

FURTHER INSIGHTS INTO THE MULTIPLE-SATISFACTIONS APPROACH FOR HUNTER MANAGEMENT

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Abstract: A multiple-satisfactions approach was used to determine hunting satisfaction for deer hunters using the Arnot Forest, a controlled hunting area in central New York. A sample of these hunters was surveyed via mail questionnaire; 144 (73.5%) hunters responded. Among 12 potential components of hunting satisfaction in respondents' concept of an ideal situation, "to get outdoors and enjoy nature" and "to see deer or deer signs" were of primary importance, while "to get shots at deer," "to use hunting skills," and "to get away from everyday problems and get a chance to relax" were secondary. Five components of hunting satisfaction were found to be deficient when compared to an ideal situation: getting shots at deer, seeing deer or deer sign, trophy display, using hunting equipment, and using hunting skills. Highly satisfied hunters ranked getting out-of-doors the most important component of the hunt; minimally satisfied hunters ranked getting shots at deer highest. The greatest dissatisfactions were related to harvesting game. We concluded that the multiple-satisfactions approach may prove most useful when used to identify (1) types of hunters seeking similar satisfactions and (2) areas that best provide those satisfactions. Thus, it may be possible to combine hunters seeking similar satisfactions with areas having the greatest potential to provide those satisfactions.

A primary objective of wildlife management is to provide people with opportunities for experiences from which they can derive long-term benefits (Hendee 1974, Hendee and Potter 1971). Game managers have attempted this by managing both game and hunters. However, our understanding of hunters clearly lags behind our understanding of most game animals. We are still considering questions such as, "What are the parameters affecting human benefits relative to hunting?," "What kinds of experiences do hunters seek and find?," and "What should be the objectives of hunter management?"

Management evolved from a "game-bagged" approach, which assumed that the more game harvested the greater the human benefits derived, to the popular

"days-afield" objective, which assumed that human benefits are maximized by increasing the number of hunter days provided (Crissey 1971). The latter objective has been appealing because over the last 2 decades hunter numbers generally have been increasing while game populations generally have been stable or declining (thus game bagged would decrease, indicating "lack of success" if harvest/hunter was the sole measure of human benefits). But the "days-afield" concept is also outmoded and is recognized as such in many states. The reporting of hunter days is rapidly falling from common usage and is being replaced by a combination of measures of hunting participation that more appropriately reflect the full spectrum of hunting activity.

Recently a multiple-satisfactions ap-

proach to hunter management has been suggested (Hendee 1972, 1974). This approach recognizes that many satisfactions are derived from hunting and that providing a wide range of these satisfactions will add to the benefits people can derive from game management (Hendee 1974, 1975, Hendee and Bryan 1978, Potter et al. 1973).

Hunter motivations and satisfactions have been studied and discussed by several authors (Arthur and Wilson 1979, Brown et al. 1977, Hautaluoma and Brown 1978, Heberlien and Laybourne 1978, Hendee 1974, Kennedy 1970, More 1973, Potter et al. 1973, Schole et al. 1973, Stankey et al. 1973). These studies have supported the long-standing claims of hunters and game managers that hunting is more than just killing game. The implications of such studies have encouraged application of the multiple-satisfactions approach to hunter management. One objective of our study was to obtain the sociological information needed to make recommendations for management using a multiple-satisfactions approach. We used a moderate-sized hunting area with controlled access to identify hunters' dissatisfaction and we intended to use this information as the basis for establishing management priorities to improve hunting quality. "Hunting quality" as used here means congruence between satisfactions of an ideal hunt and those of the actual Arnot Forest hunting experience. This definition approximates that used by Bultena and Klessig (1969) and LaPage (1968).

Another objective of this study was to enhance our understanding of hunter satisfaction. Campbell et al. (1976:10,14) indicated that, generally, (1) satisfaction is strongly influenced by an individual's past experience and current expectations, and (2) an individual's satisfaction with

an activity depends on his evaluations or assessments of various attributes of that activity. Thus, we studied the relationships among satisfaction, expectations, and previous hunting experience.

