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T.B. Wigley
University of Arkansas at Monticello, Monticello, AR

M.E. Garner
University of Arkansas at Monticello, Monticello, AR

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LANDOWNER PERCEPTIONS OF BEAVER DAMAGE AND CONTROL IN ARKANSAS

by T.B. Wigley[1/] and M. E. Garner[1/]

ABSTRACT

Landowner perceptions of damage caused by beavers (Castor canadensis) and of beaver control programs in Arkansas were determined by mail survey. Beavers were present on lands owned by 36% of the 1,716 respondents. Girdled timber, blocked culverts and flooded timber were the first, second and third most common damages reported, respectively. Thirty-two percent of all respondents and 90% of those with beavers reported at least one form of damage. Four percent of land owned by respondents was flooded by beavers. Of landowners with beavers, 50% described damage as substantial or severe, and 46% perceived damage as unreasonable. At least one benefit was reported by 27% of landowners with beavers; aesthetic enjoyment was the benefit most often cited (14%). Of those with beavers, 64% felt beavers were a nuisance, 17% said they could enjoy a few beavers but worried about potential damage and 10% said they enjoyed beavers. Decreased beaver populations were desired by 74% of landowners with beavers, but only 47% had tried beaver removal and only 25% said they would pay for removal. Of all respondents, 26% were aware that government agencies offered beaver control programs but only 15% knew that the Arkansas Game and Fish Commission offered the control program in Arkansas. Ninety percent of respondents felt government agencies should provide assistance. Landowners most often requested information on controlling beavers (44%) and demonstration of control techniques (40%). Coordinating assistance programs among several agencies, emphasizing education and demonstration, and loaning traps might improve landowner assistance programs in Arkansas.

1/Agricultural Experiment Station, Department of Forest Resources, University of Arkansas at Monticello, Monticello, AR 71655

INTRODUCTION

Beavers have greatly affected our nation's natural resources through their ability to impound water and fell trees. Trade in beaver and other furbearer pelts was important to the early commerce and settlement of Arkansas (Plaisance 1952). Beaver pelts were among the most highly prized furs during the 17th and 18th centuries, and were used to produce fine felt hats for consumers in Europe. The influence of beavers in Arkansas is evidenced by place names such as the town of Beaver and Beaver Lake in the Ozarks region of the state.

Unregulated trapping resulted in beavers being eliminated from Arkansas soon after 1900 (Sealander 1979). Other species such as white-tailed deer (Odocoileus virginianus) also reached record low population densities in Arkansas and throughout the Southeast during the early 1900s because of unregulated exploitation and habitat destruction. Although many Arkansans desired restoration of these diminished wildlife populations, the Arkansas Game and Fish Commission did not have the financial resources to undertake the task. Passage of the Federal Aid in Wildlife Restoration Act in 1937 provided the needed funding through a 10% manufacturers' excise tax on sporting goods and ammunition.

State wildlife agencies throughout the Southeast used Pittman-Robertson funds during the 1940s and 1950s to restore populations of many species to more desirable levels. Transplants of about 50 beavers between 1943 and 1945 succeeded in reestablishing a viable population in Arkansas (Sealander 1979). Beavers, however, have caused damage throughout the southeastern United States since their reintroduction. Hill (1976) estimated that beavers had flooded at least 161,877 hectares (ha) in the Southeast. Estimates of inundated land in individual states include 29,000 ha in Mississippi (Arner and DuBose 1978), 116,477 ha in

Georgia (Godbee and Price 1975), and minimums of 4,444 ha in South Carolina (Woodward et al. 1976) and 4,112 ha in North Carolina (Woodward et al. 1985). Economic losses due to beaver-caused damage have been high. Annual timber damage caused by beavers was estimated at $17 million in Mississippi (Arner and Dubose 1980), and in 1975 cumulative timber damage was estimated at $66 million in Georgia (Godbee and Price 1975).

The nature and extent of beaver damage remains undocumented in many states, including Arkansas. The objectives of this study were to determine landowner perceptions of beaver-caused damage, beaver control methods and beaver-control programs in Arkansas.

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METHODS AND MATERIALS

Questionnaires used by Woodward et al. (1976) and Hill (1976) were adapted for this study. The survey contained 30 questions divided into five sections. The sections were designed to provide (1) a profile of landowners and their lands, (2) a description of land-use practices, (3) an estimate and description of beaver-caused damage on the land, (4) a description of methods being used to control beaver damage and (5) an evaluation of control and assistance programs sponsored by government agencies.

The names and addresses of 3,369 rural, noncorporate landowners owning more than two ha were systematically selected from real property tax records. Sample sizes were roughly equal within the four major physiographic regions of Arkansas: the Ozarks, the Ouachitas, the Mississippi Alluvial Valley, and the Coastal Plain. Statewide estimates were made by weighting data by the number of farm operators in each region (U.S. Dept. of Commerce 1984).

A questionnaire, a cover letter and a stamped return envelope were mailed first-class to each selected landowner during February 1985. Postcard reminders were mailed one and four weeks after the initial mailing. One-hundred and seven randomly selected nonrespondents were surveyed by telephone during June 1985. Land owned by thirty randomly selected respondents who reported beavers on their property was visited to evaluate landowner estimates of damage.

Descriptive statistics and contingency table analyses were conducted with SPSS/PC+ (Norusis 1986). Landowner characteristics were associated with perceptions of beaver damage, beaver control methods and control-assistance programs using the Chi-square statistic. Statistical significance was accepted at the 0.05 probability level.

