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Colorado Deer Hunting Experiences

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Colorado Deer Hunting Experiences

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Those responsible for managing environmental resources, like big game, have often posed questions regarding how best to manage and allocate the resource to "provide benefits to people." One approach to obtaining information for answering these questions is based on consumer behavior concepts and research.

Our consumer-oriented approach to deriving management information for environmental resources, particularly game and other recreational resources, rests on ideas conceptualized by Wagar (1966) and having their theoretical base in psychology's expectancy-value theory (Lawler 1973). The general theoretical orientation we follow is described in Driver and Brown (1975). We also acknowledge a debt to the multiple satisfactions approach to game management articulated by Hendee (1974).

The management orientation of this paper suggests that managers should produce opportunities for game-related recreation which recognize the multiple dimensions of the experience. It is the experience that is the important product of recreation, and quality experiences are a function of how well the consumer's desired satisfactions are fulfilled.

Within this orientation, this paper reports characteristics of the Colorado deer hunter population in terms of the kinds of satisfaction that make up deer hunting experiences. In doing so, the usefulness of cluster analytic techniques for social research in wildlife management is illustrated. The information and analytical techniques discussed in this paper have implications for resource valuation, resource allocation, user management, and related aspects of wildlife planning and management.

Some Related Research

Most writers on game-related experiences have focused on hunting activities, even though there are other uses of game. While harvest has usually been an important attribute of the hunting experience, several writers have discussed nonharvest attributes of hunting.

In a study of Arizona hunters, Davis (1967) found that the benefit to bodily health, aesthetics, associations with others, intellectual stimulation, character building, and religious factors were each important in characterizing hunting. Kennedy's (1970) study of hunters in Maryland's Pocomoke Forest indicated that hunters valued companionship, camping out, getting out of doors, "getting away from it all," and the suspense and challenge of the hunt. More (1973), in a study of Massachusetts hunters, identified the most positively scored characteristics of hunting as aesthetic benefits, affiliation with people, and the challenge of the hunt.

Nearly all investigators of the hunting experience have rated harvest as a positive attribute although not as highly as one might expect. For instance, Kennedy (1970) found it rated positively, but ranked fourth in his list of satisfactions. More (1973) found both "killing" and "display" of game neutrally rated factors with neither contributing much to the satisfaction of Massachusetts hunters.
Potter, Hendee, and Clark (1973) reported a study designed to determine many of the important hunt factors necessary for understanding the "multiple satisfaction" model of hunting. From a 73-item pool of Likert type items, they identified eight dimensions (of more than one item) of the hunting experience related to satisfaction of Washington State hunters. The dimensions, produced by factor analysis, are attributes of the hunting experience that are rated as either adding to or detracting from the satisfaction derived from hunting. The dimensions are named nature, escapism, shooting, skill, vicariousness, trophy display, harvest, and equipment. Three single-item dimensions reported are in-group companionship, out-group verbal contact, and out-group visual contact.

A recent re-analysis of the Potter, Hendee, and Clark (1973) data by Hautaluoma and Brown (1977) revealed some specific characteristics of the Washington State deer hunter and his hunting experiences. Using the BC-TRY Cluster Analysis programs (Tryon and Bailey 1970), the original items were re-clustered into dimensions and then the hunters were classified according to their cluster scores across the dimensions. The value of this re-analysis was in the classification activities. Five strong dimensions applicable to all groups of deer hunters—nature, harvest, equipment, out-group contract, and skill—were identified and used in the hunter typing. For all Washington State deer hunters, 10 different types were identified. These types ranged from a group that might be termed minimum satisfaction from deer hunting to a group that indicated all five dimensions added greatly to their satisfaction.

The Colorado deer hunter study reported here employed data collection methods and scales similar to those of the Washington State study and employed the analytical methods used in the reanalysis of the Washington State data. A discussion of methods and results obtained follows.

**Method**

The methods involved sampling from among all 1974 Colorado deer hunting license holders, mailing questionnaires which contained hunting experience items, clustering the data on returned questionnaires, performing typological analysis using selected clusters of dimensions, and relating the identified types to other hunt and hunter characteristics.

Sampling was performed in a manner to insure representation from all deer hunter license types and geographic origins of hunters. Separate samples were drawn for in-state and out-of-state rifle, primitive weapon, sportsman, and archery license holders. For in-state samples, each county of hunter origin was assigned a quota based upon historical records and random selection of the sample was made. Out-of-state samples were drawn randomly from all license stubs. The total sample drawn was 2,508.