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METHODS

Study Area

The Arnot Teaching and Research Forest (hereafter called the Arnot Forest) is located about 32 km southwest of Ithaca, New York, in Tompkins and Schuyler counties. This 1,610-ha tract is owned by Cornell University and managed by the Department of Natural Resources as a teaching, research, and demonstration area. This area is typical of some 2.4 million ha in southern New York State. Hunting is a long-established tradition on the Arnot Forest and the area has been a Cooperative Hunting Area under New York's Fish and Wildlife Management Act program since 1960.

Data Collection and Analysis

Check stations were established at the only 2 vehicle access points and were operated by wildlife students who had been instructed in the data collection procedures. All hunters were required to check-in before entering the Arnot Forest and to complete a brief, self-administered questionnaire at the conclusion of their hunt. The questionnaire requested each hunter's name and address and each participant's initial reaction to, and general overall satisfaction with, his or her hunting experience on the area. The check stations were operated on 8 key days of the 20-day regular big game season—first 6 days and subsequent 2 Saturdays (no Sunday hunting). A total of 246 different hunters were contacted at the stations.

Following the deer season, 206 of these hunters were sent mail questionnaires; 40 illegible names and addresses were omitted. Two days after the close of the deer season the initial mailing was made, followed by up to 3 reminder letters to all nonrespondents.

The mail questionnaire solicited background information about the hunters and their evaluation of various hunting satisfactions experienced during their hunt. They were asked the degree to which each of 12 components (i.e., specific satisfactions) of overall hunting satisfaction either added to or

detracted from their perception of an *ideal* hunt, using a 9-point, Likert-type scale (Maranell 1974) from "greatly detracts" to "greatly adds." They were also asked the level of satisfaction actually experienced (i.e., quality) for each component on their hunt, again using a 9-point, Likert-type scale from "greatly dissatisfied" to "greatly satisfied." Means were calculated for each satisfaction and an index of disparity was calculated based on the differences in means. We used this disparity as an index of the degree of improvement needed for each satisfaction in the Arnot Forest deer hunting experience. This index was essentially a measure of quality because it indicated the degree to which the hunters' expectations or desires were met for each component. The satisfactions were derived from the findings of More (1973), Potter et al. (1973), Schole et al. (1973), and Stankey et al. (1973).

A component of "to kill a deer" was not included because previous research has indicated that such a component might produce bias (More 1973:74). We also knew that only a small number (≈ 25) of deer would be harvested, thus "actual" satisfaction would be predictably low for such a component and cause a large disparity. To assess consumptive (harvest-oriented) satisfactions, we used 2 related elements: getting shots at deer and trophy display.

In addition to indicating an overall satisfaction level with the hunt, respondents also ranked the components for relative importance to a satisfying deer hunt. Weight factors for each component were derived from the ranking and were used in conjunction with disparity data to establish hunter satisfaction management priorities. The Kolmogorov-Smirnov test was used to identify differences between the ideal versus actual level of satisfaction reported for each component (Daniel 1978:276-295). The Friedman 2-way analysis of variance by ranks and a multiple comparison procedure based on this test (Daniel 1978:225-253) were used to find differences in disparities between components of satisfaction. Significance was evaluated at $P \geq 0.95$ in most instances.

An overall satisfaction score for respondents was used to further evaluate the determinants of variations in hunter satisfaction. This overall score was calculated by adding the scores of actual level of satisfaction reported for the 12 satisfaction components, after each was first weighted by the absolute value that hunters indicated the component contributed to an ideal hunt. Scores were then proportioned to allow a range of -100 to +100; -100 indicated total dissatisfaction, 0 indicated zero net satisfaction, and 100 indicated total satisfaction. Since the scale ranged from -4 to +4, the formula for a hunter's satisfaction score (S) was

$$S = \frac{100 \times \sum(|\text{Ideal}|)(\text{Actual})}{4 \times \sum(|\text{Ideal}|)}$$

The hypothesis that hunting satisfaction is influenced by previous experience was examined by

correlating satisfaction scores with several background variables.

