United States
Department of
Agriculture

Forest Service

Intermountain
Research Station

Research Paper

November 1993

Hikers and Recreational Stock Users: Predicting and Managing Recreation Conflicts in Three Wildernesses

Alan E. Watson
Michael J. Niccolucci
Daniel R. Williams

THE AUTHORS

ALAN E. WATSON is research social scientist with the Aldo Leopold Wilderness Research Institute on the University of Montana campus, Missoula. He was educated at the School of Forestry and Wildlife Resources, Virginia Polytechnic Institute and State University, where he received a Ph.D. degree in 1983. His research interests are primarily in the area of wilderness experience quality, including the influences of solitude, conflict between different types of visitors, and resource impacts.

MICHAEL J. NICCOLUCCI is an economist with the Intermountain Research Station's Economics Research Work Unit at the Forestry Sciences Laboratory on the University of Montana campus, Missoula. He studied economics at the University of Montana, Missoula, where he earned an M.A. degree. He specializes in econometric and quantitative analysis.

DANIEL R. WILLIAMS is assistant professor of forest recreation, Department of Forestry, Virginia Polytechnic Institute and State University, Blacksburg. He received his B.S. degree from the University of Nevada, Reno; his M.S. degree from Utah State University, Logan; and his Ph.D. degree (1984) in forest recreation from the University of Minnesota, St. Paul. He has written extensively on outdoor recreation behavior, particularly the role of experience on recreation motivation and choice.

RESEARCH SUMMARY

A long-term problem that continues to grow in many wildland areas is the displeasure hikers express about meeting recreational livestock (primarily horses and mules) and seeing impacts from stock use. Three studies were conducted to provide a broad look at this interaction in wilderness and some of the contributors to the conflict between hikers and horse users. Studies were conducted at the John Muir Wilderness in the Sierra and Inyo National Forests, at the Sequoia-Kings Canyon National Parks in California, and at the Charles C. Deam Wilderness in the Wayne-Hoosier National Forest in Indiana.

Not all hikers dislike encountering horses in wilderness. Based on values hikers have for wilderness and their perceptions of horse users, models developed during the study can predict with more than 80 percent success (87 percent at the Deam Wilderness) whether hikers will experience conflict when they encounter horses. Twenty percent of Deam hikers who encountered horses on their visit enjoyed meeting them. About half of all hikers who encountered horses reported they did not mind meeting them in the wilderness. From 25 to 40 percent of hikers at these three wildernesses did not encounter horses on their trips. Whether this occurred by chance or is evidence they tried to avoid meeting horses is not known. At the Deam Wilderness nearly one-fourth of hikers and horse riders disliked encountering groups with dogs. At this wilderness, the only one where we asked visitors whether they liked encountering dogs, the social conflict related to such encounters equals or exceeds that of hikers encountering horses.

Strong, consistent predictors of conflict between hikers and horse users were general feelings of inappropriateness of horse use in wilderness, differences in perceptions of visitors' status related to horse use, differences in the strength of attachment to the wilderness, and the value placed on opportunities for solitude. About half the hikers indicated that the behaviors of others interfered with their wilderness experiences, though only about half of those identified horse groups as interfering. At the John Muir and Sequoia-Kings Canyon Wildernesses the majority of the behaviors creating conflict for hikers were horses defecating in places where hikers have to walk, noisy stock groups, and rude stock groups. Deam hikers were similar, but they had fewer complaints about manure and more complaints about horse-related trail damage.

The management option of separating uses by providing some trails for hikers only is generally supported by hikers, but not by horse users, at these three wildernesses. While persuasive and educational messages may reduce conflict between hikers and horse users, if managers fail to reduce the number of encounters that create conflict or impacts of horse use that hikers label as inappropriate, they may find some restrictions on horse use to be necessary.

CONTENTS

	Page
Introduction	1
Measuring Conflict	2
Potential Determinants of Conflict	3
Methods	4
Study Areas	4
Sampling Procedures	4
Measures	5
Analysis Procedures	6
Results	7
Characteristics of the Sample	7
Definition of Place	14
Specialization Level	19
Focus of Trip/Expectations	22
Lifestyle Tolerance	23
Relative Contributions of Potential Conflict Predictors	25
Discussion of Results	31
References	34

Hikers and Recreational Stock Users: Predicting and Managing Recreation Conflicts in Three Wildernesses

Alan E. Watson
Michael J. Niccolucci
Daniel R. Williams

INTRODUCTION

Horse use is well established in many western wilderness areas. The proportion of horse use by outfitters and guides, compared to use of privately owned stock, varies from area to area, as does the proportion of horse use to hiker use. In one area where trends have been studied, the Bob Marshall Wilderness Complex, the relative proportion of horse use decreased from 1970 to 1982 (Lucas 1985). However, actual horse use had not decreased; in fact, horse use increased by 20 percent. Hiking use had grown much faster (nearly doubled). With this overall increase in wilderness use came a substantially greater number of reports of hiker conflict with horse use.

In some western areas, particularly the wildernesses along the crest of the Sierra Nevadas in California, visitor-use quota systems have been in place for several years to control the impacts of overuse. Though some use restrictions exist, conflict between horse use and the many visitors who rely solely on their feet to gain access to remote wildlands often confronts managers (McClaran 1989; Snyder 19661. Hikers have complained in letters about their perceptions of unacceptable impacts to trails, campsites, and meadows (fig. 1) in many of these areas, as well as unpleasant confrontations with horses and horse users along trails and around campsites (fig. 2). Many of the complaints suggest that horse use and its associated impacts are not appropriate for these areas and that the managing agency should take some action to eliminate it or reduce its impacts. Absher and Absher (1979) reported that less than 15 percent of hiking parties surveyed in a Sierra Nevada study approved of horses as a means of recreational travel.

In the Eastern United States, horse use appears to be growing in many areas. No accurate horse-use statistics exist for eastern wildernesses, but managers report that environmental damage related to horse use and concern by hiker groups about these impacts are increasing. Many hikers perceive that horse use in some of the relatively small wildernesses in the East and South (mostly ranging from 12,000 to 35,000 acres) is incompatible with the goals of ecosystem preservation and maintaining opportunities to experience the special qualities of wilderness recreation, such as solitude. At some areas, horses are restricted from some hiker trails. For the most part, however, horse use is not restricted in wilderness. This is probably related to our National Wilderness Preservation System's heritage; the system largely grew out of the desire to preserve skills associated with horsemanship and packtrain travel (Leopold 1966). Historically, wilderness managers and horse users have seen horse use of wilderness as appropriate, in most cases.

Horse-related impacts to wilderness are important for other reasons. In addition to maintaining the recreational values of wilderness, the Wilderness Act (P.L. 88-577) requires managers to maintain natural conditions and the educational and scientific values that wilderness provides. When stock use occurs in

Figure I- Hikers sometimes perceive that horses cause unacceptable impacts to wilderness trails, campsites, and meadows.

Figure 2 - Hikers sometimes complain about unpleasant confrontations with horses and horse users along trails and around campsites.

wilderness, high environmental, social, and maintenance costs might be expected with this activity that benefits a relatively small proportion of the visitors (Cole 1990).

This report will help managers and researchers better understand the differences and similarities between wilderness hikers and stock users, and the role these characteristics play in the conflict reported between the two groups. Although this conflict has occurred for many years in some places, it is a rather new problem that is anticipated to grow in other parts of the country. It would be difficult to imagine eliminating this conflict. As long as horse use and hiker use occur in the same area, the potential exists for negative interaction. Approaches to help manage this conflict include using persuasive communication to change inappropriate or unacceptable behaviors, discouraging use at certain times when competition between the horse users and hikers is likely to be high, separating the uses in order to avoid conflict, changing each group's perception of the other group, and changing each group's expectations about interactions with the other group. More direct options include using regulations to separate uses physically or temporally, or limiting or reducing use. Each potential solution has its own cost, however. This research is aimed at learning enough about these two groups, their interactions, and their perceptions of each other to evaluate potential management solutions.

Measuring Conflict

Psychology literature is the parent discipline for interpersonal conflict research. It contains an abundance of examples where the concept of interpersonal conflict has been examined. Unfortunately, one of the leading criticisms of this line of investigation is the problem of comparing research findings because of differences in definitions and ways to conceptualize conflict (Wall and others 1987). Conflict has been defined as anything from intellectual disagreement to physical violence (Thomas 1976).

Jacob and Schreyer (1980) offered a theoretical basis for studying conflict in the recreation setting. They defined conflict for an individual as goal interference attributed to another's behavior. Within this definition, conflict is not an objective state but must be understood as an individual's interpretation and evaluation of past and future social contacts. This definition is based on assumptions that recreation behavior is influenced by expected achievement of defined goals, and interference with these goals leads to the perception of conflict. Gramann and Burdge (1981) found only weak support for these assumptions, however.

Historically, the recreation literature has focused on estimating the extent of conflict between specific activity groups (Adelman and others 1982; Brewer and Fulton 1973; Knopp and Tyger 1973; Lime 1975, 1977; Lucas 1964; McCay and Moeller 1976; Shelby 1975; Stankey 1973; Watson and others 1991). This has commonly been done through a set of forced-choice questions in which respondents were asked to evaluate specific encounters (enjoyed, disliked, or did not mind meeting other types of users) or by obtaining an indication of a more general attitude toward encountering other group types based on a multiple-point scale anchored by "very desirable" and "very undesirable."

The most consistent finding from this research has been that responses were generally asymmetric, or one sided; negative evaluations were expressed by only one of the groups involved, or one group expressed negative evaluations to a greater extent. This has persisted, at least for canoe paddlers and motorcraft users in the Boundary Waters Canoe Area Wilderness (Adelman and others 19821, where two studies nearly 20 years apart using forced-choice questions found similar asymmetrical conflict situations.

Jacob and Schreyer (1980) believed that "social contact" is a necessary condition for conflict. Social contact, however, may consist only of knowledge of another's behavior, requiring differentiation between direct and indirect social contact. Jacob and Schreyer illustrated indirect social contact through the example of seeing a tent but not having a face-to-face contact with its occupant. The concept of indirect contact could be extended to include behaviors that leave visible impacts, such as a campsite that shows considerable damage from poor previous stock

handling practices. Jacob and Schreyer did not offer a specific method of measuring conflict.

The recreation conflict literature has tended to equate expressions of enjoy/dislike and desirable/ undesirable with conflict. It is not clear that these expressions measure conflict. In fact, references by Adelman and others (1982) suggest that the measure of enjoy/dislike focuses more on positive interaction (attraction theory) than may be desirable for a measure of conflict (which is more closely related to discrepancy or reactance theories). The most specific definition of recreation conflict appears in Jacob and Schreyer (1980). The standard enjoy/dislike or desirable/undesirable measures do not precisely fit this definition. Therefore, this research will use the standard enjoy/dislike and desirable/undesirable measures so the hiker/stock user conflicts reported here can be compared with others that have been investigated, but we will also present measures of conflict in a manner more compatible with the definition offered by Jacob and Schreyer.

Potential Determinants of Conflict

According to Jacob and Schreyer (1980), four factors may lead to conflict. One is the difference in the degree to which groups or individuals are attached to the recreation place. A sense of possession or perception of the place as a "central life interest" commonly exists among users who become "attached" to the resource. In contrast to central life interests, there are mandatory behaviors and settings, such as work, for which the individual may feel little ego involvement. Work is often viewed only as a means to achieve the central life interest-the behavior or setting that provides substantial personal reward. The degree to which a particular activity or place is a central life interest can vary substantially between groups using an area, even when the groups are participating in the same activity. Thus, either backpackers or stock users may feel more attached to the area or the activity than the competing group, or at least perceive that "interfering" groups are less attached.

The second factor possibly linked to conflict is variation in the personal meanings, or inner significance, visitors attach to particular activities. A more specialized visitor (Bryan 1977), with more well-developed meanings for the activity is said to have an "intense activity style" (Jacob and Schreyer 1980). More specialized participants in an activity are believed to apply more specific norms of proper behavior to other participants. If you put an avid fly fisherman (someone with a highly specialized, intense activity style) along a river beside someone who is plopping orange and yellow bobbers and a worm on a hook into the same pool, there is high potential for conflict. The conflict is in "activity style intensity," not necessarily in interference with catching fish. Jacob and Schreyer (1980) propose that "the more specialized the participant, the greater the likelihood a social interaction with low specialized participants will result in conflict."

A status hierarchy is often associated with specialized activity styles. Such status hierarchies in recreation are often based on possessing equipment and expertise; the more specialized participants use enviable equipment and techniques. In the snowmobile studies, power, noise, and brand name identification provided considerable satisfaction to the owner or user because they were perceived to indicate high status (Knapp and Tyger 1973). Cross-country skiers, who do not value these attributes, but are often forced to tolerate them, may express conflict because of this differential feeling of status. Similarly, hikers are often expected to step off the trail when meeting horse groups. Although this expectation may be to prevent horses from spooking, or damaging vegetation near the trail, the implied status hierarchy may contribute to feelings of conflict on the part of the hiker.

Another element of specialization is the amount of experience a recreation visitor has in a particular activity or in a particular type of recreation setting. Novices have little previously accumulated information to base their judgment of other groups upon. Their tolerance of certain conditions will be based on less extensive information than that possessed by the veteran user (Jacob and Schreyer 1980).

A third class of conflict determinants discussed by Jacob and Schreyer (1980) is the "mode of experience" or the aspect of the experience individuals focus on during the recreation activity and the expectations they have regarding the benefits they will receive from the experience. Jacob and Schreyer suggested recreational conflict may be influenced by the degree to which the senses are directed toward a detailed examination of the environment versus a broad, sweeping impression of the landscape. People are believed to vary in the focus of their visits based on the expectations they possess. It is also believed that those with specific expectations are more conflict prone than those with undefined or general expectations.

More recently, Williams (1988) has suggested three primary modes (focuses) of an outdoor recreation experience: activities, companions, and settings. In this framework, the setting may be central to the experience for some (entailing a detailed examination of the environment), but for others the setting may be only a backdrop for achieving particular social or activity goals.

