In Our Opinion: Are Michigan Deer Hunters Satisfied Stewards or Coerced Conservationists?

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Abstract: *There can be no doubt that hunters and anglers in the U.S. have played a major role in North American conservation efforts. They have contributed political leadership and support and engaged in habitat improvement projects. A significant contribution has been the financial base provided through license sales and excise taxes. The "great North American Conservation Model" partnership has traditionally justified hunting and trapping as effective "management tools" and extolled hunters and trappers as "conservationists", indispensable for wildlife management.*

The hunting community has unarguably been an enthusiastic steward of scarce game species and critical habitat. But that partnership is being tested in a new era of game species abundance. Every state with white-tailed deer has experienced the difficulty of getting hunter cooperation in achieving agency management goals for deer. The wildlife management community is increasingly examining whether or not consumptive wildlife use can serve as an effective management tool in the control of these abundant wildlife populations. This presentation focuses on Michigan deer hunters as partners in deer management.

Certainly some deer hunters have become active stewards with concerns for social and ecological impacts of deer as well as deer hunting quality for hunters. Some hunting organizations remain staunch advocates of responsible deer management and support state agencies. However, considerable resistance to efforts to lower deer numbers have also surfaced in the state's hunting community for a plethora of reasons. Efforts to optimize deer management in the state cannot succeed if a substantial portion of deer hunters refuse to cooperate in harvest goals – or worse – present strong political opposition to those goals. The presentation draws on a decade of research as well as existing literature and theory. Specifically, we explore the influence that hunters' motivations, satisfaction, attitudes, and behaviors may exert on the potential role of hunters as stewards not only of deer, but of the social and ecological values impacted by deer.

There can be no doubt that hunters and anglers in the U.S. have played a major role in the bulk of conservation efforts in North America. In times of wildlife scarcity, they have contributed political leadership and support and engaged in habitat improvement projects. A critical contribution has been the financial base for conservation provided through license sales and excise taxes. The partnership between consumptive recreational wildlife users and the management agencies has been lauded as the "North American Conservation Model" (Muth and Jamison 2000). The partnership has traditionally extolled hunters and trappers as "conservationists" and justified hunting and trapping as indispensable wildlife "management tools".

The partnership has been successful in bringing many game species back to abundance. There is no question that hunters have been enthusiastic stewards of scarce game species and critical habitat. But the partnership has experienced some limitations such as when confronted with today's challenge to manage overabundant game species. Today the wildlife management

community is examining whether or not consumptive wildlife use is equally effective as a management tool in the control of these abundant wildlife populations (see The Wildlife Society Bulletin, 2000, Vol. 28, #4 for a number of articles exploring this relationship). The discussion presented in this paper focuses on the partnership role of Michigan deer hunters in achieving deer management goals. Specifically, we address the implications of hunters' attitudes and behaviors for their role as stewards not only of deer, but of the social and ecological values impacted by deer.

Our discussion of Michigan hunter attitudes, intentions and behaviors is based on the following quantitative surveys and, to a lesser extent, qualitative focus groups associated with these and other investigations of Michigan deer hunters. These studies are briefly annotated here because many are unpublished.

Bull and Peyton 1999: A mail survey of landowners and hunters in Deer Management Unit 015 (Menominee County, MI). Survey was sent to all landowners in the DMU and to deer hunters contacted in the field during the 1998 deer season (adjusted response rate was 62% with 688 useable returns). The study was done as part of the "Quality Hunting Ecology" project of the Sand Co. Foundation.

Bull et al 2004: Michigan deer hunters (N = 4000; randomly drawn statewide from license data) were surveyed regarding their attitudes towards, use of and success with bait for deer hunting during the 2001 season (response rate = 60.4%; n = 2320 usable returns).

Bull et al 2005: In 2003, a study of hunter mobility and the impact of bovine TB on hunter choice of hunting area involved two different surveys. One was sent to a statewide random sample of license holders (response rate = 67%; n = 1919 usable returns). The other survey involved a sample of hunters who had hunted in the northeastern TB counties in 1997 and a control sample who hunted in non-affected nearby counties in 1997 (both had a response rate = 77%; total usable surveys = 1894) .

Holsman and Peyton 2003: Users of state game areas in the Maple River watershed were surveyed to assess their attitudes about the benefits of ecosystem management compared to traditional game species management. Surveys were mailed to hunters (adjusted response rate = 78%; n = 764 usable returns), as well as members of Sierra Club, Audubon Club and area residents.

Minnis 1996: A study of hunter and farmer attitudes regarding crop depredation by deer and the associated management problems was conducted in 1995. Surveys were mailed to 1257 deer hunters (adjusted response rate = 65%; n = 792 usable returns) who hunted in counties selected for the study based on the levels of crop losses in those areas.

Minnis and Peyton 1994: A mail survey was used to investigate hunter attitudes towards baiting, motivations for baiting and to explore whether use of bait created problems among hunters. A sample of 4000 deer hunter was drawn from the 1992 license data base (adjusted response rate = 71%; n = 2788 useable returns).

Peyton and Bull 2001: A study of Michigan deer hunters' attitudes and behaviors regarding quality deer management (QDM) issues. A survey mailed to 9423 randomly selected Michigan deer license holders in 2001 (adjusted response rate = 60.4%; n = 5470 usable returns). The survey was also sent to all (439) current members of the QDM Association (adjusted response rate = 82%; n = 350 usable returns). Responses from the statewide sample and the QDMA membership were not combined for analysis so that QDMA members could provide a comparison for QDM attitudes and behaviors among the statewide sample.

Wallmo et al. 2004. A public choice study regarding trade-offs associated with various deer management outcomes (e.g., auto accident rates, prevalence of deer disease, availability of wildlife viewing and hunting benefits, etc.) was completed in 2003. Multiple survey versions

were used in an experimental design to compare the values placed on these attributes. Versions of the survey were sent to a sample of licensed hunters (N = 1980, response rate = 66%) and the general public (N = 2970; response rate = 62%). The general public sample was drawn from state driver's license data.

