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LANDOWNER TOLERANCE OF BEAVERS: IMPLICATIONS FOR DAMAGE MANAGEMENT AND CONTROL

by Ken G. Purdy, Daniel J. Decker, Richard A. Malecki and John C. Proud*

ABSTRACT

Management of beaver (Castor canadensis) populations can be an effective way to create wetlands while at the same time producing a valued recreational and furbearer resource. Optimizing beaver populations for such a dual objective, however, requires careful integration of biological and sociological considerations in management planning. Knowledge of beaver population dynamics by itself is insufficient for sound management; human tolerance data also must be included in management decisions to reduce the potential of encountering problems that could impede the attainment of beaver-wetlands management objectives. Expansion of beaver into new areas often may be constrained by managers' perceptions of the potential for landowner complaints of beaver damage. Responding to numerous complaints can be a time-consuming and costly drain on agency resources. In response to wildlife managers' concerns about landowners' reactions to increasing beaver populations, landowners in central New York were surveyed in January-February 1985 to determine public attitudes and tolerances associated with beaver activities. Survey responses indicated that over one-half of the owners of sites occupied by beaver had incurred previous damage or nuisance problems. Site owners' perceptions of the severity of damage were strongly related to their overall tolerance orientation toward beaver. Damage estimates indicated that site owners were willing to incur nearly $800 of damage per landowner in return for the presence of beaver on their property during the period of 1982-1984. Individuals attempting damage control often relied on the assistance of others with their control efforts and a majority of all site owners indicated they were willing to conduct habitat modifications on their property that would aid in the prevention of future beaver damage problems. Implications of these findings are discussed in relation to issues that must be addressed by wildlife managers developing damage management and control programs.

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INTRODUCTION

Beaver populations are a valuable resource in the eastern United States. The activities of beaver provide nature enthusiasts with numerous hours of enjoyment. As a furbearing wildlife species they provide trappers with thousands of days of recreational activity. From an economic perspective, the sale of beaver trapping supplies and beaver pelts generates millions of dollars of revenue, much of it returned to local economies throughout the region. Furthermore, wetlands created by beaver provide, among other benefits, flood and erosion control, groundwater recharge, and critical habitats for many kinds of fish and wildlife species. These benefits notwithstanding, the activities of beaver may, at times, conflict with human land uses. As described by Woodward (1983), such conflicts generally occur as a result of the animal's innate behavior to raise water levels to a depth in which it feels secure in its movements and adequate for transport of building material; water levels differing from those desired by humans result in problems.

In New York, as in other eastern states, the activities of beaver are likely to create problems that exceed levels of human tolerance. In fact, the New York State Department of Environmental Conservation (DEC) annually receives more formal complaints about beaver than about deer. DEC's current management plans are influenced strongly by regional wildlife managers' perceptions of landowner tolerance of beaver damage. Little or no information, however, had been obtained to corroborate the accuracy of managers' perceptions of human tolerance. Because understanding landowner attitudes about wildlife damage has been an important element in efforts by DEC to develop species management plans sensitive to public needs and concerns, information about individuals affected by changes in the distribution and abundance of beaver populations was sought.

To assist beaver planning efforts, specific types of information were needed. These included the characteristics of landowners affected by beaver, the extent and magnitude of damage incurred, and landowners' propensity for involvement in beaver damage control. The authors believe that for beaver management, as well as for other wildlife species where human tolerance is a concern, ascertaining these types of information allows managers to address questions that will guide development of damage management and control programs.

The purpose of this paper is to describe the results of a study (Purdy and Decker 1985) of landowners with beaver sites in central New York, their tolerance of beaver damage, and their preferences for future beaver population trends. The implications of these findings are related to issues that managers must consider when developing beaver damage management and control programs.

The authors acknowledge gratefully the assistance of the following individuals in this research: R. Gotie, G. Parsons, and G. Mattfeld of the New York State Department of Environmental Conservation; M. Link, N. Connelly, R. Smolka and L. Mattei of the Human Dimensions Research Unit, Cornell University; and S. Anderson, typist in the Department of Natural Resources, Cornell University. This study was supported by the New York Federal Aid in Wildlife Restoration Project W-146-R and by Cornell Agricultural Experiment Station Hatch Project 147441.

