

## Literature Review

# A Review of the Recreation Opportunity Spectrum and its Potential Application to Transportation in Parks and Public Lands

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## Introduction: Extending the Recreation Opportunity Spectrum to Transportation

Transportation is a critical element of the recreation experience in parks and public lands. Therefore, transportation in this context warrants planning and management attention. This report reviews the scientific and professional literature on the Recreation Opportunity Spectrum (ROS), a framework that is widely used to guide outdoor recreation planning and management, and suggests how this framework might be applied to transportation. The report begins with a brief section describing the need for a diverse system of recreation opportunities. The second section outlines the development and application of ROS as a tool for defining and managing a diverse system of recreation opportunities. The third section reviews a substantive body of research that has examined linkages among recreation activities, settings, motivations, and benefits, an underlying assumption of ROS. The fourth section outlines how ROS has been extended to other professional and specialized areas, including wilderness, tourism and ecotourism, water resources, land use patterns and ownership, and roads. The fifth section proposes how ROS might be extended to transportation in the context of parks and public lands and uses data collected by the University of Vermont Park Studies Laboratory to illustrate this proposed extension. A short conclusion section summarizes the major findings of the report.

## Designs for Diversity and Democracy

Public lands must serve a broad population base with diverse interests and desires for outdoor recreation. In satisfying these societal demands, employment of a systems-oriented approach to planning and management is essential. It would be difficult for a single recreation area, regardless of size, to provide a full spectrum of recreation opportunities. Examining each recreation area in isolation will usually lead to management decisions favoring the majority or plurality of potential visitors. While this is justified in many cases, this process will ultimately result in an entire system of recreation areas designed for the “average” visitor while neglecting a desirable element of diversity. Instead each recreation area, individual site, zone, park, etc., should be evaluated as part of a larger system of areas, each contributing as it can to serve the diverse needs of the public. It has been suggested that this systems approach be applied on a broad, regional basis; in this way management can best ensure a “diverse resource base capable of providing a variety of satisfactions” (Stankey 1974).

Demand for diverse recreation opportunities has led to development of several zoning and related organizational frameworks designed to help guide planning and management. As early as the 1930’s it was proposed that different kinds of forests be planned and managed for distinct recreation activities (Marshall 1933, 1938). It was also suggested that recreation opportunities should extend “from the flowerpot at the window to the wilderness” (Wagar 1951). By the early 1960’s, a formal classification system for recreation managers began to take shape. A wildland planning handbook cataloged lands on a scale from “wilderness” to “semi-urban” (Carhart 1961) and the Outdoor Recreation Resources Review Commission proposed a six-fold framework for public lands that ranged from primitive to high-density use areas (ORRRC 1962). This classification system was one of the Commission’s principal recommendations and it was

suggested that it be utilized on all federal recreation lands. Since the formulation of these early frameworks, other recreation classification systems have been developed as shown in Table 1 (Manning, 2011). The most widely used and highly advanced classification system is the Recreation Opportunity Spectrum (ROS).

**Table 1.** Recreation classification or zoning systems (adapted from Manning 2011).

Carhart (1961)	Seven wildland zones ranging from wilderness to semi-suburban
ORRRC (1962)	Six area classifications ranging from high-density to historic/cultural
Lloyd and Fisher (1972)	Concentrated and dispersed
Brown et al. (1978)	ROS including six opportunity classes ranging from “primitive” to “modern urbanized”
Clark and Stankey (1979a)	ROS including four opportunity classes ranging from “primitive” to “modern”
Nash (1982)	Paved, pastoral, primeval
Boyd and Butler (1996)	ROS adapted to ecotourism
Orams (1999)	ROS adapted to marine recreation
Brown (2003)	A spectrum of highway experience opportunities ranging from efficient/effective transportation to enjoyment of transport experience
More et al. (2003); Bulmer et al. (2002); Lynch and Nelson (1997)	ROS adapted to Eastern private lands
Butler and Waldbrook (2003)	ROS adapted to tourism
US Bureau of Reclamation (2004)	Water Recreation Opportunity Spectrum
Kil and Confer (2006); Aukerman and Haas (2004)	ROS adapted to water resources
Roman et al. (2007)	Four zones for coral reef snorkeling ranging from “conservation” to “general use”
Flanagan and Anderson (2008)	ROS applied to wilderness
US Forest Service	Five recreation experience levels ranging from those emphasizing challenge, solitude, and demanding high skills to those involving extensive facilities and few skills
Wild and Scenic Rivers Act (PL90-542)	Three classes of rivers: wild, scenic, and recreational
National Trails Act (PL90-543)	Three classes of trails: scenic, recreational, and side

## The Recreation Opportunity Spectrum

ROS is a tool used to support definition and management of diverse outdoor recreation opportunities. It is based on the assumption that a range of factors (e.g., ease of access, density of use) contribute to recreation experiences, and through arraying various combinations of these factors, distinct recreation opportunities may be defined and managed. Prior to ROS, recreation experiences such as camping had been segmented based upon a number factors, influencing “satisfaction.” These factors were conceptualized as a “continua” and it is this notion that remains rooted in ROS (Bultena and Kessig 1969). Advancement from a camping continuum to ROS arose from refinements to the planning instrument and ultimately its transformation into a management strategy. This strategy incorporates a range of recreation-related factors that, in alternative combinations define a standardized system of recreation opportunities. Today, this system is widely used and has been implemented by a number of federal land managing agencies including the U.S. Forest Service, Bureau of Land Management, and most recently the U.S. Bureau of Reclamation (Buist and Hoots 1982, Driver et al. 1987, U.S. Bureau of Reclamation 2004).

More specifically, ROS is conceptualized as a four-tiered framework that links activities, settings, motivations, and benefits. The basis for this system is often described as “experience-based setting management” (Manfredo et al. 1983, Floyd and Gramman 1997), and may be thought of as a type of “production process.” It theorizes that experiences are derived from recreation activities, and that these activities are linked to the settings in which they occur. Settings, in turn, are comprised of three categories of factors; resource, social, and managerial. Through articulating ranges and varying combinations of these factors, ROS may be used to

