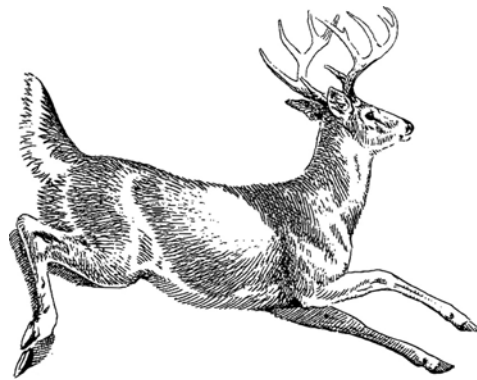

Longitudinal Evaluation of a Quality Deer Management Cooperative, King Ferry, NY: Final Report



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EXECUTIVE SUMMARY

In November 2000, deer managers with the New York State Department of Environmental Conservation (DEC) met with landowners and deer hunters within a 16,000ac area in the vicinity of King Ferry, NY with the idea of establishing a quality deer management (QDM) cooperative as an incentive for greater deer harvest, and therefore a means of reducing concerns about crop damage and deer-related vehicle accidents and improving the deer sex ratio and buck age structure. Many landowners and hunters who typically hunted deer on those properties initially embraced the idea of QDM at that time, but decided to establish at a later date the specific harvest criteria that would be applied through QDM. DEC asked staff with the Human Dimensions Research Unit (HDRU) at Cornell University to evaluate this case of QDM as it was being applied at King Ferry in May 2001. By August 2001, DEC decided that enough landowners and hunters wanted to participate that the QDM initiative should be implemented for the upcoming hunting season. In October 2001, landowners and hunters decided to establish voluntary antler restrictions and voluntary emphasis on harvesting more antlerless deer.

HDRU staff engaged participating landowners and hunters in a large-group discussion in September 2001 to elicit important desired outcomes and concerns associated with participation in QDM. With the assistance of the participants, HDRU staff also identified a set of positive and negative impacts that landowners and hunters believed would be managed through QDM. During the period October 2001 through May 2002, HDRU staff worked with small groups of landowners and hunters to describe and “map” participants’ assumptions and reasoning about how QDM would manage the identified impacts. Substantial social learning occurred in the small group discussions: (a) as participants articulated and revised their conceptual models of the deer management system with respect to the QDM cooperative, and (b) improved their capacity to think about how to improve management success. Much of what was learned in small-group discussions was not transferred well to the larger group of participants.

Our evaluation revealed several important insights about QDM as applied in this case, and about trying to manage for desirable/tolerable levels of deer-related impacts through any deer management intervention. One insight was that negative impacts associated with seeing deer were consistent regardless of location where the observations occurred. For example, regardless of whether landowners saw deer around home, in their crop fields, or along local roads, such sightings led to anxiety about the possibility of having deer-vehicle accidents among large majorities of landowners. On the other hand, positive impacts seem to be more context-specific. Most landowners recognize a sense of “feeling connected to nature” when they see deer around home or in their farm fields, but not when they see live deer near local roads.

Another insight supported by our data, but needing more research attention, is that negative impacts seem to carry more weight than positive impacts in landowners’ preferences for changes in the deer-related interactions that contribute to those impacts. For example, landowners who reported intolerable levels of frustration about crop damage also preferred a decrease in “seeing deer” interactions around home and in their crop fields, regardless of whether positive impacts associated with such sightings were at desirable levels or were too low.

Landowners also apparently consider collateral impacts when developing preferences for changes in deer-related interactions. Despite almost universal interest in reducing intolerable

levels of several negative impacts, landowners' concern about being injured by hunters shooting unsafely at deer or interfering with their own hunting experiences limited their willingness to provide access for more hunters on their properties. The low willingness to allow access for more hunters highlights a challenge for QDM or any other deer management intervention to be implemented effectively across large areas. These findings also highlight the importance of identifying and managing collateral impacts that may influence landowners' behaviors.

A surprising finding was that a majority of both landowners and hunters were willing to continue participating in the QDM cooperative despite what they saw as lack of progress as manifested through the intolerable or undesirable levels of impacts they experienced to date. Although negative impacts have greater influence than positive impacts on preferences for changes in contributing interactions, positive impacts (experienced or expected) have more influence on their willingness to continue. Specifically, landowners' and hunters' beliefs that QDM will eventually result in desired outcomes seems to be a stronger motivation to continue participating than the lack of management success they have experienced is a cause to quit.

The QDM cooperative at King Ferry included landowners with a range of interests (some enthusiastic and some disinterested) in QDM. Deer hunters also varied in their interest in QDM. Some of the hunters typically having access to properties participating in the program wanted to engage in QDM, but others did not. Unlike DEC's experiences elsewhere in which hunting clubs or single landowners asked for assistance establishing a QDM plan, in this situation the landowner and hunters who were interested in QDM could not agree on a galvanizing purpose and collective commitment to implement QDM consistently across properties.

ACKNOWLEDGMENTS

We greatly appreciated support of staff from the New York State Department of Environmental Conservation (DEC), Bureau of Wildlife, particularly Dave Riehlman and Wayne Masters. All members of the DEC Deer Team provided input and conceptual assistance, particularly for the various surveys. We are especially grateful to the many landowners and hunters who met with us and who responded to the surveys. We thank members of the King Ferry volunteer fire department for use of their facility for the small group discussions.

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INTRODUCTION

Background About The QDM Cooperative at King Ferry

In November 2000, deer managers with the New York State Department of Environmental Conservation (DEC) met with landowners and deer hunters within a 16,000ac area in the vicinity of King Ferry, NY with the idea of establishing a quality deer management (QDM) cooperative as an incentive for greater deer harvest, and therefore a means of reducing concerns about crop damage and deer-related vehicle accidents and improving the deer sex ratio and buck age structure. Many landowners and hunters who typically hunted deer on those properties initially embraced the idea of QDM at that time, but decided to establish at a later date the specific harvest criteria that would be applied through QDM. DEC asked staff with the Human Dimensions Research Unit (HDRU) at Cornell University to evaluate this case of QDM as it was being applied at King Ferry in May 2001. By August 2001, DEC decided that enough landowners and hunters wanted to participate that the QDM initiative should be implemented for the upcoming hunting season. In October 2001, landowners and hunters decided to establish voluntary antler restrictions and voluntary emphasis on harvesting more antlerless deer.

The General Idea of QDM

QDM is a general concept and management approach to deer harvest for the purpose of ensuring that a deer population is in-line with local habitat conditions, and that the age and sex ratio of deer more closely reflects a natural condition than typically results from conventional deer management (Woods et al. 1996, Collier and Kremetz 2006). As applied to this cooperative, QDM was a voluntary intervention, supported in principal, but not regulated by DEC. Landowners and hunters participating in the cooperative debated the ideas of antler restriction and additional antlerless harvest. They adopted a voluntary buck harvest standard in which antlers must be wider than the ears when viewed from the front, or the main beam must extend in front of the eye when viewed from the side. Hunters also would be encouraged to make additional, voluntary effort to harvest antlerless deer, but quotas of doe harvest were not required for hunters to be eligible to harvest a buck meeting the QDM standard.

