

Review

Outdoor recreation planning: a comprehensive approach to understanding use interaction

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Abstract

Growing demands for outdoor recreation have led to increased levels of crowding, displacement, competition and antagonism among alternative recreational uses. Recreational activities interact with differing degrees of compatibility resulting in various outcomes. In this review, we critique the relevant literature on recreation conflict, use compatibility and additivity with a focus on the interaction that takes place among alternative recreational uses. Results suggest that the literature is replete with theoretical and empirical studies focused on recreational conflict, while more comprehensive interaction types remain less studied and, in general, lacking overarching conceptual and analytical approaches. Further, there exists a need to link comprehensive approaches that address recreational use interaction with empirical analyses and management-specific strategies that allow for proactive planned outcomes that are positive-sum. We forward an approach to recreation planning that focuses on managing for relative compatibilities that involves maximizing those uses thought to be complementary and supplementary, while segregating and/or regulating those uses that are competitive and antagonistic.

Keywords: Compatibility, Conflict, Dispute, Outdoor recreation planning, Leisure, Management, User groups, Complements, Supplements, Competitive, Antagonistic

Introduction and Scope

As demands for outdoor recreation have grown, conflict among uses becomes an increasingly important issue of public recreation policy and management planning. Two alternative venues for conflict require continued and increasingly creative management input for those charged with prioritizing scarce public resources. The first venue of interaction is that which arises between outdoor recreation and other forms of land use [1]. This inter-use interaction has affected how open space develops and is represented by contentions between disparate land uses. Examples include land use choices that exist between residential development, commodity production and outdoor recreation. Within each primary use, however, there exists a rich heterogeneity of individual interactions leading to a second type of use interaction. This intra-use

interaction grows as a result of a finite resource base combined with both increased aggregate demand for outdoor recreation [2] and technological change that allows new forms of outdoor recreation, such as geo-caching, all-terrain vehicle use, and jet skiing to proliferate [3, 4].

Without diminishing the contextual importance of inter-use compatibility, the focus of the work reported here is on this latter challenge of how to understand, plan for, and manage interactions between recreational users. This review provides a snapshot and critical perspective of the past 25 years of applied research in outdoor recreation and leisure science. Further, it informs and analytically extends related concepts of land resource and environmental economics. In particular, our approach to recreational use interaction builds on the concept of relative land-use compatibilities developed by Clawson [1]

Table 1 Interaction types, characteristics, outcomes and recreation examples

Interaction type	Key characteristic	Outcome	Example
Complementary	Increasing rates of return with increased use	Positive sum and symbiotic – growing	Canoeing and fishing
Supplementary	Neutral interaction	Positive sum – linear and additive	Hiking and horseback riding
Competitive	Decreasing rates of return with increased use	Trending toward zero sum – conflictive	Fishing and jetskiing
Antagonistic	Any activity of one drives the other to zero	Negative sum – strongly conflictive and/or inimical	Wilderness camping and ATV riding

and incorporates multiple-use, joint-production trade-off concepts of van Kooten [5], formalized as multi-product ‘additivity’ in the environmental economics literature [6, 7].

Broadly speaking, this approach forwards the more comprehensive notion that positive outcomes result when interaction between recreation types is complementary (increasing benefits with increased use) or supplementary (neutral interaction with increased use). Negative outcomes result when interaction between recreational users is competitive (decreasing benefits with increased use) or antagonistic (when the presence of one activity does not allow the other to occur). Competitive and antagonistic interactions between recreational users (resulting in conflict) can be understood as representing relative levels of incompatibility between alternative recreation uses. While clearly dependent on many factors, specific forms of recreation are more able to interact in supplementary or complementary ways (without conflict) with some forms of recreation than they can with others.

Characteristics, outcomes and examples for each interaction type are shown in Table 1. To state the obvious, the challenge for recreation planners and land managers involves managing group interaction with an eye towards maximizing complementary and supplemental uses, whereas minimizing those which result in competition or antagonism. To be sure, this is easier said than done.

Conceptually, this framework extends contemporary approaches to conflict management, where competition and antagonism are recognized as inevitable elements of outdoor recreation but recognizes the opportunities that exist to stimulate positive-sum outcomes. Recreation management, planning and research are focused on developing opportunities that adapt to carrying capacity constraints and that allow users to cope with and respond to conflict [8].