The initial mailing consisted of a questionnaire with cover letter plus an addressed postage-paid return envelope. Two subsequent mailings were made to nonrespondents to the first or second mailing. A reminder letter was included with these follow-up mailings.

Data analyses were performed using the BC-TRY (Tryon and Bailey 1970) cluster analysis system. Seventy-three scale items were analyzed and grouped into dimensions because of their relatedness in mathematical space.
After dimensions were identified, they were used to classify hunters into distinct types. In this procedure, each hunter is scored on how much he perceives each dimension contributing to his hunting satisfaction, and then each hunter's pattern of scores over all the dimensions is considered. To type a person requires that his pattern of scores over the dimensions be similar to that of a group of other hunters (thereafter called his type), and that this group's scores be different from other groups' scores.

In performing the typing, only four of the dimensions identified were employed. Five criteria were used in selection of the dimensions: (1) The dimension had to be common to all license type groups; (2) it had to be relatively independent of the other dimensions; (3) the strength of the dimension was considered; (4) the consistency of the items appearing in the dimension over all license types was important; and (5) the degree to which the dimension was directly and clearly relevant to game management was considered (i.e., was the dimension amenable to manipulation). The four dimensions were named: nature, harvest, easy hunt, and out-group contract.

After hunters were typed, Monte Carlo and inferential statistical procedures were used to relate hunt and hunter characteristics to the types. Such things as success in hunting, days hunted, age and education of hunters, and preferences for management practices were involved in this analysis.

In summary, the method of this study involved determining dimensions of the hunting experience perceived as providing satisfaction, typing users according to their preferred mix of dimensions, and relating other user characteristics to the types identified.

Results

Reported here are results drawn from analysis of the 1971 returns by all license types (77 percent of the effective distribution of 2,333 questionnaires) and 694 returns from the in-state regular rifle license holders (74 percent of the effective distribution for this license type). Similar results are available for the other license types.1

Dimensions of the Deer Hunting Experience

Cluster analysis of the 73 Likert type items produced nine dimensions for both the inclusive license group and the in-state rifle license type. While the same names are given to the dimensions for both groups, it should be noted that the items describing each dimension were not always the same for both groups. Also, the names were assigned to represent the meaning of the dimension as closely as possible, but a simple name is not totally descriptive. The names assigned, in the order that the dimensions emerged for the in-state rifle group, were: nature, out-group contact, equipment, frustration release, easy hunting, in-group affiliation, skill, harvest, and suspense. Each of these dimensions had at least four items and a dimension reliability exceeding 0.60.

Four of these dimensions were selected for hunter typing based upon the criteria mentioned previously. The four were: easy hunt, harvest, out-group contact, and nature. The items which describe these dimensions are listed below.

1Space does not permit presentation of results for all license types. Therefore, typological and prediction results are only reported for the in-state rifle license group. Information on the other license groups may be obtained from the authors.

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Forty-Second North American Wildlife Conference
Easy Hunt
Looking for deer from a vehicle
Hunting in pleasant weather
Hunting where you don't have to work hard to find game
Killing game close to my vehicle

Harvest
Killing game
Shooting my weapon
Being more successful than my hunting companions
Getting meat to eat
Eating game
Getting a quick kill
Showing game I have killed to my family and friends

Out-Group Contact
Knowing there are other hunters around
Seeing hunters in other parties have success
Sharing hunting experiences with other hunting groups
Seeing and talking with game wardens
Being able to count on hunters of other groups for help if it is needed
Seeing hunters from other parties
Socializing with hunters from other parties
Hearing other hunters' shots

Nature
Being outdoors
Being close to nature
Being where things are natural
Camping out while hunting
Seeing some wildlife
The smells, sights, and sounds of the woods and fields
Being where it is quiet
Physical exercise

Typing
After identifying these four dimensions of satisfaction that Colorado deer hunters receive from hunting, the hierarchical clustering routines of BC-TRY were used to identify the types of deer hunters in the sample according to their patterns of satisfaction over the dimensions. In doing the typological analysis, each hunter was scored on each dimension. A pattern across all five scores was established for each hunter. The hunters' score patterns were then compared, and groups of hunters with similar patterns were formed. Several typing iterations were performed on the computer until a stable set of types was found. Nearly all of the hunters were assigned to one of the groups, though there were a few (eight percent) unique individuals who did not fit well with any group.