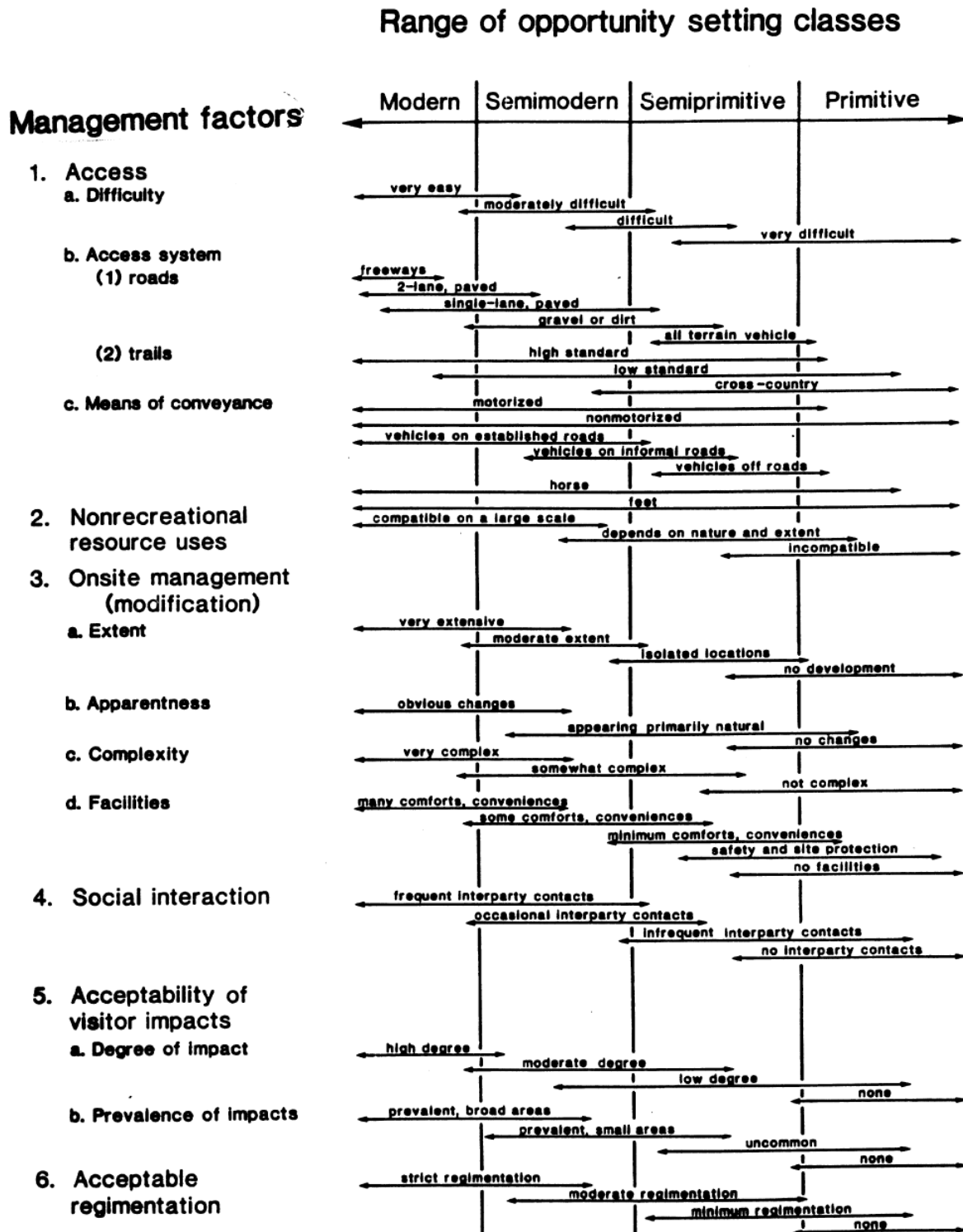
design, plan, and allocate diverse recreation opportunities for a more comprehensive recreation system.

ROS was established concurrently by two groups of researchers: Clark and Stankey (1979) and Brown, Driver, and associates (Brown et al. 1978, Driver and Brown 1978, Brown et al. 1979). While both methodological approaches acknowledge the four-tiered framework described above, they may also be distinguished by some important characteristics. For instance the work of Brown, Driver, and associates was built on a foundation of research regarding motivations for recreation. A rational extension of this work led to an empirically based approach to ROS, where settings were linked to motivations or the psychological outcomes they satisfy.

Clark and Stankey (1979) took a more pragmatic approach. They postulate that as awareness of associations between recreation settings and psychological outcomes improves, so will efficiency in meeting visitor demands. As knowledge increases, managers should then anticipate and accentuate diversity in recreation settings assuming that a consequent diversity of experiences will be created.

Both approaches to ROS acknowledge the three basic categories of factors that define recreation opportunities as described earlier: resource, social, and managerial. Clark and Stankey (1979) articulate the most specific arrangements of these factors and their respective recreation opportunity classes. They imply that six basic factors – access, nonrecreational resource uses, on-site management, social interaction, acceptability of visitor impacts, and acceptable regimentation – be employed to define ROS. Figure 1 demonstrates how each of four recreation opportunity types, or classes (i.e., modern, semimodern, semiprimitive, primitive), is formulated from the arrangement of factors lying beneath it.

**Figure 1.** Factors defining outdoor recreation opportunities  
(adapted from Clark and Stankey 1979).





Brown, Driver, and associates define recreation opportunity types using a more narrative and descriptive approach as illustrated in Table 2 (P. Brown et al. 1978). This approach recognizes six opportunity classes and their corresponding physical, social, and managerial setting attributes. In this case, managerial regimentation, interaction among user groups, evidence of human modification to the environment, size or extent of the area of opportunity, and remoteness are the five factors used to categorize opportunity types.

ROS is a conceptual and organizational framework with many potential applications. As an allocation and planning tool, it accounts for a variety of recreation opportunities and their relative scarcity or abundance. It may assist in guiding allocation decisions so that individual recreation areas contribute to a more comprehensive system of recreation opportunities.

**Table 2.** The Recreation Opportunity Spectrum (from Brown et al. 1978).

Opportunity class	Experience opportunity	Physical, social, and managerial setting
Primitive (P)	Opportunity for isolation (from the sights and sounds of man), to feel a part of the natural environment, to have a high degree of challenge and risk, and to use outdoor skills.	Area is characterized by essentially unmodified natural environment of fairly large size. Concentration of users is fairly low and evidence of other area users is minimal. The area is managed to be essentially free from evidence of man-induced restrictions and controls. Only essential facilities for resource protection are used and are constructed of on-site materials. No facilities for comfort or convenience of the user are provided. Spacing of groups is informal and dispersed to minimize contacts with other groups or individuals. Motorized use within the area is not permitted.
Semi-primitive, non-motorized (SPNM)	Some opportunity for isolation from the sight and sounds of man, but not as important as for primitive opportunities. Opportunity to have a high degree of interaction with the natural environment, to have moderate challenge and risk, and to use outdoor skills.	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but there is often evidence of other area users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Facilities are primarily provided for the protection of resource values and safety of users. On-site materials are used where possible. Spacing of groups may be formalized to disperse use and provide low-to-moderate contacts with other groups or individuals. Motorized use is not permitted.

Semi-primitive,  
motorized (SPM)

Some opportunity for isolation from the sights and sounds of man, but not as important as for primitive opportunities. Opportunity to have a high degree of interaction with the natural environment, to have moderate challenge and risk, and to use outdoor skills. Explicit opportunity to use motorized equipment while in the area.

Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but there is often evidence of other area users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Facilities are primarily provided for the protection of resource values and safety of users. On-site materials are used where possible. Spacing of groups may be formalized to disperse use and provide low-to-moderate contacts with other groups or individuals. Motorized use is permitted.