There is a significant body of literature that has dealt with subjects, such as the definition of recreation conflict, theories of recreation conflict, the determinants of recreation conflict, coping behaviours and recreation conflict management. This review acts to summarize the literature relating to these conflict elements as a subset of the broader research interests in compatibility and use interaction in outdoor recreation. The scope of the

review was limited to the applied research relevant to managing outdoor recreation using a comprehensive definition of recreational compatibility. Although our intent was to capture the literature on recreational use interaction broadly defined, it is important to note that the exhaustive search yielded literature focused heavily on managing conflict and alleviation of negative interaction outcomes. Literature that addressed interaction resulting in positive or neutral outcomes (complementary and or supplementary) and approaches to consideration of a broader definition of recreational use interaction is more limited; notably lacking were analytical frameworks and management-specific approaches based upon a more comprehensive understanding of use interaction. The review focuses on how outdoor recreation conflict has been understood and researched from a wide range of disciplines. Specific areas of focus included the theories and models of recreation use interaction, compatibility, conflict, crowding, carrying capacity, coping, norms, managing recreation use interaction and economic additivity.

Previous research into outdoor recreation use interaction is most firmly rooted in the behavioural sciences of psychology, sociology and leisure sciences, and within the study of tourism and recreation. However, in the interest of our focus on compatibility and an analytical framework, we have extended the scope to include the related research disciplines of land economics, environmental economics, landscape ecology, resource management and land-use planning. In these cases, we were searching for research that delved into the subject of relative compatibilities among alternative uses from the general perspective of tradeoffs resulting from joint production of multiple recreation types. The Web of Knowledge, GEOBASE and AGRICOLA databases were the most useful search engines for identifying the literature contained in this review. Specific search terms used in these datasets included *recreation*, *land-use*, *conflict*, *compatible*, *compatibilities*, *incompatible*, *incompatibilities*, *complements*, *complementary*, *competition*, *competitive* and *additivity*. Additional sources were identified from the references of key articles identified in this fashion. The time frame of our search generally corresponds to the rise of a modern view of leisure science, which began in the 1960s and

1970s. Although we attempted to focus on the recent literature (the past 10 years), there are several inclusions of earlier works from the 1970s and 1980s that represent 'classics' of the behavioural literature in leisure science. Finally, although our applications are focused within a North American context, the geographic scope of our literature search was global and spanned across land-based, coastal and water-based recreational pursuits. Geographically, our review is representative of generic approaches to recreational use interaction.

Several areas of outdoor recreation and leisure science research were deemed to fall outside of our bibliographic scope. The broad literature on: (1) developing typologies of recreation activities, (2) understanding recreation specialization, and (3) economic benefits of outdoor recreation, whereas germane to some of the research methods on recreational use interactions, do not squarely address understanding of recreational use compatibility or conflict. Similarly, there is a large body of literature on the management of outdoor recreation and we have only highlighted the work that deals with the issue of compatibility, user interaction and conflict management.

This review represents a summary of the relevant published works and is organized into four subsequent sections. First, we provide the background necessary to understand the literature that addresses outdoor recreation use interaction. This includes a critical discussion of models that attempt to explain various interaction relationships. The second section provides a review of the literature on managing recreation use interaction, compatibility and the conceptual basis resulting in a comprehensive spectrum of outcomes. The third section describes an analytical framework within which a comprehensive spectrum of use interaction can be modelled. The final section concludes with a discussion of what was learned from our review of the literature and forwards an expanded and more comprehensive model of recreational use interaction.

Understanding the Nature of Recreational Use Interaction

The predominant form of use interaction addressed in the leisure science and outdoor recreation literature involves competitive and antagonistic interactions, which result in outcomes characterized by conflict. A general lack of an overarching theoretical model on user compatibility combined with a dearth of both comprehensive approaches to compatibility and clearly accepted definitions of outdoor recreation interaction type has led to: (1) challenges in comparing research results, (2) ineffective metrics that characterize recreational use interaction and (3) inconsistencies in recreation management strategies [8, 9]. Our use of the term 'metrics' here relates to the focus within the literature on determinants to conflict sensitivity. A more comprehensive approach to

recreational use interaction, while acknowledging the importance of conflict, extends alternative metrics that focus on joint production outcomes, rather than conflict determinants. This would have the benefits of allowing comparisons among alternative user interactions with outcome as a basis.