Results of the typological analysis of the in-state rifle license type are shown in Table 1. The four dimensions selected for typing are across the top of the table and down the left side are the eight hunter types that were found and the number of persons in each type. The modifiers below the four dimensions describe the
Table 1. Colorado deer hunter types based on empirically derived scores on satisfaction dimensions.\footnote{a}

<table>
<thead>
<tr>
<th>Type</th>
<th>N</th>
<th>Percent</th>
<th>Easy hunt</th>
<th>Harvest</th>
<th>Out-group contact</th>
<th>Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>79</td>
<td>11</td>
<td>Moderately detracts (-2)</td>
<td>Moderately adds (2)</td>
<td>Neutral (0)</td>
<td>Most strongly adds (4)</td>
</tr>
<tr>
<td>2</td>
<td>23</td>
<td>3</td>
<td>Neutral (0)</td>
<td>Slightly adds (1)</td>
<td>Neutral (0)</td>
<td>Neutral (0)</td>
</tr>
<tr>
<td>3</td>
<td>117</td>
<td>17</td>
<td>Neutral (0)</td>
<td>Slightly adds (1)</td>
<td>Slightly adds (1)</td>
<td>Most strongly adds (4)</td>
</tr>
<tr>
<td>4</td>
<td>67</td>
<td>10</td>
<td>Slightly adds (1)</td>
<td>Strongly adds (3)</td>
<td>Slightly detracts (-1)</td>
<td>Most strongly adds (4)</td>
</tr>
<tr>
<td>5</td>
<td>84</td>
<td>12</td>
<td>Neutral (0)</td>
<td>Slightly adds (1)</td>
<td>Neutral (0)</td>
<td>Moderately adds (2)</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td>21</td>
<td>Slightly adds (1)</td>
<td>Strongly adds (3)</td>
<td>Moderately adds (2)</td>
<td>Strongly adds (3)</td>
</tr>
<tr>
<td>7</td>
<td>53</td>
<td>8</td>
<td>Strongly adds (3)</td>
<td>Most strongly adds (4)</td>
<td>Strongly adds (3)</td>
<td>Most strongly adds (4)</td>
</tr>
<tr>
<td>8</td>
<td>67</td>
<td>10</td>
<td>Slightly detracts (-1)</td>
<td>Most strongly adds (4)</td>
<td>Moderately adds (2)</td>
<td>Most strongly adds (4)</td>
</tr>
</tbody>
</table>

\footnote{b}The numbers in parentheses indicate the approximate mean satisfaction level for the type on the dimension.

\footnote{c}There were 57 hunters unassigned to types because of the uniqueness of their score patterns across the dimensions.

The importance of the dimension to hunter satisfaction. "Neutral" indicates that the dimension neither adds to nor detracts from the hunting experience. The numbers in parentheses represent the mean degree of contribution to satisfaction that the hunters scaled on their questionnaires. The scale ranged from plus four (extremely adds) to minus four (extremely detracts).

In looking down the columns of Table 1, the degree to which each dimension discriminates among hunter groups is apparent. Nature, for instance, is a highly positive dimension and provides little discrimination. Easy hunt, on the other hand, discriminates greatly ranging from moderately detracts for Type 1 to strongly adds for Type 7. The other two dimensions are between these two on discrimination with out-group contact somewhat more variable than harvest.

The row data in Table 1 provide profiles of hunter types with Type 1 being a nature-harvest oriented type who reacts negatively to the easy hunt items. Type 2 might be called a "minimum gratification" type. For this type, only harvest contributes at all to deer hunting satisfaction, and then only in a small way. As a group, members of this type may be potential dropouts from deer hunting. Type 3 individuals gain most satisfaction from the nature aspects of deer hunting, while also gaining satisfaction from harvest and out-group contact, but not easy hunting. Type 4 are nature-harvest satisfied hunters who do not receive satisfaction from out-group contact. In fact, they indicate that meeting and hearing other hunters actually detracts from their experience. Type 5 might simply be characterized as a nature-harvest type, but one that does not have strong feelings about any of the dimensions. Type 6, the largest type with 21 percent of the population, perceives each of the four dimensions as positively contributing to the deer hunting experience. Nature and harvest are strongest for this group. Type 7 hunters are generally
positive about all the dimensions. They scored the highest on every dimension, and appear to be gung-ho hunters. Type 8 is composed of hunters who gain great satisfaction from the nature and harvest components of deer hunting, gain satisfaction from being around hunters from other parties, and react negatively to easy hunt aspects of some hunting experiences. The last row shows the number and percent of deer hunters who could not reliably be included in any of the eight hunter types.