Opportunity class	Experience opportunity	Physical, social, and managerial setting
Rustic (R)	About equal opportunities for affiliation with user groups and opportunities for isolation from sights and sounds of man. Opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities are not very important. Practice and testing of outdoor skills may be important. Opportunities for both motorized and non-motorized forms of recreation are possible.	Area is characterized by predominantly natural environment with moderate evidences of the sights and sounds of man. Such evidences usually harmonize with the natural environment. Concentration of users may be low to moderate with facilities sometimes provided for group activity. Evidence of other users is prevalent. Controls and regimentation offer a sense of security and are on-site. Rustic facilities are provided for convenience of the user as well as for safety and resource protection. Moderate densities of groups is provided for in developed sites and on roads and trails. Low to moderate densities prevail away from developed sites and facilities. Renewable resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.
Concentrated (C)	Opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities. These factors are generally more important than the setting of the physical environment. Opportunities for wildland challenges, risk-taking, and testing of outdoor skills are unimportant, except for those activities like downhill skiing for which challenge and risk-taking are important.	Area is characterized by substantially modified natural environment. Renewable resource modification and utilization practices are primarily to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of man are readily evident, and the concentration of users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate to high densities of groups and individuals are provided for in developed sites, on roads and trails, and water surfaces. Moderate densities are provided for away from developed sites. Facilities for intensified motorized use and parking are available.

Modern urbanized (MU)	The opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities. These factors are more important than the setting of the physical environment. Opportunities for wildland challenges, risk-taking , and testing outdoor skills are unimportant.	Area is characterized by a substantially urbanized environment, although the background may have natural elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Soil protection usually accomplished with hard surfacing and terracing. Sights and sounds of man, on-site, are predominant. Large numbers of users can be expected both on-site and in nearby areas. A considerable number of facilities are designed for the use and convenience of large numbers of people and include electrical hookups and contemporary sanitation services. Controls and regimentation are obvious and numerous. Facilities for highly intensified uses and parking are available with forms of mass transit often available to carry people throughout the site.
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Additionally, once a suitable opportunity class has been selected, ROS can help establish specific management objectives for each setting characteristic. For instance, Clark and Stankey (1979) demonstrate how ROS may assist in the formulation of an appropriate management objective using noise as an example. In this case, four types of opportunities ranging from modern to primitive were classified. Assuming most people would prefer to enjoy a relatively quiet environment, but also considering that people may expect some level of human-made sound in modern settings, a series of hypothetical sound standards was developed for each opportunity class. As a result, the authors illustrated a single management area planned and allocated for a variety of recreation opportunities based on noise.

Setting attributes of ROS also aid managers with inventorying recreation opportunities (Kliskey 1998). It also offers a framework that allows for direct comparisons of alternative management actions, and provides a process that coordinates public desires with available opportunities. By depicting relatively distinct opportunities, visitors may more easily identify those opportunities that are most likely to fulfill their desired experiences. As another benefit, this may also lessen potential conflict between incompatible recreation activities (Daniels and Krannich 1990). When recreation resources are consistently managed for specific types of

opportunities, and the public is made aware of them, both visitors and managers are likely to benefit (Jubenville and Becker 1983). Visitors benefit from being more likely to achieve their recreation aspirations and managers are less likely to have to design and enforce regulatory measures to control inappropriate visitor use.

## Linking Activities, Settings, Motivations, and Benefits

Recreation can be understood within a “behavioral” approach or model (see Table 3). This model’s basic structure postulates that recreationists participate in selected activities in specific settings to fulfill motivations that in turn lead to benefits. Under this model, managers might be able to provide recreation opportunities (comprised of alternative activities and settings) designed to fulfill certain motivations and produce related benefits. ROS, by suggesting a series of relationships among these factors, begins to provide a formal structure within which this model can be made operational.

Some of the linkages inherent in ROS appear intuitively obvious. Opportunities for contact with the natural environment, for example, are likely to be enhanced through limited development of the setting, retaining the important natural character of the environment. Opportunities for solitude might be enhanced in relatively low use areas. And opportunities for challenge and risk-taking should be greater in areas providing only low-standard trails and few other improvements. But these are only generalities, and knowledge about such relationships can be enhanced through empirical testing.

A number of studies have begun searching for these relationships. An early study of visitors to three western wilderness areas examined both motivations and physical setting preferences (Haas et al. 1979). Respondents reacted to a series of scaled items for both

**Table 3.** Four levels or hierarchies of demand for outdoor recreation  
(adapted from Haas et al. 1980).

Level	Example 1	Example 2
1. Activities	Wilderness hiking	Family picnicking
2. Settings		
A . Environmental setting	Rugged terrain	Grass fields
B. Social setting	Few people	No boisterous teenagers
C. Managerial setting	No restrictions	Picnic tables
3. Motivations	Risk taking	In-group affiliation
	Challenge	Change of pace
	Physical exercise	
4. Benefits		
A. Personal	Enhanced self-esteem	Enhanced personal health
B. Social	Lower crime rate	Family solidarity
C. Economic	Lower health care costs	Increased work production
D. Environmental	Increased commitment to conservation	Higher quality environment

motivations and physical setting attributes, and these response sets were cluster analyzed.

Several domains for both motivations and setting attributes were identified, but no attempt was made to relate the two. A second study of visitors to the Glenwood Springs Resource Area, CO, attempted to go a step further (Brown and Ross 1982). Multiple regression analysis was used to explore for relationships between motivations and settings, and a number of such relationships were found. The statistical significance of these relationships was generally enhanced when the sample was grouped according to activity. In other words, people sharing the same activity had more uniform relationships between motivations and setting preferences than all recreationists considered together.

Several studies have included more thorough tests of these relationships. A survey of snowmobilers and cross-country skiers asked respondents to rate motivation scale items and scale items describing selected attributes of the resource, social, and management environments (McLaughlin and Paradice 1980). Cluster analysis revealed four types of visitors based on recreation motivations. A number of statistical relationships were found among these types of users and desired attributes of the recreation environment.

A second study surveyed visitors to three wilderness areas, asking respondents to rate a number of motivation, setting attribute, and management action scale items (Manfredo et al. 1983). Each set of scale items was cluster analyzed, and five of the motivation clusters were selected for further object cluster analysis, isolating three visitor types based on similar motivation ratings. Type 1 visitors were labeled High Risk/Achievement Group, type 2 visitors were labeled Low Risk/Social Interaction Group, and type 3 visitors, who represented the largest proportion of visitors (60% of the sample) and tended to be less distinctive in their motivation ratings, were labeled Norm Group. The three types of visitors were then examined to see whether there were significant differences among them in activities engaged in and preferences for setting attributes and management actions. A number of differences were found. Though there were no differences among the three groups with regard to the four activities having the highest participation rates and the one activity with a very low participation rate, there were differences for the two activities with moderate participation rates. In addition, there were statistically significant differences among the three types of visitors on seven of the setting attribute clusters and four of the management action clusters. Though the magnitude of the differences was generally not large, the sample was relatively homogeneous – all respondents were wilderness visitors. A more diverse respondent group may have yielded greater levels of

statistical significance.

A third study examined relationships among recreation activities, settings, and motivations for visitors to the Delaware state park system (Vogelsong et al. 1998). Relationships among all three of these variables were found. For example, visitors to historical parks (defined as a setting attribute) placed more emphasis on "nature/learning" than did visitors to other types of parks. Recreation activities also varied by type of park. For example, swimming/sunbathing was the dominant activity at seashore parks, hiking/walking predominated at suburban parks, and activities were more mixed at lake and pond-based parks.