The most commonly used definition of outdoor recreation use interaction focuses on conflict and was proposed by Jacob and Schreyer [10], where conflict is defined as goal interference attributed to another's behaviour. This definition emphasizes that conflict arises when the pursuit of one or more of an individual's recreation experience goals encounters interference with the activities pursued by other individuals. Furthermore, the individual must be able to attribute the source of conflict to another individual's behaviour. The need for some kind of interaction to occur between individuals has led to this type of conflict to be called 'interpersonal' conflict [11, 12]. However, interpersonal conflict can occur between any combination of recreation users, recreation planners and local community members [13].

Based on the research at the time, Jacob and Schreyer [10] postulated four different factors behind recreation conflicts. These included: (1) *activity style* – the various personal meanings assigned to an activity, (2) *resource specificity* – the significance attached to using a specific recreation resource or recreation area, (3) *mode of experience* – the varying expectations of how the natural environment will be perceived, which is often related to the use of technology, and (4) *lifestyle tolerance* – the tendency to accept or reject lifestyles different from one's own. Subsequent research has focused on validating these premises and, in general, suggests mixed support for these conflict antecedents [4, 14–19]. In some cases, researchers have suggested other variables that should be added to the model including specific topics such as safety [20] or philosophical appropriateness [21]. Watson *et al.* [22] found support for the goal interference model of conflict, but found that the strongest determinant of conflict was individual attitudes towards encountering other types of recreation groups.

Manning [23–27] provides a synthesis of this modelling literature through the use of what is commonly referred to as a 'goal interference model' of recreation conflict. This is schematically presented in Figure 1. In this model, the four variables postulated by Jacob and Schreyer remain, but these are seen as simply setting the pre-conditions for conflict. These four variables determine the sensitivity to conflict, and other catalysing factors or stimuli are needed to actually create conflict. These catalysing factors may be both interpersonal and/or are the result of differing social values. Whether the conflict leads to diminished satisfaction is largely dependent on whether the recreation users engage in coping behaviours.

Note from the figure that several conflict determinants and goal interference lead to conflict sensitivity. Interestingly, this one-way explanatory model of user interaction

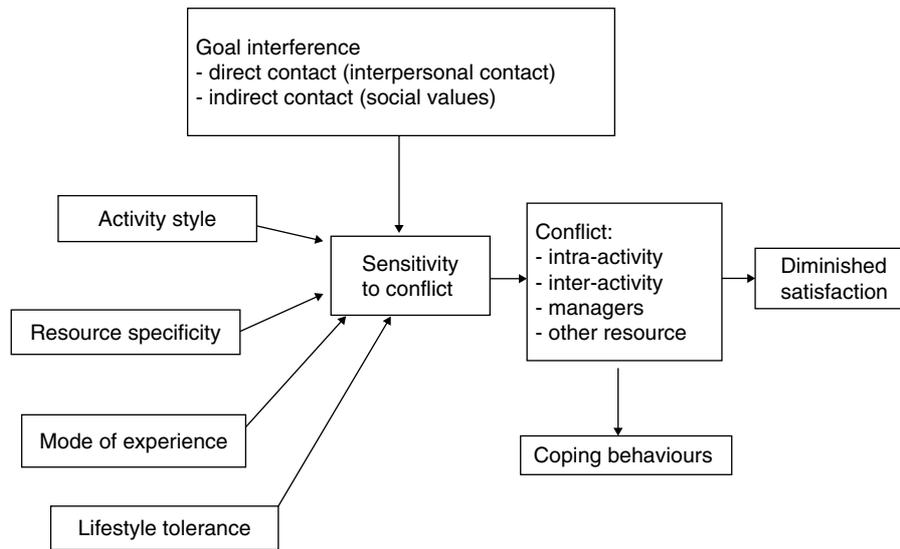


Figure 1 A goal interference model of recreation conflict (adapted from [26])

focuses solely on that type of interaction that is represented by conflict while omitting broader types of recreational use interaction (e.g. complementary forms of use interaction). Thus, the only types of outcomes well represented by this model are diminished satisfaction and/or a coping with conflict outcome. Clearly, this suggests the need for a more comprehensive approach to recreation compatibility. Further, the general lack of planning input limits the model's applicability to resource planning and recreation management. This is particularly so if planning attempts to pro-actively manage for the type and extent of use interaction.

Goal interference as a model of use interaction stands in contrast to another popular theory of recreation conflict, which attributes competition and antagonism of alternative recreational users (conflict) to differences in their respective social values [12, 28, 29]. In this model, interpersonal contacts need not occur as there may be conflict over recreation management activities or goals based purely on individual beliefs or values. For example, the different values people have about treatment of animals may lead to a conflict between hunters and other recreation groups even though they never interact on the land [11, 30].