**Predicting Management Preferences and Social Characteristics from Types**

The analyses described above have generated a set of Colorado deer hunter types based upon each individual's relationship to four hunting experience dimensions. The deer hunter questionnaire contained several items about hunters and management of hunting which can be related to the hunter types in order to: further describe the types; assess the validity of the type descriptions; and suggest hypotheses about hunter reaction to imposition of management alternatives. Selected results of these prediction analyses are given in the following paragraphs. Results are based on a multiple range test of all pair-wise comparisons using Scheffe's technique, unless otherwise noted.

Respondents were asked about their feelings toward 10 different management practices which the Colorado Division of Wildlife either was presently using or had used in recent years. These practices dealt with topics such as the taking of bucks only, changing access conditions, timing of big game seasons, and having separate seasons for archery, primitive weapon, and rifle hunters. For three of these management items significant differences between hunter types were found. For the item, "changing road access so that more hunting areas are easy to reach," the mean score, on a five-point (+2 to -2) favorability-unfavorability scale, for hunter Type 1 (-0.91) was significantly different \((p < .05)\) from the mean of hunter Type 6 (0.00) and Type 7 (0.58). The mean of hunter Type 4 (-0.55) was significantly different \((p < .05)\) from the mean of Type 7 (0.58).

A hypothesis related to these comparisons was that those hunter types expressing negative or neutral feelings toward easy hunt and out-group contact would express negative feelings toward increased road access. It was also hypothesized that the reverse situation would be true. Type 1 indicated that easy hunt moderately detracts from the hunting experience while Types 6 and 7 indicated that an easy hunt slightly adds and strongly adds, respectively. While Type 1 was neutral toward out-group contact, Types 6 and 7 indicated that this attribute moderately adds and strongly adds, respectively, to the hunting experience. Although Type 4 felt that easy hunt slightly adds to the hunting experience, this type also felt that out-group contact slightly detracted from the experience. The results shown above for these different hunter types support the hypotheses.

Reaction to "changing trail access so that more hunting areas are easy to reach" showed similar results to those for the road access item. The mean scores for hunter Types 1 (-0.74) and 4 (-0.34) differed significantly \((p < .05)\) from the means for Types 6 (0.26) and 7 (1.00). In comparing these means to those for the road access item, it is apparent that a more positive reaction to changing trails was obtained. This result was not surprising given the strong harvest orientation of all four types. While improving trail access would likely enable more people to enter
an area, it would probably not have nearly as large an effect as improving road access. For many of the hunters in the types indicated, better trails might be perceived as increasing the opportunity to harvest animals while not increasing the number of hunters very much. Still, however, the majority of hunters in Types 1 and 4 were negative toward increasing trail access.

To investigate the relationship between the types and the management item, "holding the deer season early, before elk season" the prediction program of the BC-TRY package was used. This technique was used because of the small \( n \) in some data cells. The procedure involves Monte Carlo sampling. The program draws several hundred samples of a type's size from the total \( n \), thus providing a distribution of sample means against which the type's actual mean is compared. The result is a probability statement of the likelihood of finding a mean as or more deviant than the type's mean by chance alone.

The item about holding the deer season first was viewed favorably by all hunter types, except Type 2 whose mean \((-0.67)\) was significantly \((p<0.001)\) below the population mean (approximately 0.38). In looking at Table 1, the distribution of dimension scores for Type 2 suggests that it is a minimum gratification type, with a slightly positive reaction to the harvest dimension. In the absence of other information one might hypothesize that this type would be neutral on the timing of the season. But, in looking at results of other season timing items, a reason for the negative response to the item about holding deer hunting first is apparent. This group also negatively scored the item, "holding the deer season late, after elk season." For the item, "holding deer and elk season at the same time," it had a positive score. One possible conclusion from these findings is that the group felt the chances of harvesting something are greater if you can hunt for both deer and elk at the same time.

Illustrative of the social and economic description of the hunter types are the income data. The mean income of the population is in the range $13,000-$14,000. Using the prediction program of the BC-TRY package, the mean incomes for Types 3 and 5 were found to be significantly \((p<0.05 \text{ and } p<0.01, \text{ respectively})\) above the population mean. The income means for Types 7 and 8 were significantly \((p<0.001 \text{ and } p<0.01, \text{ respectively})\) lower than the population mean.

In reviewing all of the income data, those hunter types with relatively low scores on harvest (1, 2, 3, and 5) were above the mean in income, except for Type 2, the minimum gratification type. Those hunter types with high scores on harvest (4, 6, 7, and 8) were right at (Type 4) or below the mean income. Also, it can be observed that those hunter types which appear to be gung-ho hunters are of lower income than other hunter types.

Additional descriptive data are available for the hunter types even though they are unreported here.