A fourth study surveyed visitors to the Cohutta Wilderness, GA/TN and the Okefenokee Wilderness, GA (Shafer and Hammitt 1995). Visitors were asked to rate the importance of five motivations for wilderness recreation; the importance of selected resource, social, and managerial conditions in wilderness; and the extent to which visitors adopted selected behaviors to direct or control the recreation experience. A number of significant correlations were found suggesting that visitors who rated selected motivations as important tended to associate certain wilderness settings with those motivations, and often behaved in ways designed to maximize attainment of those motivations. For example, visitors who rated the "unconfined" nature of wilderness experiences as highly important tended to use wilderness areas where fewer management restrictions were present.

A fifth study surveyed hunters in five states (Floyd and Gramann 1997). Respondents were asked to rate the importance of 30 motivation scale items, and resulting data were used in cluster analysis to group respondents into four "market segments." These four groups were then compared with regard to their preference scores for selected hunting setting characteristics, including access, amount of regimentation, presence of other hunters, traces of other hunters,

nonrecreational uses, and on-site management. In many cases, the four market segments of hunters differed significantly in their preferences for specific setting features. For example, the "outdoor enthusiast" market segment of hunters reported the strongest preferences of any group for exclusive use, lack of evidence of previous hunters, and lack of development.

A sixth study surveyed campers at three proximate but diverse campgrounds on the Sumter National Forest, SC (Cavin et al. 2005). Study sites included a developed campground, a walk-in campground, and a wilderness campground. Respondents rated the desirability of 22 campground setting attributes and significant differences were found in nearly all of these ratings across at least two of the study sites. However, indicators for camping were also measured, and few meaningful differences were found among the different types of study campgrounds. The study concludes that "ROS, in regards to campers, was supported in terms of preferences toward level of facility/service development" (Cavin et al. 2005: 43).

Several other studies have explored the relationships among selected elements of the behavioral model. Most have found what might best be described as "modest" relationships. These include relationships between the activities in which respondents participated and the type of resource selected within an Australian national park (Collins and Hodge 1984), activities and motivations of Delaware state park visitors (Confer et al. 1997), and setting attributes and type of resource selected by anglers in Colorado (Harris et al. 1985). However, a study of visitors to five protected areas in Costa Rica found little relation between motivations of visitors and setting preferences (Wallace and Smith 1997).

Two related studies have used different, less direct approaches to linking motives, settings, and activities. The first approach was an effort to translate motivational scale items directly into management terms (Knopp et al. 1979). Respondents were asked to rate a series of



environmental setting elements that were designed to reflect basic motivations, rather than motivation items themselves. The data set was combined with preferences for eleven management actions and reduced through cluster analysis to four rather distinct associations, descriptively labeled "noise and development tolerant," "activity setting," "nature and solitude," and "nature with comfort and security." The second approach studied motivations for river floating across eleven diverse rivers (Knopf et al.1983). The study hypothesized that if motives are related to setting attributes, then significant differences in motives should be found across diverse settings. The results were mixed. While some significant differences in motives were found, there was a striking general similarity of motives across river settings. However, the degree to which similar motives were satisfied in different settings was not addressed.

Two studies have taken a “wilderness perceptual mapping” (WPM) approach to test the assumed relationships in ROS. A study in New Zealand measured judgments about the desirability of related activities, facilities, and experiences among visitors to 19 wilderness areas (Kliskey 1998). Resulting data were used to create four classes of wilderness recreation based on the notion of “wilderness purism” (Stankey 1973; Kliskey 1998). These four classes of wilderness were mapped and compared to conventional ROS maps. The analysis concluded that “a significant association was obtained between the WPM and ROS mapping”, and this suggests ROS generally captures and incorporates the activities and settings that recreationists feel are appropriate for a range of wilderness-related experiences (Kliskey 1998:86). A similar research approach was taken in a study of the San Juan National Forest, CO and this study also found a close relationship between perceived wilderness conditions and ROS mapping (Flanagan and Anderson 2008). For example, 96 percent of lands perceived as “wilderness” by “strong wilderness purists” were all included in the “primitive” land classification of ROS.

A final group of studies is related to benefits-based management. The objective of benefits-based management is to allow managers to more directly measure and facilitate benefits associated with recreation participation (Allen 1996, Allen and McGovern 1997). Managers are encouraged to specify the benefits they wish to provide, design facilities and services to facilitate these benefits, and measure the extent to which benefits have been realized. Among other things, this requires an understanding of the potential relationships described in Table 3. In other words, what benefits are associated with fulfillment of recreation motivations, and how are motivations, in turn, related to recreation activities and the settings in which they occur?

In response to this question, the following studies focus more directly on relationships among elements of ROS and benefits-based management. For instance, a nationwide study of river floaters explored the degree to which motivations for recreation varied across river segments reflecting a primitive-urban continuum (Williams and Knopf 1985). Motivations were found to be more strongly related to other variables including water flow and trip duration. A study of campers in several Australian parks examined the relationships between one biophysical site attribute (naturalness) and one social site attribute (use level) (Heywood 1991, Heywood et al. 1991). Both linear and nonlinear relationships were found. A third study measured motivations of campers in three ROS classes at Land Between the Lakes, KY (Yuan and McEwen 1989). Thirteen motivations were found to vary across at least two ROS classes; however, no differences were found for eighteen motivations across any of the ROS classes. A related study of visitors to a Bureau of Land Management area in Colorado measured activity preferences, motivations associated with these activities, and preferred ROS class (Virden and Knopf 1989). While findings were mixed, the study concluded that "the data clearly suggests that relations among these variables exist, in support of tenets of underlying theoretical principles of

the Recreation Opportunity Spectrum." Finally, another study of visitors to a Bureau of Land Management area in Colorado was designed to test relationships suggested by benefits-based management (Stein and Lee 1995). This study concluded that "the benefits visitors desire can be linked to particular recreation activities and to physical, social, and managerial setting characteristics." However, more support was found for the linkage between benefits and setting characteristics than for the linkage between benefits and recreation activities.

A more comprehensive approach to this issue was taken by combining the findings of nine studies conducted at a diverse array of outdoor recreation areas in Minnesota, Colorado, and Arizona (Pierskalla et al. 2004). These studies used similar methods to define and measure recreation activities, settings, and benefits. Using a meta-analytical approach, recreation activities of respondents were found to significantly influence attainment of five of the 12 benefits included in the studies. However, recreation settings were found to significantly influence attainment of only one benefit (though the authors note the challenges of effectively characterizing the inherently complex concept of "recreation settings"). The study notes that activities may be more important in managing for some types of outdoor recreation-related benefits (such as physical fitness) while settings may be more important for others (such as learning about nature). The study concludes that "both activity and setting opportunities contribute to recreation outcomes" (Pierskalla et al. 2004:176).