Are Deer Hunters a "Single Species"?

Marketing experts have made lucrative careers using the "market segmentation" concept. Auto manufacturers do not make cars for "the average" car consumer, they make cars for distinct car consumer types (market segments), each representing a unique market to be developed. The concept of "segmentation" works equally well when trying to understand the preferences, behaviors, expectations, etc. of hunters. In this paper, "segment" implies a grouping that is useful in understanding or influencing hunter responses to management goals. To illustrate, we have found that deer hunters who prefer bowhunting are measurably different in important ways from those who prefer firearm hunting. The two segments differ from the segment that enjoys both hunting methods equally. Deer hunters who own recreational land and hunters who use primarily public land show important differences in attitudes and behaviors. Some attitudes differ among segments based on age. All of these are functional means of segmenting deer hunters when considering important management implications. Knowledge of the stewardship attitudes and behaviors of deer hunter segments holds more potential for improving deer hunter cooperation with agency harvest goals than notions about the "average" deer hunter. Although it is sometimes useful to report characteristics of "general deer hunters" it must be remembered that the "average" deer hunter does not exist as a "single species" and it is often more productive to think in terms of hunter segments when selecting management approaches. Unfortunately, space permits only a few references to hunter segments here. More detailed discussions of deer hunter segments have been discussed in Peyton and Bull 2001.

What Do Social Science Theories Offer to Understand Hunter Choices?

Some social theories offer a place to begin. For our limited discussion here, we illustrate with application of the Theory of Reasoned Action, recently revised to the Theory of Planned Behavior (TPB) (Fishbein and Ajzen 1975; Hrubes et al 2001). This is a popular model using attitudes to predict intentions and behavior. One critical element posed by this theory is whether an individual believes that positive consequences would result from some behavior such as lowering deer densities. A deer hunter who does not agree that excessive levels of crop damage are being inflicted and/or disagrees that reduction in deer numbers would be a reasonable means of reducing the economic impact on farmers is less likely to harvest antlerless deer for the purpose of lowering the deer herd. We have found evidence that a broad range of beliefs exist to influence deer hunters' positions on acceptable deer densities. To illustrate, some deer hunters believe that the consequences of deer densities could be avoided by actions other than reducing deer numbers (e.g., fencing out deer). Some argue that high rates of deer-auto accidents is not a function of deer density but of driver behavior; therefore, lowering deer densities would have little effect on lowering accident rates.

The TPB also suggests that another precursor required for hunter acceptance of fewer deer is that they place a value on the accumulated gain in positive consequences that is greater than the value placed on any lost hunting benefits they believe would result. I.e., the total value they place on reducing accident rates, lowering crop losses, etc., has to be greater than the value they place on benefits of high deer densities such as numbers of deer sighted, harvest rates, etc.

The Theory of Planned Behavior poses other factors that play a role in hunter support or opposition regarding goals to manage deer within social carrying capacity. But certainly the hunters' beliefs about what positive and negative consequences will occur if deer densities are changed and the values they hold for those consequences are major contributors.

Do Hunters have Holistic Stewardship Attitudes?

It is appropriate to ask: "stewards of what?" We have established that hunters have traditionally led in the conservation of the resources needed for their recreation. They demand protection for any game species from over-harvest when they believe it is in decline and they guard critical habitat needed by a valued game species. But the question here is, how much are hunters concerned about a broader range of environmental attributes and social values, especially those impacted by the abundance of deer we are experiencing today in many areas? A holistic definition of stewardship extends beyond deer to ecological and social systems. As holistic stewards, we would expect hunters to support a deer management program that balances an interest in available deer for harvest with a need to avoid unacceptably high impacts of deer on biodiversity, public safety, habitat, and agricultural crops, for example (see Holsman and Peyton 2003). The management question of importance is whether a substantial portion of deer hunters in Michigan is willing to trade off hunting benefits dependent on high deer densities in order to avoid environmental and social costs of having "too many deer". I.e., is their conservation ethic restricted to deer and deer habitat or do they advocate – or at least accept – a broader stewardship approach?

Case Study: Hunter support for ecosystem-based management

Resource management is moving towards a more integrated "ecosystem-based management" approach. The trend is to address the ecosystem at larger spatial scales, over longer periods of time and to be more concerned with attributes such as native biodiversity than what is most often associated with traditional "featured species management". It could be argued that support for ecosystem-based management would be consistent with a holistic stewardship attitude. In the study regarding ecosystem management goals (Holsman and Peyton 2003) hunters who used the state game areas and refuge in the Maple River watershed valued biodiversity as much as did environmental groups who were surveyed (e.g., non-hunting Sierra Club members). Would area hunters then accept a shift to ecosystem management that might produce more biodiversity even at the cost of lower game surplus for harvest in the area? Unfortunately, they would not. Although the two groups placed the same value on such benefits, they differed in their beliefs regarding whether more was needed (i.e., their perceptions of consequences differed). Hunters generally reported there were sufficient numbers of native non-game species (biodiversity); environmental respondents reported there were too few. The good news is the hunters reported that they placed importance on values that would support stewardship choices. The bad news is that their beliefs regarding biodiversity would not support a shift to ecosystem-based management.

Case Studies: Deer numbers versus a reduction in social and ecological costs of deer

The real test of the stewardship attitude is to see if stewardship values dominate in choices when hunters are aware of the consequences. In the QDM survey (Peyton and Bull 2001), we inferred levels of stewardship among respondents by examining the relationships between their desires for more or fewer deer and their awareness of deer-related problems (deer-auto accidents, crop damage, and overbrowsing of forests). Our assumption was that a steward who recognized deer-related impacts would prefer fewer deer to reduce the problems.

Many respondents were undecided about the level of deer-related problems in the area where they hunted. Few agreed that either crop (20%) or forest damage (12%) was a problem in their hunting area; however, 44% agreed that car-deer collisions were too high (ranging from 48% of upper and southern lower peninsula hunters to 39% of northern lower peninsula hunters). Overall, 49% did not see any deer-related problems, 31% identified one problem, 13% two problems and 6% saw all three as problems. Respondents were more likely to agree that hunting-related problems existed in their area. For example, 42% agreed that the deer harvest rate was too low in their area and 66% agreed that the buck to doe ratio was too low.