The Intervention: Application of QDM Harvest Standards on the Cooperative

Several research questions formed the basis of joint HDRU-DEC efforts to collect baseline information from participants (Enck et al. 2003): (1) What fundamental objectives do the stakeholders want to be achieved through changes in these deer population characteristics? (2) Could the desired changes be accomplished voluntarily or would a mandatory approach be needed? (3) Why do the desired characteristics not occur under conventional deer management (CDM)? (4) What is the system of hunter-deer and hunter-hunter interactions that affect harvest-related outcomes of the deer management system and (5) Could this system be managed in some way other than through regulations?

Conceptual Foundation for the Evaluation

The evaluation was based on the dual concepts of wildlife stakeholder acceptance capacity (WSAC; Decker and Purdy 1988, Carpenter et al. 2000) and adaptive impacts

management (AIM; Riley et al. 2002). WSAC posits that the capacity of stakeholders to accept the presence of a particular wildlife species is influenced by the interplay of their tolerance of negative impacts and their desire for positive impacts associated with that wildlife species, modified by characteristics of the stakeholder groups and the contexts in which the species-related impacts occur (Lischka et al. 2008). The main premise of AIM is that management success depends on identifying impacts to be managed at desirable (for positive impacts) or tolerable (for negative impacts) levels (Riley et al. 2003, Enck et al. 2006). Stakeholders' conceptualizations of the system producing human-wildlife interactions can be thought of as the *management system* to be influenced through some kind of intervention – in this case, QDM as described above.

A key to understanding effective intervention in a management system is to identify or determine how interactions among components of the system yield particular outcomes, whether they are ecological, recreational, economic, psychological, or pertain to health and safety. Some outcomes go unrecognized. Others are recognized, but not very important. Still other outcomes (either positive or negative) are considered by stakeholders to be important *impacts to be managed*. Stakeholder satisfaction and acceptance of management should be highest when these impacts are the *focus of management* (i.e., when fundamental objectives are defined in terms of impacts). Fundamental objectives often can be articulated as minimum desirable levels for positive impacts, and maximum tolerable levels for negative impacts (Riley et al. 2003). This provides a basis for evaluation.

Study Objectives

1. Evaluate the idea of quality deer management (QDM) in a particular geographic area.
2. Synthesize results and insights from this evaluation that pertain to the application of adaptive impact management (AIM).

METHODS

We first worked with landowners and hunters to develop a description of the management system, including major interactions, positive and negative impacts to be managed, and feed-back loops within the system. These were depicted in a concept map. Identification of impacts to be managed required considerable effort. Stakeholders' thinking needed to evolve from general, "fuzzy" descriptions of what and why they wanted or did not want particular outcomes from QDM interventions to more specific impacts (outcomes) desired. Assisting stakeholders to develop and refine their conceptions of the management system allowed us to assess why QDM might, or might not, address the impacts of interest to them.

In the fall of 2001 and periodically thereafter, DEC and HDRU held meetings with large groups (i.e., 25-40 people) of potential and active participants to identify their motivations for participating and their concerns about QDM. Additionally, 12 smaller-group meetings of 4-8 deer hunters were held to understand how they conceptualized the deer management system, and why they believed a QDM approach to deer management would be better than conventional regulations. One small-group meeting was held with 5 participating landowners in June 2002.

Using insights gained through these meetings, HDRU conducted a pre-hunting season mail survey of participants in early fall 2002. We conducted telephone surveys in October 2004 prior to deer season with 27 of the 36 originally-participating landowners and 54 deer hunters who could be reached. We also conducted telephone interviews with 19 non-participating landowners to assess reasons for their lack of participation. We implemented our final mail survey with participants in early 2005. That survey included a set of questions developed collaboratively with researchers from Michigan State University (MSU) to identify specific impacts to be managed and whether those impacts were within desirable/tolerable levels. Collaboration with MSU staff was part of a multi-state project¹ assessing the influence of landscape-level variables on landowner and hunter behaviors and attitudes towards deer (Lischka et al. 2008).

The longitudinal design of the evaluation allowed us to assess real changes (not inferred through statistical tests) in the beliefs, attitudes, and behaviors of individual participants over time. This made possible a powerful analysis of the QDM intervention despite the relatively small number of participants.

SYNTHESIS OF RESULTS AND DISCUSSION

This longitudinal case-study provided DEC with an opportunity to identify and manage fundamental ends, or impacts, of greatest importance to both landowners and deer hunters within the context of a QDM cooperative. In addition, we gained insights about a process that is useful for identifying those impacts, and for enhancing social learning opportunities within and among groups of stakeholders. We found that the social learning that occurred among individuals involved in the small-group process did not get transferred to the broader group. Furthermore, we found that improved understanding does not always translate into a change in behavior.

Insights from the small-group discussions were shared at an open meeting for all participating landowners and hunters in September 2002. The intention was to have the broader groups of landowners and hunters use the results to improve the suite of QDM "rules" to be included in the management intervention. Despite the general sense of participants at the meeting that "something had to be done" to lower perceive non-compliance, no changes were made in the QDM rules. Similar pre-season meetings were held in 2003, 2004, and 2005; no changes in the QDM rules were made at any of those meetings. Landowners consistently were unwilling to take on additional responsibility for recording deer harvested on their properties or using the threat of noncompliant hunters losing access privileges as a disincentive for shooting a buck not meeting the agreed-upon antler standard. Hunters, too, were reluctant to impose rules "with teeth." Apparently, imposing stronger "rule" was viewed as giving greater advantage to hunters who would ignore them.

2002 Pre-season Mail Survey of Participating Landowners and Hunters

In October 2002, we conducted a mail survey of all landowners and deer hunters known to be participating in the QDM cooperative. This survey verified that hunters and landowners

¹ Multi-state Hatch grant NC-1005 coordinated through state-level Agriculture Experiment Stations.

wanted to participate in the QDM cooperative because they believed QDM would change the characteristics of the deer population, which would increase or maintain high levels of positive deer-related impacts, and decrease or maintain low levels of negative impacts. In particular, many hunters greatly valued these positive impacts: (1) friendships with landowners, (2) healthy individual deer, (3) a sense of fairness among hunters, and (4) naturalness in the deer population. On the other hand, many hunters also were very concerned about being injured by other hunters indiscriminately shooting at deer. Landowners were most concerned about these negative impacts: (1) frustration about the persistent risk of crop damage, (2) risk of injury from a deer-vehicle accident, and (3) risk of excessive cost from a deer-vehicle accident. Participants believed that desirable or tolerable levels of these impacts had not been achieved under conventional deer management.

That first mail survey also verified participants' assumptions that desirable or tolerable levels of impacts "automatically" would be achieved if QDM successfully changed deer population characteristics in ways they expected (i.e., overall fewer deer, more balanced deer sex ratio, improved age structure among bucks). We found some differences in assumptions between those who greatly valued these outcomes as impacts to be managed (high-importance groups) compared to those who recognized that these outcomes might occur through QDM but placed less importance on them (low-importance groups). In particular, those in the low-importance groups tended to over-estimate the benefit of switching to QDM from CDM. Among hunters in the high-importance groups, we found higher levels of uncertainty and/or disagreement about whether various impacts would be more likely under QDM vs. CDM.