The research reviewed in this section offers some empirical support for the conceptual foundation of ROS and related frameworks. However, definitive relationships among the elements comprising these frameworks are far from clear (McCool et al. 1985). It may be unrealistic to expect to find such highly structured relationships. It seems reasonable, for example, to expect that some motivations for recreation might be fulfilled through multiple

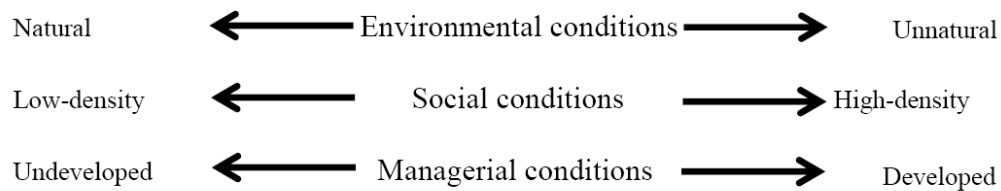
activities and/or settings (McCool 1978). For instance, the motivation to experience nature might be fulfilled through mountain biking as well as hiking, and might be found, at least to some degree, in a city park as well as a national park. Indeed, some motivations, as well as benefits, may be nearly universal. Moreover, the empirical relationships assumed in ROS and related frameworks may be partially masked by limited choices that often confront recreationists and by peoples' inherent adaptability. The emotional and symbolic meanings that recreationists may assign to some recreation areas may confound the relationships assumed to underlie ROS. Finally, the dynamic character of some recreation activities (e.g., hiking) can extend across multiple ROS classes and this can confound the types of studies described above. (This issue is discussed more fully in the next section.)

## Extending the Opportunity Spectrum

ROS is a pragmatic tool used by public land managers and continues to warrant further investigation by researchers. In fact, one founder of the ROS concept notes that the instrument is simply a 'best guess' tool for planning, management, and research. Furthermore, he states that "changes in the specifications of the ROS details will be necessary" (Clark 1982:10). To support this original intent researchers have suggested extending ROS in three ways.

One proposal is to redefine relationships between the components that comprise recreation settings: resource, social, and managerial conditions (Manning, 1985). The tacit relationship among these factors is linear as illustrated in Figure 2. As resource conditions change from natural to unnatural, it is implied that social and managerial conditions will change in an analogous fashion. This suggests that only particular combinations of factors are viable. While the linear relationships that help define ROS are clearly important in most situations, exceptions may exist and warrant further research. For instance, it is possible that natural

**Figure 2.** Linear relationship among environmental, social, and managerial conditions as suggested by ROS (from Manning 1985).



environments can, and maybe should, sustain high-density use under intensively managed conditions in some cases. Additionally, empirical evidence suggests demand for “non-traditional” recreation opportunities of this kind exists. The diversity of attitudes, preferences, and motivations of broad user constituencies reflect these possibilities and numerous studies have focused on this topic precisely. One example comes from an early study in the Quetico-Superior Area, MN (Bultena and Taves 1961). In this case, 99% of respondents strongly favored preservation of the area in its natural condition. Concurrently, an ample subpopulation of these visitors also favored further development of facilities in the area. The authors referred to this user group as “wilderness compromisers.” A second study found that river users tended to group into sets or packages based upon their motivations, and that “Most of the sets or packages...meet the criterion of conventional wisdom, or an intuitive notion of what belongs together. On occasion, however, a grouping may occur which appears incongruous to the manager or planner. This package may have a small but real constituency which deserves attention” (Knopp et al. 1979:325). A study of campers also found both linear and nonlinear relationships among visitor preferences for naturalness and use levels of campgrounds (Heywood 1991, Heywood et al. 1991). Finally, a study of various outdoor recreation areas in California offered visitors a brief description of four ROS opportunity classes and asked them to evaluate the appropriateness of 25 management actions (Martin et al. 2009). Findings indicated mixed support for conventional

ROS relationships. For example, in the “primitive” opportunity class, respondents tended to support “hardening” of environmental resources through “engineering”-oriented management practices less. While this supports traditional ROS classification, respondents in the primitive opportunity class also showed more support for regulatory management practices; an alternative view from a conventional ROS standpoint.

A second suggestion to extend the ROS concept is to add a dynamic element (Pierskalla et al. 2000, Pierskalla et al. 2007). ROS-based mapping of recreation opportunities can be interpreted as “static”, especially in view of the fact that recreation experiences often flow over both space and time. The conventional activity and setting formulation of ROS might be appropriately extended through addition of a movement component, and the resulting concept has been termed “leisure events” or “perceptual events” (Gibson 1986, Pierskalla et al. 2000, Pierskalla et al. 2007). In a study of visitors to Spruce Knob-Seneca Rocks National Recreation Area, WV, one-third of respondents selected directionally-oriented vocabulary to describe their recreation experience suggesting the importance of movement in understanding and mapping recreation experiences (Pierskalla et al. 2007). Respondents translated this vocabulary to map symbols denoting such movement and resulting maps were seen as potentially more effective than polygon-oriented maps conventionally associated with ROS. For example, hiking along a ridge trail was a directional, movement-oriented experience that traversed three conventional ROS zones. Mapping the associated vector in addition to the conventional ROS zones might promote more integrated and consistent management of this hiking experience.

A third proposal to extend ROS is through its application to broader outdoor recreation contexts. For instance, while ROS was originally applied to public parks and forests, it has also been expanded to other recreation-related fields. These areas of recreational interest include

wilderness (Flanagan and Anderson 2008), ecotourism (Boyd and Butler 1996), tourism (Butler and Waldbrook 2003), land use patterns and ownership on a regional basis (Lichtkoppler and Clouts 1990, Kaltenborn and Emmelin 1993, Lynch and Nelson 1997, Bulmer et al. 2002, More et al. 2003), water-based recreation (Orams 1999, Aukerman and Haas 2004, U.S. Bureau of Reclamation 2004, Kil and Confer 2006), and recreation-oriented roads (Brown 2003).

As it relates to tourism, ROS was modified to incorporate six characteristics relevant to the quality of tourism experiences. These included 1) type and level of access, 2) other non-adventure uses, 3) level of development of tourism infrastructure, 4) social interaction between guests and hosts, 5) acceptability of visitor impacts, and 6) acceptability of visitor regimentation (Butler and Waldbrook 2003). As a result, a range of tourism options are created, defined, and offered based on a scale of “hard” to “soft” adventure. This continuum is referred to as the Tourism Opportunity Spectrum (TOS).

The recent growth of ecotourism has led to blending ideas from both ROS and TOS. The planning and management tool produced contains eight components and provides diverse opportunities for eco-tourists ranging from “eco-specialists” to “eco-generalists.” The eight factors that define the Ecotourism Opportunity Spectrum (ECOS) are 1) type and level of access, 2) relationships between other resource-related activities, 3) forms of attractions offered, 4) extent, complexity, visibility, number, and type of existing infrastructure, 5) social interaction between other eco-tourists and hosts/local populations, 6) level of knowledge and skill of eco-tourists, 7) acceptance of visitor impacts, 8) and acceptance of management regime (Boyd and Butler 1996). ROS has been applied to fields other than tourism as well.

For instance, the growth in popularity of wilderness recreation over recent decades also led to the more specific application of ROS to wilderness settings. In this case, maps of

perceived wilderness were developed in a geographic information systems (GIS) environment based upon visitor preferences in wilderness settings. Wilderness visitors were classified into user groups utilizing a “purism scale.” The scale ranked recreationists in terms of the level of primitiveness, or purity, required in a setting in order for them to consider it wilderness.

Individuals with similar tastes were classified into four purism groups based upon their responses to a series of questions related to wilderness settings. Maps were created for these groups based upon an inventory of the wilderness features deemed desirable by them (Flanagan and Anderson 2008). As a result, a finer grain of detail was developed for wilderness opportunities within the San Juan National Forest. ROS applications are not restricted to land-based recreation however.