To analyze the impact of individual components on overall hunting satisfaction, hunters were divided into 3 groups by satisfaction scores: (1) those whose total score, on a -100 to +100 basis, was less than 25 (minimally satisfied and dissatisfied hunters, Min), those scoring between 25 and 62 (moderately satisfied hunters, Mod), and those scoring above 62 (highly satisfied hunters, Max). These categories were chosen for both conceptual and natural clustering reasons. The order of importance of components influencing a satisfactory hunt was analyzed by comparing mean absolute values assigned by hunters to an ideal deer hunting experience.

Knowledge of the level of importance of the components must be supplemented by an understanding of the direction in which they are valued. Such items as traveling to the hunting site, hunting under regulations, and seeing or hearing other hunters are viewed positively by some hunters and negatively by others. Thus, the 3 groups of hunters were also compared as to hunting satisfaction, using a 9-point signed-scale of -4 to +4. Finally, satisfaction scores for the 3 groups were analyzed to determine to what degree and how consistently different components influenced the total score.

RESULTS

Characteristics of Respondents

A total of 144 (73.5%) of the 196 hunters contacted by mail returned their questionnaires. Two-thirds of the respondents were in 1 of 5 general occupational categories: craftsmen-foremen, professional-technical, operatives, managerial-official, and retired (17, 15, 13, 12, and 10%, respectively). Hunters in our sample were distributed similarly among occupational categories ($\pm 6\%$) as were hunters from the surrounding area in a 1976 statewide hunting study (Decker and Brown 1979).

Arnot Forest hunters were middle-aged, experienced hunters. The mean age of respondents was 39—the same as that found in the 1976 statewide hunting study—and had hunted an average of 18 years. The 75% who had hunted on the Arnot Forest prior to 1978 averaged 9 years of hunting experience on the Arnot Forest. The reasons respondents gave

Table 1. Importance, satisfaction (ideal and actual), disparity, and weighted disparity of 12 components of hunting satisfaction for Arnot Forest hunters, 1978.

Components ^a	Importance		Mean values		Disparity	Weighted disparity	
	Ordinal rank	Weight factor	Ideal mean	Actual mean	(Ideal-actual)	Order	Weighted value
1. Getting shots at deer ^{b,c}	3	0.127	2.95	0.67	2.27	2	0.289
2. Seeing deer or deer signs ^{b,c}	2	0.204	3.44	1.56	1.88	1	0.384
3. Trophy display ^{b,c}	7	0.053	1.79	0.06	1.73	4	0.091
4. Using hunting equipment ^{b,c}	9	0.020	2.50	1.31	1.19	6	0.024
5. Using hunting skills ^{b,c}	4	0.117	2.43	1.33	1.10	3	0.129
6. Traveling a long distance to hunt ^b	12	0.005	-0.40	0.50	-0.90	9	-0.005
7. Having regulations placed on hunter	11	0.015	-0.19	0.42	-0.61	12	-0.009
8. Hearing shots and voices of other hunters	10	0.015	-0.84	-0.50	-0.34	10	-0.005
9. Seeing many other hunters ^b	8	0.024	-0.35	-0.07	-0.28	11	-0.009
10. Being with hunting companions	6	0.079	2.56	2.30	0.26	8	0.021
11. Having a chance to relax	5	0.105	3.26	3.05	0.21	7	0.022
12. Getting a chance to enjoy nature	1	0.237	3.53	3.37	0.16	5	0.037

^a Components are listed from greatest to least *absolute* disparity index value.

^b Kolmogorov-Smirnov test indicates that the responses for actual versus ideal differ significantly ($P \geq 0.95$) for this component.

^c The Friedman test and multiple comparison procedure based on this test show that the disparity values for these 5 components are not significantly different.

most frequently for hunting here during the 1978 season were their perception of abundant game on the area (22%) and their familiarity with the area (21%).

Sixty percent were generally satisfied, 15% were neither measurably satisfied nor dissatisfied, and 25% were generally dissatisfied with their hunting experience. A 7% difference between the "satisfied" responses on the survey and on-site questionnaires, 60% versus 53%, indicated that the survey respondents were not notably biased toward those who were "satisfied."