We found other areas of disagreement between high-importance and low-importance groups with respect to current (i.e., experienced) levels of impacts and desired/acceptable (i.e., possible objective) levels. Respondents in the high-importance groups indicated that current levels of positive impacts fell short of objective levels they desired, and current levels of negative impacts exceeded tolerable levels. Respondents in the low-importance groups thought current levels of positive impacts were below desirable levels, and they underestimated the levels desired by those in the high-importance groups. Also, those in low-importance groups generally thought that current levels of negative impacts were below maximum tolerable levels.

Results of the 2002 mail survey were shared at an open meeting of participants in September 2003. At that meeting, landowners and hunters again decided not to change how QDM was being implemented at King Ferry. The consensus of the group was that it might take "a couple years" before desired outcomes were noticed. DEC and HDRU staff decided not to re-survey participants in 2003.

Another open meeting was held with participants in September 2004. By that time, DEC staff had conducted several spot-light surveys in an effort to estimate the deer sex ratio and the buck age ratio. HDRU staff also had developed by then a conceptual model of several possible factors affecting hunters' willingness to pass-up shots at younger bucks (i.e., comply with the QDM rules). Discussion at the meeting revolved around the DEC deer population data and the face validity of the HDRU models. Based in part on disagreement among the meeting participants about the validity of both the DEC data and HDRU models, we decided to conduct a telephone survey of all known participants to assess the data and model validity and to collect

additional data to help us refine our conceptual models. We also decided to survey non-participating landowners to determine why they were not participating.

2004 Telephone Surveys

Why Did Some Landowners Decide Not to Participate?

We completed interviews with 19 of the 26 non-participating landowners within the overall footprint of the QDM area. Eleven of these 19 said their most important deer management issue involved negative impacts from deer. Seven said their most important issue was conflict with deer hunters, and the other said it was conflict with other landowners over deer management considerations. The landowner or close family members hunted deer on 7 of the 19 properties.

Eleven of the 19 did not want to enroll in QDM. Of these, 1 did not know enough about QDM to enroll, 3 did not think QDM would address their deer-related concerns, and 4 said the people who hunted deer on their property did not want them to enroll. The others mentioned additional, unsolicited reasons for not wanting to enroll were: “my property is too small,” “this is the only place I have to hunt and don’t want anyone else on it,” “I don’t like the DEC,” “I am not a hunter,” and “I don’t think QDM will reduce the deer population.”

Perceptions of Participating Landowners:

The telephone survey determined that participating landowners were split about whether the QDM intervention was resulting in the kinds of outcomes they wanted, with 44% reporting that the intervention was successful to \leq a slight extent and 41% reporting that it was working to \geq a moderate extent (15% said they were not sure). The vast majority of landowners who believed QDM was not successful reported increases in (1) the number of deer they saw (i.e., their estimate of the deer population), (2) crop damage, (3) deer-related vehicle accidents, and (4) damage to tree regeneration in woodlots. A plurality of those who assessed QDM as working to at least a moderate extent still reported no changes in the same factors.

We developed several hypotheses about why some landowners said QDM was working although they perceived none of the desired changes were occurring:

- Landowners may have revised their initial assumptions about whether negative impacts would decrease under QDM.
- Landowners may have learned that the negative impacts they wanted reduced were not as strongly linked to deer population size as they had initially thought.
- Landowners may have perceived that QDM was improving levels of positive impacts that “out-weighted” the lack of improvement in negative impacts.

- Landowners may weight an impact differently depending on whether they are assessing success from the context of being a farmer vs. a hunter.

We had no data to examine these hypotheses. We note, however, that even though some landowners evaluated QDM as not very successful, and most believed that QDM was not yet achieving outcomes they desired, 78% still were willing to continue participating in QDM for the 2004 hunting season.

Perceptions of Participating Deer Hunters:

Unlike landowners, most deer hunters (68%) in 2004 believed QDM was successful to at least “a moderate extent” (20% said, “a great extent”). Most hunters believed the total number of older bucks meeting the QDM buck harvest standards had increased during 2001-04 (70%) and that the ratio of older bucks to yearling bucks had increased (59%). Opinions differed about whether the doe to buck ratio had decreased as desired (22%), not changed (46%), or increased (31%). Hunters who believed QDM was successful to at least “a moderate extent” generally indicated an increase in positive hunter-deer interactions in the QDM area during 2001-04, whereas hunters believing QDM was less successful generally expressed mixed opinions. No single factor seemed to underlie hunters’ evaluations of QDM as not very successful. The vast majority of hunters (93%) were willing to continue participating in the QDM cooperative for the 2004 hunting season; 74% said they were “very willing.”

The Issue of Non-compliance with QDM harvest Standards:

More hunters perceived an improving (50%) vs. worsening trend (13%) from 2001-03 in the proportion of hunters complying with the QDM buck harvest standard. Nearly one-fourth (24%) believed there had been no change in compliance, and another 13% said they were unsure. Those who believed compliance had improved estimated a median non-compliance rate of 10% (the maximum tolerable rate determined from the 2002 survey). Among those who thought compliance had not changed, the median estimate of non-compliance was 30%. The median estimated non-compliance rate was 50% among those who believed compliance had worsened. In 2002, the median estimate of non-compliance had been 20% (Enck et al. 2003).

Perceived rate of non-compliance with QDM regulations was found in the 2002 survey to have a large influence on sense of fairness among hunters (Figure 1). A “tipping point” seems to exist between 7-12% non-compliance; i.e., when about one out of 10 hunters are thought to be “cheating” by shooting at bucks that do not meet the QDM standards. “Sense of fairness” among hunters drops quickly from just less than “complete fairness” at 5% non-compliance to something akin to “slight fairness” at about 18% non-compliance. Sense of fairness continues to erode as non-compliance rises above 18%, but at a much slower rate of decline.

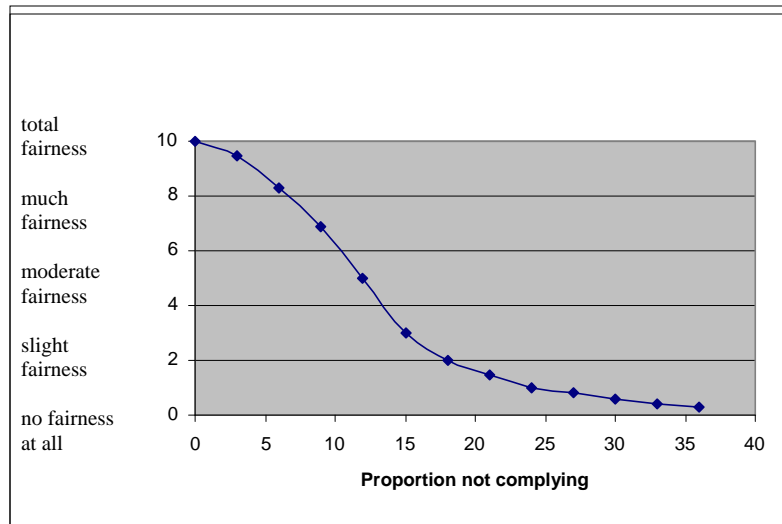


Figure 1. Relationship between perceived hunter noncompliance with quality deer management (QDM) and level of fairness among hunters, from a 2002 mail survey of hunters near King Ferry, NY.