Respondents were also asked how many deer would be a reasonable goal for their hunting area compared to the present population. Only 11% wanted fewer deer, 22% were

satisfied with the current number, 47% wanted more deer (11% wanted twice as many) and 20% were not sure. Those hunting only public land (where deer densities tend to be lower) were most likely to prefer more deer. However, the majority of those who spent at least part of their effort on private land also preferred more. A desire for more deer was expressed by more Northern Lower Peninsula (NLP) hunters (62%) than Upper Peninsula (U.P.) (54%) or Southern Lower Peninsula (S.L.) hunters (58%) (19.3, df=4, $p<0.001$).

We cannot determine the accuracy of a respondent's perceptions about either the number of deer or the severity of the three deer-related problems in their hunting area. However, we can infer whether their perceptions of deer problems are related to the number of deer they preferred; i.e., how many hunters would desire a reduction of the herd if they were persuaded that serious problems existed for agriculture, automobile drivers and/or forest ecosystems? Most (65%, n=2091) of the respondents who agreed that one or none of the three problems existed in their hunting areas wanted more deer. Among respondents who acknowledged that two or all three of the listed problems existed at excessive levels in their hunting area (n = 742), 34% wanted more deer and only 36% wanted a reduction in deer numbers; i.e., well over half wanted to maintain or increase deer numbers even though they reported two or more excessive problem levels. Of the respondents who reported two or more deer-related problems, those who hunted land they owned were more likely to prefer a reduction in deer numbers (43% versus 31%). Certainly, our measure of stewardship attitude was not precise, but the pattern that emerged is not encouraging. A substantial portion of our respondents placed more value on hunting opportunity than on costs of deer-related impacts they acknowledged to exist.

Although the precise questions and context varied somewhat, we have probed this stewardship question on several surveys with Michigan deer hunters that produced similar results. In the survey on crop damage (Minnis 1996), 83% of deer hunters believed crop losses ought to be considered in setting deer density goals but they rated the importance of crop losses in setting deer goals as significantly less important than providing for hunting benefits. In a study which asked respondents to make choices among trade-offs associated with deer, both hunters and non-hunters valued the presence of deer (Wallmo et al. 2004). But hunters chose scenarios that presented higher levels of deer-vehicle accidents, deer health problems and forest over-browsing in order to maintain or increase deer numbers. When the choice involved increased numbers of "bucks", hunters (but not non-hunting respondents) were willing to accept even higher levels of problems (e.g., crop damage, deer-auto accidents) than when increased numbers of deer in general were offered.

The conflict that hunters experience in choosing between deer and social/ecological costs were clearly displayed in the results of a small survey of Menominee County deer hunters and landowners (Bull and Peyton 1999). About 45% agreed that deer management should minimize crop losses and prevent impacts on natural ecosystems and two-thirds agreed that over-browsing of new forest growth and high rates of car-deer accidents should be prevented. Those are encouraging attitudes. However, 58% agreed that deer management should maintain the highest possible success rate for hunters and over 70% wanted management to produce as many large-antlered bucks as possible. When they were asked to assign priorities to those kinds of outcomes, "large antlered bucks" was ranked most important, prevention of over-browsing new forest growth was second and maintaining the highest possible harvest success was number three. Maintaining low car-deer accidents rates was ranked as the number one management priority by non-hunting landowners; but was ranked lowest by hunting respondents.

Case Studies Implications

Results of our studies suggest that as a group, deer hunters place values on the costs of maintaining high deer numbers that are similar to those expressed by the non-hunting public. However, many hunters often opposed – or at least failed to cooperate in – efforts to lower deer densities because (1) they hold high competing values for the benefits of those high deer numbers and because (2) they hold conflicting beliefs regarding the actual impacts of deer densities and the consequences of various management options.

Enck and Brown (2001) reported findings that support our inferences. In a study of Pennsylvania deer hunters, they found that although 94% of respondents held positive attitudes

towards the land ethic, only 2/3 of them believed it was the hunters' responsibility to help lower deer numbers when the population was "out of balance". When asked to evaluate the quality of the habitat in their hunting area, most hunters believed it was in good shape, without serious problems. Most hunters, even those who acknowledged some habitat problems, did not associate moderate or great deer herbivory with decreased condition of the Land Community. As with our Michigan studies, this Pennsylvania study revealed small segments of hunters who did acknowledge deer impacts and held associated stewardship attitudes regarding hunter responsibility. Generally Pennsylvania hunters were similar to many Michigan hunters. They had positive stewardship values (e.g., supported the land ethic), but failed to accept the extent of problems created by deer and/or the stewardship role of deer harvesters towards a quality ecosystem.

Is Deer Hunter Satisfaction Incompatible with Michigan's Needs for Stewardship?

The criterion for evaluating management success shifted from the "game bagged" to "multiple satisfaction models" in the 1970's (Hendee 1972). Since then, researchers have attempted to measure the importance hunters place on various motivations and events in order to identify the factors that influence hunter satisfaction. The assumption has been that deer managers can achieve their goal of hunter satisfaction by using these factors as guidelines. Although a fairly rich body of research has addressed deer hunter motivations and satisfactions, only a few are selectively discussed here to illustrate certain points.

Some clear patterns emerge regarding the factors that consistently play some role in motivating hunters. For example, research supports grouping many motivations for hunting into three categories: achievement (related to getting game, using equipment, obtaining a trophy, etc.), appreciative (motivated by enjoying nature, practicing hunting skills, relaxation and escape from routine) and affiliative (social benefits such as spending time with family and/or friends) (Decker and Connelly 1989).