"Lifestyle tolerance" is the last major factor that Jacob and Schreyer (1980) proposed to explain

recreational conflict. People frequently are unwilling to share resources with members of other lifestyle groups. Research on snowmobilers and cross-country skiers has demonstrated that different types of people are involved in these two activities (Knapp and Tyger 1973). Their education, job type, and income are quite different. The highly educated, professional, high-income group opts for the closer-to-nature, less expensive, more labor-intensive activity of cross-country skiing.

Owens (1985), in reviewing the recreation conflict literature, questioned if conflict is a consequence of purely social relationships and differences between users, as Jacob and Schreyer (1980) suggest, or if it might result more directly from physical influences. Maybe the competition between hikers and horse riders for space and the difficulty hikers have in avoiding impacts caused by horses are directly related to conflict. Owens points out the lack of information we have about sources of conflict and stresses the need to consider conflict as a cumulative process of social interaction, not the result of a single incident.

The potential determinants of conflict discussed by Jacob and Schreyer remain largely untested. From their discussion of a hypothetical model, and subsequent conflict research, we could label the major domains that are likely to influence conflict as (1) definition of place, (2) specialization, (3) focus of trip/expectations, and (4) lifestyle tolerance. Research has not specifically documented the relevance of these domains. Some elements within each of these domains need to be measured so their relative contribution to predicting conflict can be assessed.

METHODS

Three study areas were selected that represent some variation in horse-use patterns and user characteristics. Methods of measuring the potential conflict determinants were decided on, and a method of testing the contribution of each predictor of overall conflict was selected.

Study Areas

Two criteria were considered when selecting study areas. First, we wanted to study the conflict between hikers and horse riders at places we knew had conflicts. Second, we wanted to study this conflict in different types of wilderness to understand whether the findings could be applied more widely. Three wildernesses were chosen:

John Muir Wilderness (580,675 acres)- Located in the Inyo and Sierra National Forests in California, the John Muir Wilderness has been the subject of discussions about the conflict between horse use and backpackers for many years. In the early 1960's, backpackers made up over half of the visiting public; in addition, the area had high use of private and outfitted stock. Today some private stock use still exists, but commercial outfitters dominate the stock use. Each year, many letters report encounters that resulted in conflict between hikers and stock. Use **was** estimated at 451,400 recreation visitor days (RVD's) per year in 1986 (0.77 RVD's per acre).

Sequoia-Kings Canyon National Parks Wilderness (about 800,000 acres)-This wilderness is adjacent to the John Muir Wilderness. Many trails connect the two areas. While its terrain and its history of use are similar to that of the John Muir Wilderness, stock use is more likely to be private than outfitted in the Sequoia-Kings Canyon Wilderness. Less stock use occurs at the Sequoia-Kings Canyon Wilderness.

Charles C. Deam Wilderness (12,935 acres)- Located in the Wayne-Hoosier National Forest, this area is the only federally classified wilderness in Indiana. It was designated in 1982. Horse riders and hikers used the area before wilderness classification. High horse use occurs regularly, peaking on fall weekends. Total annual use was estimated at 20,000 RVD's for 1989 (1.55 RVD's per acre). Interactions and conflict between horse riders and hikers have led to substantial concern at the Deam. Horse riders and hikers have voluntarily segregated themselves to some extent to avoid conflict, but in public meetings the conflict between the two groups has been apparent.

Sampling Procedures

Visitors to the John Muir and Sequoia-Kings Canyon Wildernesses are required to obtain a permit before entering. Permits were systematically sampled starting from a randomly selected permit within the sampling interval, from June 1, 1990, through the end of November 1990. The last question in the 16-page questionnaire asked permit holders to provide the names and addresses of up to two group members from their trip to allow party members to be sampled. Responses were obtained from 501 visitors to the John Muir Wilderness (339 hikers and 162 stock users) (table 1). The Sequoia-Rings Canyon sample consisted of 389 visitors (307 hikers and 82 stock users) (table 1). A postcard reminder and two replacement followup questionnaires were sent to persons who did not respond. The response rate at both the John Muir and Sequoia-Kings Canyon Wildernesses was 80 percent.

A permit system is not used at the Deam Wilderness. Visitor contact was difficult because the area

Table l-Number of hikers and stock users from each area who responded to questionnaires

Area	Hikers	Stock users	Response rate
			Percent
John Muir Wilderness	339	162	80
Sequoia-Kings Canyon Wilderness	307	82	80
Charles C. Deam Wilderness	335	167	70

has few developed trailheads with parking, Visitor contact was based on a roadside interview of a sample of those who drive the road bisecting the wilderness. On randomly selected groups of days between July 1, 1990, and June 30, 1991, visitors passing either direction at one of three randomly assigned interview points were stopped briefly and interviewed. The 105 sample days included two weekday clusters (three days each) and two weekend clusters (two days each) per month, except for January through March when there was just one weekday and one weekend cluster per month. On each sample day, at a randomly selected location, traffic was stopped and interviews were conducted during two of six possible 2-hour blocks of time (between 8 a.m. and 8 p.m.), with the constraint that there be no more than 6 hours between the two time blocks chosen on one day. In the roadside surveys, 2,400 people were contacted. About 52 percent of those contacted (1,252) were driving through the area and were not there to visit the wilderness. Of those who agreed to receive and complete a mailback questionnaire, 80 percent of the horse users (167) and 66 percent of the hikers (335) returned their answers (table 1). The overall response rate was 70 percent.

Measures

Three conflict-related measures were used. First, to maintain comparability with previous recreation conflict research, each visitor had the opportunity to respond to a forced-choice conflict question. Visitors could express feelings of enjoyment, dislike, or neutrality toward encounters with various types of groups on trails in the wilderness on the recent trip. An encounter that they disliked was considered conflict. Reports of enjoyment or "didn't mind meeting them" were considered to be "no conflict." Hikers could also indicate that they did not meet stock users on this trip, and stock users could indicate that they did not meet hikers.

The more cumulative conflict attitude was appraised through a Likert-type scale response (very desirable to very undesirable) to encountering other types of groups on any wilderness trip. In this case, any level of undesirability was considered an expression of predisposition toward conflict. All other points on the scale were considered "no conflict".

A more specific measure of conflict, more in line with Jacob and Schreyer's (1980) goal interference definition and Owens' (1985) call for a cumulative measure, was a question that asked if the behavior of any other group had ever interfered with the quality of a wilderness experience at this particular place. If the respondent said yes, he or she was asked to identify the type of group that was responsible and to specify the behavior that interfered with enjoyment of the wilderness.

The remaining pages of the questionnaire consisted of items that would potentially predict why visitors responded as they did on the conflict questions. Items were selected from past conflict research or associated research that was believed to assess various aspects of each of the four principal conflict determinant categories: focus of trip/ expectations, specialization level, definition of place, and lifestyle tolerance. Each of the 17 potential predictors of conflict that were selected can be classified into one of these categories (table 2).

The 17 potential conflict predictors consisted of multiple-item scales, principally two types of summative scales, scales in which responses were summed for several items (Nunnally 1978). Most scales were of a Likert format, anchored by "strongly agree" and "strongly disagree." One scale, "importance of solitude to activity enjoyment," was based on respondents indicating the degree to which nine solitude items influenced the quality of their wilderness visits. This set of responses was recorded on a six-point scale from "not at all influential" to "influences an extreme amount."

Reliability of the summative scales was tested using inter-item correlation analysis (Nunnally 1978). Decisions on the reliability of the summative scales were based on a commonly used reliability coefficient, Cronbach's Alpha (SPSS 1990). Each scale's overall reliability was evaluated by examining the Alpha coefficient. Individual squared multiple correlation coefficients were estimated and reviewed to determine the sensitivity of Alpha to deletions of individual scale components. The highest possible Alpha, generally above 0.80, was targeted. This

Table 2-Potential conflict predictors and methods of measuring them

Causal domain	Potential predictors
Definition of place	Place identity[1] Place dependence[1] Place attachment[1] Place-specific experience, factor l[2] Place-specific experience, factor 2[2] Definition of place in solitude terms[1] Definition of place in regulation terms[1]
Specialization level	Intensity of activity style[1] Activity-associated status1 General experience, factor 3[2] Importance of solitude to activity enjoyment[3]
Focus of trip/expectations	Degree of focus on the activity[1] Degree of focus on the physical setting[1] Degree of focus on the social setting[1] Desired place characteristics[1]
Lifestyle tolerance	Perceptions of similarities between groups[1] Degree of tolerance of the other user group[1]

[1]Summative scale (strongly disagree to strongly agree).
[2]Derived by factor analysis.
[3]Summative scale (amount of influence on quality of wilderness experience, from not at all influential to an extreme amount).

guaranteed that each summative scale consisted of items that were strongly related. The summative scales were derived by adding the individual items identified by reliability analysis and dividing by the number of items in the scale to obtain an average score. Individual items that were not retained in the summative scales were entered in the predictive analysis as 13 individual items.

One departure from the summative scales was the measure of wilderness experience. Following the logic of Watson and Niccolucci (1992a), place-specific experience (number of previous visits, number of years since first visit, and average number of visits) and general experience (number of other wildernesses visited and number of visits to any wilderness in the past 12 months) were combined using factor analysis techniques. The number of factors and their composition were determined based on the size of the eigenvalues and the rotated factor pattern matrix. Based on the resulting factor structure, factor scores were generated and used as experience variables in the predictive analysis. Three factors emerged from this analysis, two with high loadings on place-specific experience measures and one with high loadings on general wilderness experience measures.

Analysis Procedures

Two types of analyses were conducted in this study of conflict. First, all variables were compared across the two potential conflict groups to gain an understanding of how similar or dissimilar hikers and horse users are at these three areas. The two groups were compared on basic use and user characteristics as well as individual items within the scales and indexes used in the conflict prediction analysis. The basic question of the extent of conflict is also addressed descriptively. Two sample t-tests and frequency tables using a chi-square measure of association were used to statistically test these comparisons.

Second, we hoped to take this analysis farther than other conflict analyses by trying to directly specify a linear model relating these potential predictors of overall conflict to the conflict evaluations given. Because the conflict measures (response variables) could be represented on nominal scales (conflict/no conflict), and the predictor variables included both interval and ratio-scale variables, discriminant analysis was selected as the appropriate statistical technique. The discriminant model uses linear combinations of potential variables to predict whether recreation users will indicate conflict or no conflict in a given situation.

A stepwise procedure (SAS 1987) was used to aid model development. We required that potential predictors be significant at the a = 0.10 level to be included and retained in the model. In some cases we retained items that were not significant to achieve consistency between models, so long as they did not reduce the model's predictive power (classification results).

Initially, the data from the wilderness areas were pooled. A discriminant model based on this pooled data set was estimated. Two indicator variables (dummy variables) representing the wilderness areas were included as independent variables. Following the procedure outlined by Neter and others (1989), the indicator variables were tested for statistical significance. The statistical significance or insignificance of the indicator variables was used to determine if the discriminant models should be based on a pooled data set or individual data sets. Statistical significance of the indicator variables would imply that the wilderness areas were different and that individual models were needed. Statistical insignificance of the indicator variables would imply that only one discriminant model should be estimated, based on data from all wilderness areas (pooled data set).

The predictive powers of the final models were measured using the cross-validation technique described in Lachenbruch and Mickey (1968) and found in SAS (1987). This technique does not require that the data be split into a set for model development and a set for model validation. Cross-validation treats the first n-l observations as the model development set and the remaining observation as the model validation set. The discriminant models were developed using the n-l observations and then used to classify the remaining observation. This was done for all observations, and the misclassification proportions resulted from this process. Also, the cross-validation error rates and error rates derived from using all observations to estimate the model were compared to determine the sensitivity of the models.

The relative importance or predictive power of the conflict predictors was based on the standardized discriminant coefficients. The interpretation of the standardized coefficients is analogous to the interpretation of standardized coefficients in regression analysis. A larger standardized coefficient, in absolute terms, suggests a higher rank order for the predictor variable.

RESULTS

Before we determine the contribution of potential conflict predictors, we will describe the samples and compare potential conflict groups for each area. This analysis will help readers understand the conflict models we produced.

Characteristics of the Sample

Method of Travel-Table 3 illustrates that private stock use was heavier in the Sequoia-Kings Canyon Wilderness (40 percent) than at the John Muir Wilderness where 78 percent of stock users were outfitted. Stock use at the Deam Wilderness was relatively homogeneous: most horse use originated from campers at the Blackwell Horse Camp, a Forest Service development (exclusion) within the boundaries of the wilderness, accessible by all-weather road. Very little overnight horse use occurred inside the wilderness. Although all hikers

Table 3-Method of travel for wilderness visitors

	John Muir Wilderness		Sequoia-Kings Canyon Wilderness		Charles C. Deam Wilderness	
	Hiker	Stock user	Hiker	Stock user	Hiker	Stock user
	percent					
Hiked, carrying own equipment	87	[1]20	99	[1]16	100	0
Hiked, leading horses, mules, or burros	0	3	0	10	0	0
Hiked, with an outfitter dropping off gear	13	0	2	0	0	0
Hiked, leading llamas	0	1	0	6	0	0
Rode on horses provided by an outfitter (dropped off to camp)	0	63	0	24	0	0
Rode on horses provided by an outfitter; outfitter personnel remained with the party	0	15	0	1	0	0
Rode on other privately owned horses	0	12	0	40	0	100
Day use	0	0	0	0	51	28
Overnight	100	100	100	100	49	72

[1]These people rode on horses provided by an outfitter, were dropped off to camp, and hiked out, carrying their own equipment. For that reason stock user column may not add to 100 percent.

in the sample at the John Muir and Sequoia-Kings Canyon Wildernesses were overnight campers, day hikers were included in the sample at the Deam. Most of the hiking use at the Deam was day use, and most places within the Deam are accessible on day hikes. For this reason, all hikers were included in comparisons.

Organization Membership - Wilderness visitors were asked if they belonged to any organizations concerned primarily with conservation or outdoor recreation activities. Although hikers were equally as likely to belong to organizations as stock users, the proportion of hikers who were members was higher in the West (about half belonged) than at the Deam (about one-third belonged) (table 4). Stock users showed consistently high membership at all the areas, with about half belonging to organizations.