2005 Post-season Mail Survey of Landowners

We developed an initial set of landowner-identified impacts during the first large-group meeting in 2001, and refined these in a small-group model-building exercise in June 2002. We refined this set of impacts further using results of the 2002 mail survey and 2004 telephone survey. Despite these efforts, it still was unclear how landowners' perceptions of those impacts were linked to changes they wanted in their interactions with deer and hunters. We believed that better understanding those linkages could lead to an improved QDM intervention. We developed the 2005 survey to determine those linkages.

Interactions Landowners Associate With Impacts to be Managed:

Our previous research indicated that location-specific context may influence landowners' association of impacts with interactions. To explore this phenomenon further, we analyzed landowners' reactions to observing deer in different situations. We examined 3 contexts of "seeing deer": (1) seeing live deer around home, (2) seeing live deer in their crop fields, and (3) seeing live deer along local roads. We also examined effects of seeing deer hunters on their property. We were interested in two questions:

- What effects do landowners associate with "seeing deer" or "seeing hunters" in the various contexts?
- Which of these effects do landowners value highly enough (either positively or negatively) for those effects to be impacts to be managed?

Most landowners associate several effects with “seeing deer” regardless of the context, and many of these effects are important enough to be considered the foci of management (Table 1). “Seeing deer” contributes to both positive and negative impacts for landowners when those deer are seen either around home or in crop fields. Landowners associate negative impacts with seeing live deer along local roads, but our data are inadequate to determine whether landowners associate any positive impacts with seeing live deer in that context.

Table 1. Context-specific interactions, effects, and impacts are context specific for landowners, based on a 2005 mail survey of landowners near King Ferry, NY.

<u>Landowner-deer interaction</u>	<u>Possible effects that might be associated with interaction</u>	<u>% recognized this effect</u>	<u>% for whom this is an impact</u>
“Seeing live deer” around home	Feel connected to nature	85	38
	Worry about cost of repairs from a deer-related vehicle accident (DRVA)	79	71
	Worry about being injured in DRVA	79	64
	Worry about hassle of dealing with DRVA	79	64
	Confident that hunting will be good	64	43
	Worry about cost of replacing plants	47	27
	Frustrated about wasting time replanting plants	47	20
	Worry about CWD	36	29
	“Seeing live deer” in my crop fields	Feel deer are healthy, well-fed	86
Confident that hunting will be good		85	46
Worry about cost of repairs from DRVA		79	71
Worry about being injured in DRVA		79	64
Worry about hassle of dealing with DRVA		79	64
Feel like a steward of nature		79	57
Feel connected to nature		71	36
Feel like property can support many deer		67	36
Worry about lost income from crop damage from deer		53	36

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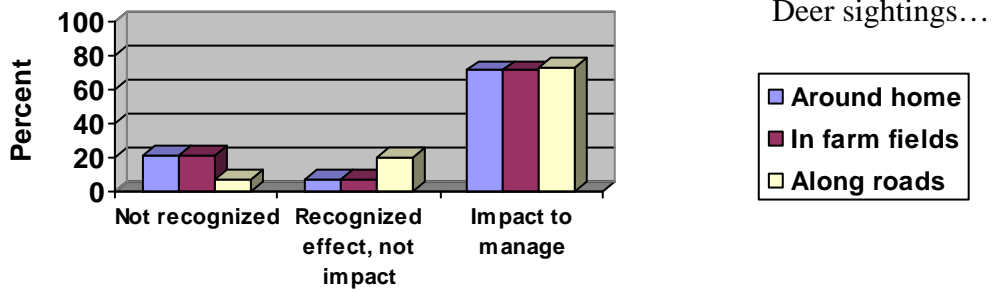
Table 1. Continued.

<u>Landowner-hunter interaction</u>	<u>Possible effects that might be associated with interaction</u>	<u>% recognized this effect</u>	<u>% for whom this is an impact</u>
“Seeing live deer” along local roads	Worry about cost of repairs from DRVA	93	73
	Worry about being injured in DRVA	93	67
	Worry about hassle of dealing with DRVA	93	67
	Anxiety about a deer dying in a DRVA	43	14
	Feel connected to nature	29	14
“Seeing hunters” on my property	Worry someone may trespass	79	57
	Confident that the population can sustain hunting	64	33
	Worry about being injured by hunters shooting unsafely	50	29
	Worry that other hunters will interfere with my hunting	43	21
	Anxiety about a deer dying from hunting	7	7

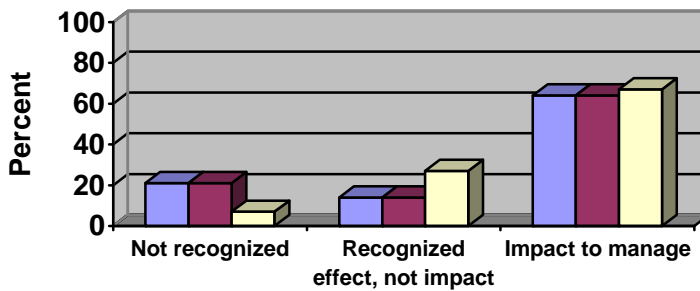
Negative effects associated with “seeing deer” were consistent regardless of location of the sightings. For example, concerns about deer-vehicle accidents were held by large majorities regardless of whether deer were seen around home, in nearby farm fields, or along roads (Figure 2; columns of the same color sum to 100%). Landowners reported that the mere possibility of having a DRVA gives rise to anxiety about multiple negative impacts.

On the other hand, positive effects associated with deer sightings seem to vary depending on context (Figure 3; columns of the same color sum to 100%). For example, feeling connected to nature is recognized as an effect of seeing deer around home and in farm fields by the vast majority of landowners, but feeling connected to nature generally is not associated with seeing live deer near a road. Feeling confident that deer hunting will be good is a positive impact for similar percentages of landowners regardless of whether they see deer around their homes or in their crop fields, but location of sightings does influence whether landowners even associate this effect with seeing deer. That is, seeing deer in crop fields is more often associated with the prospects for deer hunting than seeing deer around homes.

DRVA cost anxiety



DRVA injury anxiety



DRVA hassle anxiety

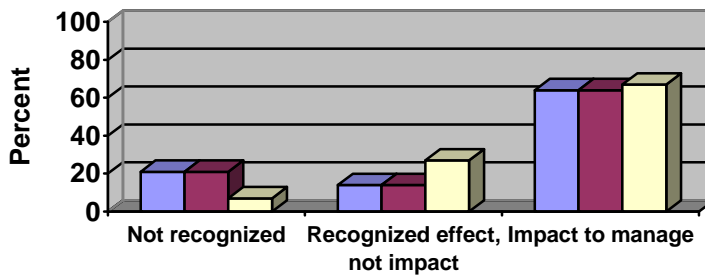


Figure 2. Location-specific effects and impacts of the landowner-deer interaction “seeing deer,” from a 2005 mail survey of landowners near King Ferry, NY.