Given the importance that hunters placed on increased number of bucks in our studies, satisfaction would be expected to increase if that goal to produce available bucks for harvest was achieved. However, although the motivation to harvest a buck is prevalent among deer hunters, it is not always the most important factor determining choice. In the northeastern Lower Peninsula hunter mobility survey (Bull et al 2005), 18% of hunters rated "the number of mature bucks (2.5 years or older) as a "very important" reason for selecting the area they hunt most. However, for the entire group of respondents this factor ranked as number 11 based on the importance they assigned to the 13 choices we provided. "Seeing many deer" had a higher importance score (scored number 5 among the 13) and was rated as "very important" by 31%. When asked to identify the first or second most important reasons for choosing their hunting area, "seeing many deer" was identified as the second most important reason by 16% of respondents. The number of mature bucks was selected as either a first or second most important reason by only 6% of hunters. "Having a traditional camp in the area" was identified as either first or second most important reason by 16%.

Although harvest of a deer is not always the most important motivation for hunting – and therefore, not always the most important determination of hunting satisfaction – it certainly cannot be described as unimportant. Further, harvests of bucks are clearly preferred rather than antlerless deer and that makes it more difficult to achieve desired control of the deer herd through antlerless harvest. In the QDM study (Peyton and Bull 2001), we asked under what conditions hunters would shoot a doe. About 10% would never harvest a doe, 31% would harvest does only as a last resort to get venison. However, 27% would harvest a doe regularly to get venison. About 28% would shoot does to balance the buck to doe ratio and 30% would shoot does if convinced the herd needed to be reduced. Respondents were able to check more than one condition; however, 52% checked one or both of the latter reasons for shooting does. This probably represents the most reliable pool of cooperators among our respondents. However, even this group must be convinced there is a need to control the herd as a prerequisite to their cooperation. As discussed elsewhere in this paper, that presents a major challenge to achieving the desired antlerless harvest. This study had a 61% response rate and our non-response follow-up showed that hunters using a mixture of public and private land for deer hunting were under-

represented among respondents (23% versus 43% among non-respondents). Given that public land hunters in our studies have been more inclined to believe deer numbers are already low, the percent of potential cooperators among the statewide population of deer hunters is likely well below 52%.

One way to achieve desired doe harvest levels is to exploit hunter interests in tagging a buck by requiring them to harvest an antlerless deer in order to validate their buck tag ("earn-a-buck"). Wisconsin achieved some harvest success with this, but the approach was not acceptable to many deer hunters in that state and a strong lobby against the strategy was exerted recently. In our QDM study, 70% of respondents agreed there were too few mature bucks for harvest in their hunting area but none of the options we presented for addressing that problem were acceptable to a large portion of hunters. In other words, most agreed they wanted more big bucks, but they were strongly divided on the way they wanted to achieve that goal. The "earn-a-buck" option was one of the least acceptable. It was strongly opposed by 28% and strongly approved by only 16%. Similarly, respondents were strongly polarized on all options presented to them for achieving a higher ratio of mature bucks to does. Satisfaction would be increased for many hunters if the chance of harvesting a mature buck increased, but the regulations required to achieve that goal could decrease the satisfaction to produce a no-win gain, at least in the short term.

Deer sightings also play an important role in determining hunter satisfaction. In a study of hunters on the state's Shiawassee Refuge in 1985 (unpublished data) unsuccessful hunters rated the quality of the hunt as "good" if they had sighted large numbers of deer, in fact, unsuccessful hunters who saw large numbers of bucks rated the hunt similarly to successful hunters. However, the satisfaction of unsuccessful hunters who saw even more bucks was significantly lowered, likely due to the frustration of not being able to harvest at least one when so many were seen. Langenau (1980) found that Michigan deer hunters preferred some level of hunter crowding because associated deer movement resulted in higher levels of deer sightings. The sighting of deer and other wildlife can also add enjoyment to the use of bait for hunting deer. In the statewide mobility study (Bull et al. 2005), 36% of respondents reported that the ability to bait for deer was at least somewhat important as a reason for selecting a hunting area. Nearly all (95%) of this group also indicated that seeing deer was at least somewhat important as a reason for choosing a hunting area. If baiting was banned in their hunting area, 30% of our statewide respondents said they would stop hunting there (50% would continue and 20% were uncertain). In another statewide survey on baiting (Minnis and Peyton 1994) 39% of respondents agreed that hunting with bait was more satisfying or at least as satisfying as hunting without bait; 41% disagreed and 20% were undecided. Of those who used bait, 52% rated as a "very important" reason for baiting that it "... is more exciting because I can watch more deer and other wildlife...". About 43% rated "a better chance to harvest a deer..." as a very important reason for baiting.

Frawley (2002) reported that the baiting ban in the northeastern Lower Peninsula caused a reduction in the number of archery hunters in the area. About 50% of the archers in the northeast Lower Peninsula (excluding Deer Management Unit 452) hunted less because of the baiting ban, while 31% of people hunting in the regular firearm season hunted less. However, when the Natural Resource Commission temporarily lifted the archery season baiting ban for one year, the action failed to produce an increase in antlerless deer harvest.,

Surveys have consistently shown that baiting is not strongly related to success rates. Based on a more recent deer hunter survey on baiting practices (Bull et al. 2004), 20% of the state's deer hunters always hunted with bait. Bait was never used by 53% and occasionally used by 27% of respondents. Harvest efficiency of bait (total deer harvested/ total days hunted with bait) was higher in the archery seasons, while hunting without bait was more efficient in the firearm and muzzle loader seasons. Deer were harvested more efficiently (fewer reported days effort per deer) without bait. When only successful hunters are considered, there is no real difference between deer harvested with bait per successful hunter (1.34) and those without bait (1.39). Overall, bait appears to be less important to statewide harvest effectiveness than other hunting behaviors. Because hunters report they see more deer over bait it would seem antlerless harvest might be increased by its use. However, that was true only for the archery season where slightly more antlerless deer were taken with bait (47% with bait, 53% without). When all seasons are combined, fewer antlerless deer were taken over bait.