There is a growing body of literature on the role of social values in helping to explain recreation use interaction. Further, there have been attempts to modify these dominant conceptual bases and suggest realistic alternatives. For example, Owens [31] suggested that recreation conflict was not the result of a single event, but rather a social process, with conflict being a negative experience occurring when competition for shared resources prevents expected benefits of participation accruing to an individual or group. Other authors have emphasized that both the goal interference and social values models only deal with the factors that lead to

conflict and the recreation user's perception of the conflict [32], rather than a comprehensive model of use interaction outcomes.

To be sure, it is important to note that models of goal interference and social values have been developed and are (purely) used to explain conflict sensitivity including perceptions of and reactions to conflict. We do not discount their usefulness as a basis to develop suitable conflict management strategies. However, to explain and extend positive or neutral interaction outcomes (complementary or supplementary interactions) as input to management planning approaches requires alternative models that explore recreation motives, expectations, norms, crowding and coping behaviours. Further, extending positive outcomes requires incorporation of planning responses that address key carrying-capacity constraints of the recreation resource itself. One of the problematic aspects of outdoor recreation use interaction research is explaining the lack of relationship that exists between conflict and satisfaction in recreation. Researchers have consistently found that visitor satisfaction can remain high despite crowding [33–37] and the presence of recreation constraints that require individual strategies such as coping [38].

Much of the literature on satisfaction and conflict is related specifically to crowding. While some researchers have tried to distinguish crowding as a concept distinct from conflict (e.g. [31]), much of the literature either does not make that distinction or is silent on the issue. Nevertheless, researchers have consistently pointed out that an individual's satisfaction with a recreation experience is based on a complex set of factors, and it is inappropriate to assume a bivariate relationship between satisfaction and conflict or crowding [23–27, 33, 39, 40]. Early crowding research focused on use levels and visitor density and its relationship to visitor satisfaction [34, 41].

Lack of relationship between these two factors led researchers to examine visitor perceptions of crowding [37, 42–44] and behavioural and cognitive responses [45–47]. Recent research has focused more on the concept of visitor encounter norms [23–27, 48–54]. That is, individuals have certain expectations about how many people they are willing to encounter during their recreation experience. Only when this norm is exceeded will encounters begin to impact the quality of their experience and potentially lead to conflict. Thus, identifying thresholds where complementary or supplementary outcomes shift to competitive outcomes become critical.

An equally important dimension to the applied research in recreational use interaction is that which deals with how individuals cope with competitive and/or antagonistic recreational uses. Stress-response models have been used as theoretical constructs to explain these types of interactions [32, 55]. Coping behaviours are a mechanism that individuals have for avoiding or minimizing the negative experiences of crowding, competition and/or antagonistic use interactions [39, 56]. Various types of coping behaviours have been documented. These include: (1) displacement to other recreation sites, within the recreation site itself or to other times of the day, week or season [35, 36, 45, 57, 58]; (2) a product shift where the individual shifts their expectation or develops a new definition for their activity more in line with current conditions [46, 47]; (3) a cognitive process of rationalization that attempts to rectify the incongruities between their expectations and the reality [2, 59]; and (4) substituting other activities that provide similar benefits to the user [60–64]. The relatively high level of coping behaviours found in outdoor recreation have led Manning and Valliere [2] to speculate whether these are 'productive' responses or are indicative of an unhealthy and ultimately dysfunctional system.

One model for coping behaviours sees them as a reaction to stress [32, 38, 55, 65]. One study found that high stress levels were more strongly related to direct action aimed at changing environmental conditions (such as talking to someone) or absolute displacement behaviours, whereas the lower stress levels were associated with cognitive coping mechanisms. Moderate stress levels were more related to substitution behaviours [55].

Research on outdoor recreation use interaction has revealed some of its unique features. Studies have consistently shown that the interactions are often asymmetrical [15, 18, 28, 66]. Those users reliant on technology for their recreation experience, such as snowmobilers, all-terrain vehicle (ATV) users, or heli-skiers, perceive less conflict than the recreation groups engaged in more silent pursuits, such as cross-country skiers, hikers, mountain climbers or canoeists.

Recent research has looked at how emotions and feelings influence perceptions of use interaction and satisfaction with recreation experiences [67, 68]. This research is based on the affect control theory which sees

happiness as based on two independent affects: positive and negative, which measure mood based on such factors as feelings of relaxation or annoyance [69, 70]. For example, cross-country skiers with recent encounters with snowmobilers had the quality of their affective experiences significantly reduced [71]. These individuals also had significantly more negative views about the extent to which noise from snowmobiles disturbed the quality of ski-touring in general.