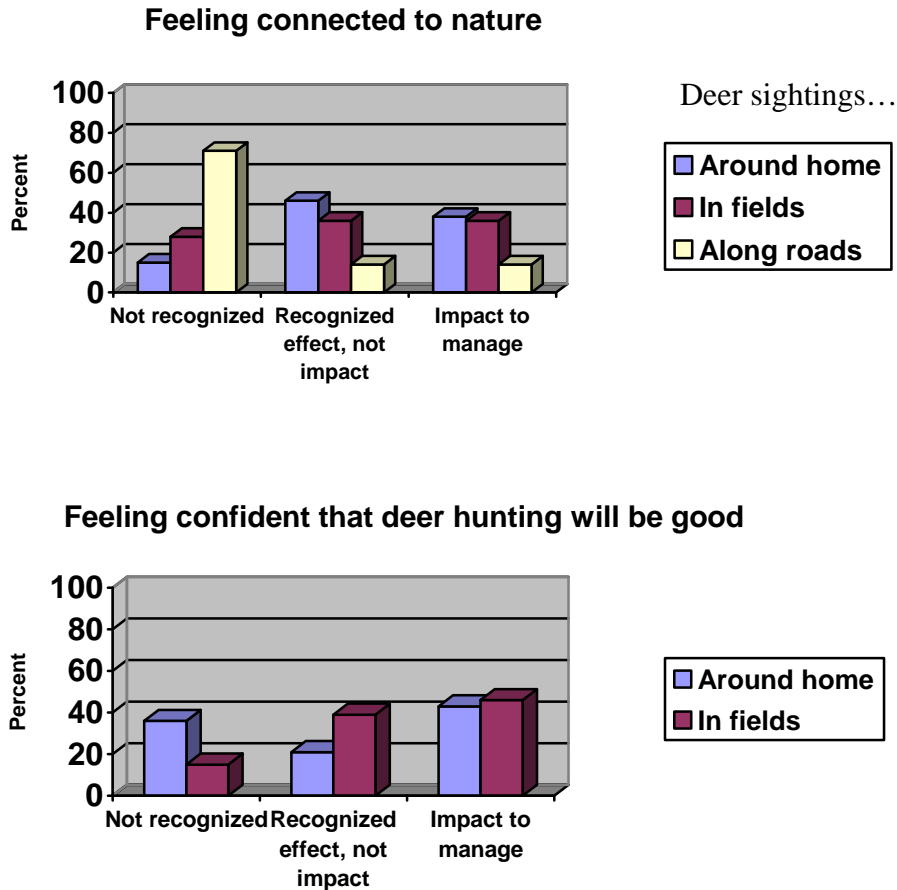


Figure 3. Location-specific effects and impacts associated with the landowner-deer interaction “seeing deer,” from a 2005 mail survey of landowners near King Ferry, NY.

Other attributes of context in addition to location were related to whether landowners experienced particular effects, and whether those effects were sufficiently important to be impacts to manage. For example, deer may be killed either in the context of DRVAs or hunting. Someone may worry that a deer may die in either context – particularly if they are concerned about the fate of individual deer. More landowners recognized a negative effect (“deer death anxiety”) when they saw live deer along roads compared to when they saw deer hunters during the hunting season (Figure 4; columns of the same color sum to 100%). In neither situation did many landowners indicate that this anxiety should be a focus of management.

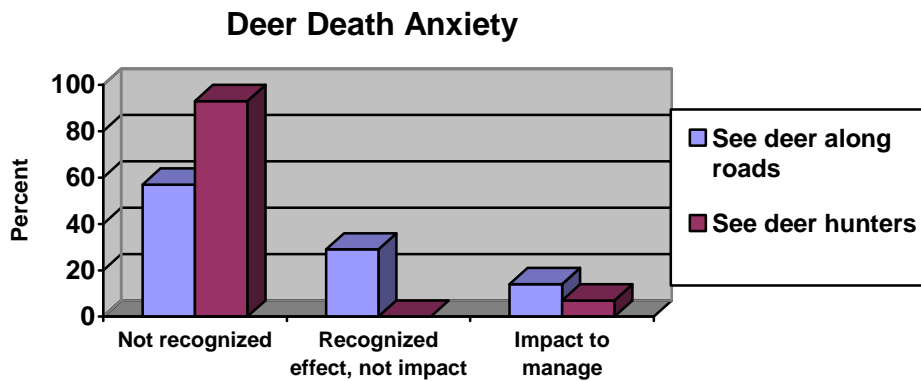


Figure 4. Context and experience of “deer death anxiety” for landowners, from a 2005 mail survey of landowners near King Ferry, NY.

Landowners’ Preferences for Changes in Interactions:

Not surprisingly, the more concern landowners placed on particular effects of seeing deer around home, the more likely they were to prefer decreases in both the negative effects and the contributing interaction. For example, about 70% of landowners identified 3 negative impacts from seeing deer (regardless of whether the context was around home, in their crop fields, or along roads): (1) anxiety about the cost of DRVA repairs, (2) anxiety about being personally injured in a DRVA, and (3) anxiety about the hassle of having to deal with a DRVA. Those landowners preferred a decrease in the contributing interaction – “seeing deer” – suggesting that in aggregate those negative impacts were above tolerable levels. On the other hand, the vast majority of landowners who did not consider these 3 effects to be impacts to manage preferred no change in the number of deer in the area or in their sightings of deer.

Similarly, about 25% of landowners associated 2 other negative impacts with seeing deer around their homes: (1) worry about the cost of replacing ornamental plants, and (2) frustration with the wasted effort of planting ornamentals. Most of these landowners preferred to see fewer deer. Landowners who did not consider these effects (worry, frustration) to be impacts were split about whether they preferred to see fewer or the same number of deer.

Despite most landowners associating positive impacts with deer sightings, those landowners preferred a decrease in “seeing deer” interactions. For example, many landowners reported that the interaction “seeing deer around home” contributed to experiencing 2 positive impacts: (1) feeling connected to nature, and (2) being confident that deer hunting will be good. Yet, most landowners who reported these positive impacts preferred to see fewer deer. This finding suggests that landowners make trade-offs between (i.e., place different weight on) positive and negative impacts when deciding on their preferences for changes in contributing interactions.

Exploring How Trade-offs Among Impacts Influence Landowners' Preferences for Changes in Interactions:

Considering that landowners' associate multiple impacts (both negative and positive) with a particular interaction, we wanted to understand the trade-offs among these impacts when developing preferences for future changes in that interaction. Nearly all participating landowners enrolled in the QDM cooperative because they preferred a lower deer population overall (Enck et al. 2003), and preferred to see fewer deer around their homes, in their crop fields, and along local roads (2005 survey data). Nevertheless, landowners also reported experiencing positive impacts from seeing deer as noted above. They undoubtedly make trade-offs when stating preferences for management that would reduce both the positive and negative impacts.