Hunting Satisfaction

Weighted rankings of the relative importance of the 12 components of deer hunting satisfaction indicate that "to get outdoors and enjoy nature" and "to see deer or deer signs" were of primary importance (Table 1). Three components were of secondary importance: "to get shots at deer," "to use hunting skills," and "to get away from everyday problems and get a chance to relax."

Disparity Between Ideal Versus Actual Satisfaction

Five components had an absolute disparity value >1.0 between the ideal and actual means (Table 1). The first 5 components in Table 1 each had a mean of actual satisfaction that was lower than the mean for ideal satisfaction. Consequently, the disparity indicates a deficiency in these 5 components in the hunt. These components are very much associated with game abundance and harvest. The Friedman test indicates that the disparity values for components 1 and 2 are similar to those of 3-5, but differ significantly from those of 6-12.

The disparity indices can help area managers assess the *degree* of improvement needed for each individual component, but if a manager is to establish realistic priorities for improving quality of the hunt by enhancing satisfactions, these still need to be placed in the context of their *relative importance* to one another. This was accomplished by weighting the disparity for each compo-

ment by its relative importance weight factor derived from the direct ranking of components made by respondents; the top 4 components were still very much related to the abundance of deer and harvest (Table 1).

Overall Satisfaction

Overall satisfaction scores of Arnot Forest hunters ranged from -52 to +100 ($\bar{X} = 36.7$; $SD = 36.7$). The hypothesis that satisfaction is influenced by previous experience was examined by correlating scores with (a) number of years deer hunting experience, (b) number of years hunting on the Arnot Forest, and (c) number of days hunting deer in 1978. In each case the correlation was low ($r = 0.11$, 0.10 , and 0.04 , respectively) and was not significant. The mean score for those hunting the study area for the first time was slightly higher than for other hunters (41 versus 35).

Satisfaction was somewhat higher for the 31% of respondents who were favorable about the check-in and check-out procedures than for those who were neutral or negative (mean scores were 44 and 33, respectively; $t = 1.48$, significant at $P = 0.90$). Also, hunters who had experience using bows or muzzle-loaders had lower satisfaction scores (means of approximately 25) than hunters who had not used such equipment (means of approximately 40; $t = 1.81$, significant at $P = 0.95$).

The greatest difference in satisfaction scores occurred between hunters who had harvested deer (mean score of 54) and those who had not (mean score of 34). Although a difference in scores would be expected, the magnitude of the difference should be placed in perspective. Of the 13 responding hunters in our survey who harvested a deer, 3 (23%) scored be-

low the overall satisfaction mean of 36.7. However, of the 101 hunters completing the satisfaction scale who did not harvest a deer, 50% scored above the overall satisfaction mean. The limited number of successful hunters prohibited a more meaningful comparison of scores on the various components of satisfaction.

Satisfaction with Individual Components of Satisfaction

Since overall satisfaction in deer hunting for our hunters was only partially explained by the harvest variable, and other background variables contributed little to the explanation, we believed it was important to examine the individual components of satisfaction. We hypothesized that individuals hunting on the same area at a similar time can experience different levels of satisfaction with respect to individual components (which affect overall satisfaction) for the following reasons:

- A. Hunters having similar experiences:
 1. Individuals differ as to what elements are important to a satisfying hunt.
 2. Individuals differ as to whether some elements enhance or detract from the hunting experience.
- B. Hunters having different experiences:
 1. Some saw signs of deer, got a shot at deer, hunted with friends, etc., while others did not.
 2. Individual hunters were affected differently by factors external to the hunting site (e.g., amount of time available to hunt, time of day when hunting took place, hunting skills, experience, and background).

Of the 4 categories listed above, the first 3 can be examined, at least in part, by

Table 2. Mean satisfaction scale scores of Arnot Forest hunters.