It is important to reiterate that the applied research basis upon which to address outdoor recreation use interaction has primarily focused on competitive and antagonistic forms of interaction and approaches to ameliorate negative outcomes. It is interesting to note that our strongest critique of the use interaction modelling literature focuses on the general absence of comprehensive use compatibility models specific to recreation, their theoretical and analytical bases, and their application for a management-specific approach to recreation compatibility. Further, from a planning-response perspective, the user-interaction literature can be characterized as focusing on conflict from the perspective of the user, not the planner and recreation manager. Certainly, other outdoor-recreation planning stakeholder groups would be of interest as well. Our focus on planners and recreation managers, themselves, reflects our interest in informing those charged with affecting the outcomes of recreational-use interaction. Clearly, a more comprehensive approach to recreation use interaction would be beneficial to the study of outdoor-recreation planning, the practice of recreational site planning and the profession of outdoor-recreation management.

Use Interactions as a Basis for Outdoor-Recreation Planning

Hammit and Schneider [8] outline the history of managing use interaction in outdoor recreation. Various strategies have been proposed including: (1) managing recreation areas based on social and environmental carrying capacity [23–27, 33, 40, 72]; (2) separating uses in either time or space [3, 16]; (3) educating users and managers about the issues [21, 30, 73]; (4) being clear about the goals of management [74, 75]; and (5) providing a spectrum of different recreation opportunities [13, 23–27].

The most recent focus in management of outdoor recreation use interaction is on the application of visitor norms to set standards of quality or management targets [23–27, 60, 76]. Certainly, we recognize that while encounter norms have been a focus of attention since the pathbreaking work of Jackson [77] and its application within the recreation literature by Heberlein and Shelby [33], its incorporation into the recreation-management planning literature has been more recent. In this normative approach, a management standard can be set based

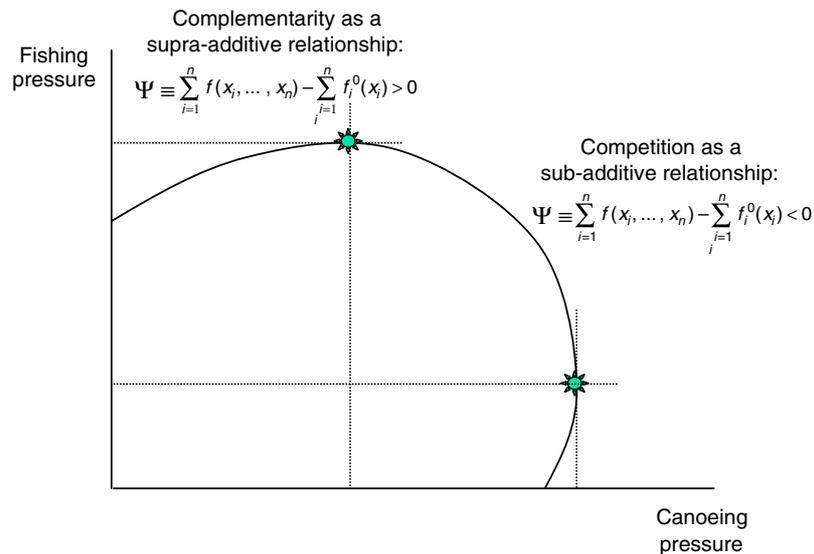


Figure 2 Transformation function with joint output levels of two recreational activities including complementary, threshold and competitive ranges assuming alternative relative compatibilities (adapted from [5])

on the social norm for a certain element, such as the number of people encountered on a trail or type of facilities required [78, 79]. Various issues have been identified in the norms research including whether everyone really has norms: termed 'norm prevalence' [50, 52, 80], how important the norms are to recreationists: termed 'norm salience' [81], and whether their norms tend towards a social norm: termed 'norm congruence' [81]. Other research has focused on appropriate measurement techniques that ensure the management standards defined by norms are defensible [51, 82, 83].

Returning to a more comprehensive set of recreational use interactions, it is important to note that application of visitor norms within a management context appears insufficient in understanding outcome metrics. Additional attributes including assessment of carrying capacity, environmental resource sensitivity, and alternative use interaction provide a link between the quality of recreational opportunities, alleviations of competitive and antagonistic outcomes, and visitor satisfaction. Notable and recent management strategies in this regard include the Limits of Acceptable Change (LAC) planning framework [84], Carrying Capacity Assessment Process (CCAP) [72], Visitor Impact Management (VIM) [85] and Visitor Experience and Resource Protection (VERP) [86, 87]. The link to recreation quality, conflict, satisfaction makes clear the meaning of norms for developing standards and mirroring of expectations of how an area should be.