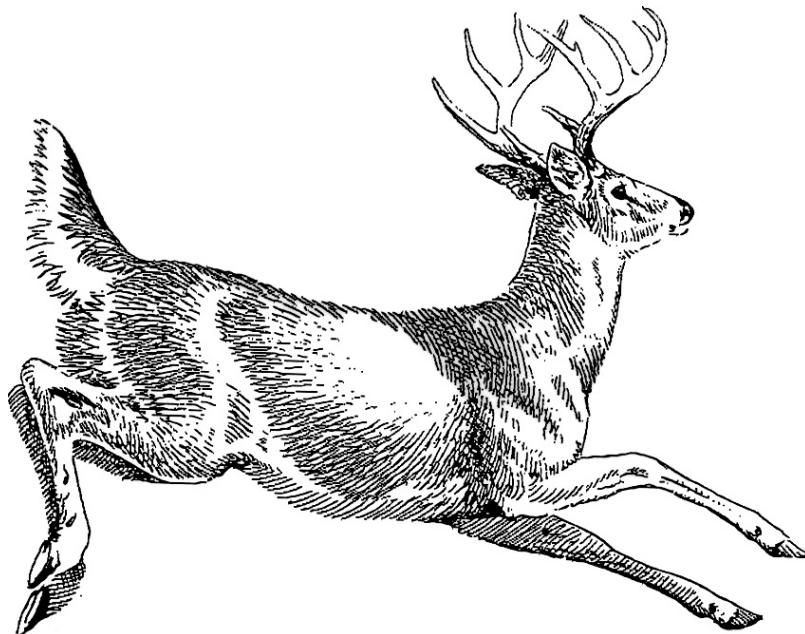
Hypothetically, these trade-offs likely involve differential weighting of positive and negative impacts by the landowners. Whether positive or negative impacts are weighted more heavily likely depends on landowners' perceptions of the relationship between experienced levels of the impacts and desirable/tolerable levels. The most informative scenario with respect to the weighting of positive and negative impacts would be when experienced levels of positive impacts are below desirable levels and experienced levels of negative impacts are above tolerable levels. Only under this scenario would landowners' preference for changes in the contributing interaction reveal the weighting they use in making trade-offs (Table 2). Negative impacts would be found to carry more weight if landowners prefer a decrease in the contributing interaction. Alternatively, positive interactions would be found to carry more weight if landowners prefer an increase in the interaction. A scenario in which landowners are uncertain about their preference for a change in the contributing interaction would reveal equal weighting of positive and negative impacts.

We lack sufficient data to examine these hypothesized relationships. Nonetheless, our data suggest that negative impacts may carry more weight than positive impacts for landowners in the King Ferry QDM cooperative vis-à-vis their preferences for changes in the deer-related interactions that contribute to those impacts. For example, landowners who reported intolerable levels of frustration about crop damage also preferred a decrease in seeing deer (around home and in crop fields), regardless of whether positive impacts were below desirable levels.

When landowners express preferences for changes in any particular interaction, they consider impacts associated with other interactions. This was revealed in our examination of factors affecting landowners' willingness to allow hunters access to their property. Landowners almost universally wanted to reduce the local deer population as a means for achieving more tolerable levels of several negative impacts. Nevertheless, 60% said they are not willing to allow any strangers to have access, in large part, because they believed other, collateral impacts would occur (e.g., interference with farming activities, anxiety about being injured by hunters shooting indiscriminately at deer, etc.). This low willingness to allow access for hunting has important implications for efforts to maintain or decrease deer populations in WMUs that are at or above population targets. Our results highlight the need to identify and manage collateral impacts that influence access decisions by landowners, which in turn can limit deer harvest and result in more negative impacts.

Table 2. Hypotheses about the relative weight of positive and negative impacts being traded-off by stakeholders when they consider their preferences for changes in an interaction such as “seeing deer.”

Stakeholders’ assessment of experienced levels of impacts relative to desirable/tolerable levels	<u>Direction of change preferred in interaction...</u>		
	<u>Decrease</u>	<u>Increase</u>	<u>No change</u>
positive impacts are high enough, and negative impacts are low enough	neg > pos	pos > neg	same weight
positive impacts are high enough, and negative impacts are too high	neg > pos or same weight	pos > neg	pos > neg
positive impacts are too low, and negative impacts low enough	neg > pos	same weight or pos > neg	neg > pos
positive impacts are too low, and negative impacts are too high	neg > pos	pos > neg	same weight



Changes in Experienced and Desirable/Tolerable Levels of Impacts from 2002-05:

Both experienced and tolerable levels of two negative impacts identified by landowners changed between 2002 and 2005 (Figure 5). Frustration about losing income from crop damage by deer worsened from 2002-2005, resulting in decreasing tolerance for that frustration. On the other hand, landowners experienced decreasing anxiety about being injured by hunters shooting indiscriminately at deer, leading to an increase in the level of anxiety tolerated.

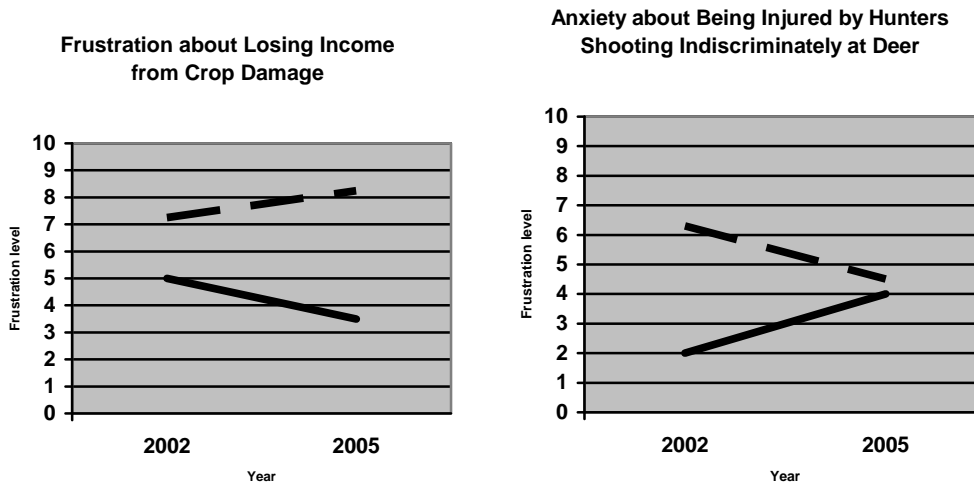


Figure 5. Changes in experienced (dashed lines) and tolerable levels (solid lines) of two negative impacts identified by landowners participating in a quality deer management cooperative near King Ferry, NY, based on mail surveys conducted in 2002 and 2005.

2005 Post-season Mail Survey of Deer Hunters

One of the main purposes of this survey was to monitor hunters' perceptions of levels of impacts that had been identified in the group meetings and verified in the 2002 mail survey (Enck et al. 2003) these impacts were: experiencing desirable level of naturalness in the deer sex ratio, experiencing desirable level of naturalness in the buck age ratio, experiencing a desirable level of fairness among all hunters, and experiencing a tolerable level of anxiety about being injured by other hunters shooting unsafely at deer. To interpret hunters' perceptions about levels of impacts, we also investigated their perceptions of changes in hunter-deer interactions with which they associated the impacts. These interactions included, seeing older bucks meeting QDM standards, seeing younger bucks not meeting QDM standards, seeing antlerless deer, and seeing/hearing other hunters.

Interactions Associated with Naturalness of the Deer Population:

Seeing antlered bucks. In 2005, one-half (50%) of the deer hunters believed that the number of antlered bucks meeting the QDM harvest standard on the area had increased since inception of QDM, and another 30% believed that the number of these mature bucks had remained about the same. Only 7% reported a decrease with the remaining 27% reporting uncertainty or no opinion. Similarly, about one-half (53%) reported a slight increase in the ratio of bucks meeting the QDM standard to smaller-antlered bucks on the area between 2002 and 2005, with 30% reporting no change in the buck age ratio and 13% being uncertain or having no opinion. A hunter-by-hunter comparison of perceptions from the 2002 and 2005 surveys revealed a slight improvement in the median buck age ratio in 2005 (ratio = 8 smaller, non-qualifying bucks to 2 larger, QDM-legal bucks) compared to 2002 (ratio = 9 smaller bucks to 1 QDM-legal buck). Overall, 40% of hunters who responded to both surveys believed the buck age ratio had not changed while 45% perceived a slight improvement. Trail-camera and spotlight surveys conducted by DEC indicated that the buck age structure did not change from 2001-2004 (DEC unpublished data).