Place of Residence -The John Muir stock users were about as likely to grow up in urban areas as John Muir hikers (table 4), with more than half growing up in population centers of at least 50,000 people. Sequoia-Kings Canyon stock users, however, were less likely to grow up in cities (only 24 percent from cities of 50,000 or more) than hikers (44 percent from cities of 50,000 or more). Deam stock users were extremely likely to have rural backgrounds. Only 10 percent of Deam horse users grew up in cities of 50,000 or more, while 30 percent of the hikers

Table 4-Chi-square analysis results of wilderness visitor characteristics[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- Percent -			*- Percent -*			*- Percent -*		
Organization membership			0.169			0.061			0.113
Members of conservation or outdoor recreation groups	52	45		47	58		36	43	
Not members	48	55		53	42		64	57	
Where visitors grew up			.957			<.001			<.001
On a farm or ranch	6	8		6	32		16	50	
Rural or small town	7	7		7	7		17	17	
Town (1,000-5,000 population)	10	8		8	13		12	8	
Small city (5,000-50,000 population)	26	25		35	24		25	14	
Medium city (50,000-l million population)	24	26		23	10		21	6	
Major city (over 1 million population)	27	26		21	14		9	4	
Where visitors live now			<.001			<.00l			<.001
On a farm or ranch	2	12		3	30		6	53	
Rural or small town	4	6		6	10		18	22	
Town (1 ,000-5,000 population)	6	8		4	3		8	4	
Small city (5,000-50,000 population)	19	21		19	18		35	12	
Medium city (50,000-l million population)	28	24		28	25		21	7	
Major city (over 1 million population)	42	30		40	15		11	1	
Education levels			.149			.249			<.001
High school graduate or less education	7	11		10	15		36	65	
Some college	17	23		18	24		24	19	
College graduate (BS/BA)	23	20		23	18		16	9	
Graduate study	52	46		49	43		24	7	
Are you still a student?			.049			.065			<.00l
Yes	20	12		23	12		29	8	
No	80	88		77	88		71	92	
Annual household income			.021			.356			.172
Less than $25,000	12	7		23	15		44	37	
$25,000-$34,999	13	8		14	13		18	28	
$35,000-$49,999	18	15		21	18		22	21	
$50,000-$74,999	29	29		20	24		13	9	
$75,000-$100,000	12	18		9	15		3	4	
More than $100,000	15	24		13	15		1	1	

[1]H = hiker; SU = stock user; Sign. = level of significance.

Table 5 - Wilderness visitor group size comparisons[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- - *Mean* - -			- - *Mean* - -			- *Mean* - -		
Group size comparison	3.7	5.0	<0.00l	2.8	4.4	<0.00l	2.6	3.6	<0.001
	- Percent -			- Percent -			- Percent -		
One-person group	11	3		21	6		23	13	
Two-person group	43	26		47	1 9		47	38	
Three- to four-person group	23	30		21	45		20	28	
More than four-person group	23	41		11	3 0		10	21	

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.

did. Stock users at all areas showed significantly more current rural residence than did hikers (table 4), with the Deam stock users far more likely to live in rural areas than the hikers. Wilderness visitors in California tend to live in more urban. environments than those where they grew up. Deam visitors do not show this tendency; in fact, stock users currently live in areas that are at least as rural as those where they grew up.

Education - Education levels of hikers and stock users were similar for the two Sierra Nevada wildernesses. These visitors were extremely well educated, with nearly half indicating some graduate study (table 4). Deam visitors generally had less formal education, particularly stock users, 65 percent of whom had the equivalent of a high school education or less. Across all three areas hikers were more likely to be students (20 to 29 percent) than were stock users (8 to 12 percent). Only 40 percent of Deam hikers and less than 20 percent of Deam stock users graduated from college.

Income - Stock users at the John Muir Wilderness reported higher levels of annual household income than hikers; these differences were not significant at the other two study areas (table 4). Regional differences in income, from California to Indiana, were apparent, though they may also be related to differences in education levels.

Trip Characteristics- Some significant differences in the characteristics of wilderness trips were found between hikers and stock users. Average stock parties were significantly larger than hiker groups (table 5). Nearly half of hiker groups at all areas were two-person groups. Nearly three-fourths of western horse user groups were groups of more than two people. Two-person horse groups were more common in the Deam Wilderness than in the other areas.

The length of stay is likely to be longer for horse parties than hiker groups (table 6). Stock users also reported seeing significantly fewer groups of people per day in the wildernesses than were reported by

Table 6 - Length of stay for wilderness visitors (number of nights)[1]

	John Muir Wilderness[2]			Sequoia-Kings Canyon Wilderness?			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- - *Mean* - -			- - *Mean* - -			- - *Mean* - -		
Length of stay (number of nights)	4.1	5.6	<0.00l	4.0	4.3	0.3727	0.9	4.1	0.0106
	- *Percent* -			- *Percent* -			- *Percent* -		
0 nights							54	31	
1 night	11	3		14	4		26	7	
2 nights	23	8		21	25		13	19	
3 nights	17	18		19	12		4	16	
4 to 5 nights	25	34		25	29		2	10	
More than 5 nights	24	37		21	30		1	17	

[1]H = hiker; SU = stock user; Sign. = level of significance, &test.
[2]Includes overnight users only.

hikers (table 7). Stock users also tended to have fewer encounters with others at their campsites in the Muir and Sequoia-Kings Canyon Wildernesses. This was not true at the Deam, however, where stock users had more encounters than hikers at the campsite. Extremes also tended to be higher for Deam stock users than Deam hikers, though when differences existed between California groups, extremes were highest for hikers. Stock users had the fewest encounters in the West and the most in Indiana.

There were many differences in the way hikers and stock users evaluated various problems they encountered during their visits. Hikers tended to evaluate problems as more severe than the stock users (table 8). The problems commonly evaluated as most severe by hikers were those related to horses, specifically impacts to trails, horse manure on the trails, and vegetation damaged by horses. Litter and crowding were also big problems for hikers. Stock users rated litter and human damage to vegetation as the most severe problems, but horse impacts to trails also received negative evaluations.

Most stock users and hikers in the West (71 to 85 percent) supported group size limits. Hikers were significantly more supportive of group size limits (table 9). Even though visitors to the Deam Wilderness often indicated that encountering large groups in the wilderness was a problem, most of them opposed group size limits. Hikers in the Deam were more likely to favor this measure than stock users.

Hikers recommended lower limits on group sizes in wilderness than did stock users (table 10). Median values for both groups were similar to mean scores, indicating that visitors' recommendations did not vary widely.

At the Deam, where there were no restrictions on use, hikers were more supportive of overall use restrictions, though supporters in either group were in the extreme minority (table 11). A sizable proportion (56 percent of hikers, 38 percent of stock users) would support use limits in the future if managers could convince them that the level of use is too high. Six in ten stock users did not support use limits for any reason, at any time. If use restrictions were initiated at the Deam, the least objectionable alternative overall may be rationing by charging a flat-rate user fee (table 11). Issuing permits on a first-come, first-served basis would be almost as attractive, although stock users were more strongly opposed to this alternative than hikers. Stock users, particularly, were much more opposed to the other alternatives for limiting use, such as a drawing or lottery, mail reservations, or charging higher fees for congested times and places.

Table 7- Encounters with other parties during the wilderness visit[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sian.	H	SU	Sian.	H	SU	Sign.
	- - *Mean* - -			- - *Mean* - -			- - *Mean* - -		
Groups of people seen per day	3.6	2.7	0.0422	3.4	1.9	<0.001	3.6.	2.3	0.0023
Large groups (>l0) per day	.3	.3	.7495	.2	.1	.0012	1.2	.6	.0163
Groups with horses or mules per day	.4	.5	.4852	.3	.3	.6526	.9	2.1	<0.001
Groups that camped within sight or sound per night	.7	.3	<.001	1.2	.5	<0.001	.7	5.3	<0.001
Groups that walked past campsite per day	.5	.5	.4430	.8	.6	.2143	.4	2.8	<0.001
Fewest groups of people seen in one day	2.1	1.4	.0052	2.4	1.2	<0.001	3.7	2.4	.0054
Fewest large groups seen in one day	.2	.3	.5862	.3	.1	.0693	1.4	.9	.1261
Fewest groups with horses or mules in one day	.4	.4	.6447	.3	.3	.4901	1 .0	2.7	.0224
Fewest groups that camped within sight or sound in one night	.5	.3	.0390	.7	.5	.2392	1.2	7.1	<.001
Fewest groups that walked past campsite in one day	.5	.4	.6811	.7	.8	.8439	.6	5.4	<.001
Most groups of people seen in one day	8.3	7.8	.6306	7.6	4.7	<.001	5.1	5.0	.9101
Most large groups seen in one day	1.2	1.1	.8813	.8	1 .0	.6699	1.8	2.0	.6264
Most groups with horses or mules in one day	1.5	1.9	.2916	1.0	1.2	.3461	1.5	5.1	<.001
Most groups that camped within sight or sound in one night	1.8	1.1	.0047	2.8	1.3	<.001	1.9	14.2	<.001
Most groups that walked past campsite in one day	1.8	1.7	.7263	2.7	2.2	.1818	1 .0	9.9	<.001

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.

Table 8- Evaluations of potential problems during wilderness visits [1,2]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- - *Mean* - -			- - *Mean* - -			- - *Mean* - -		
Trails heavily impacted by horses	1.5	0.7	<0.001	1.3	0.5	<0.001	1.4	0.5	<0.001
inability to get off the trail when meeting other groups	.4	.3	.0309	.5	.4	.4491	.4	.3	.6032
Horse manure on the trails	1.5	.5	<.001	1.4	.4	<.001	1.1	.1	<.001
Too many hikers on the trails	.7	.4	<.001	.6	.4	.0025	.3	.1	<.001
Too many horses on the trails	1.0	.3	<.001	.9	.3	<.001	.9	.1	<.001
Horse manure in campsites	1.0	.5	<.001	.8	.3	<.001	.6	.1	<.001
Streambank or lakeshore erosion due to stock use	1.0	.3	<.001	.8	.2	<.001	.9	.2	<.001
Horse damage to vegetation	1.1	.4	<.001	.9	.4	<.001	.8	.1	<.001
Human damage to vegetation	1.0	.8	.0379	1.0	.7	.0078	.9	.4	<.001
Not enough firewood	.6	.6	.5475	.5	.4	.3613	.3	.3	.8562
Liner	1.1	.8	<.001	1.1	.8	.0221	1.4	1.1	<.001
Rowdy people	.4	.2	.0016	.5	.2	.0015	.6	.4	<.001
Too many large groups	.6	.4	.0571	.6	.4	.0323	.5	.2	<.001
inadequate disposal of human wastes	.7	.4	<.001	.7	.4	<.001	.4	.3	.2898
Too many people in area	.7	.5	.0047	.8	.5	.0024	.5	.1	<.001
Too many people at certain places in the area	1 .0	.6	<.001	1.2	.7	<.001	.8	.2	<.001
Dogs	.4	.2	<.001	.1	.1	.1788	.4	.4	.9306
Low-flying aircraft	.5	.3	.0039	.5	.3	.0218	.3	.2	.0015
Sonic booms	.4	.2	.0112	.3	.2	.1667	.2	.1	.0678
Lakes/streams appear polluted	.4	.2	.0016	.4	.3	00371	.5	.2	<.001
Loose stock	.3	.1	<.001	.2	.1	.6379	-	-	-
Stock making noise during night	.2	0	<.001	.1	.1	.9518	-	-	-
Groups with too many horses	.7	.2	<.001	.6	.2	<.001	-	-	-

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.
[2]Scale: 0 = no problem at all; 1 = a small problem; 2 = a moderate problem; 3 = a big problem. Stock users did not stay overnight in the Deam, explaining why there are no data for problems related to overnight stays there.

Table 9- Chi-square analysis results of wilderness visitors' support for group size limits [1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- *Percent* -			- *Percent* -			- *Percent* -		
Visitor response			0.057			0.007			<0.001
Does not support group size limits	21	29		15	28		64	92	
Supports group size limits	79	71		85	72		36	8	

[1]H = hiker; SU = stock user; Sign. = level of significance.

When visitors were asked to indicate how satisfied they were with their wilderness trip, stock users in the Deam and John Muir Wildernesses had significantly more enjoyable trips than hikers (table 121, though the averages were high (good to very good) for all users at all areas. Stock users and hikers at the Sequoia-Kings Canyon Wilderness had similar evaluations of their trips.

ConflictConflict proved to be asymmetric, as had been found in previous recreation conflict research. While less then 4 percent of stock users disliked their encounters with hikers, up to 44 percent of hikers disliked encounters with horseback riders (table 13). Generally, hikers did not mind meeting other hikers, and stock users did not mind meeting other stock users on their trips. At the Deam

Table 10- Wilderness visitor recommendations for group size limits[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
Number of people in hiking parties									
Mean	10	11	0.0924	9	12	0.0034	9	13	0.2245
75th percentile	12	12		10	15		10	20	
Number of people in horse parties									
Mean	7	11	<.001	6	10	<.001	6	10	.0832
75th percentile	10	12		8	10		7	11	
Number of horses in one party									
Mean	6	13	<.001	6	13	<.001	5	10	.0332
75th percentile	8	15		8	20		6	10	

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.

Table 11 -Deam Wilderness visitors' support for use limits

	Hiker	Stock user	Significance
	----*Percent*----		
Need for controls on numbers of people using the Deam[1]			<0.001
Yes, controls needed now to lower current level of use	9	0	
Yes, controls needed now to hold use at current level	8	2	
No controls now, but in future when use gets too high	56	38	
No controls now or in the future	26	60	
	Mean		
It controls were used, how would you view each system below ?[2,3]			
issue permits on a first-come, first-served basis	-0.1	-1 .0	<0.001
issue permits by drawing or lottery basis	-1 .0	-1.5	<0.001
issue permits through a mail reservation system	-.2	-1.2	<0.001
Ration use by charging a flat rate user fee	-.4	-.6	.3005
Charge a higher fee at congested times and places	-.7	-1.2	<0.001

'Chi-square analysis.
[2]Scale: -2 = strongly oppose; -1 = oppose; 0 = neutral; 1 = favor; 2 = strongly favor.
[3]t-test comparisons of means.