Recent research has led to the formulation of a water recreation opportunity spectrum (WROS) as well (Orams 1999, Aukerman and Haas 2004, U.S. Bureau of Reclamation 2004, Kil and Confer 2006). In this context, the ROS framework was applied to numerous water-based recreation areas ranging from rivers and reservoirs to coastal zones and marine protected areas. Numerous water related activities were incorporated, a spectrum of opportunity classes ranging from urban to primitive was developed, and ultimately the WROS progressed into a planning guidebook by the Bureau of Reclamation.

Highway travel is another example of how ROS may further refine management factors. As Figure 1 illustrates, access is one management factor that contributes to the development of opportunity setting classes. Furthermore, within an access system there may be multiple recreation contexts such as roads and trails. Through singling out road contexts (even more specifically highways) a Highway Experience Opportunity Spectrum was recently developed (Brown 2003). In this case, seven dimensions were utilized to place highways on a spectrum from “efficient and effective transport of people” to “enjoyment of transport experience.” The seven factors that make this system operational include 1) intrinsic scenic byway qualities, 2) capacity, 3) length, 4)



remoteness, 5) connectivity, 6) speed, and 7) purpose. However, this study focuses on only one means of access. As illustrated by Figure 1, access systems may be more comprehensive and also incorporate other means of conveyance (or multiple modes of transportation).

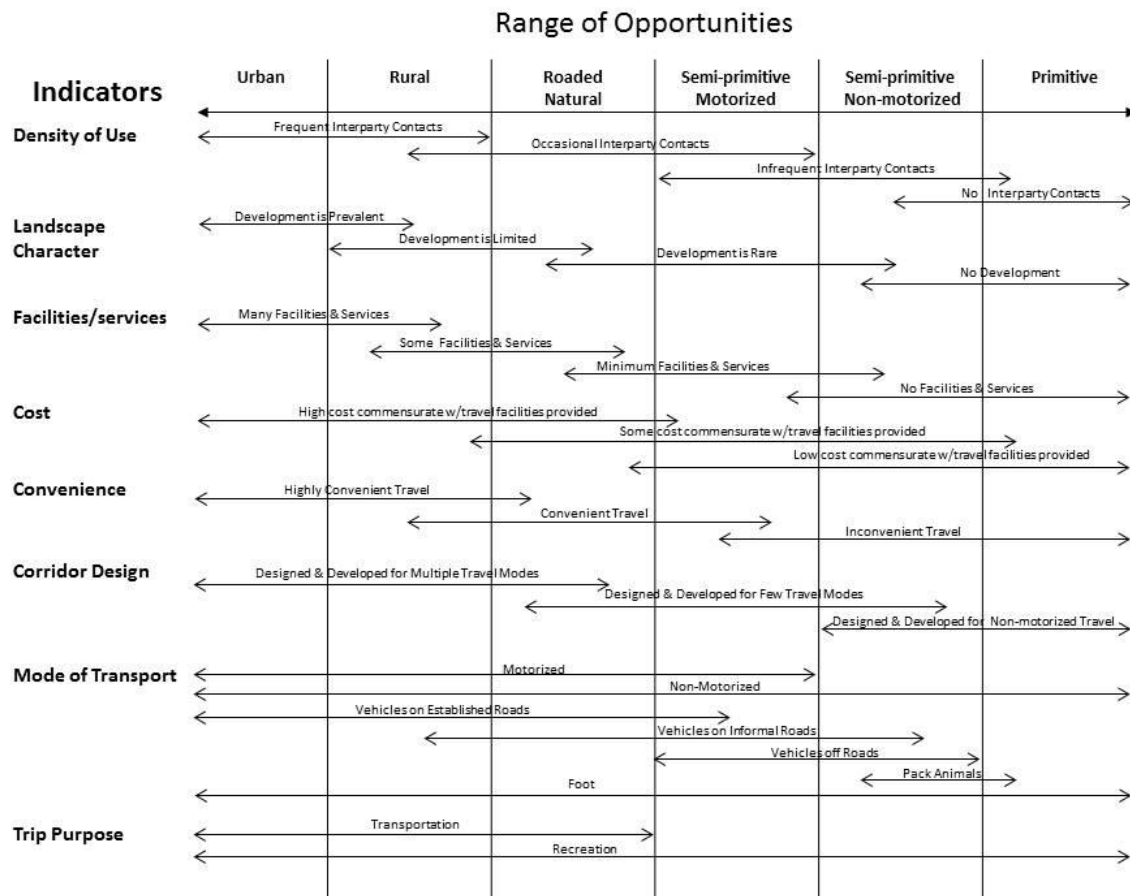
## Towards a Transportation Recreation Opportunity Spectrum

Transportation is fundamental to parks, outdoor recreation, and public lands. For example, every year millions of visitors travel to, from, and within national parks. But transportation can be more than this – it is often a form of recreation itself, offering many visitors their primary opportunities to experience and enjoy parks and related public lands as they “drive for pleasure”. Moreover, recent emphasis on designing alternative transportation systems for parks and public lands has led to a more holistic view of recreational travel that incorporates transit, pedestrian, and bicycle transportation in addition to private automobiles (23 CFR 970.214). This section proposes development of conceptual models for a transportation recreation opportunity spectrum (TROS) in the interest of continuing to develop ROS as it relates to transportation planning and management in outdoor recreation-related settings.

Figure 3 illustrates how TROS might be developed. Recent research has found that park and scenic roads are more than just an access system. In fact, driving for pleasure is an important form of recreation (Hallo and Manning 2009, Hallo and Manning 2011). Furthermore, roads in some contexts may be inherently more recreational than others (Brown 2003). Therefore, the proposed TROS considers transportation systems as more than just a means of access, but rather as a range of recreation opportunity classes.

The information incorporated into Figure 3 emerged from data collected by a program of research currently underway at the University of Vermont Park Studies Laboratory. This program of research was designed to solicit knowledge of how people perceive, assess, and value

**Figure 3. A Proposed Transportation Recreation Opportunity Spectrum.**



transportation systems using an indicators and standards of quality framework. Indicators and standards of quality, widely used in the field of outdoor recreation management, consider visitor perspectives and incorporate them into management. Indicators are measureable, manageable variables that help define the quality of parks and outdoor recreation areas and opportunities, and standards define the minimum acceptable condition of indicator variables. The program of research to address indicators and standards of quality for transportation was administered across several modes of travel and several recreation-related contexts. For instance, visitor surveys were conducted across a spectrum of recreation-oriented roads in northern New England. These highway opportunities ranged from an ‘All-American’ road designed for a series of visual experiences (Acadia National Park’s Loop Road); to a scenic byway recognized for its access to

premier outdoor recreation opportunities (Vermont's Green Mountain Byway); to a four lane interstate highway that connects numerous tourism destinations and spans Vermont's Green Mountains (Interstate 89). A similar survey was administered to visitors using two park shuttle bus systems. One, the Muir Woods Shuttle, delivers visitors from the urban environs of the San Francisco Bay area to Muir Woods National Monument. The other transports its riders from the rural gateway community of Bar Harbor, Maine to the natural destinations of Acadia National Park. The study also incorporated non-motorized forms of travel including biking and walking. For these travel modes, surveys were administered across a continuum of greenways. The first links six city parks and provides access to downtown Burlington (Vermont's largest urban area); the second is located in the tourism-based town of Stowe, Vermont and connects the community center with pastoral landscapes including farmlands and forests; and the third, the Acadia carriage road network, runs throughout the national park and incorporates both sweeping and close-up views of the natural environment. Together, the data collected across transportation modes and recreational contexts, creates an empirical basis to begin developing a TROS. In exploring these indicators and standards, the survey instrument utilized both qualitative and quantitative approaches and incorporated normative methods and visual simulations to integrate an experiential component in defining and measuring transportation quality.