Seeing antlerless deer. In 2005, hunters generally believed that the deer population on the QDM cooperative had an adult sex ratio skewed toward antlerless deer, with a median adult sex ratio of 80 antlerless deer and 20 antlered bucks out of every 100 deer. Hunters were split about whether the adult deer sex ratio had decreased as desired (30%; 27% said “slightly”), stayed the same (30%), or worsened (30%; 23% said “greatly”). The remaining 10% were uncertain or had no opinion. A hunter-by-hunter comparison of perceptions from the 2002 and 2005 surveys revealed that 75% of hunters had seen a higher ratio of adult antlerless deer to antlered bucks in 2005 compared to 2002. Trail-camera and spotlight surveys conducted by DEC indicated that the adult deer sex ratio did not change from 2001-2004 (DEC unpublished data).

Consistent with hunters’ perceptions of the adult deer sex ratio, they generally observed 3-4 times as many adult antlerless deer than antlered bucks per day during the regular firearms season (Table 3). Hunters also observed about 3 times as many smaller-antlered bucks not meeting the QDM harvest standard than QDM-legal bucks. Adult deer sex and buck age ratios based on these averages of observations are slightly better than the 4:1 ratios estimated by hunters, and reported above. Altogether, 31 deer hunters reported harvesting 10 antlerless deer and 3 QDM-legal bucks on the area in 2005. We have no independent verification of deer harvest in large part because participating hunters resisted the idea of having their deer recorded at a nearby DEC check station.

Based on hunters’ self-reports of the number of deer (by sex and age) at which they could have taken shots out of those they observed, smaller-antlered bucks were the most vulnerable to harvest and larger-antlered, QDM-legal bucks were the least vulnerable (Table 3). These data are consistent with harvest vulnerabilities of deer by age and sex determined in a recent statewide survey of deer hunters (Enck and Brown 2008a) and in a recent survey of hunters participating in a mandatory antler-restriction program in southeastern NY (Enck and Brown 2008b).

Table 3. Numbers of deer (by sex and age) that were observed, perceived as potential targets, shot at, and harvested during the regular firearms season by deer hunters participating in a quality deer management (QDM) initiative near King Ferry, NY during the 2004 hunting season, from 2005 mail survey.

<u>Hunter-deer interactions</u>	<u>Segment of the deer population by sex and age</u>		
	<u>Antlerless deer</u> <u>Mean</u>	<u>Smaller-antlered bucks (sublegal)</u> <u>Mean</u>	<u>Larger-antlered QDM-legal bucks</u> <u>Mean</u>
Number seen during regular firearms season	23.4	5.4	1.7
Number seen per day during regular firearms season	4.9	0.9	0.3
index to harvest vulnerability (of seen, % that could have been shot at; hunter had tag, deer was in-range for safe shot)	51%	60%	31%
index to willingness to shoot (of those vulnerable, % shot at by hunter)	12%	4%	39%
index to shooting effectiveness (of those shot at by hunter, % harvested)	52%	0%	40%
index to shooting efficiency (total shots taken per deer harvested)	1.2	0.0	1.2
# harvested	0.3	0.0	0.1
% harvested 0	70.0	0.0	93.3
% harvested 1	30.0	0.0	3.3
% harvested 2	0.0	0.0	3.3

Similar to findings from these other studies, hunters participating in the QDM initiative reported a relatively low willingness to take shots at deer when they had the opportunity to do so (Table 3). The findings that hunters were willing to shoot at only 39% of bucks meeting the QDM harvest standard and only 12% of harvest-vulnerable antlerless deer are surprising. We have no additional data to help us understand the low willingness to harvest mature bucks, but these data are consistent with the finding from other areas that hunters are not willing to shoot at many of the larger-antlered bucks that present an opportunity for a shot (Enck and Brown 2008a, Enck and Brown 2008b).

The low willingness to harvest antlerless deer invalidates an important stated assumption from the outset of the QDM initiative. Most hunters had assumed that the decreased buck harvest opportunity stemming from the voluntary QDM harvest standard would lead hunters to increase harvest of antlerless deer (Enck et al. 2003). That anticipated, additive harvest seems not to have occurred, most likely because of the low willingness to shoot at antlerless deer, rather than particularly low vulnerability of those deer to harvest or particularly low shooting effectiveness on the part of hunters (Table 3).

The low willingness to take shots at antlerless deer demonstrated by hunters was not consistent with their stated level of willingness determined through the survey. When asked how willing they were to harvest an antlerless deer when they hold a valid deer management permit (DMP), 45% said they were “extremely willing” and another 33% said “very willing.” Hunters reported that “if my friends or I could use more venison,” or “if it seems enough does are surviving to produce a good crop of buck fawns next year,” then they were more willing to harvest an antlerless deer. The following factors all had much less influence on their willingness to harvest an antlerless deer: amount of prestige associated with taking a buck, scarcity of bucks relative to hunters, naturalness of the deer sex ratio, and whether a hunter already had filled a buck tag.

That hunters were willing to shoot at only 4% of smaller-antlered bucks that do not meet the QDM harvest standard suggests that an improvement in the buck age ratio is at least possible. When those same hunters hunted deer outside of the QDM cooperative, about one-half of them said they were either “extremely willing” (21%) or very willing (29%) to pass-up shots at small bucks. Seventeen percent were “moderately willing,” and 8% had no opinion about their willingness. The survey revealed that the two factors with the greatest influence on hunters’ willingness to pass-up shots at smaller bucks operate in different directions. If hunters think there are some mature bucks in the area, they are more willing pass-up shots at smaller bucks and to “hold-out” for a mature buck. Conversely, if they think antlered bucks are scarce relative to antlerless deer in the area, they are less willing to pass-up smaller bucks.

Interactions Associated with Fairness Among Hunters:

Issues of fairness among hunters, or the perceived lack of fairness, remain unresolved among participants and are manifested in perceptions of high levels of non-compliance with the QDM buck harvest standard on the area. In 2005, the median perceived level of non-compliance was 30%, even higher than the 25% median non-compliance rate perceived in 2002. When asked about changes in perceived compliance from 2002-2005, 37% said they thought more hunters were complying, 30% believed fewer hunters were complying, and 33% thought that about the same percentage were complying in 2005 as had been complying in 2002. A hunter-by-hunter comparison of those who responded in both 2002 and 2005 revealed improved estimates of compliance by 44% of hunters, but worse estimates of compliance for 56%.

Perceptions of non-compliance were associated with a variety of hunter-hunter interactions. More than one-half of hunters (57%) based their perceptions on what they overheard other hunters talking about, and nearly one-half (47%) said they based their perceptions of non-compliance on the behavior of their own hunting group (i.e., allowed young

hunters to take a small buck, someone made a mistake, etc.). Substantial percentages of hunters also based their perceptions on “all the shots I hear coming from adjacent properties” (40%), seeing other hunters with small bucks they have taken (37%), and based on knowledge that hunters put on deer drives on adjacent properties (23%).