Table 12- Trip satisfaction scores for wilderness visitors[1]

	Hiker	Stock user	Significance[2]
	Mean		
John Muir Wilderness	4.5	4.8	<0.001
Sequoia-Kings Canyon Wilderness	4.6	4.6	.9602
Charles C. Deam Wilderness	4.3	4.8	<0.001

[1]Scale: 1 = very poor; 2 = poor; 3 = fair; 4 = good; 5 = very good.
[2]Level of significance, r-test.

Table 13-Chi-square analysis results of intergroup encounter level and degree of enjoyment of intergroup encounters'

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- *Percent* -			- *Percent* -			- *Percent* -		
On this trip they met:									
Hikers with daypacks	88	82	0.080	90	73	<0.001	59	68	0.072
Hikers with backpacks	97	96	.428	96	98	.609	54	63	.051
Horseback riders	73	86	.001	65	80	.006	59	93	<.001
Hikers leading horses or mules	48	51	.305	37	48	.076	-	-	-
Groups with llamas	24	34	.022	21	29	.091	-	-	-
Groups with dogs	-	-	-	-	-	-	56	82	<.001
Evaluation of encounter with:									
Hikers with daypacks			.467			.773			.110
Enjoyed meeting them	36	41		36	38		40	49	
Didn't mind meeting them	61	55		60	60		58	51	
Disliked meeting them	2	4		4	2		2	0	
Hikers with backpacks			.001			.571			.112
Enjoyed meeting them	55	47		57	54		44	44	
Didn't mind meeting them	45	49		42	44		51	56	
Disliked meeting them	0	4		1	3		5	0	
Horseback riders			<.001			<.001			<.001
Enjoyed meeting them	13	39		11	57		20	82	
Didn't mind meeting them	51	58		46	38		54	22	
Disliked meeting them	36	2		44	5		27	1	
Hikers leading horses or mules			<.001			<.001			
Enjoyed meeting them	20	33		9	54		-	-	
Didn't mind meeting them	49	64		50	11		-	-	
Disliked meeting them	32	3		41	0		-	-	
Groups with llamas			.491			<.274			
Enjoyed meeting them	28	26		15	36		-	-	
Didn't mind meeting them	54	65		41	36		-	-	
Disliked meeting them	17	9		44	27		-	-	
Groups with dogs									.535
Enjoyed meeting them	-			-	-		23	28	
Didn't mind meeting them	-	-		-			49	49	
Disliked meeting them	-	-		-	-		27	22	

[1]H = hiker; SU = stock user; Sign. = level of significance.

Wilderness we also asked visitors to evaluate encounters with dogs. Hikers encountered nearly as many groups with dogs as groups with horses (table 13). Hikers and stock users were nearly as likely to dislike encounters with dogs, 27 percent for hikers and 22 percent for stock users, a level comparable to hikers' dislike for horse encounters at the Deam.

Hikers rated encounters with horses as somewhat undesirable (-0.3 to -0.7, -1 = undesirable), while stock users rated encounters with hikers as somewhat desirable (0.2 tc 0.7, 1 = desirable) (table 14). As a measure of whether there is predisposition toward conflict, further analysis of these data indicates that 53 percent of John Muir Wilderness hikers (55 percent of Sequoia-Kings Canyon Wilderness hikers and 39 percent of Charles C. Deam Wilderness hikers) indicate some level of undesirability for meeting stock users, while only 10 percent of John Muir Wilderness stock users (8 percent of Sequoia-Kings Canyon Wilderness stock users and 4 percent of Charles C. Deam Wilderness stock users) find it undesirable to meet hikers.

Significantly more hikers than stock users indicated the behavior of others had interfered with their enjoyment of the wilderness (table 15). The tremendously asymmetric relationship observed

Table 14 - Desirability of various types of encounters in wilderness [1,2]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- - *Mean* - -			- - *Mean* - -			- - *Mean* - -		
Meeting hikers with daypacks	0.3	0.2	0.0398	0.3	0.3	0.9388	0.3	0.7	<0.001
Meeting hikers with backpacks	.6	.3	<.001	.6	.5	.2240	.4	.6	.0090
Meeting horseback riders	-.7	.1	<.001	-.7	.4	<.001	-.3	1.2	<.001
Meeting hikers leading horses or mules	-.5	.1	<.001	-.6	.3	<.001	-	-	-
Meeting groups with llamas	-.3	0	.0053	-.5	0	<.001	-	-	-
Meeting groups with dogs	-	-	-	-	-	-	-.3	.3	<.001

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.
[2]Scale: -2 = very undesirable; -1 = undesirable; 0 = neutral; 1=desirable; 2 = very desirable.

Table 15 - Chi-square analysis results of goal interference with enjoyment of wilderness[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- *Percent* -			- *Percent* -			- *Percent* -		
Interference by the behavior of others	47	30	<0.001	49	38	0.091	42	22	<0.001
Interfering group									
Hikers with daypacks	14	9		11	7		14	14	
Hikers with backpacks	37	72		47	50		15	19	
Horseback riders	52	26		52	23		42	8	

[1]H = hiker; SU = stock user; Sign. = level of significance.

with other measures was not evident, however. About one-fourth of each group associated the goal interference with the opposite group at the Muir and Sequoia-Kings Canyon Wildernesses. Substantial intragroup conflict was apparent also. An asymmetric conflict relationship remained at the Deam, with 18 percent of hikers describing behaviors of stock users that interfered with enjoyment of their trips, compared to only 4 percent of stock users associating these behaviors with hikers.

The main behavior of stock users that western hikers complained about was horses defecating in places (primarily along trails) where hikers would have to walk (table 16). While the place of this behavior can be controlled somewhat by riders (if they avoid taking stock to campsites and popular lookouts), this behavior would be difficult or impossible to control along the trail. Stock groups making noise, being rude to hiker groups, and littering were the next most frequently cited problem behaviors in the West. At the Deam, making noise, doing things like short-cutting and getting off the trail, interfering with hunting, and making it difficult to pass on the trail were the behaviors most frequently cited as problems by hikers. Stock users identified noise and being rude as the primary hiker behaviors that interfered with their experiences (table 17).

Nearly two-thirds of the hikers saw impacts to the wilderness resource they attributed to the improper behavior of others, compared to less than half of the stock users, a statistically significant difference (table 18). The majority of the impacts were not attributable to a particular type of user. Generally, at least half of hikers and stock users who noticed impacts listed litter as an impact, without suggesting who had littered (table 19). Too many, or ugly, firerings were described by many western visitors as problems, as were concerns about water pollution or sanitation due to inappropriate disposal of human waste.

Definition of Place

Personal definitions of each wilderness were explored through several questions. Included in these questions were how strongly the visitors identify with the place, how dependent they are on the place, how attached they are to that particular wilderness,

Table 16 - Stock user behaviors that hikers identified as interfering with the quality of their experiences

	John Muir Wilderness *(n = 80)*		Sequoia-Kings Canyon Wilderness *(n = 76)*		Charles C. Deam Wilderness *(n = 59)*	
	Percent	*Number*	*Percent*	*Number*	*Percent*	*Number*
Horses defecating in places that hikers have to walk	34	27	43	33	-	<5
Stock groups making too much noise	30	24	18	14	25	15
Stock groups being rude	21	17	28	21	17	10
Stock groups leaving litter	14	11	8	6	15	9
Stock users having large or illegal campfires	9	7	7	5	-	<5
Stock users drinking alcohol	8	6	-	<5	-	<5
Stock users damaging trails	-	<5	-	<5	24	14
Stock users interfering with hunting	-	<5	-	<5	22	13
Hard to pass stock users on trail	-	<5	-	<5	22	13

Infrequent responses (fewer than five):

John Muir
Traveling in large groups, getting off the trail
Sequoia-Kings Canyon
Traveling in large groups, bringing too many comforts

Table 17 - Hiker behaviors that stock users identified as interfering with the quality of their experiences

	John Muir Wilderness *(n = 36)*		Sequoia-Kings Canyon Wilderness *(n =* 15)		Charles C. Deam Wilderness *(n=* 11)	
	Percent	*Number*	*Percent*	*Number*	*Percent*	*Number*
Hiking groups making too much noise	53	19	20	<5	-	<5
Hiking groups being rude	17	6	67	10	55	6
Hiking groups drinking alcohol	17	6	-	<5	-	<5

Infrequent responses (fewer than five):

John Muir
Littering, ignorant of stock
Sequoia-Kings Canyon
Littering
Charles C. Deam
Littering, camping in the trail

Table 18 - Chi-square analysis results of wilderness visitors who say impacts are attributable to improper behavior of others

	Hiker	Stock user	Sign.[1]
	- - - *Percent* - - -		
John Muir Wilderness	66	46	<0.001
Sequoia-Kings Canyon Wilderness	62	38	<.001
Charles C. Deam Wilderness	57	43	.003

[1]Sign. = level of significance.

Table 19 - Impacts described by those who noticed them

	John Muir Wilderness		Sequoia - Kings Canyon Wilderness		Charles C. Deam Wilderness	
	Percent	*Number*	*Percent*	*Number*	*Percent*	*Number*
			Hikers			
	(n = 223)		***(n =*** 191)		***(n =*** 191)	
Litter	46	103	55	105	65	124
Too many or ugly firerings	22	48	16	30	-	<5
Evidence of water pollution or concern about sanitation	18	40	18	35	-	<5
Horse damage to trails or vegetation	17	38	-	<5	24	46
General trail damage	8	18	14	27	8	15
General vegetation damage	10	23	12	23	7	14
Horse manure	7	16	-	<5	-	<5
Infrequent responses (fewer than five):						
John Muir						
Poor campsite choices, water dam, dead horse						
Sequoia-Kings Canyon						
Stock fences						
Charles C. Deam						
Off-road vehicles, campfire damage, graffiti						
			Stock Users			
	(n = 75)		*(n = 32)*		*(n =* 71)	
Litter	61	46	72	23	85	60
General trail damage	13	10	-	<5	-	<5
General vegetation damage	13	10	-	<5	7	5
Too many or ugly firerings	12	9	-	<5	4	<5
Evidence of water pollution or concern about sanitation	8	6	16	5	-	<5
Human damage to vegetation	-	<5	16	5	-	<5
Infrequent responses (fewer than five):						
John Muir						
Horse damage to vegetation, horse damage to trails, manure						
Sequoia-Kings Canyon						
Horse damage to trails						
Charles C. Deam						
Horse damage to trails, alcohol use						

their wilderness experience, and how strongly they define the wilderness in solitude terms, in regulation terms, and in general wilderness-value terms.

Place Identity, Dependence, and Attachment - Some differences exist across areas on the place identity, dependence, and attachment indexes (table 20). John Muir Wilderness visitors scored nearly the same on all three. For Sequoia-Kings Canyon Wilderness, stock users were significantly more dependent on the wilderness, more attached to it, and they showed a stronger place identity than hikers. Even greater differences emerged at the Deam Wilderness. Deam hikers were similar to hikers at the John Muir or Sequoia-Kings Canyon Wildernesses. Deam stock users, however, were very different from hikers. Stock users identified strongly with the Deam as a place, they were very dependent upon it for their recreation, and they had a strong general sense of attachment.

Place-Specific Experience, Factor l - Only at the Sequoia-Kings Canyon Wilderness did stock users average significantly more visits to the wilderness than hikers (table 21). At the Muir and Deam Wildernesses the averages were similar for the groups. The median in the West was one or two previous visits. The median number of previous visits was much higher at the Deam Wilderness. Deam and Sequoia-Kings Canyon had fewer stock users visiting the

Table 20 - Place identity, dependence, and attachment of wilderness visitors[1,2]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- - Mean - -			- - Mean - -			- - *Mean* - -		
Place identity	0.6	0.6	0.8696	0.7	0.9	0.0900	0.7	1 .1	<0.001
Place dependence	.4	.4	.4587	.4	.6	.0417	.5	1.2	<0.001
Place attachment	.5	.6	.8356	.6	.8	.1087	.7	1.1	<0.001

[1]Strength of identity, dependence, and attachment scales range from -2 to +2, with 0 = neutral.
[2]H = hiker; SU = stock user; Sign. = level of significance, r-test.

Table 21-Place specific wilderness experience, factor 1[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	_ _ _ Mean _ _ _			_ _. Mean _ _ _			_ _ _ Mean _ _ _		
Factor comparison	-0.1	0.2	0.0028	-0.1	0.3	0.0212	0	-0.1	0.1373
Previous visits to this wilderness	7.8	8.1	.8987	5.5	14.9	.0198	32.9	35.9	.5408
Average number of visits per year to this wilderness	.7	.6	.1259	.7	.9	.0127	4.5	3.7	.3315
Number of trips in past 12 months to any wilderness	4.2	3.0	.0068	4.8	3.6	.0180	11.5	12.2	.6285
	- Percent -			- Percent -			- Percent -		
Previous visits									
First visit	22	21		27	13		12	7	
One or two previous visits	27	27		27	20		12	7	
Three to eight previous visits	28	31		29	26		19	16	
More than eight previous visits	24	21		17	42		57	70	
Average number of visits per year									
One or less	86	86		82	77		38	41	
Number of trips in past 12 months to any wilderness									
This is the only one	24	35		21	27		9	10	
One other wilderness trip	20	28		17	20		12	13	
Two to four other wilderness trips	32	19		40	17		29	24	
More than four other wilderness visits	24	12		22	36		50	53	

[1]H = hiker; SU = stock user; Sign. = level of significance, r-test.

wilderness for the first time than the John Muir. Hikers at the John Muir and Sequoia-Kings Canyon Wildernesses reported more wilderness visits in the past 12 months than stock users; about one-fourth to one-third of both groups surveyed were on their only wilderness visit during that time period. Also, about one-fourth to one-third had made more than four other wilderness visits in the last year. At the Deam Wilderness, 10 percent or fewer of the hikers and stock users were on their only wilderness visit in the last year; 50% or more of both groups reported more than 4 other wilderness trips during that time. The average number of wilderness trips in the past 12 months was not significantly different for these two groups at the Deam Wilderness; however, hikers and stock users at the Deam Wilderness averaged nearly three times as many wilderness trips in the past 12 months as these groups at the western wildernesses. Hikers averaged significantly more wilderness trips than stock users at the Muir and Sequoia-Kings Canyon Wildernesses,

Place Specific Experience, Factor 2 - Stock users had higher values on this index for the Sequoia-Kings Canyon and Deam Wildernesses (table 22).