The qualitative approach utilized a series of open-ended questions to identify indicators that have an impact on visitors' travel experience. Questions asked respondents what added to and detracted from the quality of the transportation experience. Responses such as 'too much traffic', 'congestion', and 'too many people' illustrate that density of use is important to the quality of transportation experience. Furthermore, density of use makes a good indicator because it is both measureable and manageable. A series of more quantitative, close-ended

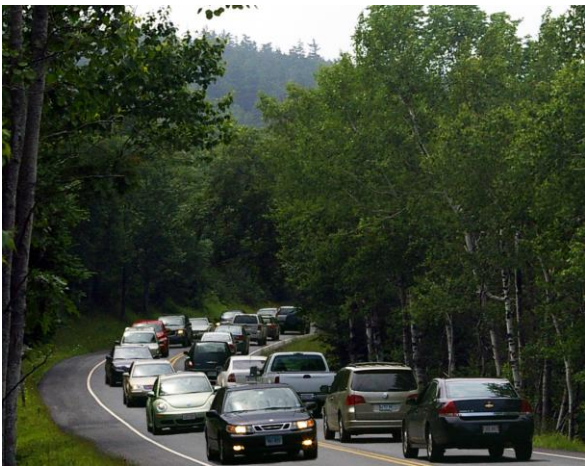
questions were also included in the questionnaire. These included lists of items that may be considered desirable or undesirable components of a transportation system, including items related to density of use such as “few vehicles on the road”, “adequate spacing between vehicles”, and “ability to maneuver as you drive.” Respondents were asked to rate the degree to which each item was considered desirable or undesirable using a scale that ranged from -2 (“very undesirable”) to +2 (“very desirable”). All of the indicators included in Figure 3 emerged from the program of research.

The program of research also addressed standards of quality for selected indicators. Normative research and visual simulations were used as a part of this research (Manning 2011; Manning and Freimund 2004). For example, respondents who were driving were presented with a series of six visual simulations showing a range of cars on a section of the road they were traveling. Study photos for the Loop Road in Acadia National Park are shown in Figure 4. Respondents were asked to rate the acceptability of each photograph on a scale from -4 (“very unacceptable”) to +4 (“very acceptable”). Acceptability scores across the sample were averaged and plotted to form a norm curve as shown in Figure 5. The point at which the norm curve crosses the neutral point on the acceptability scale represents a standard of quality, or the minimum acceptable condition. In the case of Figure 5, this is about eight cars per 125 meter length of road.

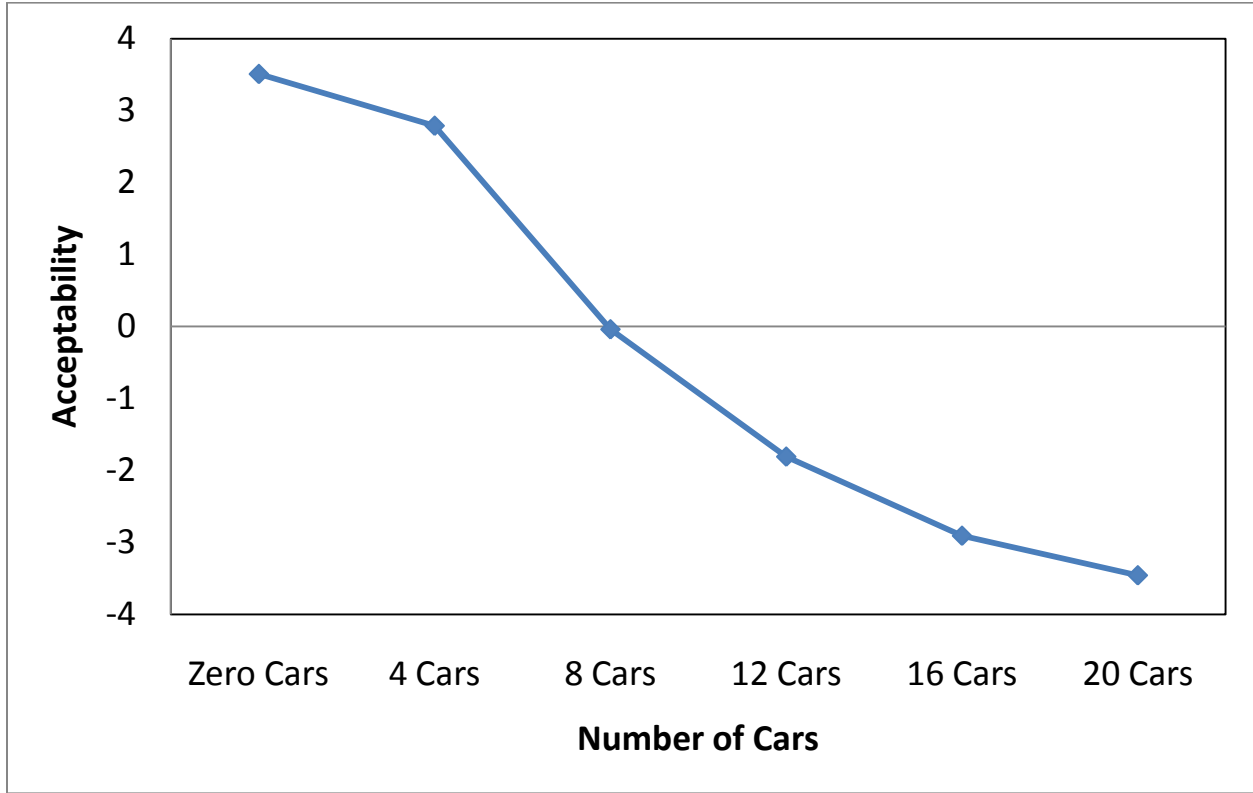
Figure 3 presents TROS at a macro scale designed to encompass overarching concepts relevant to all transportation modes, but it may also be used at a micro level to further develop mode-specific measures of quality across a range of recreation opportunity classes. For instance, Figure 6 focuses on a single transportation indicator of quality, density of use. Furthermore, it specifies these indicators on a mode-by-mode basis. The values within Figure 6 represent potential standards of quality for their associated travel mode and opportunity class, and

**Figure 4.** Visual Simulation of Acadia Park Loop Road Traffic.





**Figure 5.** Social Norm Curve for Traffic Congestion on the Acadia Park Loop Road.



correspond to the photos and narrative statements that respondents said were the minimum acceptable condition. The visual simulations of these standards may be found in the appendix of this document.