**Conclusions**

The methods employed in this study could be used to investigate the demand for many kinds of fish, wildlife, and other environmental resource related experiences. Users' expressions of satisfaction or dissatisfaction toward elements of the experience can be dimensionalized with cluster analysis and the dimensions used to define types of users. These user types are segments of the user population receiving differential gratification from an experience. Knowledge of different
types enables managers of wildlife resources to make decisions based upon the resource, social, and managerial attributes which provide user satisfaction. An understanding of users and their preferences can be enhanced by examining items such as socioeconomic characteristics and management preferences that might be expected to differentiate user types.

There are several conclusions which can be derived from our analysis of the rifle license holder group of Colorado deer hunters. A nature emphasis seems warranted in the production of deer hunting opportunities. Nature was clearly the most positively rated attribute of the experience in terms of providing satisfaction. The contrast between nature and harvest appears particularly striking, and three hunter types (2, 3, and 5) were identified for whom hunting in low harvest areas would not detract from the experience. Two of these groups would be gratified by nature-oriented experiences which include seeing game but not necessarily harvesting it, while the other, Type 2, is likely to be a hunting drop-out because hunting provides them little gratification.

Another conclusion is that out-group contact, commonly called crowding when at unacceptable levels, is quite tolerable within acceptable limits for seven of the hunter types (Type 4 excepted). Types 1, 2, and 5 are neutral toward out-group contact while the other four types feel it adds to their satisfaction. Future research might focus on the point at which different hunter types indicate that there are too many hunters present.

The data show that some Colorado deer hunters gain more satisfaction from the hunting dimensions studied than do other hunters. If these dimensions represent a valid set to describe the managerially relevant aspects of deer hunting, then one might use these indications of satisfaction in allocating and managing game resources. Endee (1972; 1974) has argued that the hunters who are most dependent on hunting for their satisfactions in life should be catered to more than those who describe themselves as having alternative means of gaining satisfaction. Using this rationale one might argue that those types that value the harvest dimension highly should be given greater consideration when allocating scarce game resources. Implicit here is that hunters emphasizing other hunt attributes have many substitute activities which provide the same kind of satisfaction.

Finally, some conclusions can be drawn from the prediction analyses. Increasing access to game resources through modification of roads and trails would be received negatively by some hunter types and positively by others. Knowledge of the experience preferences of hunters using particular hunting areas would thus be beneficial to making decisions about where to modify access conditions, or in assessing the recreational impacts of road and trail changes.

Data such as those for income can be used to answer questions about the equity inherent in game resource allocation. The kinds of hunter types described, in terms of hunt experience desired, can be related to age, sex, income, and other population descriptors. While the types of hunters can be used to describe experiences desired, the population descriptors can be used to socially describe groups of hunters desiring specific experiences. If these data are compared with local and state population data and with the actual distribution of deer hunting opportunities, the equity implications of present Colorado deer hunting policy can be determined.

In addition to these empirically based conclusions, we can also suggest some general applications of the methods used. Valuing specific hunting sites, estimat-
ing demand for hunting experiences, and allocating game related resources are activities for which the methodology can provide information.

Wennergren and Fullerton (1975) have identified that there are large differences between the location and amenity values of hunting sites, and that the total site value is composed of these two components. The methods utilized fit well within these concepts and enable the identification, from the hunters' perspective, of the site attributes which have value. In order to supply highly valued resources, the manager can then manipulate key resource elements to produce a desired mix of site attributes.

In estimating demand, the method can be used to delineate specific hunting experiences for which management might provide opportunity. Rather than treating all deer hunting as one experience, the method enables the identification of more discrete experience packages and the size of the hunter groups relating favorably to the different experiences. In the sense that Wagar (1966) discussed a need to provide a spectrum of recreation facility types within an activity category (e.g., camping), this method allows identification of the experience spectrum demanded. Such information enables deriving economic estimates of willingness-to-pay for specific hunting or other recreational experiences. This would produce demand estimates for specific products rather than for classes of products as have been generated many times. In the present volume, the paper by Miller, Prato, and Young approaches the demand problem from this perspective.

Finally, the output of the method is also relevant to resource allocation decisions (apart from economic demand estimation and site valuation). Presently, various mathematical models are used as resource allocation aids. Very popular are linear programming models, among which is goal programming. The information obtained, utilizing the method described here, about groups and the kinds of experiences which provide them satisfaction can be utilized as the goal sets in these models. Also, information about experience attributes can be used to specify the dimensions of other parts of a goal programming model. For instance, land unit descriptions (e.g., response unit classification) and the identification of management alternatives might be aided by the kinds of information produced by utilizing the method described.

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