Table 22 - Place-specific wilderness experience, factor 2[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	___Mean___			___Mean___			___Mean___		
Factor comparison	0.1	-0.1	0.0668	-0.1	0.4	0.0010	-0.1	0.2	0.0028
Years since first visit to this wilderness	10.6	13.8	.0034	9.9	16.6	.0015	9.0	10.9	.0266
Previous visits to this wilderness	7.8	8.1	.8987	5.5	14.9	.0180	32.9	35.9	.5408
	- Percent -			*- Percent -*			*- Percent -*		
Years since first visit									
3 years or less	27	21		40	24		33	23	
4 to 6 years	23	12		12	11		19	18	
7 to 15 years	26	28		24	27		29	32	
More than 15 years	24	39		24	38		19	27	
Previous visits									
First visit	22	21		27	13		12	7	
One or two previous visits	27	27		27	20		12	7	
Three to eight previous visits	28	31		29	26		19	16	
More than eight previous visits	24	21		17	42		57	70	

[1]H = hiker; SU = stock user; Sign. = level of significance, f-test.

Besides the number of previous visits to the wilderness, this factor consisted of the number of years since the person first visited the particular wilderness. Stock users averaged more years since that first visit than hikers, about 14 years for stock users at the John Muir Wilderness, 17 years at the Sequoia-Kings Canyon Wilderness, and 11 years at the Deam Wilderness. The medians also appeared larger for stock users than for hikers, although the medians for stock users were lower than the means. The median number of years since the first visit for Muir hikers was 6 years, compared to 15 years for Muir stock users. At Sequoia-Kings Canyon, hikers had a median of 6 years since the first visit, compared to 11 years for stock users. The medians were more nearly alike at the Deam, where the median was 6 years for hikers and 8 years for stock users.

Definition of Place in Solitude Terms- Hikers were more likely to think that the wilderness they were visiting had too, many people (table 23), though hikers' mean and the median ratings tended to vary around the neutral point of a 5-point scale (strongly disagree to strongly agree). Although stock users disagreed somewhat with this statement at all areas, Deam horse users showed the greatest disagreement and were farthest from agreement with the hikers'

Table 23-Definition of place in solitude terms[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	---Mean---			___Mean___			___Mean___		
Summative scale comparison[2]	-0.1	-0.5	<0.001	-0.1	-0.4	<0.001	-0.3	-1.0	<0.001
This wilderness is:									
A place with too many people	0	-.2	.0243	.1	-.1	.0253	-.2	-.8	<.001
A place with too many backpackers	-.4	-.4	.4964	-.2	-.3	.5107	-.6	-.9	<.001
A place with too many day hikers	-.4	-.6	.0356	-.3	-.5	.0800	-.6	-.9	<.001
A place with too many horses	.2	-.6	<.001	.2	-.7	<.001	.1	-1.3	<.001
A place with too many hunters[3]	.1	-.3	<.001	-.2	-.4	<.001	0	-.4	.0028

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.
[2]Scale: -2 = strongly disagree; -1 = disagree; 0 = neutral; 1 = agree; 2 = strongly agree.
[3]This item was not retained in the summative scale.

position (-0.8, -1 = disagree). On both the summative scale measure and on all but one of the individual elements, hikers were more likely to agree with crowding statements than stock users, suggesting that stock users either saw fewer people in the wilderness or were less concerned about crowding than hikers.

Definition of Place in Regulation Terms- Hikers and stock users viewed wilderness regulations differently. Stock users viewed regulations significantly more negatively than hikers, although both groups disagreed that there are too many *regulations* (table 24). Deam horse users particularly disagreed t-0.7,1 = disagree) that more regulations are needed.

Specialization Level

As a reflection of the personal meanings visitors attach to their wilderness visits, indexes were developed for intensity of activity style, activity-associated status, general past experience, and the importance of solitude to enjoyment of the activity.

Intensity of Activity Style-Analysis of the summative scale and individual items comprising the scale indicate hikers and stock users did not agree on which activity is more specialized (table 25). Both groups believed that their activity required more skill. Stock users in the John Muir, who were more likely to be outfitted, were a slight exception to

Table 24 - Definition of place in regulation terms[1,2]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	S U	Sign.	H	SU	Sign.
	_ . _ Mean . _ _			---Mean---			_ _ _ Mean _ _ _		
This wilderness is:									
A place with too many regulations	-0.8	-0.6	0.0471	-0.7	-0.4	0.0023	-0.8	-0.7	0.3374
A place with not enough regulations	-.1	-.3	<.001	-.1	-.3	.0321	-.3	-.7	<.001
A place with some areas where only hikers go	.5	.2	.0101	.6	.1	<.001	.2	-.2	<.001

[1]These items did not form a reliable summative scale. The scale ranged from -2 = strongly disagree; -1 = disagree; 0 = neutral; 1 = agree; 2 = strongly agree.
[2]H = hiker; SU = stock user; Sign. = level of significance, t-test.

Table 25 - Intensity of activity style[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	s u	Sign.	H	SU	Sign.	H	s u	Sign.
	--Mean--			- - Mean - -			--Mean--		
Summative scale comparisons[2]	1.2	1.5	<0.001	1.2	2.1	<0.001	1.4	2.3	<0.001
It takes more skill to backpack than to visit the wilderness on horseback	.7	.2	COO1	.7	-.3	<.001	.5	-.7	<.001
Learning to handle stock is an important wilderness skill	-.2	.6	<.001	-.1	1.2	<.001	0	1.0	<.001
Trips by horseback are more difficult to plan than backpacking trips	-.1	-.3	.0630	-.1	.7	<.001	0	.5	<.001
It takes more time to acquire the skills necessary to ride a horse into wilderness than it does to walk into wilderness	-.3	-.2	.1140	-.1	.4	<.001	0	1.0	<.001

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.
[2]Scale: -2 = strongly disagree; -1 = disagree; 0 = neutral; 1 = agree; 2 = strongly agree.

the pattern. They do not disagree as much with hikers on the difficulty in planning horse trips and the time necessary to acquire the skills for horseback trips.

Activity-Associated Status- Stock users consistently scored higher on elements of this index measuring activity-associated status (table 26). That means they felt stock use had a higher status than hiking. Some of the most extreme differences were on right-of-way issues. Stock users express much stronger opinions that horses should have the right-of-way when meeting hikers than hikers do. Stock users also take a negative view of hikers having the right-of-way when meeting stock. Stock users and hikers take similar, moderately positive views toward deciding right-of-way depending on the situation, except at the Deam, where stock users support that concept significantly more than hikers.

General Wilderness Experience, Factor 3- Across all areas, hikers show more wildernesses visited, with the majority of Muir and Sequoia-Kings Canyon visitors having visited more than five other areas (table 27). Deam visitors appear to have visited fewer areas than the California visitors, but the trend for hikers to have visited more areas than stock users occurred there, too. Stock users reported longer wilderness visits than hikers at the John Muir and Charles C. Deam Wildernesses, but not significantly so at the Sequoia-Kings Canyon Wilderness. Considering only overnight visitors, over half the visitors at the Deam stay only 1 or 2 nights, whereas at the California areas, 78 to 92 percent usually stay more than 2 nights. This difference probably reflects the difference in the size of the areas and the type of stock use. Overnight hikers at the Deam also show a considerably greater proportion of visits in the l - to 2-night category than at the California wildernesses.

Importance of Solitude to Activity Enjoyment- Hikers at all areas placed more importance than stock users on solitude and on the number of encounters with other groups than stock users (table 28). The differences between groups seemed most extreme at the Deam, where stock users' evaluations of most individual items showed the importance of solitude was extremely low. Hiker scores significantly exceeded those of stock users at the Deam, even though these hikers' scores, and the summative scale score, were lower than for hikers at the other areas.

Table 29 further illustrates the differential importance the two groups place on social conditions in the wilderness. At the John Muir and Sequoia-Kings Canyon Wildernesses, when significant differences existed in the maximum acceptable numbers of encounters, stock user maximums were higher than the maximums for hikers, twice as high in some

Table 26 - Activity-associated status[1]

	John Muir WiMerness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	---Mean---			___Mean___			__Mean___		
Summative scale comparison[2]	-0.5	0.3	<0.0001	-0.4	0.5	<0.001	-0.3	0.5	<0.001
I am often impressed with the horsemanship skills of riders I meet	-.6	-.1	<0.001	-.5	.3	<.001	-.1	1.0	<.001
I am often envious of those who ride horses into wilderness	-1.0	-.1	<.001	-1.0	0	<.001	-.4	.3	<.001
Horse riders should have right-of-way when meeting hikers in wilderness	.3	1.1	<.001	.3	1.1	<.001	-.3	.2	<.001
Hikers should have right-of-way when meeting horses in wilderness[3]	-.5	-1.1	<.001	-.4	-1.1	<.001	0	-.4	<.001
Horse riders are often rude to hikers they meet along the trail[3]	-.5	-1.0	<.001	-.5	-1.2	<.001	-.3	-1.3	<.001
Hikers are often rude to horse riders they meet along the trail[3]	-.6	-.6	.8898	-.5	-.4	.3914	-.5	-.8	<.001
There are some situations where horses should have the right-of-way and some situations where hikers should have the right-of-way when they meet[3]	.4	.3	.3270	.4	.6	.1312	.6	1.1	<.001

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.
[2]Scale: -2 = Strongly disagree; -1 = disagree; 0 = neutral; 1 = agree; 2 = strongly agree.
[3]These items were not retained in the summative scale.

Table 27- General wilderness experience, factor 3[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deem Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- - Mean - -			*- Mean -*			*- Mean -*		
Factor comparison[2]	0.1	- 0 . 2	0.0012	0.1	- 0 . 3	0.0033	0.1	- 0 . 2	<0.001
	- Percent -			*- Percent -*			*-Percent -*		
Number of other wildernesses visited[3]			.032			.021			<.001
This is the only one	3	5		2	7		16	22	
One or two other areas	9	16		10	15		25	34	
Three to five other areas	23	24		25	31		26	27	
More than five other areas	66	55		64	48		34	16	
Typical length of trips			<.001			.364			<.001
Usually stay a day or less	2	1		2	7		47	32	
Usually stay 1 to 2 nights	24	8		28	20		42	35	
Usually stay more than 2 nights	75	92		70	78		11	33	

[1]H = hiker; SU = stock user; Sign. = level of significance.
[2]t-test comparison of means.
Chi-square analysis.

Table 26- Importance of solitude to activity enjoyment[1,2]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deem Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- - Mean - -			*- - Mean - -*			*- - Mean - -*		
Summative scale comparisons[3]	3.4	2.6	<0.001	3.4	2.4	<0.001	2.2	1.1	<0.001
Number of groups of hikers seen along the trail	2.7	2.3	.0061	2.9	2.3	.0025	1.8	.8	<.001
Number of people seen hiking along the trail	2.8	2.3	<.001	2.9	2.5	.0100	1.8	.7	<.001
Number of large groups (>10 people) seen along the trail	3.4	2.9	.0016	3.5	3.1	.0694	2.1	.8	<.001
Number of hiker groups that camp within sight or sound	3.8	3.7	.6664	3.7	3.5	.3926	2.5	.7	<.001
N umber of hiker groups that walk past campsite	3.6	3.3	.0595	3.5	2.8	.0014	2.2	.7	<.001
N umber of horse groups seen along trails	3.4	2.0	<.001	3.5	1.6	<.001	2.4	1.6	<.001
Number of horses seen along trails	3.4	1.9	<.001	3.4	1.7	<.001	2.3	1.6	<.001
Number of horse groups that camp within sight or sound	4.3	3.5	<.001	4.1	2.9	<.001	2.7	1.7	<.001
Number of horse groups that travel past campsite	3.9	2.7	<.001	3.7	2.0	<.001	2.5	1.6	<.001
Percent of time other people are in sight along trails	2.7	2.3	.0032	2.9	2.2	<.001	2.2	1.1	<.001
Size of horse parties met	3.4	2.7	<.001	3.5	1.8	<.001	2.4	1.4	<.001
Size of hiker groups met	2.7	2.1	<.001	2.9	2.0	<.001	1.7	.8	<.001

[1]The importance question asked how much each of the encounter dimensions influenced the quality of wilderness visits.
[2]H = hiker; SU = stock user; Sign. = level of significance, I-test.
[3]Scale: 0 = not at all; 1 = slightly; 2 = somewhat; 3 = moderate amount; 4 = very much; 5 = extreme amount

Table 29 - Wilderness visitor reports of maximum acceptable numbers of social contacts in wilderness[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	- - Mean - -			*- - Mean - -*			*- - Mean - -*		
Number of people seen along trails in a day	24	23	0.6846	21	22	0.5317	26	43	<0.001
Number of large groups (>10 people) seen along trails in a day	5	6	.3250	4	7	.0397	8	18	<.001
Number of hiker groups that camp within sight or sound	3	3	.2838	4	4	.9939	5	13	<.001
Number of hiker groups that walk past campsite in a day	5	6	.3081	5	6	.3634	7	15	<.001
Number of horse groups seen along trails in a day	5	7	.0073	4	9	<.001	9	26	<.001
Number of horse riders in a single group	8	11	<.001	7	13	<.001	11	26	<.001
Number of horses seen along trails in a day	15	26	<.001	13	27	<.001	22	59	<.001
Number of horse groups that travel past campsite in a day	5	6	.0893	4	9	<.001	8	32	<.001
Number of hiker groups seen along trails in a day	10	11	.4213	10	10	.5854	11	25	<.001
Number of horses seen in a single group	9	14	<.001	8	15	<.001	11	26	<.001
Number of hikers seen in a single group	11	12	.4522	10	13	.0040	13	22	<.001

[1]H = hiker; SU = stock user; Sign. = level of significance. t-test.

cases. At the Deam, the two groups showed significant differences on all encounter items, with the stock users showing unusually high tolerance for encounters with others in the wilderness.

Focus of Trip / Expectations

Four summative scales measure a variable that Jacob and Schreyer (1980) called mode of experience and that we have termed focus of trip and expectations regarding the trip. These are the desired place characteristics and the degree of focus on the activity, on the physical setting, and on the social setting.