The prevalence of deer baiting in the past two decades has most likely played a role in determining deer sightings and hunter perception of deer numbers. Baiting has enabled hunters to use increasingly smaller units of private land because they can attract deer to a small portion of their home range. Bait piles can shift movement patterns of deer and greatly influence the number of deer sighted by a sedentary hunter near a bait pile. On the other hand, if a large portion of hunters use bait, fewer hunters moving around to displace and move deer, further reduces sighting. Hunters are inclined to equate these reduced sightings to inadequate deer densities. Those hunters whose satisfaction remains dependent on deer harvest or sightings, present managers with a no-win challenge of managing deer numbers.

Understanding hunter satisfaction and the implications for deer management is a complex endeavor, in part because deer hunter satisfaction is a moving target. One reason is that the factors that bring about satisfaction for hunters vary in importance depending on whether they are measured before, during or after the season. Jackson and Anderson (1985) found significant shifts on pre-season, season, and post-season surveys among Wisconsin deer hunters in the importance of the time spent with friends and family, the rewards of getting a trophy, and the use of equipment. In our April 1999 survey of Menominee County (Michigan Upper Peninsula) deer hunters, "spending time with family and friends" was a "very important" reason for hunting for two thirds of the respondents. "Getting close to nature", "escaping stresses of life" and "seeing many kinds of wildlife" were each "very important" to about 55% of respondents. The motivations described as "very important" by the fewest number of respondents were "using hunting equipment" (15%), "using hunting skills" (22%), and "getting venison" (23%). Had this survey been conducted before the season the previous fall, Jackson's study suggests the latter three motivations would have been considerably more important. More research into the temporal nature of hunter expectations and satisfactions would provide some utility to managers striving to optimize hunter benefits.

Age and experience also introduce variability into the importance placed on various motivations for deer hunting. Researchers in New York found that hunters who placed more importance on use of equipment and harvesting a deer (achievement oriented hunters) were younger than those who placed more importance on enjoying the natural experience (appreciative hunters) or those who placed most importance on being with friends and family (affiliative hunters) (Decker and Connelly 1989). Although achievement hunters were more motivated to harvest deer, appreciative hunters had a higher success rate. Many appreciative hunters purchased antlerless tags but they contributed little to achieving deer goals because they used the tags as a means of continuing to participate in the hunt and did not harvest substantially more deer.

An individual's motivations for hunting and related satisfaction also appear to develop over time. Jackson and Norton (1980) proposed developmental stages for hunters. They suggested that beginning hunters were first motivated to use equipment and develop skills (e.g., shooting stage), then moved on to successive stages that focused on harvesting a limit of game, getting a trophy, using more challenging methods, and finally a sportsperson stage. Although the progression of stages is not infallible, evidence exists that some pattern of motivation shifts do occur among hunters. Developmental stages have also been proposed for anglers (Bryan 1977). To the extent that deer hunters experience these stages, shifts in hunting demographics could have more implications for deer hunter abilities to control deer numbers. In the New York study (Decker and Connelly 1989), the three segments exhibited the same relationship; with increasing age and experience there was a trend to shift importance from "getting game" to enjoyment of non-harvest related benefits. We have found a relationship between increasing age and decreasing importance of deer hunting (Bull et al. 2005). Respondents to the hunter mobility survey who said deer hunting was their most important recreational activity had an average age of 44. Average age increased from the identification of hunting as "one of the more important activities" (48 years) to "less important than most activities" (50 years) and finally to "not at all important" (55 years). A similar distribution was found in the QDM survey results (Peyton and Bull 2001).

Unfortunately, a shift in motivation for hunting with diminished interest in harvest may mean that the older and potentially more effective deer hunters may not harvest at desired rates. An analysis of age demographics in Michigan revealed that participation generally began to

decline among males when they were 45-54 years old, although the decline has become less apparent since 1980 (Frawley 2004a). The mean number of deer harvested per hunter in 2002 peaked among hunters at 25-44 years of age and declined steadily among hunters older than 50 years of age. Frawley inferred that hunting success among older hunters declined because of fewer days spent hunting. He projected that the lower antlerless harvest among older hunters will cause antlerless harvest rates to lag behind the harvest of antlered deer.

Not only is there a tendency for hunter motivations and participation to shift developmentally with age and experience, but there is also a tendency towards recreational specialization that further complicates the matter of hunter satisfaction (Ditton et al. 1992). Theories of recreational specialization are still being debated in the literature (e.g., Scott and Shafer 2001; Salz et al. 2001) but essentially it involves an individual placing an increasing importance and emphasis on some recreation. Hunters may specialize on some attribute of the experience such as a method (e.g., archery), a species (e.g., deer), a place or some combination of those attributes. The phenomenon is proposed to be more than just an increased interest in a favorite past time, it takes on the attributes of a social subworld – a cultural entity (Ditton et al. 1992). The theory predicts that increased recreational specialization will be associated with mediated communication (e.g., regular readers of deer hunting magazines), group-defined standards of behavior (ethics), membership in related organizations, investments in equipment or hunting areas and leadership in the activity. For a recreational specialist, the activity (e.g., deer hunting) plays a highly central role in their life (centrality). The motivations of specialists usually broaden from activity-specific benefits such as harvesting "a deer" towards benefits such as nature appreciation and affiliation with family and friends. This does not imply that deer-hunting related benefits necessarily become unimportant, simply that other benefits become more important.

Recreational specialists are not excluded from being members of more than one sub-world. A specialist in archery deer hunting may also specialize in fly fishing or some other sub-world. They may participate in a number of other forms of hunting such as upland birds or waterfowl, but at a more casual level and without reaching the same level of membership in those sub-worlds. Conversely, someone who hunts only for deer and not other types of game may not actually be a specialist unless deer hunting meets the other criteria of intensity, e.g., exhibits centrality in their life style and membership in the social sub-world. Frawley (2004a) found that 62% of those who purchased a deer license in 2000, 2001 and/or 2003, did not purchase any other type of hunting license. Some, but not all of this group are likely to be deer hunting specialists. The most highly specialized deer hunters are likely contained within the 23% of respondents to the QDM survey who reported that deer hunting was "my most important recreational activity" (Peyton and Bull 2001).

