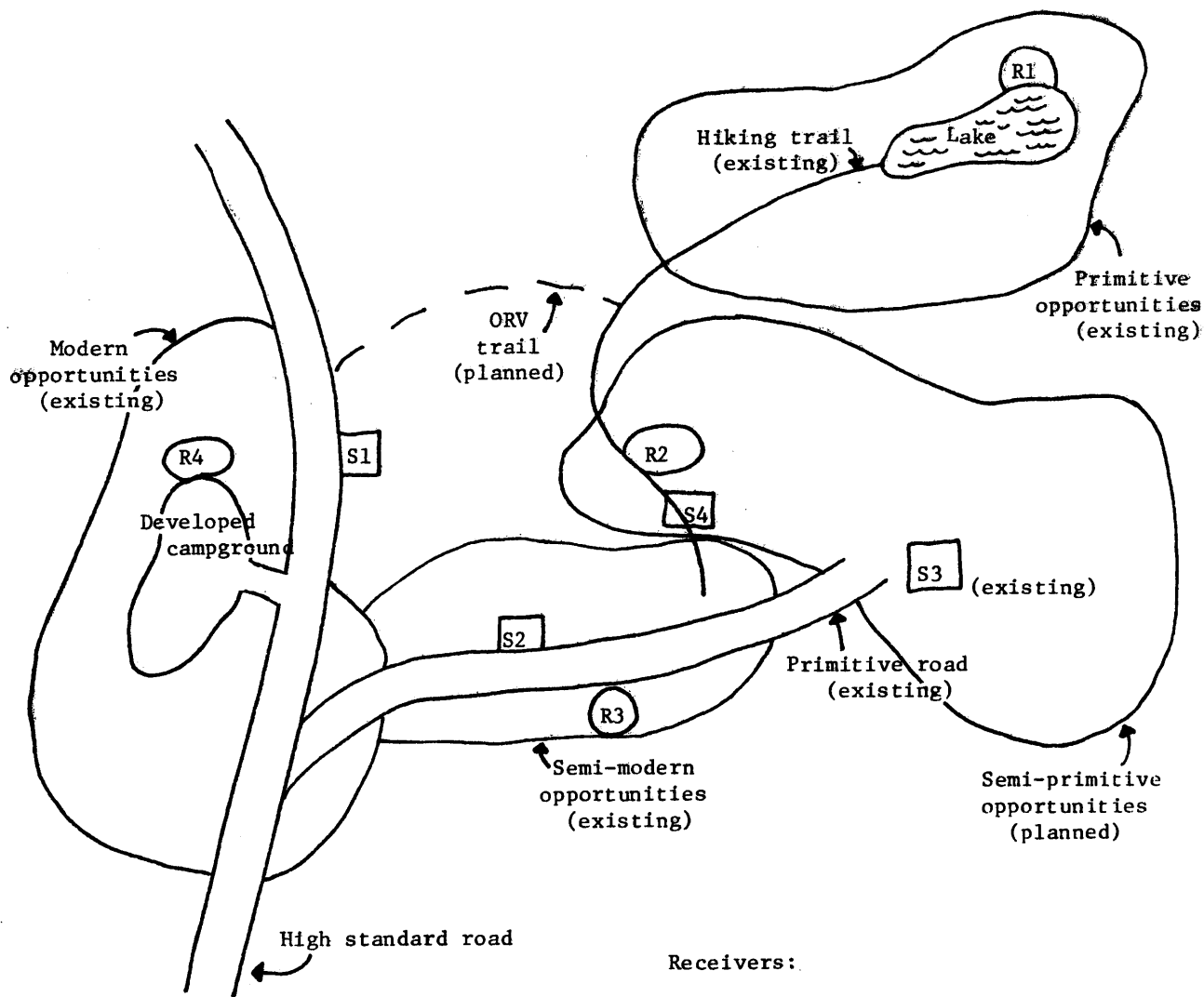
3. Using Harrison's physical model, determine the sound levels at various receiver locations in the area(s) in

question--that is, determine whether sounds from source locations S1-S4 will be heard in receiver location R1-R4 in Figure 3. (Care must be taken to identify critical problem spots so that hundreds of calculations are not needed to characterize an area).