STUDY AREA

The study was conducted in a 9-county area of central New York (Fig. 1). The 16,250 km^2 area, classified as DEC Region 7, is bordered by Pennsylvania to the south and by Lake Ontario to the north. The land is characterized by rolling hills interspersed with croplands and mixed-species hardwood forests. The region contains approximately 56,000 ha of wetland environments and supported about 5,000 beaver in 1984. In addition, a population of about 1.2 million people reside within the region, most living in or around 4 metropolitan areas.

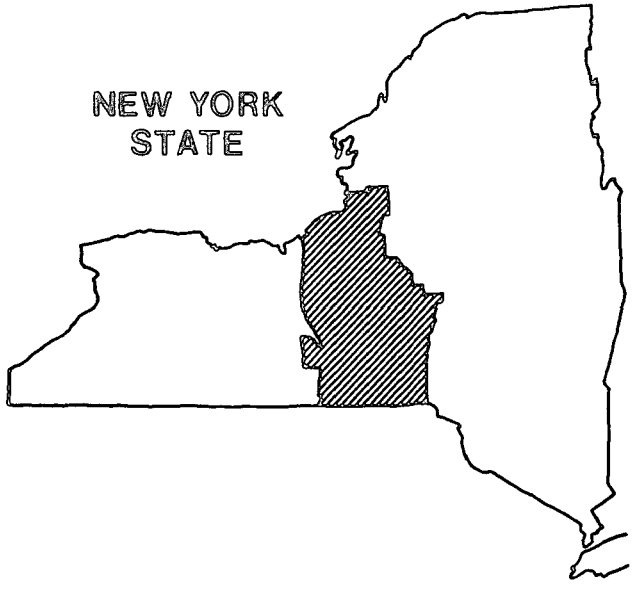

Fig. 1. Study area of the 1985 central New York beaver damage tolerance study.

METHODS

Properties with beaver sites were identified using DEC beaver habitat maps developed from aerial surveys of beaver colony sites conducted in 1983. The properties were stratified according to the nature of the site located

thereon. Three strata were thus identified: (1) active sites that had generated complaints (active/complaint sites), (2) active sites that had not generated complaints (active/noncomplaint sites), and (3) sites without beaver activity (inactive sites).

The names and mailing addresses of property owners (henceforth termed "site owners") with beaver sites were obtained from DEC Division of Regulatory Affairs wetland landowner listings and New York county property tax records. A sample of about 200 names was systematically selected from each of the strata of site-types with 1 person selected per site. To achieve the desired sample size for site owners of active/complaint sites, all individuals who had filed beaver complaints during 1982 and 1983 were included in the survey. The total initial sample size was 679.

A mail questionnaire was developed for the survey and implemented in January-February 1985. The mailing strategy consisted of an initial mailing and 3 follow-up reminder letters sent to nonrespondents.

RESULTS AND DISCUSSION

Of the 679 questionnaires mailed to site owners, 129 were nondeliverable and 423 were returned, for an adjusted response rate of 77%. Responses were weighted to compensate for the sampling of site owners at rates disproportionate to their occurrence within the study area. The results reported herein are based on these weighted estimates.

Site Owner Characteristics

A review of preliminary survey results indicated that data analysis based on a classification of site owners' that reflected their attitudes about beaver would be most suitable for decision-making purposes by wildlife managers. Therefore, a typology of beaver tolerance was developed using a composite of site owners' attitudes about beaver on their property, their preferences for future beaver population levels in Region 7, and their previous "experience" with beaver (experience is used here to indicate whether respondents had observed evidence of beaver activity on their property since 1982). The 4 site owner types resulting were (1) experienced tolerant site owners, (2) inexperienced tolerant site owners, (3) experienced intolerant site owners, and (4) inexperienced intolerant site owners. A summary of the characteristics for the combined groups of tolerant and intolerant site owners follows:

Tolerant site owners -- This group of site owners, both experienced and inexperienced with beaver, comprised about two-thirds of all respondents. While 71% of this group indicated that the presence of beaver on their own property was either enjoyable or did not matter to them personally, the remainder were worried about the possibility of damage. Nevertheless, all of these individuals exhibited strong, positive beliefs about the values of beaver and nearly 90% associated recreational uses such as nature observation, hunting or fishing with the beaver site located on their property. Tolerant site owners had the additional characteristic of believing that beaver populations should either be maintained at current levels (71%) or increased in size (29%).