Satisfaction component	Hunter group*			Hunter group			Hunter group		
	Min	Mod	Max	Min	Mod	Max	Min	Mod	Max
Getting out-of-doors	3.28	3.50	3.87	3.28	3.50	3.87	2.69	3.48	3.87
Seeing deer or deer signs	3.68	3.48	3.71	3.25	3.48	3.71	-1.03	2.39	3.45
Getting away/relaxing	3.31	3.00	3.68	3.31	3.00	3.68	2.56	2.93	3.71
Use of skills—stalking, tracking	2.82	2.73	3.19	1.85	2.36	3.19	-0.44	1.55	3.13
Use of equipment	2.64	2.27	3.16	2.44	2.27	3.16	-0.64	1.48	3.10
Getting shots at deer	3.69	3.02	3.16	3.18	2.84	3.16	-2.18	1.32	2.97
Companionship	2.72	2.66	3.00	2.46	2.48	3.00	1.44	2.57	3.32
Trophy display	1.56	2.36	2.16	1.15	2.05	2.16	-1.79	0.43	1.48
Seeing other hunters	2.44	2.70	2.13	-0.07	-1.11	0.84	-1.13	-0.36	1.42
Site regulations	1.62	1.32	1.26	-0.85	-0.23	0.74	-0.64	0.09	1.77
Travel to site	1.26	1.68	1.48	-0.90	-0.59	0.61	-0.33	0.47	1.16
Hearing other hunters	2.21	2.18	1.16	-0.67	-1.55	0.12	-1.46	-0.27	0.77

* Min = minimally satisfied hunters, Mod = moderately satisfied hunters, Max = highly satisfied hunters.

analysis of the individual components of hunting satisfaction.

By comparing the mean absolute values assigned by hunters to an ideal hunting experience, 2 potentially important findings emerged. First, highly satisfied (Max) hunters ranked getting out-of-doors as the single most important component of the hunt (Table 2). Seeing a deer or deer signs was ranked second, followed by getting away from everyday problems/relaxing, and using skills such as stalking and tracking. Getting shots at deer and use of equipment tied for fifth. Conversely, minimally satisfied (Min) hunters ranked getting shots at deer and seeing deer or deer signs highest, while ranking getting out-of-doors fourth. Second, the Max group assigned high importance levels to more components than other groups. On a scale of 0-4, Max hunters assigned a mean importance value of at least 3.0 to 7 components, compared to 4 components for the less-satisfied groups. Besides the added emphasis placed on getting out-of-doors, the only other component for

which these hunters differed significantly from other groups was that of hearing shots or voices of hunters in other groups; Max hunters were less concerned about the presence of other hunters.

Mean ideal component scores differed somewhat for signed versus absolute values because all but 2 (getting out-of-doors and getting away from problems/relaxing) were rated as detracting to the satisfaction of some hunters. Comparing mean signed values to their absolute counterparts, the positive importance of being out-of-doors ranked second to relaxed for Min hunters, and getting shots at deer dropped to fourth (Table 2). The rank order of the 8 most important components to the Max group remained unchanged. Min hunters still ranked the value of getting out-of-doors significantly lower than Max hunters, and Max hunters still assigned a mean value of at least 3.0 to 7 components, compared to 4 components for the Min group. Max hunters placed significantly more positive importance than Min hunters on the opportunity to use skills such as stalking and

tracking, on the opportunity to display a trophy species, and on traveling to reach a hunting area.

Examining *actual* satisfaction components, Min hunters placed a significantly lower evaluation on each component than Max hunters (Table 2). Only getting out-of-doors, getting away from everyday problems/relaxing, and hunting with companions received mean positive evaluations. Getting shots at deer received the lowest evaluation (mean of -2.14). For each component, Min hunters reported a lower mean evaluation than moderately satisfied (Mod) hunters, and Mod hunters reported a lower mean evaluation than Max hunters. Not all differences are statistically significant between a lower group and a succeeding higher group, perhaps due to relatively small sample size.

The greatest disparities in mean component scores between Max and Min hunter groups occurred in getting shots at deer, followed by seeing deer or signs of deer, use of equipment, using skills such as stalking or tracking, and opportunity to display a trophy. Each of these components resulted in a mean disparity of greater than 3 satisfaction units. The minimum disparity, greater than 1 unit, was in the evaluation of the Arnot Forest trip in terms of getting away from everyday problems/relaxing, followed by getting out-of-doors. Getting shots at deer, and seeing deer or deer signs also accounted for the greatest disparity between Mod and Min hunters.