Changes in Experienced and Desirable/Tolerable Levels of Impacts from 2002-05:

In both 2002 and 2005, we measured experienced and tolerable levels of four impacts: (1) anxiety about being injured by hunters shooting unsafely at deer, (2) sense of fairness among hunters, (3) feeling like an expert deer hunter, and (4) naturalness of the deer population [general “deer population” in 2002; specific “proportion of bucks compared to does” in 2005]. In 2002, anxiety about being injured by other hunters shooting unsafely at deer exceeded the level tolerable to hunters, but experienced anxiety was below the maximum level tolerable to hunters by 2005 (Figure 6). In the case of injury anxiety, the level tolerated by hunters increased concurrent with a decrease in experienced anxiety.

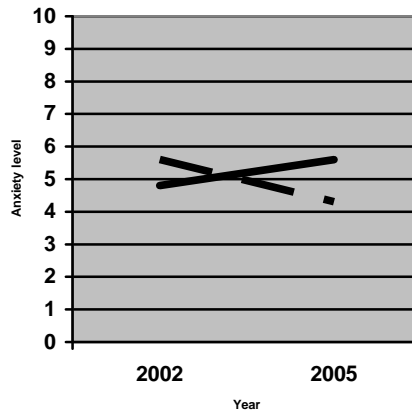


Figure 6. Changes in experienced (dashed lines) and tolerable level (solid lines) of “anxiety about being injured by other hunters shooting indiscriminately at deer” for deer hunters near King Ferry, NY, based on mail surveys conducted with the same individuals in 2002 and 2005.

In the case of “sense of fairness among hunters,” neither experienced nor desirable levels changed from 2002-2005 (Figure 7, left). Experienced levels of “fairness” were substantially below desirable levels both years. In the case of “naturalness of the buck age ratio,” both desirable and experienced levels decreased in parallel from 2002-2005 (Figure 7, center). Similar to “fairness,” “naturalness” was below desirable levels both years. In the case of “sense of expertness as a better-than-average deer hunter,” experienced level increased slightly from 2002-2005 whereas desirable level was constant (Figure 7, right). Experienced level was essentially at the minimum desirable level in 2002 and 2005.

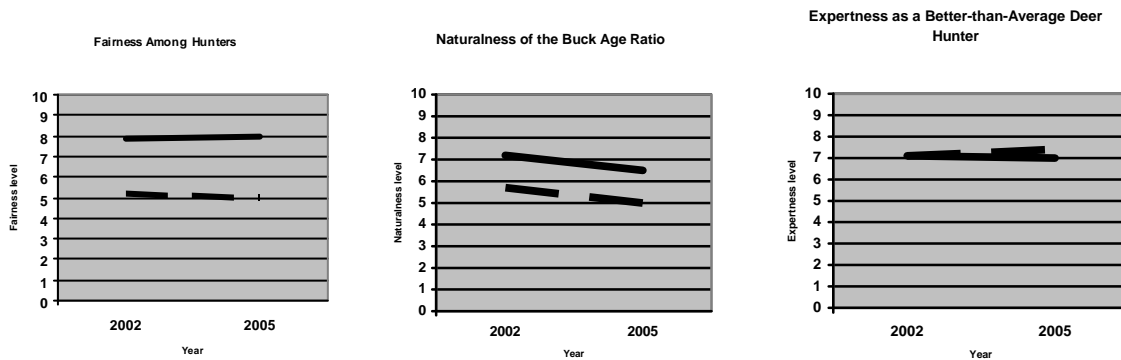


Figure 7. Changes in experienced (dashed lines) and desirable levels (solid lines) of three positive impacts identified by deer hunters near King Ferry, NY, based on mail surveys conducted in 2002 and 2005 with the same individuals.

Hunters’ Willingness to Continue in the QDM Cooperative:

Given the comparison in the previous section of experienced vs. tolerable/desirable levels of impacts, we anticipated that few hunters would be willing to continue participating in the QDM cooperative. Many of the outcomes they sought when they chose to participate in 2001 were not yet met in 2005. Unexpectedly, more than one-half of deer hunters (52%) were “very willing” to continue, and another 23% were “moderately willing.” Sixteen percent of hunters were “slightly willing” whereas 6% were “not at all willing” to continue participating.

CONCLUSIONS AND IMPLICATIONS

This case study provided DEC with an opportunity to identify and manage fundamental ends, or impacts, of greatest importance to both landowners and deer hunters within the context of a QDM cooperative. In addition, we gained insights about a process that is useful for identifying those impacts, and for enhancing social learning opportunities within and among groups of stakeholders. We found that social learning that can occur among some individuals involved in a process does not easily get transferred to the broader group. Furthermore, we found that improved understanding does not always translate into a change in behavior.

Our evaluation revealed several important insights about QDM as applied in this case, and about trying to manage for desirable/tolerable levels of deer-related impacts through any deer management intervention. One insight was that negative impacts associated with seeing deer were consistent regardless of location where the observations occurred. For example, regardless of whether landowners saw deer around home, in their crop fields, or along local roads, such sightings led to anxiety about the possibility of having deer-vehicle accidents among large majorities of landowners. On the other hand, positive impacts seem to be more context-

specific. Most landowners recognize a sense of “feeling connected to nature” when they see deer around home or in their farm fields, but not when they see live deer near local roads.

Another insight supported by our data, but needing more research attention, is that negative impacts seem to carry more weight than positive impacts in landowners’ preferences for changes in the deer-related interactions that contribute to those impacts. For example, landowners who reported intolerable levels of frustration about crop damage also preferred a decrease in “seeing deer” interactions around home and in their crop fields, regardless of whether positive impacts associated with such sightings were at desirable levels or were too low.

Landowners also apparently consider collateral impacts when developing preferences for changes in deer-related interactions. Despite almost universal interest in reducing intolerable levels of several negative impacts, landowners’ concern about being injured by hunters shooting unsafely at deer or interfering with their own hunting experiences limited their willingness to provide access for more hunters on their properties. The low willingness to allow access for more hunters highlights a challenge for QDM or any other deer management intervention to be implemented effectively across large areas. These findings also highlight the importance of identifying and managing collateral impacts that may influence landowners’ behaviors.

A surprising finding was that a majority of both landowners and hunters were willing to continue participating in the QDM cooperative despite what they saw as lack of progress as manifested through the intolerable or undesirable levels of impacts they experienced to date. Although negative impacts have greater influence than positive impacts on preferences for changes in contributing interactions, positive impacts (experienced or expected) have more influence on their willingness to continue. Specifically, landowners’ and hunters’ beliefs that QDM will eventually result in desired outcomes seems to be a stronger motivation to continue participating than the lack of management success they have experienced is a cause to quit.

The QDM cooperative at King Ferry included landowners with a range of interests (some enthusiastic and some disinterested) in QDM. Deer hunters also varied in their interest in QDM. Some of the hunters typically having access to properties participating in the program wanted to engage in QDM, but others did not. Unlike DEC’s experiences elsewhere in which hunting clubs or single landowners asked for assistance establishing a QDM plant, in this situation the landowner and hunters who were interested in QDM could not agree on a galvanizing purpose and collective commitment to implement QDM consistently across properties.

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