Intolerant site owners -- Individuals characterized by intolerant attitudes, regardless of their previous experience with beaver, comprised about one-third of all site owners. These individuals exhibited weak, but positive beliefs about the values of beaver although few (35%) indicated they valued beaver-created wetlands for recreational purposes. While some (6%) did not strictly oppose the presence of beaver on their own property, all site owners classified as intolerant believed that beaver populations should be reduced.

Extent of Beaver Damage

About one-half (53%) of the survey respondents indicated they had observed evidence of beaver on their property during the period 1982-1984. While it is important to recognize the potential inaccuracies inherent in these site

owner reports, it is perhaps more important from a management perspective to recognize that site owners perceived beaver to be present on their property. Among all site owners with such perceptions, 55% indicated they had incurred previous beaver damage and the mean number of years in which damage was reported during the period used as a referent in this study (1982-1984) was 2.

As expected, most (83%) site owners classified as intolerant reported previous damage. It is important to note, however, that a mere perception of damage did not indicate that a person was intolerant of beaver; 37% of site owners classified as tolerant also reported damage.

The type of damage resulting from beaver activity reported most by site owners was cutting or girdling damage to trees. Three types alone comprised about four-fifths of all damage reported; these were damage to trees (45%), flooding that resulted in soil erosion (21%), and damage to structures such as fences, outbuildings, drainage culverts and roads (17%).

Considering all damage types, dollar estimates per incidence of damage averaged about $700 per site owner (Table 1). Persons with crop damage

Table 1. Average estimates of total dollars-of-damage per incidence of beaver damage reported.*

Damage Type	All Site Owners	Tolerant Site Owners	Intolerant Site Owners
All types	736 (780)	342 (215)	892 (565)
Trees	666 (363)	297 (205)	1143 (158)
Soil erosion	386 (126)	350 (2)	167 (124)
Structural	700 (174)	1700 (7)	657 (167)
Crops	1542 (68)	2000 (1)	1536 (67)
Culvert blockage	1219 (49)	0 (0)	1219 (49)

*( ) refers to number of estimates provided by damaged site owners.

reported the highest amount of damage at about $1500 per incidence. On an annual basis, the amount of property damage incurred per site owner was estimated at $465.

Comparisons of tolerant and intolerant site owners' estimates of damage suggested that intolerance was associated with considerably higher amounts of damage. By categorizing dollars-of-damage we were able to identify the category wherein the attitudes of the majority of site owners reporting damage "shifted" from tolerance to intolerance of beaver. As shown in Fig. 2, this tolerance change occurred at the $401-$500 estimate level. Using

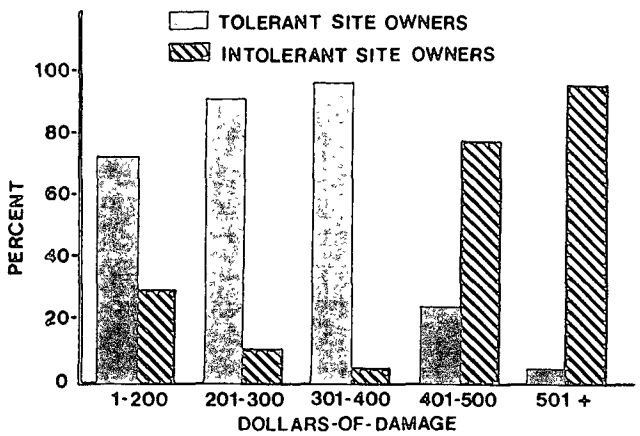

Fig. 2. The effect of dollars-of-damage per damage incidence on site owner tolerance.

these data as simple indicators suggests that site owners generally were willing to incur $\leq$ $400 of damage per incidence and remain tolerant of beaver on their property. Nearly one-half (46%) of all damaged site owners were within this range of tolerance. If this economic indicator of tolerance is combined with the average of 2 years in which damage was reported from 1982-1984 (assuming only 1 incidence of damage per year), the product suggests that Region 7 site owners were willing to incur about $800 of damage per person in return for the presence of beaver on their property from 1982 to 1984, or about $265 annually. Furthermore, assuming that "inexperienced" site owners would tolerate similar amounts of damage, these estimates imply that the existence of beaver in Region 7 between 1982 and 1984 had a minimum net worth of about $4,700,000 to the population of site owners.