Getting shots at deer, use of equipment, and using skills such as stalking and tracking were among the components of highest disparity separating Max versus Mod groups. However, the disparity of these components was exceeded slightly by that of seeing other hunters,

and being subjected to regulations, respectively.

DISCUSSION AND IMPLICATIONS

Basically, 2 schools of thought exist with respect to the potential for the multiple-satisfactions approach in increasing overall hunter satisfaction. Hendee (1974) generally views nonharvest-related satisfactions similar in importance with bagging game, trophy display, and getting shots. Under this premise, by managing for these other satisfactions, it is possible to increase substantially overall hunter satisfaction. Other researchers, such as Stankey et al. (1973), would maintain that while other aspects of the hunt are important in a supplementary role, overall satisfaction is closely tied to the probability of success, number of deer seen, and other components directly related to harvest. Thus, management for nonharvest satisfactions will improve overall satisfaction but to a more limited extent and with more quickly diminishing returns.

Our study supports the latter hypothesis, although our findings generally agree with all those mentioned earlier on 1 fundamental point—there is more to hunting than killing (e.g., getting outdoors to enjoy nature was most important to our hunters).

From an area manager's perspective, the disparity between ideal and actual hunting satisfactions defines a hunter management problem. The significance of the disparity is relative to the importance hunters place on a component. For the Arnot Forest hunt, the important factors "getting outdoors to enjoy nature," "getting a chance to relax," and "being with hunting companions" were adequately met for 2 of the 3 hunting satisfaction level groups. The 4 potentially

negative factors relating to travel distance, seeing or hearing other hunters, and hunting regulations were of low importance and little disparity, indicating that major efforts to improve these would seem questionable.

The 4 components that appear in greatest need of improvement to upgrade quality and increase hunter satisfaction are closely related to game abundance. These can be interpreted as reflecting the need for a greater probability of success—a dimension of hunting for which a certain threshold is believed necessary to provide hunters with a satisfactory hunting experience (More 1973, Potter et al. 1973, Schole et al. 1973, Stankey et al. 1973). The 1978 harvest of bucks (16) and does (9) on the Arnot Forest was exactly what was prescribed for the area. This illustrates the basic paradox in the controversy over objectives in hunter management. Although hunters in our study reflect the same spectrum of satisfactions found elsewhere among other hunters and generally support the hypothesis of the multiple-satisfactions approach (i.e., hunting is more than killing), we found the management implications of this approach difficult to apply. The intangible aesthetic and nature contact satisfactions are relatively easily provided by hunting (or by a number of other outdoor recreation activities); however, most hunters hunt to bag an animal, and it appears that at least in some situations increasing the probability of accomplishing that objective would yield maximum satisfaction from the hunting experience. We should note, however, that despite the dissatisfaction expressed, 75% of the respondents had hunted on the Arnot Forest prior to 1978 and hunting pressure and harvest have been relatively consistent in recent years.

There is a limit to the carrying capacity and harvest potential of any area. Once these are optimized, the game or hunter manager may not be able to enhance hunter satisfaction to any large degree. Thus, for the manager using a multiple-satisfactions approach, the alternatives for improving quality and deer hunting satisfaction in some situations may not be much different from those of a manager using a game-bagged objective. This is not to imply that the intangible components of hunting are unimportant. Certainly they are necessary, but apparently they are not sufficient to ensure a quality hunting experience for many hunters. What may be needed is a hunter education effort that strives to bring hunters' expectation of success closer to reality. Such an effort, accompanied by further research on identifying satisfactions sought by hunters, is definitely needed in regard to the group of minimally satisfied hunters.

More research is needed to determine which elements of hunting satisfaction can best be provided by specific management areas and which factors are most important to different types of hunters (e.g., regular gun versus muzzle-loader).

Development of more special hunting seasons and areas where hunter expectation of success is generally lower may continue to be a means of meeting hunting demand without undue pressure on the resource. Thus, through better determination of resource satisfaction potential and user satisfaction typologies, it may become possible to manage different areas for the types of hunters most likely to use the areas (Hautaluoma and Brown 1978). Achieving these combinations may prove to be the most productive use of the multiple-satisfactions approach to hunter management.

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