Despite its introduction into the literature over 30 years ago [1] the concept of managing a wide range of outdoor-recreation activities at different scales based on an understanding of their relative compatibility needs to be more widely explored. Fundamentally, the goal interference model of conflict is based on the concept of

incompatibilities of goals [10], but it has not been used as a management tool *per se*. The Recreation Opportunity Spectrum or ROS [13, 23–27] is a conceptual framework for encouraging diversity in outdoor-recreation opportunities, but it also provides a framework for considering how to separate incompatible recreation uses and minimize conflict between competitive and/or antagonistic uses. On the other hand, it fails to provide the means for analysing relative compatibilities between alternative recreational uses, the identification of use interaction thresholds, or the development of strategies that assist planners and recreation managers in stimulating complementary uses and positive-sum outcomes.

An Analytical Framework of Recreational Use Interaction

The analysis of recreational use interactions using transformation functions that extend the work by van Kooten [5] and others provide an important means for conceptualizing different degree of compatibility and incompatibility and the value of managing for complementary and supplementary relationships. Conceptually, recreational-use compatibility can range from complementary and supplementary to competitive and antagonistic, as identified previously. The manner in which alternative uses interact is summarized in Figure 2. Complementarity reflects decreasing marginal rates of substitution between alternative recreational uses. In essence, complementarity reflects the notion that one recreational use acts to stimulate the production of another land use.

Neutral compatibility is reflective of supplementarity as shown at the point in Figure 2, where the threshold between complementarity and competitive interactions

(signified by the *) is attained. In essence, supplementary land uses exist when one land use does not impact (either positively or negatively) the other. Finally, strictly competitive interactions between recreational uses can sometimes be considered antagonistic. Antagonistic recreational use interaction exists when any recreational use precludes another. This type of interaction is not shown in Figure 2 but can be thought to consist of strict tradeoffs between two recreational uses leading to an outcome function resulting in either one, or the other use. Examples of this type of interaction include the obvious conflict between wilderness use and motorized use. In essence, antagonistic recreational uses are inimical to one another.

Environmental economists have developed a corresponding quantitative representation of this notion of compatibility in what is known as 'additivity'. Using diversity as a basis, Weitzman [7] recognized how a multivariate system relates to individual functions. In this work, alternative forms of additivity were defined. In what is termed supra-additivity, complementarity in utility is defined as increasing returns to utility by combining uses. Subadditivity, on the other hand, occurs when alternative uses are substitutes and exist with decreasing returns to utility in their combination. This can be functionally presented if we let $F(x_1, \dots, x_n)$ be a systemwide production function defined to equal the sum of individual production functions with alternative uses including n types [$f_i(x_1, \dots, x_n)$] across the system and $f_i^0(x_i)$ is the production function of individual recreational use i . Alternative forms of additivity in the system are defined as follows:

Supra-additivity exists if and only if:

$$\Psi \equiv \sum_{i=1}^n f(x_1, \dots, x_n) - \sum_{i=1}^n f_i^0(x_i) > 0. \quad (1)$$

Additivity exists if and only if:

$$\Psi \equiv \sum_{i=1}^n f(x_1, \dots, x_n) - \sum_{i=1}^n f_i^0(x_i) = 0. \quad (2)$$

Sub-additivity exists if and only if:

$$\Psi \equiv \sum_{i=1}^n f(x_1, \dots, x_n) - \sum_{i=1}^n f_i^0(x_i) < 0. \quad (3)$$

Some attempts have been made to analyse complementarity of outdoor recreation activities. For example, Hay and McConnel [88] found some evidence of complementarity between wildlife watching and hunting, whereas Fesenmaier and Lieber [89] found many examples of compatibility between different recreation types based on household recreation choices. Recent research has found reasonable levels of compatibility among a range of recreational activities and different forest harvest levels, despite vociferous public debate [90, 91]. Some

researchers investigating recreation substitutability concepts have concluded that the results of factor or cluster analysis based on participation rates or psychological benefits of recreation may actually be measuring complementary activities rather than activity substitutes [63, 64].