A common characteristic of hunting specialists is that they become dedicated stewards of their recreation-dependent resources. Wetland conservation would not have happened without the support of waterfowl hunting specialists who not only supported, but led in the political battles to create special funding sources for wetland protection. Hunting specialists become more effective at influencing the management system because of their "social subworld" status (e.g., mediated communication and organization). Specialist subworlds learn the agency management system and find ways to "capture" its attention and resources for their own brand of resource-dependency (Langenau 1982). One means of doing this is to lobby for license fees to become restricted funds that can be spent only on the species of interest (e.g., Michigan's turkey license fees, Deer Range Improvement Program fees). Highly specialized deer hunters can be extremely demanding and vocal protectionists of the resource they depend on for recreation. This protection can sometimes occur at the expense of more holistic management goals such as maintaining deer within a biological or social carrying capacity.

But specialist groups are not always self-serving and many reflect stewardship ethics. Many specialist organizations and individuals recognize that conservation goals must extend beyond their own resource-dependent recreation. Some hunting organizations have exhibited real interest in stewardship concerns beyond their species of interest. Individuals may gravitate towards organizations such as Michigan United Conservation Clubs or Safari Club International that have agendas to work for broader environmental improvement, including a reduction of deer numbers where they surpass habitat or social carrying capacity. Many hunting specialists

become leaders who are passionate and well informed about natural resources. As such they make potential allies in working to gain support to achieve deer population goals. However, managers must recognize that these deer hunting specialists do not reflect the same pattern of motivations, preferences, value priorities, beliefs and behaviors as do less specialized participants that comprise a plurality if not a majority of deer hunters. The involvement of specialists cannot be accepted as representative of the views of the deer hunting community.

Exploring options

Responsible deer management must approach deer as a key component of both ecological and social systems. The conundrum is how to optimize (versus maximize) the benefits and costs of deer among a diversity of stakeholders and within the limits posed by biological carrying capacity. A compounding element is the fact that, for multiple reasons, deer management must strive to achieve reasonable levels of deer hunter satisfaction. If harvest rate or numbers of deer sighted remain the over-riding criterion of success for achieving the latter goal, conflict between this and an equally important goal of maintaining deer within biological and social carrying capacities is unavoidable. In some areas of Michigan and many other states, management needs to address deer over-abundance through hunter harvest. New York models projected that even if antlerless permits were unlimited, there were too few hunters in the state willing to harvest antlerless deer to achieve the desired level of control (Brown et al 2000). That lack of willingness appears to be a factor in at least some regions of Michigan as well. Our studies suggest that the solution will require a shifting of priorities and beliefs on the part of hunters; a goal fraught with inter-related barriers.

Addressing hunter values as barriers

A majority of hunters appear to place value on the ecological and social attributes that can be impacted by deer populations (e.g., public safety, biodiversity). This is fortunate because there is little we can do to bring about changes in values held by individuals. Personal values change over time slowly through life experience, if at all. The changes in hunter motivations over time we described earlier illustrate the individualized, intrinsic nature of value development. We can expose hunters to new experiences (e.g., lower deer densities), but we cannot ensure that values and motivations will shift to accommodate those experiences. However, we can keep hunters aware of the range of values that are involved (e.g., ecological integrity as well as hunting satisfaction) and encourage them to examine and reconsider their own priorities in the light of consequences of deer management; i.e., maintain a saliency of these tradeoffs among hunters. For any real shifts in perspective and evaluations to take place, hunters must be accurately informed of the consequences for those values. The latter falls into the realm of addressing beliefs which is not an easy task, but is easier than addressing values.

Addressing hunter beliefs as barriers

Failure to consider the range of consequences can be attributed to a lack of awareness, understanding, and/or acceptance of those consequences. Many hunters are not at all aware of the actual or potential impact of deer on biodiversity, for example. The dynamics and functions of biodiversity are subtle and not easily understood, so many who are aware of the arguments may not be persuaded by them. Even those who come to understand the arguments may not accept them and may choose to challenge the credibility of the sources instead. Of course, there is the risk that some well informed deer hunters will place a higher value on the benefits of high deer densities than on the losses, e.g., biodiversity, crop damage. Perhaps the most contentious category of these beliefs relate to the need for and consequences of lowering deer population in a region.

Very often deer hunters disagree with the proposition that deer densities are high in the first place. That poses an obvious barrier to getting them to accept proposals to lower deer densities. A large portion of Michigan deer hunters spend limited time in the field observing and studying deer – few of us qualify as a wood-wise Natty Bumpo. Although it varies by age

segments and regions, the average number of days Michigan hunters spent deer hunting was about 14 (Frawley 2004b). Respondents to our statewide mobility survey (Bull et al. 2005) spent an average of 8 days in off-season scouting and building blinds, but the median was 3 days. About 40% of those who hunted less than 50 miles from their home reported no days were spent in scouting, blind construction, etc. Half of the rest of that group spent 5 days or less. Those who hunted more than 50 miles from their home tended to spend even less time afield. Zero days were reported by 54% and the median days spent by the other 46% was 3 days. Certainly, some hunters spend considerable time in the field observing deer and habitat, but it appears to be a small proportion. In addition, half of the respondents to the QDM survey who used private lands reported they hunted 80 acres or less, so their observations are not only limited temporally, but spatially as well.

We projected from our 2001 deer baiting survey that at least 47% of hunters used bait to hunt deer; 20% hunted only with bait (Bull et al 2004). A substantial portion of hunter observations during hunting season is limited to animals responding to bait. If baiting is used to attract deer to small parcels with marginal habitat, reliability of observations is vulnerable to slight decreases in regional deer density and to local competing food sources. Considering the basic home range size of Michigan deer and the variability of factors that influence seasonal and daily movements, the majority of deer hunters in Michigan appear to have an unreliable basis for determining deer densities through direct observation.