Degree of Focus on the Activity- Although stock-user mean scores tended to be slightly higher than hiker scores, there were no significant differences between the two groups at any of the three wildernesses (table 30). At all areas, focus on activity was high (with means of 0.7 to 1.0 on a scale of -2 **to 2).**

Degree of Focus on the Physical Setting- Wilderness hikers had a greater degree of focus on the physical setting at all three areas, significantly so at Muir and Sequoia-Kings Canyon (table 30). The degree of focus on the physical setting appears to be higher across the areas than the degree of focus on the activity.

Degree of Focus on the Social Setting- Consistent with stock users' more positive attitudes about encounters in the wilderness, they generally focused more than hikers on the social setting of the wilderness (table 30). At least that was the case for the Sequoia-Kings Canyon Wilderness and the Deam Wilderness where the difference was statistically significant. At the Muir Wilderness the two groups focused equally on the social setting. Generally, the degree of focus on social setting was comparable to the degree of focus on physical setting and activity for both groups (means of 0.8 to 1.1 on a scale of -2 **to 2).**

Desired Place Characteristics-On the combined set of items intended to measure perceptions of what the wilderness should be, hikers had significantly higher mean scores than stock users (table 31). Hikers and stock users had significantly different views on each of the individual items included within the scale, except for agreement at the California wildernesses that the wilderness should not be a place with more people. At the Deam, the item about treeless openings was an effort to include something comparable to natural meadows in the Sierras, but there is the possibility, judging from the strong negative evaluation from both groups, that treeless

Table 30 - Degree of focus[1,2]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	-- *Mean* --			-- *Mean* --			-- *Mean* --		
On the activity	0.8	0.8	0.8488	0.7	0.8	0.5188	0.9	1.0	0.1759
On the physical setting	1.1	1.0	.0116	1.1	.9	<.001	1.1	1.0	.1988
On the social setting	.9	.9	.8188	.9	1.0	.0741	.8	1.1	<.001

Scale: -2 to 2, with 0 = neutral.
[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.

openings may be equated with clearcuts outside wilderness, an unpopular tree harvesting method in which all trees are removed from a targeted area.

Lifestyle Tolerance

Two indexes to lifestyle tolerance were developed. One, perceptions of similarities between wilderness hikers and stock users, deals with visitors' perceptions of differences between the two groups in lifestyles and motivations for visiting wilderness. The other, the degree of tolerance for the other user group, includes several items that estimate the extent that each group perceives the other to be competing for wilderness resources.

Perceptions of Similarities Between Groups- The summative scale scores indicate stock users thought the two groups were more alike than did hikers (table 32). Hikers and stock users differed significantly across all areas on only four items included within this scale. They were perceptions of similar: (1) levels of education; (2) reasons for coming to wilderness, (3) things they enjoy about wilderness, and (4) feelings about the values of wilderness. On these items stock users perceived the two groups as more similar than hikers. For the Deam, the two groups differ substantially on 11 of the 12 items, with agreement only about the similarity in age between the two groups.

Degree of Tolerance for Different User Groups - On this summative scale, also, hikers and stock users were significantly different at all three areas (table 33). These differences also extended to all of the items included in the summative scales.

Table 31 - Desired place characteristics[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	___Mean___			---Mean---			---Mean---		
Summative scale comparisons[2]	0.9	0.6	<0.001	1.0	0.5	<0.001	0.1	-0.6	<0.001
This wilderness should be:									
A place to be alone	1.3	1.1	.0146	1.3	1.1	.0909	1.1	.3	<.001
A place with some horse travel[3]	.1	1.1	<.001	.1	1.2	<.001	.4	1.2	<.001
A place with no horses allowed[3]	-.2	-1.4	<.001	-.1	-1.3	<.001	-.4	-1.8	<.001
A place with more people[3]	-1.1	-1.1	.4863	-1.3	-1.1	.1356	-.8	-.1	<.001
A place with strict visitor regulations	.6	.3	.0012	.6	.2	<.001	-.6	-1.2	<.001
A place with some trails for hikers only	.9	0	<.001	1.0	-.2	<.001	.7	-.4	<.001
A place with many natural meadows	1.2	1.0	<.001	1.3	.8	<.001			
A place with less people	.7	.6	.0628	.9	.6	.0303	.3	-.6	<.001
A place with many treeless openings							-1.0	-1.0	.8135

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.
[2]Scale: -2 = strongly disagree; -1 = disagree; 0 = neutral; 1 = agree; 2 = strongly agree.
[3]These items were not retained in the summative scale.

Table 32 - Perceptions of similarities between wilderness hikers and stock users[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	SU	Sign.	H	SU	Sign.	H	SU	Sign.
	Mean			Mean			Mean		
Summative scale comparisons[2]	-0.1	0.2	<0.001	-0.1	0.1	0.0049	0	0.3	<0.001
They spend about the same amount of money to visit wilderness	-.8	-.9	.4141	-.7	-1.1	<.001	-.4	-.5	.0564
They live in similar types of places	0	.2	.0814	-.1	-.1	.7690	-.1	.1	.0152
They have similar lifestyles	-.3	0	<.001	-.3	-.3	.5124	-.2	0	.0262
They have similar types of jobs	0	.1	.0788	-.1	0	.4715	1	.3	<.001
They have similar levels of education	0	.3	<.001	0	.2	.0112	0	.4	<.001
They are about the same age	-.2	-.2	.9375	-.1	-.3	.1626	0	.1	.1198
They have about the same income	-.2	0	.0325	-.2	-.1	.6598	-.2	.2	<.001
They grew up in similar types of places	-.1	.1	.0232	-.1	-.3	.9522	-.1	0	.0345
They travel about the same distance to the wilderness	.1	.1	.2822	0	.1	.3013	0	.1	.0983
They come to wilderness for similar reasons	.3	.9	<.001	.2	.9	<.001	.4	1.1	<.001
They enjoy the same things about the wilderness	.2	.8	<.001	.1	.8	<.001	.4	1.0	<.001
They have similar feelings about the values of wilderness	-.1	.8	<.001	0	.7	<.001	.4	1.0	<.001

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.
[2]Scale: -2 = strongly disagree; -1 = disagree; 0 = neutral; 1 = agree: 2 = strongly agree.

Table 33 - Degree of tolerance for the other user group[1]

	John Muir Wilderness			Sequoia-Kings Canyon Wilderness			Charles C. Deam Wilderness		
	H	su	Sign.	H	SU	Sign.	H	SU	Sign.
	Mean			*Mean*			*Mean*		
Summative scale comparisons[2]	1.1	0.5	<0.001	1.1	0.3	<0.001	0.2	-0.6	<0.001
Horse riders often gel the best camping spots	-.3	-.6	.0048	-.3	-.6	<.001			
Horses and hikers don't mix well on trails	.2	-.6	<.001	.3	-.7	<.001	.2	-.9	<.001
Hikers cannot easily camp where horse users have camped before	.6	-.3	<.001	-.6	.6	<.001			
A tent set up in a meadow is a better use of that meadow than for horse grazing	.1	-.4	<.001	0	-.9	<.001			
Horse camping groups often make too much noise	.4	-.5	<.001	.4	-.7	<.001			
Backpacking groups often make too much noise	-.3	-.5	.0194	-.2	-.6	<.001			
Horse riders have access to the best trails in the area							.2	-.4	<.001

[1]H = hiker; SU = stock user; Sign. = level of significance, t-test.
[2]Scale: -2 = strongly disagree; -1 = disagree; 0 = neutral; 1 = agree; 2 = strongly agree.

The scale for Deam visitors includes only two items because competition for campsites and camping group noise items were not relevant there since horse groups did not typically camp inside the wilderness. The results were very similar, however, with differences existing between the two groups at about the same magnitude for all areas.

Relative Contributions of Potential Conflict Predictors

The initial step in understanding the contribution of each of these scales and individual items to conflict was to test for wilderness area differences in relationships between the predictors and the measures of conflict. For the two attitudinal conflict measures (enjoy/dislike and desirable/undesirable), the extra sum of squares procedure (Kleinbaum and Kupper 1978) indicated that the area variable was significant at $p < 0.005$. For these two conflict measures, this analysis suggested the need for discriminant models for each individual area. For the goal interference conflict measure, however, the area variable could be dropped (F-test, $p > 0.50$). For this conflict measure, only one discriminant model is necessary, combining data from all three study areas into one modeling attempt.

Enjoy/Dislike Conflict Model -The discriminant models for the enjoy/dislike conflict measure are presented in table 34. The models had a high likelihood (79 to 86 percent) of correctly classifying whether visitors would experience conflict or no conflict, based on 5 (Sequoia-Kings Canyon) to 10 (Charles C. Deam) of the 30 potential predictor scales and individual items. While each model is specific to a particular, wilderness, displaying slightly different predictors in slightly different patterns with some variation in predictive power, some characteristics are shared by all three models. In descending order of relative importance, the following five predictors (two individual items and three summative scales) were consistently retained in the models and are believed to possess the greatest predictive power, based on the magnitude of their standardized discriminant coefficients:

- A single item related to expectations of the place: "This wilderness should be a place with no horses allowed."
- A summative specialization scale measuring perceptions of status attached to the activities of hiking and horse riding.
- A single item related to perceived status: "Horse riders are often rude to hikers they meet along the trail."
- A summative definition of place scale measuring strength of attachment to the specific wilderness.
- A summative definition of place scale indicating the degree to which the specific wilderness is defined in solitude terms.

Earlier analysis suggested these models would be different across the three wildernesses in slope and intercept coefficients, and they are. Although this finding was not unexpected, the strong similarities in the most predictive variables across the three areas and the consistently high classification success contribute substantially to our understanding of expressions of enjoyment or dislike for these two competing groups. Using t-tests to compare mean responses, those hikers indicating they disliked encounters with horses were found to agree significantly more with the statement that no horses should be allowed in wilderness ($p < 0.001$). They did not view horse riders as a higher status user of the wilderness, disagreeing only slightly with the statement that horse riders are generally rude to hikers when they meet on the trail; hikers who did not dislike encounters with horses strongly disagreed with the statement. Hikers who disliked meeting horses in wilderness were significantly more attached to that wilderness than those who enjoyed the horse encounters or, in the case of the John Muir Wilderness, did not mind them (t-test, $p = 0.0336$). This difference did not exist for Sequoia-Kings Canyon and Deam visitors. Hikers who disliked encounters with horses, at least at the John Muir and Charles C. Deam Wildernesses, placed significantly more importance on the solitude opportunities in wilderness than those who did not dislike encounters with horses (t-test, $p < 0.001$). Hikers expressing conflict defined wilderness in solitude terms, while on average, those who did not express conflict did not define wilderness in solitude terms.

Desirable/Undesirable Conflict Model - The discriminant models for the desirable/undesirable conflict measure are presented in table 35. The discriminant procedure again produced highly predictive models, with classification success ranging from 79 percent for Sequoia-Kings Canyon visitors to 87 percent for Charles C. Deam visitors. These models are not similar enough for the results to be generalized. While they share some elements, the predictive power of the individual items or scales varies substantially across the three areas.

The John Muir Wilderness discriminant model retained nine predictors (three individual items and six summative scales) to correctly classify 84 percent of subjects. In descending order of relative importance, the nine predictors that provided this classification rate were:

- A summative specialization scale measuring perceptions of status attached to the activities of hiking and horse riding.

Table 34 - Enjoy/dislike measure of conflict discriminant models with cross-validation results

Conflict model domain and variables	Rank	Standard coefficient[1]	Final F-value	Level of significance
John Muir Wilderness				
Focus of trip/expectations				
This wilderness should be a place with no horses allowed	1	0.243	9.816	0.0019
Specialization level				
Activity-associated status	2	-.174	9.006	.0029
Horse riders are often rude to hikers they meet along the trail	3	.167	7.213	.0077
Hikers should have the right-of-way when meeting horses in the wilderness	9	-.097	5.125	.0243
Definition of place				
Place attachment	4	.148	11.201	.0009
Definition of place in solitude terms	5	.144	8.484	.0039
This wilderness is a place with too many regulations	6	-.121	6.927	.0090
This wilderness is a place to be alone	7	-.113	3.965	.0474
Lifestyle tolerance				
Degree of tolerance for the other user group	8	.109	2.912	.0890

Overall model significance

Wilks' Lambda = 0.595

F = 25.91

Level of significance = 0.0001

Predictive power: 84.1 percent overall

Actual	Number of observations	Classified by model: Conflict	Classified by model: No conflict
		percent	
Conflict	78	87.2	12.8
No conflict	275	16.7	83.3

Conflict model domain and variables	Rank	Standard coefficient[1]	Final F-value	Level of significance
Sequoia-Kings Canyon National Park Wilderness				
Specialization level				
Activity-associated status	1	-0.291	26.960	0.0001
Horse riders are often rude to hikers they meet along the trail	3	.142	4.199	.0418
Focus of trip/expectations				
This wilderness should be a place with no horses allowed	2	.267	8.996	.0031
Definition of place				
Place identity	4	.112	5.812	.0169
Place dependence	5	-.110	2.614	.1075

Overall model significance

Wilks' Lambda = 0.665

F= 25.64

Level of significance = 0.0001

Predictive power: 78.7 percent overall

Actual	Number of observations	Classified by model: Conflict	Classified by model: No conflict
		Percent	
Conflict	77	74.0	26.0
No conflict	186	19.3	80.7

(con.)

Table 34 (Con.)

Conflict model domain and variables	Rank	Standard coefficient'	Final F-value	Level of significance
Charles C. Deam Wilderness				
Specialization level				
Activity-associated status	1	-0.227	16.095	0.0001
Horse riders are often rude to hikers they meet along the trail				
There are some situations where horses should have the right-of-way and some situations where hikers should have the right-of-way when they meet	7	-.121	5.001	.0260
Hikers are often rude to horse riders they meet along the trail	8	-.082	3.005	.0840
Focus of trip/expectations				
This wilderness should be a place with no horses allowed	2	.176	3.934	.0482
Desired place characteristics	6	-.144	4.754	.0300
Degree of focus on the activity	10	-.060	3.081	.0802
Definition of place				
Place attachment	3	.169	8.425	.0040
Definition of place in solitude terms	4	.168	4.065	.0447
Lifestyle tolerance				
Perceptions of similarities between group	9	-.071	2.525	.1131

Overall model significance

Wilks' Lambda = 0.699
F = 16.20
Level of significance = 0.0001

Predictive power: 86.3 percent overall

Actual	Number of observations	Classified by model	
		Conflict	No conflict
		- - - - Percent - - - -	
Conflict	36	66.7	33.3
No conflict	351	11.7	88.3

[1]Indicates relative importance of the variables.