Other possible influences of beaver tolerance are those related to site owners' perceptions of the severity of damage incurred. Our results indicated

that a strong relationship existed between site owners' damage severity perception and their overall beaver tolerance orientation; tolerance of beaver decreased rapidly as the perception of beaver damage increased in severity. About 70% of site owners perceiving their damage as light were tolerant of beaver. Conversely, all persons reporting severe damage were classified as intolerant site owners.

Propensity to Control Damage

Additional costs of beaver damage were reported by site owners from a damage repair and control perspective. Sixty percent of the damaged site owners undertook repairs or employed control measures; most were intolerant site owners. Site owners' estimates of out-of-pocket costs for these repair/control efforts averaged about $180 per incidence of damage (Table 2).

Table 2. Average estimates of site owners' out-of-pocket costs for beaver damage repair/control per incidence of damage reported.*

Damage Type	All Site Owners	Tolerant Site Owners	Intolerant Site Owners
All types	181 (606)	3 (226)	287 (380)
Trees	12 (306)	2 (192)	28 (114)
Soil erosion	92 (103)	2 (31)	131 (72)
Structural	153 (124)	0 (0)	153 (124)
Crops	174 (16)	0 (0)	174 (16)
Culvert blockage	1188 (57)	117 (3)	1243 (54)

*( ) refers to number of estimates provided by damaged site owners.

Annually, repairing or controlling beaver damage was estimated to cost site owners about $120.

Individuals employing damage control measures often relied on the assistance of others with their control efforts. About one-third (35%) allowed others to trap beaver at the site while only 3% were personally involved with beaver removal by trapping. Most respondents who had contacted DEC regarding beaver damage requested damage control information. However, 67% of these individuals also requested that DEC provide personnel for the removal of beaver.

As for concerns of future damage, a plurality (60%) of site owners indicated that woodlands, croplands, and ponds/wetlands were those property types where controlling damage would be most important.

Given their concerns for controlling beaver damage, site owners were asked whether they were willing, if provided technical information, to "make their property less attractive" for beaver (i.e., habitat modification) in order to prevent future damage problems. Over one-half (54%) of all site owners responded affirmatively to this question. Fewer site owners who were tolerant (39%) than who were intolerant (82%) of beaver were receptive to the notion of habitat modification. Reasons given by those unwilling to discourage beaver indicated their opposition was related more to their positive attitude about beaver and their perception of the benefits of wetlands than to a negative attitude about the control approach.

IMPLICATIONS

Investigations of human tolerance of beaver can provide valuable input into the planning process for damage management and control programs. Information such as that reported herein allows managers to make assessments necessary to guide development of such programs while further considering desired levels of beaver populations.

Perhaps the most basic assessment is that of the immediate need for damage control assistance. For owners of beaver sites in central New York, we found that at current beaver population levels, most persons were tolerant of beaver and appeared to be willing to incur considerable amounts of damage in return for the presence of beaver on their property. Moreover, most of these site owners were uninterested in implementing damage control measures due to their shared perception that beaver were not a problem, but an asset to their property. Managers must note, however, that a threshold to tolerance may be expec-

ted and that for an important portion of site owners in this study, that threshold had been exceeded even at current beaver population levels. As indicated by their previous damage control efforts and willingness to implement additional control measures, damage control programs, if targeted at these property owners, may be well-received.

These investigations have also enabled managers to assess more accurately questions related to the human impacts of a decision to increase beaver population levels. How many property owners would be affected by such an increase? How many are likely to incur damage? What portion would likely be tolerant versus intolerant of beaver moving onto their property? And what would be the economic impact of damage associated with increasing levels of beaver? Assessments of questions such as these enhance managers' ability to project the needs for damage management and control programs.

Other issues in the decision to develop damage control programs includes the extent of assistance provided to site owners. Agency efforts to reduce damage to tolerable levels should be based on assessments of the feasibiltiy and costs of applying control approaches where most needed. Site owners' estimates of the nature of and costs of damage may serve as important guidelines to these assessments. For each type of damage where a control measure may be desired, it is clearly important that the costs associated with the control do not exceed the costs of the beaver damage itself.

Management of beaver populations will continue to require an integration of biological and sociological considerations. Maintaining the delicate balance between desired population levels and human tolerance levels will be one of the wildlife manager's most difficult tasks. However, by developing an understanding of property owners' tolerance of beaver and beaver damage, managers will be better suited to make the decisions necessary to provide responsive and successful management programs.

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