One very insightful paper recently hypothesized why deer hunter observations may not produce reliable estimate of deer numbers. Van Deelen and Etter (2003) used predator/prey models to examine deer hunters' response to changes in deer densities. Although grossly simplified here, modeling relationships between prey densities, predator effort and success suggested that the relationship between the number of deer observed by hunters (exerting a constant effort) is not linearly related to changes in deer densities. If an agency reduces deer density by 10% the reduction in observed deer by local hunters will be considerably greater than 10%. When even small decreases in density create large reductions in deer sightings, there is stronger hunter resistance to continued reduction of deer numbers.

The phenomenon described by Van Deelen and Etter is confounded by the limited nature of hunters' observations in time and space and many other factors already mentioned. A large (often vocal) portion of dedicated deer hunters use their own observations and inferences to reject science-based estimates of population trends. The prevalent view among deer hunters in any state seems to be that deer number estimates by professional deer managers are wrong. Similarly, many deer hunters remain unconvinced that impacts on forests or agricultural crops are high enough to warrant a reduction in deer, which they already believe are too few.

Credibility of management agencies gets drawn into this dilemma. There are two parts to this; 1) do the constituents trust the agency to fairly consider their own interests, and 2) do constituents believe the agency is competent and skilled. Hunter perception of agency credibility varies with the issue, sometimes doubting the agency trustworthiness, sometimes questioning the agency competence and sometimes both. Agency credibility among deer hunters can also differ from the credibility they place on professional biologists in the agency. In our crop damage study, for example, many farmers with crop damage trusted the local biologists, but not the "Lansing staff" (Minnis 1996). In a survey of Michigan public, Mertig and Koval (2001) found the general public tended to believe the Michigan DNR was credible; she observed that it was the agency constituents (e.g., hunters) who worked most closely with the DNR who questioned the agency credibility most.

In part, credibility contributes to the hunter belief problems. Hunters are immediately skeptical of deer population estimates provided by an agency judged as lacking credibility. But credibility is also a victim of human nature to trust our observations and judgments. Hunters are reluctant to accept management conclusions that differ so obviously from what their own experiences tell them and so agency/biologist credibility further suffers.

Entangled with our agency credibility problems is credibility of our wildlife science. Our society in general has been ineffective in creating scientific literacy among our citizens. The deficiency is compounded in Michigan because the Department of Natural Resources lost an effective Information and Education Division to the political environment of the 1970s and 1980s. Whether or not there is a political support for the idea that a natural resource agency is an

educational as well as a regulatory agency, available financial resources make it unlikely that a return of a comprehensive Information and Education program is possible any time soon. In its absence, the mass media has emerged to fill the void of agency sponsored wildlife education. Deer hunters supplement their own observation-based conclusions with information from outdoor writers and television hosts.

Wildlife science is a complex process and the associated body of information is still burdened by a degree of uncertainty. It is not likely we could ever educate most hunters to understand, for example, the modeling and conclusions provided by Van Deelen and Etter (2003) and expect them to accept the implications of that. However, if hunters perceived the agency and its professionals to be credible, perhaps they would be more willing to fairly consider if not immediately accept uncomfortable management proposals. It seems prudent to consider a lack of credibility in our managers and our management science as considerably more than a slight inconvenience. Credibility is an absolutely critical tool in the deer management process and it cannot be established and nurtured without effective communication.

Is QDM a Movement Towards Stewardship in Michigan?

There has emerged in states with white-tailed deer, groups of specialized hunters who advocate a management approach known as Quality Deer Management (QDM). The emergence of this movement illustrates the attributes of hunter specialization discussed earlier. Among the principles advanced by some QDM proponents is the notion that this practice could contribute to shifting deer hunters toward more responsible, stewardship-based choices.

As a concept, "Quality Deer Management" (QDM) does offer some potential stewardship benefits. Goals of QDM address the need to manage deer herds within their biological and social carrying capacity. They also advocate a "natural" buck to doe ratio and older age distribution of bucks. Fundamentally, QDM is not advanced as a "trophy" deer management program, although one of the benefits is to produce more large antlered bucks in a herd. A comprehensive and successful QDM approach requires the hunter to collect and interpret biological harvest data, monitor population trends, understand deer biology and ecology, prescribe and implement harvest goals for does and bucks and to actively manage habitat where needed. Often it involves a higher participation with neighboring landowners and may create a greater awareness of social carrying capacity problems (e.g., crop damage). Unfortunately, application of QDM in Michigan has not realized this stewardship potential.

There is a risk that broader stewardship goals can be lost as some farming practices associated with "QDM" programs take on a mission of their own. "Artificial" feeding is becoming increasingly incriminated in wildlife disease problems, however 29% of the QDMA members reported using artificial feeding to support and/or attract larger deer numbers. Issues of the QDMA magazine have included advertisements of feeding equipment. Indeed, 19% of Michigan QDMA members believed artificial feeding was an accepted QDM practice. Use of food plots to enhance natural deer habitat was reported by 43% of landowners and 79% of Quality Deer Management Association (QDMA) Michigan members who responded to our 2001 QDM survey. A third of the landowner respondents and 69% of QDMA members improved habitat by fertilizing and/or mowing fields or patches. Used as part of a comprehensive program that does not seek to increase deer numbers beyond local natural habitat or social carrying capacities, food enhancement efforts such as fertilizing deer browse or producing food plots can contribute to the physical health of deer. However, without a judicious harvest system, such enhancements can simply become effective strategies for attracting and holding large numbers of deer to private property with negative impacts on surrounding natural habitat and potential disease implications. In its early adoption stages in Michigan, fencing was incorporated into some versions of "QDM" practice, although this is now heavily restricted by the state due to the presence of Bovine Tuberculosis and the risk of Chronic Wasting Disease. However, in some other states, QDM practices are associated with the "privately owned" or "captive" cervid approach to game farming.