- A single item related to expectations of the place: "This wilderness should be a place with no horses allowed."
- A summative scale measuring the importance of solitude to enjoyment of the activity.
- A summative definition of place scale indicating the degree to which the specific wilderness is defined in solitude terms.
- A summative lifestyle tolerance scale indicating the degree of tolerance a member of one group has for the other.
- A summative specialization scale measuring the intensity of activity style.
- A single item related to personal definition of the wilderness: "This wilderness is a place to be alone."
- A single item related to status: "There are some situations where horses should have the right-of-way and some situations where hikers should have the right-of-way when they meet."
- A summative scale measuring the degree of focus on the social setting during the visit.

The success in classifying hikers' predisposition to conflict at the John Muir Wilderness can be attributed partially to the unwillingness of those in conflict to attribute higher status to stock users (t-test, $p < 0.001$). Hikers who disliked encounters with stock also believed more strongly that horses should not be allowed in wilderness (t-test, $p < 0.001$). They placed significantly more importance on opportunities for solitude in the wilderness (t-test, $p < 0.0011$), more strongly defined wilderness as a place to be alone (t-test, $p = 0.0025$), were much more likely to view stock users in competition with them for resources (t-test, $p < 0.001$), and were less likely to acknowledge the specialized skills of horse riders (*t-test*, $p < 0.001$).

The Sequoia-Kings Canyon National Park Wilderness discriminant model retained eight predictors (three individual items and five summative scales)

Table 35 - Desirable/undesirable measure of conflict discriminant models with cross-validation results

Conflict model domain and variables	Rank	Standard coefficient'	Final f-value	Level of significance
John Muir Wilderness				
Specialization level				
Activity-associated status	1	-0.285	20.304	0.0001
Importance of solitude to activity enjoyment	3	.184	20.008	.0001
Intensity of activity style	6	.110	4.285	.0392
There are some situations where horses should have the right-of-way and some situations where hikers should have the right-of-way when they meet	8	-.081	8.494	.0038
Focus of trip/expectations				
This wilderness should be a place with no horses allowed	2	.220	19.428	.0001
Degree of focus on the social setting	9	.065	4.828	.0287
Definition of place				
Definition of place in solitude terms	4	.154	8.797	.0032
This wilderness is a place to be alone	7	-.082	5.653	.0180
Lifestyle tolerance				
Degree of tolerance for the other group	5	.130	4.628	.0322

Overall model significance

Wilks' Lambda = 0.512

F = 43.04

Level of significance = 0.0001

Predictive power: 84.2 percent overall

Actual	Number of observations	Classified by model: Conflict	Classified by model: No conflict
		- - - - *Percent* - - - -	
Conflict	162	85.2	14.8
No conflict	255	16.5	83.5

Conflict model domain and variables	Rank	Standard coefficient'	Final F-value	Level of significance
Sequoia-Kings Canyon National Park Wilderness				
Specialization level				
Importance of solitude to activity enjoyment	1	0.247	22.534	0.0001
Activity-associated status	5	-.192	9.193	.0026
Hikers should have the right-of-way when meeting horses in wilderness	7	-.074	1.680	.1958
Focus of trip/expectations				
This wilderness should be a place with no horses allowed	2	.220	14.402	.0002
Definition of place				
Place identity	3	.204	2.729	.0995
Place attachment	6	-.152	1.513	.2194
This is a place with not enough regulations	8	-.066	2.117	.1467
Lifestyle tolerance				
Degree of tolerance for the other group	4	.200	11.276	.0009

(con.)

Table 35 (Con.)

Overall model significance
Wilks' Lambda = 0.596
F = 27.77
Level of significance = 0.0001

Predictive power: 79.2 percent overall

Actual	Number of observations	Classified by model: Conflict	Classified by model: No conflict
		- - - - *Percent* - - - -	
Conflict	162	82.1	17.9
No conflict	175	23.4	76.6

Conflict model domain and variables	Rank	Standard coefficient[1]	Final F-value	Level of significance
Charles C. Deam Wilderness				
Lifestyle tolerance				
Degree of tolerance for the other user group	1	0.322	44.966	0.0001
Perceptions of similarities between groups	5	-.126	11.708	.0007
Specialization level				
Activity-associated status	2	-.I 72	7.168	.0078
importance of solitude to activity enjoyment	6	.I03	5.877	.0159
Intensity of activity style	7	-.082	2.948	.0869
Focus of trip/expectations				
This wilderness should be a place with no horses allowed	3	.I57	15.961	.0001
Definition of place				
Place identity	4	.143	15.961	.0001

Overall model significance
Wilks' Lambda = 0.514
F = 54.33
Level of significance = 0.0001

Predictive power: 86.8 percent overall

Actual	Number of observations	Classified by model: Conflict	Classified by model: No conflict
		_ _ _ _ _ percent _ _ _ _	
Conflict	113	81.4	18.6
No conflict	297	11.1	88.9

[1]Indicates relative importance of variables.

to correctly classify 79 percent of the subjects. In descending order of relative importance, the eight predictors that provide this classification rate were:

- A summative scale measuring the importance of solitude to enjoyment of the activity.
- A single item related to expectations of the place: "This wilderness should be a place with no horses allowed."
- A summative definition of place scale indicating the strength of identity with the specific wilderness.
- A summative lifestyle tolerance scale indicating the degree of tolerance a member of one group has for the other group.
- A summative specialization scale measuring perceptions of status attached to the activities of hiking and horse riding.
- A summative definition of place scale indicating the strength of attachment to the specific wilderness.
- A single item related to status: "Hikers should have the right-of-way when meeting horses in wilderness."
- A definition of place item: "This is a place with not enough regulations."

Hikers who were predisposed to experience conflict when they encountered horse riders at the Sequoia-Kings Canyon National Parks Wilderness placed

significantly more importance on opportunities for solitude in the wilderness than those who were not predisposed to conflict (t-test, $p < 0.001$). This is the most powerful predictor of conflict among the eight predictors retained in the model. Those classifying encounters as undesirable also believed more strongly that horses are inappropriate in wilderness (t-test, $p < 0.001$) than those who were neutral or found encounters with horses to be desirable. Individuals who experienced conflict also perceived more competition for wilderness resources (t-test, $p < 0.001$), did not accord horse riders as high a status (t-test, $p < 0.00l$), and were not as opposed to more regulations in the wilderness (t-test, $p = 0.0081$).

The Charles C. Deam Wilderness discriminant model retained only seven predictors (one individual item and six summative scales) to correctly classify whether 87 percent of subjects would or would not experience conflict based on their expressions of the desirability/undesirability of encounters. In descending order of relative importance, the seven predictors that provided this classification rate were:

- A summative lifestyle tolerance scale indicating the degree of tolerance for the other group.
- A summative specialization scale measuring perceptions of status attached to the activities of hiking and horse riding.
- A single item related to expectations of the place: "This wilderness should be a place with no horses allowed."
- A summative definition of place scale measuring strength of identity with the specific wilderness.
- A summative lifestyle tolerance scale assessing perceptions of similarities between groups.
- A summative scale measuring the importance of solitude to the enjoyment of the activity.
- A summative specialization scale measuring the intensity of activity style.

At the Deam, the most powerful predictor of hikers' predisposition to experience conflict was the amount of perceived competition between hikers and horse users. Those experiencing conflict perceived significantly more competition (t-test, $p < 0.001$). They also attributed lower status to horse riders (t-test, $p < 0.001$), believed more strongly that horses should not be allowed in wilderness (t-test, $p < 0.001$), perceived hikers and horse riders to be less similar (t-test, $p < 0.001$), placed significantly more value on opportunities for solitude in the wilderness (t-test, $p < 0.001$), and did not attribute higher specialization levels to horse riders (t-test, $p < 0.001$).

Goal Interference/Conflict Model- The model presented in table 36 represents the variables used to classify whether visitors would experience conflict/no conflict using the goal interference measure. The model correctly classified 72 percent of visitors using 13 predictors (4 individual items, 2 past experience factors, and 7 scales). While the classification success appears high, this model had the highest error rate of any of the models examined. An individual model for each of the three wildernesses might have increased classification success slightly, but prior analysis indicated these individual models were not warranted. The lower classification success for this measure is also consistent with previous modeling efforts (Watson and Niccolucci 1992b). In descending order of relative importance, the 13 predictors in the model are:

- A summative lifestyle tolerance scale indicating the degree of tolerance a member of one group has for the other group.
- An index of past wilderness experience, dominated by measures of the number of years since a visitor first visited the specific wilderness and the number of previous visits to that wilderness.
- A single item related to status: "There are some situations where horses should have the right-of-way and some situations where hikers should have the right-of-way when they meet."
- A summative definition of place scale measuring the strength of attachment to the specific wilderness.
- A summative specialization scale measuring perceptions of status attached to the activities of hiking and horse riding.
- A summative scale measuring the importance of solitude to enjoyment of the activity.
- A single item related to status: "Hikers are often rude to horse riders they meet along the trail."
- A single item related to expectations of the place: "This wilderness should be a place with no horses allowed."
- A summative scale assessing desired place characteristics.
- A summative scale measuring the degree of focus on the activity during the visit.
- An index to past wilderness experience, dominated by the number of other wildernesses visited.
- A single item related to personal definition of the wilderness: "This wilderness is a place with too many regulations."
- A summative lifestyle tolerance scale assessing perceptions of similarities between hikers and horse users.

Though this model made the most errors in classification, the ability to predict whether hikers would experience conflict or not was still good with this measure of conflict. The model was correct 72 percent of the time using attitudinal measures to predict hikers' feelings of behavioral interference with their experience goals, providing some understanding

Table 36 - Goal interference measure of conflict discriminant model with cross-validation results for the John Muir, Sequoia-Kings Canyon, and Charles C. Deam Wildernesses

Conflict model domain and variables	Rank	Standard coefficient[1]	Final F-value	Level of significance
Lifestyle tolerance				
Degree of tolerance for the other group	1	0.175	17.77	0.0001
Perceptions of similarities between groups	13	-.038	1.58	.2088
Specialization level				
Factor 2, place-specific wilderness experience	2	.137	23.16	.0001
There are some situations where horses should have the right-of-way and some situations where hikers should have the right-of-way when they meet	3	-.127	20.39	.0001
Activity-associated status	5	-.118	10.40	.0013
Importance of solitude to activity enjoyment	6	.100	7.06	.0080
Hikers are often rude to horse riders they meet along the trail	7	.098	12.43	.0004
Factor 3, general wilderness experience	11	.059	4.17	.0414
Definition of place				
Place attachment	4	.123	15.81	.0001
A place with too many regulations	12	-.54	3.67	.0555
Focus of trip/expectations				
This wilderness should be a place with no horses allowed	8	.087	5.19	.0229
Desired place characteristics	9	-.082	4.28	.0389
Degree of focus on the activity	10	-.072	5.74	.0167

Overall model significance

Wilks' Lambda = 0.785

F = 22.19

Level of significance = 0.0001

Predictive power: 72.1 percent overall

Actual	Number of observations	Classified	
		Conflict	No conflict
		- - - - *percent* - - - -	
Conflict	228	71.5	28.5
No conflict	840	27.7	72.3

[1]Indicates relative importance of variables.

of how hikers view stock users' behaviors in wilderness. This model suggests that hikers' evaluations of behaviors and impacts related to horse use are best predicted by differences in perceptions of competition among hikers and horse riders, differences in levels of experience at the wilderness area, differences in levels of agreement on who should have the right-of-way when hikers and horses meet in the wilderness, and differences in levels of attachment to the specific wilderness.

DISCUSSION OF RESULTS

Our discussion concentrates on the models. Understanding which predictor variables are most closely related to the three conflict measures will guide us as we look at potential management solutions to the problems conflict creates.

In general, the hypothesized set of predictors, drawn mostly from past recreation conflict research or from the hypotheses of Jacob and Schreyer (1980), predict attitudinal measures of conflict (enjoy/dislike, desirable/undesirable) more accurately than they predict a goal interference measure of conflict. The ability to predict whether a hiker will or will not express dislike for an encounter with horses on a particular trip, or describe horse encounters as undesirable or not, is quite high - generally over 80 percent.

The relationships between attitudinal measures of conflict and the set of potential predictors varied across the three areas, showing that the relationship between these predictors and conflict depends on site-specific influences. Despite this finding, however, we find that it is possible to isolate five items that, in combination, appear to have the greatest power in predicting how someone will describe a

particular encounter on a specific trip. We were not confident we could identify a few items to predict the overall desirability of encounters.

Stated as simply as possible, hikers who dislike meeting horses in wilderness believe the horses should not be in wilderness; they believe they are an inappropriate use of the resource. These hikers also are not as likely to accord high status to horse users, have stronger relationships with the wilderness, and place more value on the opportunities for solitude than those who do not dislike horses. Translating this knowledge into management strategies requires acknowledging first of all that hikers who dislike horses are in the minority. In fact, as many as 20 percent of hikers at the Charles C. Deam Wilderness enjoyed meeting horses, and about one-half of all hikers reported that they did not mind meeting them (fig. 3).

In addition, 25 to 40 percent of the hikers at these wildernesses did not meet horses on the specific trip they were asked about. We do not know whether some hikers selected specific routes to avoid meeting horses. These results help us understand the proportion of the population that is represented by the letters managers receive from hikers complaining about horses. In relative terms, it is interesting to note that at the Deam, where we asked about encounters with groups with dogs, nearly one-fourth of hikers and horse riders disliked those encounters. This social conflict equals that between horses and hikers there and is equally deserving of management attention.

Figure 3- Some hikers enjoy meeting horses in wilderness.

If we want to reduce the proportion of hikers who dislike encounters with horses, our options are somewhat limited. Hikers' feelings of the inappropriateness of horse use may be influenced slightly through visitor education programs. A message could be developed that emphasizes the historic role of horses in wilderness exploration and the value of preserving wilderness horse management skills in light of the overall decline in these skills. These skills are also said to be part of our cultural heritage; this appeal may persuade some hikers of the merit of allowing horse use in wilderness.