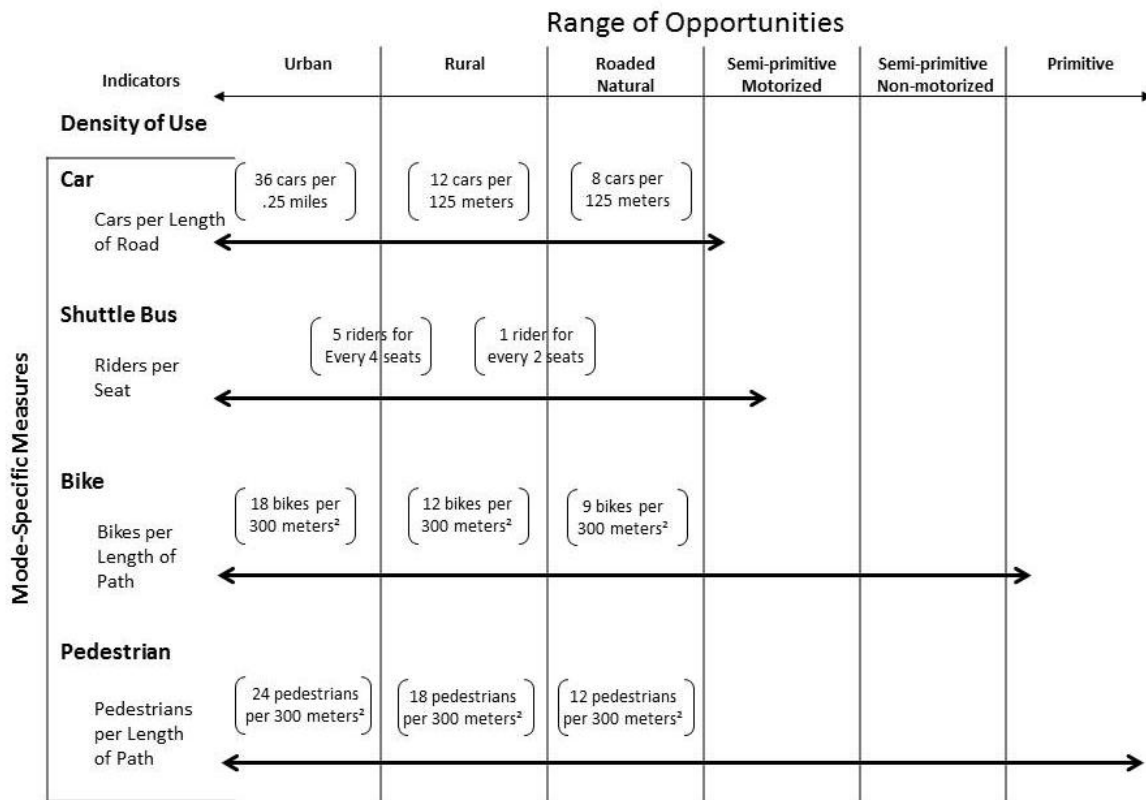
Together, Figures 3 and 6 suggest how TROS might be developed, but additional research across access systems, travel modes, and recreation-related contexts will be required to further construct and refine the framework.

## Conclusions

ROS is a widely known and applied framework that has been developed to guide management of diverse outdoor recreation opportunities. ROS is based upon three major propositions: 1) that recreation experiences are influenced by recreation activities and the settings in which they occur; 2) that recreation settings are defined by resource, social, and



**Figure 6. Mode-Specific Standards of Quality.**



managerial conditions; and 3) that alternative recreation activities and combinations of resource, social, and managerial conditions can be used to create a diversity of recreation opportunities. Furthermore, research has established some linkages among recreation activities, settings, motivations, and benefits. However, highly structured or rigid relationships among these variables may be an unrealistic expectation.

ROS can and should be extended to explicitly incorporate a wider variety of recreation opportunities based on alternative, nonlinear combinations of resource, social, and managerial conditions. Moreover, because some recreation activities and experiences have a dynamic character, ROS might be further extended to include a more dynamic component where applicable. ROS has been adapted to a variety of contexts beyond parks and outdoor recreation, including water resources, tourism, ecotourism, wilderness, roads, and variations in land



ownership patterns. In all of these contexts, ROS is a conceptual framework that continues to be useful in guiding recreation-related planning and management.

As transportation is a fundamental component of visitation to parks and public lands, it too could benefit from development and application of an ROS framework. Travel activities in parks and other public lands include an array of transportation modes, including hiking, horseback riding, biking, driving for pleasure, and public transit, including buses, ferries, and rail. Furthermore, many of these activities may take place in a broad range of settings spanning urban, rural, natural, and primitive landscapes. Development and application of a transportation recreation opportunity spectrum – TROS – would help guide planning and management of transportation in parks and public lands. This paper suggests how TROS might be structured and the types of research that are needed to make it operational.

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## Appendix

### Visual Simulations of Minimum Standards of Quality for Density-Related Indicators



Visual simulation of minimum acceptable standard of quality  
for number of vehicles-per-viewscape on a four-lane interstate highway  
(36 cars per quarter mile)



Visual simulation of minimum acceptable standard of quality  
for number of vehicles-per-viewscape on a two-lane scenic byway  
(12 cars per 125 meter length of road)

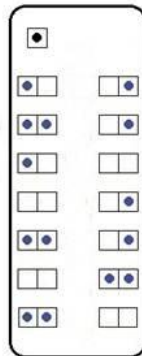


Visual simulation of minimum acceptable standard of quality  
for number of vehicles-per-viewscape on a two-lane park road  
(8 cars per 125 meter length of road)



Visual simulation of minimum acceptable standard of quality  
for number of riders per seat on a park shuttle bus

**There is 1 rider  
for every 2 seats.**

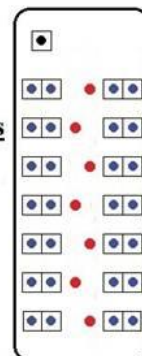


□ = Seat

● = Seated  
Rider

● = Standing  
Rider

**There are 5 riders  
for every 4 seats.**



□ = Seat

● = Seated  
Rider

● = Standing  
Rider



Visual simulation of minimum acceptable standard of quality  
for number of bicycles-per-viewscape on a city greenway  
(18 bikes per 300 square meters of path)



Visual simulation of minimum acceptable standard of quality  
for number of bicycles-per-viewscape on a village greenway  
(12 bikes per 300 square meters of path)



Visual simulation of minimum acceptable standard of quality  
for number of bicycles-per-viewscape on a park greenway  
(9 bikes per 300 square meters of path\*)



\*The path shown in this photo is twice as wide as the path shown in the previous two photos, therefore 18 bikes per 600 square meters of path are actually shown.



Visual simulation of minimum acceptable standard of quality  
for number of pedestrians-per-viewscape on a city greenway  
(24 pedestrians per 300 square meters of path)





Visual simulation of minimum acceptable standard of quality  
for number of pedestrians-per-viewscape on a village greenway  
(18 pedestrians per 300 square meters of path)



Visual simulation of minimum acceptable standard of quality  
for number of pedestrians-per-viewscape on a park greenway  
(12 pedestrians per 300 square meters of path\*)



\*The path shown in this photo is twice as wide as the path shown in the previous two photos, therefore 24 pedestrians per 600 square meters of path are actually shown.