4. Determine whether the magnitude of the sound (loudness) exceeds the standard for the opportunity level set by the area's management objectives.

- If not, then no unacceptable impacts will occur.
- If yes, then unacceptable impacts will occur. The nature of the impact should then be further examined to determine

Figure 3. Example of a management area showing potential recreation opportunities, in relation to planned and existing sound sources, and receivers' locations



Sound sources:

- S1 = trucks, highway traffic
- S2 = cycle on road, logging truck
- S3 = rock crusher
- S4 = cycle on trail

Receivers:

- R1 = recreationist expecting primitive opportunity at mountain lake
- R2 = recreationist expecting semi-primitive opportunity camped along trail
- R3 = recreationist expecting semi-modern opportunity camped along road
- R4 = recreationist expecting modern opportunity camped in campground

how severe the impacts may be. One should determine:

- (1) the duration of the sound,
- (2) the frequency of occurrence, and
- (3) its timing (day, night, season for example. Such an analysis might point out that although the sound standards will be exceeded, this would occur only during periods when most recreationists are not present.

5. After this has been done and the nature of the impacts have been described in terms of their variability in time and space, then one or more of the following options can be considered.

- a. Eliminate or move the source.
- b. Mitigate the sound source by buffering, engineering modifications of the source, or regulation.
- c. Redefine the area's management objectives, thereby changing the opportunity level to make it consistent with the sound source.
- d. Do nothing, thereby accepting the consequences of the impact. This might change the nature of opportunity, at least in terms of sound impacts.

The manager's decision will require judgment as to the consequences and feasibility of each option.

CONCLUSIONS

The OROS does not represent a good-to-bad or quality-continuum. Quality recreation experiences can be derived from along the entire spectrum; they are not restricted to those which conform to values traditionally embraced by professionals in resource management or by any one interest group. Quality is a value judgment; what represents a quality experience for one person is not necessarily the same for another.

The basic rationale underlying the Outdoor Recreation Opportunity Spectrum is that quality in outdoor recreation is best assured through provision of a diverse set of opportunities. A wide range of tastes and preferences for recreation opportunities exists among the public. For those preferring

solitude and a minimum of contact with others, primitive opportunities are appropriate. For others who seek a chance to meet and visit with friends in convenient and comfortable surroundings, modern auto campgrounds are preferable. Providing a wide range of settings varying in use density, level of development, access, and other respects ensures that the broadest segment of the public will find quality recreational experiences they seek, both now and in the future.

It is equally important to understand that impacts from recreational activities constitute only one of many factors that define opportunity settings. In some instances, recreation impacts may be the limiting factor in determining what recreation activities are possible and in what amount for certain places. In other cases, other factors may take precedence. Planners and managers must make these judgments on a case-by-case basis.

When evaluating the meaning of impacts, determine their magnitude as well as their importance. Although an objective method can be used to determine the magnitude of impacts (for example, the decibel level for sound, and the coliform count for water quality), estimating the importance of the impact is not as easy. Here, value judgments enter into the question, and considerable differences of opinion can occur between managers and recreationists as to what constitutes unacceptable impacts (for example, see Clark et al. 1971). When making these judgments, use of the Outdoor Recreation Opportunity Spectrum is useful because it recognizes that impact is a relative rather than an absolute concept and that what constitutes unacceptable damage in one opportunity setting may be acceptable and appropriate elsewhere along the spectrum.

RESEARCH NEEDS

The approach for determining the meaning of recreation impacts described in this paper is based on state-of-the-art judgment and combining findings from past research with management experience. As such, the guidelines described are tentative; further research is required to determine how well they can be generalized. Some questions needing additional study are:

1. What impacts are most disruptive to recreationists' experiences? At what

magnitudes? Do these vary across the opportunity spectrum?

2. Are specific sounds equally annoying at the same magnitude across the opportunity spectrum? Or does annoyance vary by the type of source and recreationist?

3. What specific standards are appropriate for each opportunity type? For various sound sources?

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