Hikers also need information on what to expect when encountering horses on trails in the wilderness. While some hikers infer that they have lower status than horse users because they are expected to step off the trail to allow horses to pass, they need to learn of the resource benefits: the hiker will cause much less damage to vegetation and soil when stepping off the trail than would a horse.

This educational information will not alleviate the conflict, although it may justify it to the hiker. Hikers not only value solitude more than stock users, they know they do. This suggests that hikers who dislike encounters with horses should be given the opportunity to avoid them. Hammitt (1989) suggested zoning to reduce conflict. Whether through use of the Recreation Opportunity Spectrum, as Hammitt suggests, or through application of the Limits of Acceptable Change (LAC) planning system (Haas and others 1987; Stankey and others 1985), a zone of the wilderness where horses are not allowed may be justified. Hikers would have to know about this restriction if they were to plan their travels so they could avoid encountering horse use. Opportunities for all hikers to view some portions of wilderness where horse impacts do not exist also seem desirable. This type of opportunity class within LAC would also address other values of the wilderness, such as maintaining natural conditions and providing scientific and educational values.

The options are similar if we want to influence the predisposition of hikers toward conflict with stock users at these wildernesses.. About half of the hikers have this predisposition. Earlier suggestions about the role of horse use in maintaining primitive skills and the need for hikers to step off the trail to prevent resource damage may do more to reduce hikers' predisposition to experience conflict than to affect whether they enjoy or dislike specific encounters.

Similar educational tactics that serve primarily to justify and legitimize the presence of horses in some portions of wilderness may reduce the tendency for hikers to evaluate encounters with horses in wilderness as undesirable.

The goal interference measure of conflict also offers some insight into the potential for management of conflict. In addition to differences in perceived competition for resources, differences in perceived status, differences in solitude values, and differences strength of attachment, important predictors of whether a hiker will experience conflict include the amount of experience the hiker has had at the specific wilderness and at other wildernesses. The experience items, importance of solitude, and strength of relationships to the resource are not easily influenced by persuasive or educational messages. Separating use would be the most viable solution to reduce the goal interference conflict.

Some specific behaviors and impacts of stock users can be addressed that may reduce the conflict. Cole (1990) listed five possible strategies to reduce recreation-related impacts. The manager may consider limiting or reducing use, encouraging less damaging behavior, discouraging use when the potential for damage is high, encouraging use of particularly resistant environments, and containing impacts to sacrificed sites.

About half of hikers indicated that the behaviors of others had interfered with their enjoyment of a wilderness trip, and half of those said horse groups had interfered; that means managers may be able to increase the enjoyment of one-fourth of the hikers by addressing the behaviors of horse groups. At the John Muir and Sequoia-Kings Canyon Wildernesses the majority of these problem behaviors were related to horse manure in places where hikers have to walk and noisy or rude stock groups. Deam hikers had fewer complaints about manure and more about horse-related trail damage.

Problems with horse manure are not easily solved, short of eliminating horse use or restricting horse use from some trails used by hikers. Around campsites, at popular vistas, at self-registration stations, and at major trail junctions or other places where hikers and horse riders often stop, manure can be an especially irritating problem. Educational messages that make horse riders aware of this problem and suggest they avoid taking horses to those spots or remove the manure before leaving the spot could reduce the problem (encouraging less damaging behavior). Hendee and others (1990) would classify this type of impact as unavoidable, and Roggenbuck (1992) has suggested that persuasive communication has little potential to reduce unavoidable impacts. Roggenbuck (1992) does point out the benefit of persuasive messages that help recreationists select places to recreate where the areal extent of impact is minimized. This seems particularly relevant for horse users. The cost associated with additional impacted sites is high.

Problems of noise and perceived rudeness could be at least partially addressed with educational or persuasive messages. Hendee and others (1990) classified these types of behaviors as careless actions, which the recreationist knows are wrong or inconsiderate, but are done without thinking. Roggenbuck (1992) suggests that persuasion is probably only moderately effective in reducing this sort of problem. Bringing the impacting behavior to the attention of the perpetrators may improve their behavior. For the persuasion to be highly effective, however, the reminder must be repeated, and unless the persuasive cue is frequently changed, it may no longer be effective.

Members of conservation or outdoor recreation organizations are easiest to reach with persuasive or informational messages. Managers should target local and regional organizations whose members visit the wilderness, providing written messages or presenting talks with suggestions on appropriate behavior and ways to avoid conflict. The unaffiliated user is hard to target, but may be reached at trailhead bulletin boards, at nearby visitor centers, and through chance encounters with wilderness rangers. Since the relative success of these approaches to influencing behavior is unknown, they need to be evaluated more closely. Continued experimentation with the use of videotaped presentations explaining how visitors can reduce impacts and conflict, advance registration or permits requiring contact with managers, and intentional contacts at trailheads as visitors enter the area, may prove beneficial in influencing both affiliated and unaffiliated visitors. Contact with unaffiliated users is more of a challenge at the Deam Wilderness because fewer visitors belong to organizations; but, since most horse use originates at the Blackwell horse camp, an unusual opportunity exists for personal interaction with stock users and for posting informational material.

Manfredo and Bright (1991), as well as others (such as Krumpe and Brown [1982] and Roggenbuck and Berrier [1982]), found that more experienced recreational users were less responsive to information intended to influence behavior. With the relatively high experience of hikers and horse users at the Deam Wilderness, information may be less successful in influencing behavior than it would be at the California wildernesses.

Educational levels are equally high for hikers and stock users in California wildernesses, allowing educational messages and justifications for restrictions to be presented in a fairly complex manner. Comparison of resource impacts when hikers get off the

trail instead of horses should be detailed enough to allow visitors who receive such messages to share the information with those who don't, Group leaders are often exposed to information that may never be passed on to party members, unless it is presented in an informative, challenging, and interesting way. At the Deam Wilderness, educational levels are not as high as at California wildernesses, especially for horse users. The content of informational messages should not be watered down too much, however. Messages about appropriate behaviors and inappropriate impacts can be presented in a way that adults will find interesting and that still provides basic information that can be passed on to others when opportunities arise.

The management option of separating uses by providing some trails just for hikers is generally supported by hikers but not by horse users at these wildernesses. While there is some chance that persuasive and educational messages will reduce conflict between hikers and horse users, failure to reduce the number of conflicting encounters or horse impacts that hikers label as inappropriate may lead managers to some restriction of horse use in wilderness. Numerous studies have concluded that reducing use is unlikely to greatly reduce impacts to trails and campsites (Cole 1990). Horse use would have to be eliminated at some areas to control the impacts associated with their use. Providing some portion of the wilderness that is free from impacts associated with horse use and free of encounters with horses will increase the quality of wilderness experiences for the minority of hikers who believe that horses should not be in wilderness. These restrictions will help managers meet other wilderness management responsibilities, such as maintaining opportunities to experience natural conditions in wilderness and maintaining the educational and scientific values of wilderness.

REFERENCES

Absher, J.; Absher, E. 1979. Sierra Club wilderness outing participants and their effect on Sierra Nevada wilderness users. In: Stanley, J. T., Jr.; Harvey, H. T.; Hartesveldt, R. J., eds. A report on the wilderness impact study. Palo Alto, CA: Sierra Club: 31-60.

Adelman, Bonnie J.; Heberlein, Thomas A.; Bonnicksen, Thomas M. 1982. Social psychological explanations for the persistence of a conflict between paddling canoeists and motorcraft users in the Boundary Waters Canoe Area. Leisure Sciences. 5(l): 45-61.

Brewer, J. E.; F&on, D. C. 1973. A review of recreation land allocation on the Mark Twain National Forest. In: Outdoor recreation research: applying the results. Gen. Tech. Rep. NC-g. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: l-6.

Bryan, Hobson. 1977. Leisure value systems and recreational specialization: the case of trout fishermen. Journal of Leisure Research. g(3): 174-187.

Cole, David N. 1990. Ecological impacts of wilderness recreation and their management. In: Hendee, John C.; Stankey, George H.; Lucas, Robert C. Wilderness Management. 2d ed. ***(rev.).*** Golden, CO: North American Press: 424-466.

Gramann, James H.; Burdge, Rabel J. 1981. The effect of recreation goals on conflict perception: the case of water skiers and fishermen. Journal of Leisure Research. 13(l): 15-27.

Haas, Glenn E.; Driver, B. L.; Brown, Perry J.; Lucas, Robert G. [C.]. 1987. Wilderness management zoning. Journal of Forestry. 85(12): 17-21.

Hammitt, William E. 1989. The spectrum of conflict in outdoor recreation. In: Watson, Alan H. LE.], camp. Outdoor recreation benchmark 1988: Proceedings of the national outdoor recreation forum. Gen. Tech. Rep. SE-52. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 439-450.

Hendee, John C.; Stankey, George H.; Lucas, Robert C. 1990. Wilderness management. 2d ed. (rev.). Golden, CO: North American Press. 546 p.

Jacob, Gerald R.; Schreyer, Richard. 1980. Conflict in outdoor recreation: a theoretical perspective. Journal of Leisure Research. 12(4): 368-380.

Kleinbaum, David G.; Kupper, Lawrence L. 1978. Applied regression analysis and other multivariable methods. North Scituate, MA: Duxbury Press. 556 p.

Knopp, Timothy B.; Tyger, J. D. 1973. Study of conflict in recreational land use: snowmobiling vs. skitouring. Journal of Leisure Research. 5(3): 6-17.

Krumpe, Edwin E.; Brown, Perry J. 1982. Redistributing backcountry use through information related to recreation experiences. Journal of Forestry. 80(6): 360-362,364.

Lachenbruch, Peter A.; Mickey, M. Ray. 1968. Estimation of error rates in discriminant analysis. Technometrics. 10(l): l-10.

Leopold, Aldo, 1966. A Sand County almanac. New York: Ballantine Books. 295 p.

Lime, David W. 1975. Sources of congestion and visitor dissatisfaction in the Boundary Waters Canoe Area. In: Proceedingsof the third Boundary Water Institute; 1975 May 9; Duluth, MN. Duluth, MN: Quetico-Superior Foundationa: 68-72.

Lime, David W. 1977. When the wilderness gets crowded...? Naturalist. 24(4): 1-8.

Lucas, Robert C. 1964. The recreation capacity of the Quetico-Superior area. Res. Pap. LS-15. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Lake States Forest Experiment Station. 34 p.

Lucas, Robert C. 1985. Visitor characteristics, attitudes, and use patterns in the Bob Marshall Wilderness Complex, 1970-1982. Res. Pap. INT-345. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 32 p.

Manfredo, Michael J.; Bright, Alan D. 1991. A model for assessing the effects of communication on recreationists. Journal of Leisure Research. 23(1): l-20.

McCay, Roger E.; Moeller, George H. 1976. Compatibility of Ohio trails users. Res. Note NE-225. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 4 p.

McClaran, Mitchel P. 1989. Recreational pack stock management in Sequoia and Kings Canyon National Parks. Rangelands. 11(l): 3-8.

Net&, John; Wasserman, William; Kutner, Michael H. 1989. Applied regression models. Homewood, IL; Boston, MA: Irwin Publishing. 667 p.

Nunnally, Jum C., Jr. 1978. Psychometric theory. 2d ed. New York: McGraw-Hill. 572 p.

Owens, Peter L. 1985. Conflict as a social interaction process in environment and behavior research: the example of leisure and recreation research. Journal of Environmental Psychology. 5: 243-259.

Roggenbuck, Joseph W. 1992. Use of persuasion to reduce resource impacts and visitor conflicts. In: Manfredo, Michael J., ed. Influencing human behavior: theory and applications in recreation, tourism and natural resources management. Champaign, IL: Sagamore Publishing: 149-208.

Roggenbuck, Joseph W.; Berrier, Deborah L. 1982. A comparison of the effectiveness of two communication strategies in dispersing wilderness campers. Journal of Leisure Research. 14(l): 77-89.

SAS Institute, Inc. 1987. SASSTAT guide for personal computers, version 6 ed. Cary, NC: SAS Institute.

Shelby, Bo. 1975. Social-psychological effects of motorized travel in wild areas: the case of river trips in the Grand Canyon. Boulder, CO: Human Ecology Research Service. 66 p.

Snyder, A. P. 1966. Wilderness management-a growing challenge. Journal of Forestry. 64(7): pp. 441-446.

SPSS. 1990. SPSS/PC + statistics 4.0. Chicago, IL: SPSS, Inc.

Stankey, George H. 1973. Visitor perception of wilderness recreation carrying capacity. Res. Pap. INT-142. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 61 p.

Stankey, George H.; Cole, David N.; Lucas, Robert C.; Petersen, Margaret E.; Frissell, Sidney S. 1985. The limits of acceptable change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Thomas, Kenneth. 1976. Conflict and conflict management. In: Dunnette, Marvin D., ed. Handbook of industrial and organizational psychology. Chicago: Rand McNally. 1710 p.

Wall, Victor D.; Galanes, Gloria J.; Love, Sue Beth. 1987. Small, task oriented groups-conflict, conflict management, satisfaction, and decision quality. Small Group Behavior. 18(l): 31-55.

Watson, Alan E.; Niccolucci, Michael J. 1992a. Defining past-experience dimensions for wilderness recreation. Leisure Sciences. 14(2): 89-103.

Watson, Alan E.; Niccolucci, Michael J. 1992b. Place of residence and hiker-horse conflict in the Sierras. In: Proceedings of the symposium on social aspects of recreation research; 1992 February 19-22; Ontario, Canada. Gen. Tech. Rep. PSW-132. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 71-72.

Watson, Alan E.; Williams, Daniel R.; Daigle, John J. 1991. Sources of conflict between hikers and mountain bike riders in the Rattlesnake NRA. Journal of Park and Recreation Administration. 9(3): 59-71.

Williams, D. R. 1988. Measuring perceived similarity among outdoor recreation activities: a comparison of visual and verbal stimulus presentation. Leisure Sciences. 10: 153-166.

U.S. GOVERNMENT PRINTING OFFICE 1993-0-794-634 / 10016