Towards a More Comprehensive Model of Use Interaction

Thus, our review of the literature on recreation compatibility and conflict delivered us to several interesting conclusions. First, it is apparent that the leisure science and outdoor-recreation literature on use interaction was dominated by research focused on recreation conflict. The recreation-conflict literature necessarily addressed a predefined set of outcomes that provided an incomplete picture of recreational-use interaction. A broader set of outcomes is necessary for the application of compatibility and use interaction models necessary for the usefulness of planners and recreation managers.

Indeed, if the scope of outcomes to use interactions are predefined as conflictive and addressed through either coping or diminished satisfaction, this overlooks the significant amount of recreational alternatives that, by and large, work well together. We offer the notion that recreation-management planning must work within and act to affect a comprehensive set of interaction outcomes. An obvious policy analysis decision-rule for assessing the efficiency of planning outcomes and the effectiveness of planning practice would necessarily weigh the ability to stimulate, or maximize, supplementary and complementary use interactions with the ability to ameliorate, or minimize, competitive and antagonistic use interactions. This necessitates a more comprehensive model of recreation use interaction.

Further, it is apparent that if we are interested in management-specific options for improving the manner in which planning is applied to recreation-management activities, there is a strong need to account for the role of management-specific activities in determining the sensitivity to conflict, resulting types of recreational interaction and their respective outcomes.

To this end, we offer an expanded goal interference model of recreation interaction as shown in Figure 3. Note that this expanded goal interference model is consistent with its predecessor and includes all the elements found in the original model (from [23–27] as outlined in Figure 1) but is expanded to include a more comprehensive set of interaction outcomes.

Our initial extension begins with the shaded elements found in Figure 3. Namely, we add three generic categories of specific management or planning inputs into the expanded model that incorporates the ability of: (1) interpretation, (2) adaptive site planning, and (3) recreational technologies as key elements that determine

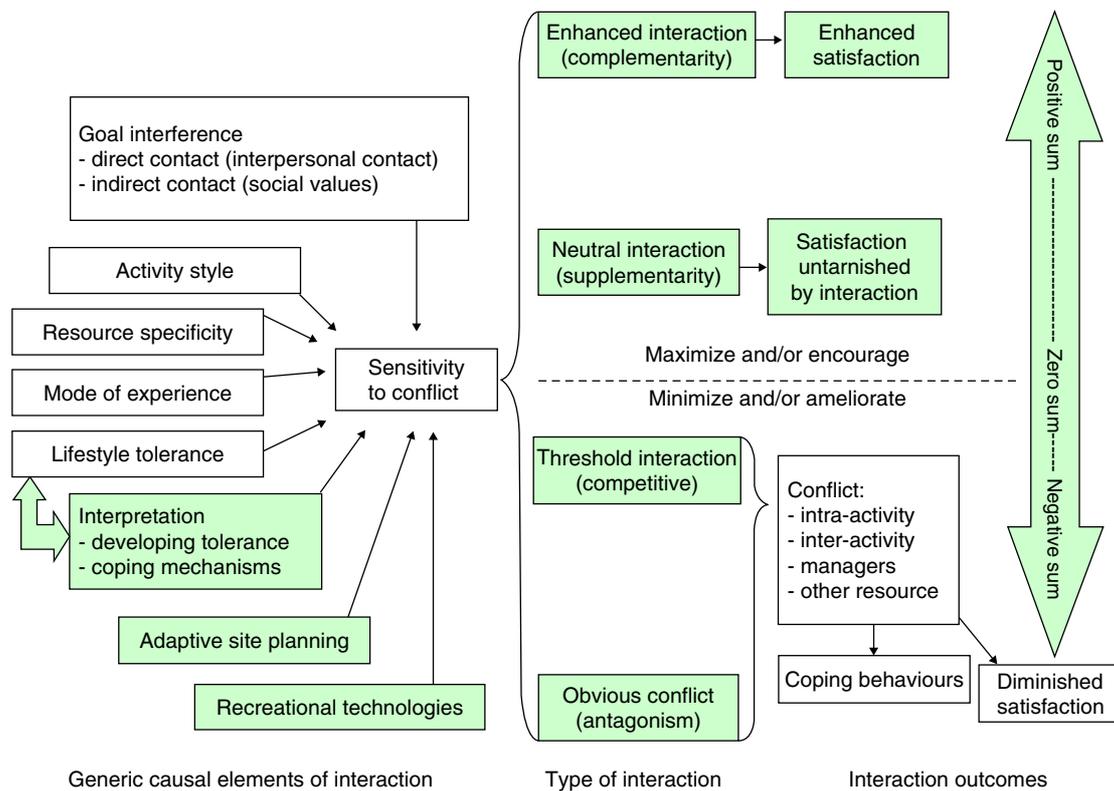


Figure 3 An expanded goal interference model of recreation interaction that provides a spectrum of outcomes and is tied to planning input