The strategy advocated by the QDMA has been to recruit voluntary supporters through education and by demonstration of the outcomes of the process. Given time to work in this fashion, true QDM has the potential to influence the thinking and stewardship attitudes of at least those hunters with access to manage private lands in Michigan. Although non-response bias

may be inflating the estimate, about 63% of our respondents on the QDM survey indicated they hunted either private land only or both public and private lands and also reported they implemented at least one of the QDM practices listed. Over a third of respondents owned the land where they deer hunted. Private lands offer the greatest challenge to achieving agency population goals and a clear understanding and acceptance of the stewardship elements in QDM philosophy among this substantial portion of the state's hunters would be an asset. Over time, if successfully marketed as a stewardship-based deer management philosophy, voluntary adoption of QDM goals in Michigan has the potential to improve hunter understanding of wildlife science, provide better relationships with agency professionals, and begin to make inroads into the barriers posed by credibility issues and lack of understanding of science based management.

Unfortunately, the voluntary, holistic practice of QDM has become redirected for most Michigan hunters as mandatory "antler point restrictions" (APR). With APR, the focus has shifted from the holistic stewardship goals described earlier to production of older aged buck classes and antler production. Since the adoption process was initiated in 1999, about ten proposals have been submitted to the Michigan Natural Resource Commission requesting that specific deer units be classified as "QDM" units with antler point restrictions on buck harvest. Although doe harvest is mentioned in these proposals, the primary interest of supporters appears not to be maintaining deer within biological and social carrying capacity, but restriction of other hunters from shooting young bucks that would otherwise mature to become large antlered deer. One advertisement advocating for a U.P. "QDM" proposal urged hunters who wanted to prevent the DNR from "shooting all our does" to support the proposed antler restrictions. Not only do these APR proposals fail to address the larger stewardship needs for maintaining deer within biological and social carrying capacity, they have done much to cloud the QDM stewardship goals and to polarize a portion of the state's hunters against the concept.

An alternative and much less popular program known as Quality Hunting Ecology (QHE) has been developed and advocated by the Sand County Foundation (*www.sandcounty.net*). QHE sets a priority on the management of deer within the constraints both biological and social carrying capacity. The Foundation has supported projects to research and/or encourage stewardship choices among deer hunters in the Great Lakes states, including the Pennsylvania project (Enck and Brown 2001). The QHE has met with mixed results regarding measurable shifts in hunter perceptions. But it is encouraging that this type of thinking is emerging and it certainly provides a model of stewardship concern among hunters.

Conclusion

Many of the problems associated with managing white-tailed deer and deer hunters are related to two needs; (1) hunter cooperation in making recreational harvest an effective management tool; and (2) reduced negative behaviors that exacerbate management problems with deer. The first is tied primarily to achieving a sufficient harvest of antlerless deer to keep deer numbers within regional biological and social carrying capacities. The second implies cooperation with other prescribed management strategies such as reduced baiting and feeding practices. There are important groups of deer hunters who are providing the desired cooperation. The challenge is to influence the much larger majority.

The barriers to achieving these needs are many and difficult to address. A majority of deer hunters are passionate about this recreation. They rate deer hunting as their most important recreation or at least "more important than most other forms of recreation". Most value the benefits of holistic stewardship, but many place priority on competing, recreation-related values. They justify their preferences with inadequate belief systems regarding the causal relationships between deer numbers and the impacts of deer; with the lack of credibility they attribute to management science and agencies; and with their own "proven" observations and intuition. These are tough barriers in part because of their resilient nature and in part because the state lacks effective information and education tools to address them.

It would be a mistake to treat all deer hunters as one. As we search for ways to bring about change, identification of segments of hunters promises the greatest reward. It is more effective to diagnose the attitudes, preferences, and behaviors of a segment (e.g., private land hunters) and target that group to meet the unique opportunities to bring about change. The

casual hunter who buys a license only two out of three years offers a different market challenge than the landowner specialist who hunts all archery and firearm seasons and practices his/her own version of deer management twelve months a year.

Fortunately, most deer hunter segments are motivated to hunt by a range of benefits and expectations and this may offer creative opportunities to appeal to a wider set of those motivations than simply "deer sighted" and buck harvest rate. Most deer hunting specialists have found ways to extend their enjoyment of deer hunting well past the fall hunting season. Specialists are avid students of deer and deer hunting technology. They participate in habitat management, develop their natural history skills and knowledge, and spend time scouting throughout the year. Often they are keen users of innovations such as remote sensing digital cameras that monitor deer movements and locate trophies. All of this broadens the source of satisfaction from the traditional deer season and heightens the rewards of non-harvest benefits.

Unfortunately, a large portion of hunters do not share all of these opportunities. Consider the hunters who are wedded to a 20 or 40 acre parcel of land and dependent on bait to bring deer to their pre-selected hunting site. It presents a challenge to encourage this group to develop their skills at studying and understanding the natural history of an animal whose home range may be a square mile or more. Yet, perhaps the specialists offer us a model that would suggest management strategies.

The satisfaction of deer hunters will be influenced by their expectations. We can argue about whether deer numbers actually were at or above two million in the past two decades, but there is no doubt that most hunters today have enjoyed the peak in white-tailed deer abundance in this state and that resistance to deer population decreases are tied to that experience. Their best years have become the norm against which all other years are to be judged. However, if we can manage to reduce deer to social and biological carrying capacities in regions where it is needed, the dynamic nature of hunter satisfaction and motivations may become an asset in bringing about some new expectations. Perhaps a decade or two with a less abundant deer population would result in lower expectations among young hunters (new recruits) and that status would become accepted by older participants to create a new level of satisfaction. Of course, a risk also exists that recruitment and retention of hunters may both be diminished by lower deer numbers, with serious impacts on deer control and agency funding. In either case, the decade or two of adjustment would likely be miserable for wildlife managers.

We are asking much of deer hunters to accept the burden of stewardship as part of their recreational choice. Yet, society and our laws remind us that hunting is a privilege and not a constitutional right. Stewardship is the primary redeeming value that hunting has to offer society in exchange for the privilege. If hunters do not voluntarily and adequately fulfill the role of holistic stewards, our privilege and the potential utility of hunting as an effective management tool will eventually be at risk.

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