sensitivity to ‘conflict’. Interpretation is an underlying planning element that can aid in visitor understanding of the recreational experience. Key interpretive elements that can directly affect sensitivity to conflict involve providing information to assist in visitor tolerance and the development of suitable coping mechanisms. Adaptive site planning assists in increasing site carrying capacities to alleviate competitive and antagonistic outcomes and stimulate supplemental and complementary interactions. Obvious examples of this include the ability of recreation planners to develop sites that segregate problematic uses in a manner which allows simultaneous provision of competitive and antagonistic uses. Finally, existing recreation technologies often serve as an important basis for conflict. Obvious examples include noise and exhaust issues from motorized recreational implements and the ability of new technologies (four-stroke engines, electric storage devices, etc.) to minimize the external influences associated with their recreational use. Planning can provide incentives and/or regulations that provide the framework for less conflict-ridden uses of recreational technologies.

We retain the term ‘conflict’ only out of deference to the original framework. We would argue that this would be better termed ‘sensitivity to alternative recreational interactions’ thus accounting for the comprehensive nature of an expanded model. We no longer present a model constrained by interaction antecedents that predefine or

limit the scope to competition and antagonistic (conflict) outcomes. Indeed, much recreational interaction can be considered supplementary and/or complementary. These types of interactions leading to positive outcomes would logically be addressed through planning and recreation management as warranting close scrutiny and encouragement. In this manner, we can view planning as a key element of maximizing the positive-sum outcomes while actively addressing those uses in conflict through the minimization of antagonistic and competitive outcomes.

Note from Figure 3 that interaction outcomes now span the entire range of positive and negative results. Further, they are tied to management inputs that are under the direct control of recreation planners and proactive-recreation policies. This said, we readily admit to several important caveats to this expanded model. Like its predecessor, it presents a stylized and dramatic oversimplification of the complex nature of recreation use interaction. Certainly, there is ample room for further elaboration of specific elements of the expanded model to more fully operationalize this model of recreation use interaction. Further, we admit to providing only a starting point for strategic elements (e.g. adaptive site planning, interpretation and recreation technologies) that can further aid in the practice of management planning with an eye toward affecting positive-sum outcomes.

Also, while acknowledging a more comprehensive spectrum of outcomes, this expanded model oversimplifies the

complex nature of use interaction. For example, much of the norms and coping literature would readily accept the fact that thresholds exist for ALL joint production possibilities. Indeed, if pushed to the extreme, even the most complementary activities will turn toward competitive interactions. Anyone who has recreated on an overcrowded lake will attest to this phenomenon of interaction thresholds.

Further, leisure science and outdoor-recreation research is needed to more fully capture the essence of use interaction. Continual extensions of the carrying capacity and recreation opportunity spectrum research will allow for better and more accurate targeting of specific planning approaches (e.g. segregation and regulation) to ameliorate competitive and antagonistic outcomes. Additionally, this type of further research can aid in the identification of thresholds of appropriate use.

An integrated approach to future leisure-science research can more fully capture the synergistic concepts being developed within other related disciplines. In particular, there is ample opportunity to incorporate environmental economics concepts into extended, integrative leisure-science research. Namely, developing useful models to test efficiency and effectiveness of recreation planning can aid in the development of sound policy–decision rules that act to stimulate, encourage and maximize positive–interaction outcomes while ameliorating and minimizing those interactions resulting in negative outcomes.

Demands for increased recreational uses of our natural landscapes and expanded forms of outdoor recreation appear as inevitable; most probably at an expanded rate given rapid socio-demographic, economic and technological changes. Match this with the notion that our supply of recreational opportunities is, at best, severely constrained, and it becomes clear that the time for a comprehensive approach to managing use interaction is upon us. This would appear to be an understatement of the supply crisis facing recreation planners today. Adding the needed landscapes to meet recreation-based demands are in direct competition with increased demands for residential, commercial, industrial and commodity uses of land. If the recent past can be used as a basis, the manner in which land use alternatives compete provides context for our future dilemma. Indeed, from a macro perspective, both intra-use and inter-use interactions dictate a need for new, proactive and creative approaches to land use and recreation planning. While much is known about recreation use interaction, there is a clear need for further work to assist in the critical planning needed for proactive management.

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