RESULTS AND DISCUSSION

Usable responses were received from 1,716 (51%) landholders. The bound on the error of estimates of proportions was 2.4% (Mendenhall et al. 1971). Survey respondents owned 312,006 ha or 2.3% of the Arkansas land base. Average ownership was 190 ha (SD = 1,276 ha), of which 92 ha were forested, 40 ha were in pasture and 54 ha were in row crops. Respondents were typically white (98%), male (90%) and high school graduates (76%). They averaged 57 years old (SD = 13) and had owned their lands an average of 23 years (SD = 16). Primary land-uses reported were grazing (37%), residence (23%), agriculture (20%), timber (14%) and investment (3%). Forty-nine percent of respondents reported no secondary land-uses. Of those reporting secondary land-uses, grazing (27%) ranked first followed by timber (25%), residence (16%), wildlife (10%) and agriculture (9%).

Thirty-six percent of respondents reported beavers were on their land.

These landowners estimated that beavers had been on their property an average of 15 years (SD = 22). Of those with beavers, 70% estimated that beavers had been there for 10 or more years. Beavers had once been present on land owned by 10% of landowners not reporting beavers. Of the nonrespondents surveyed by telephone, 13% said beavers were present and an additional 13% said beavers had once been present. Survey respondents, therefore, may have been more likely than nonrespondents to have beavers or to be aware of beavers on their land.

Girdled timber was the most often reported form of damage (68%). Blocked culverts (34%) and flooding of timber (33%) ranked second and third, respectively. Flooding of row crops (24%) and pasture land (24%), and damage to roads (22%), levees (22%) and water control structures (19%) were also often-cited problems. Thirty-two percent of all respondents reported some form of beaver-caused damage; 90% of those with beavers on their property had at least one form of damage.

Respondents reported 13,835 ha or 4% of all land owned as flooded by beavers. Of this flooded area, 50% was in row crops, 33% was in timber and 12% was in pasture. Estimated 1984 and cumulative financial losses to 703 landowners reporting beavers on their land were $913,365 and $4,718,346, respectively. Of the landowners visited, 3% had overestimated financial losses and 3% had underestimated losses. Six percent had overestimated and 10% had underestimated the area flooded.

Landowners with beavers were asked to describe property damage as no damage, light, moderate, substantial or severe (Table 1). One-half of those with beavers described damage as substantial or severe (Table 1). Of respondents reporting less than $1,000

Table 1. Descriptions of and reactions to cumulative beaver damage by landowners in Arkansas by amount of damage incurred, 1984.

Description or Reaction	Estimated amount of beaver damage($)			
	$0	$1-999	$1,000+	Total
N	238	64	203	505
	% DESCRIBING DAMAGE 1/			
No damage	13.0	0.0	0.5	6.3
Light	27.7	40.6	9.9	22.2
Moderate	22.3	29.7	17.7	21.4
Substantial	19.3	17.2	38.9	26.9
Severe	17.6	12.5	33.0	23.2
Total	100.0	100.0	100.0	100.0
	% REACTING TO DAMAGE 2/			
No damage	12.8	3.2	0.5	6.6
Negligible	16.7	23.8	4.5	12.7
Tolerable	37.6	50.8	26.0	34.6
Unreasonable	32.9	22.2	69.0	46.1
Total	100.0	100.0	100.0	100.0

1/Mean value of cumulative damage: No damage = $47, Light = $972, Moderate = $3,029, Substantial = $11,871, Severe = $23,660. 2/Mean value of cumulative damage: No damage = $58, Negligible = $670, Tolerable = $2,894, Unreasonable = $18,421.

in cumulative losses, 65% described damage as moderate, light, or no damage. Damage was described as substantial or severe by 72% of landowners with $1,000 or more in cumulative losses.

Property damage was perceived by 54% as tolerable, negligible or as no damage (Table 1). Of those with less than $1,000 in damage, 70% felt that cumulative losses were tolerable, negligible or no damage. Sixty-nine percent of landowners with $1,000 or more in estimated losses perceived that damage was unreasonable (Table 1).

At least one benefit from beavers was reported by 27% of respondents with beavers on their land. The benefit from beavers most cited was aesthetic enjoyment (14%). Trapping opportunities (7%) and provision of a duck hunting area (6%) were the second and third most cited benefits. Landowners also said that beavers provided fishing areas (6%), water for livestock (6%), water for irrigation (4%), meat (2%) and income from fur (3%). Others (< 1%) benefited by beavers felling unwanted trees, retaining water for use during droughts and removing unwanted vegetation from stream and ditch banks. Financial benefits from beavers averaging $1,420 (SD = $2,240) were reported by 22 landowners.

Of respondents with beavers, 64% felt that beavers were a nuisance. Seventeen percent stated that they enjoyed a few beavers but worried about possible damage. Another 10% reported that they enjoyed having beavers around and felt that beavers have an aesthetic value. The remaining 9% had no particular feelings about beavers. Seventy-four percent of respondents with beavers wanted decreased beaver populations. Static population densities were desired by 22%, and 3% wanted populations to increase.

Forty-seven percent of landowners with beavers had tried removing them from their lands. Sixty-seven percent had tried trapping, 59% had tried shooting and 7% had tried poisons. Of trappers, 49% had used leghold traps, 55% had tried Conibear traps, 7% had used snares and 6% had used live traps. Twenty-two percent destroyed dams to control beaver populations. Dynamite was used by five respondents, and two landholders had introduced alligators (Alligator mississippiensis) to control beavers. Beavers were harvested by 41% of those trapping and 42% of those who used shooting. During 1984, respondents trapping caught an average of four (SD = 38) beavers. Landowners shooting beavers harvested an average of three (SD = 29). Landholders reported one beaver killed by dynamite and one beaver killed by an unspecified poison.

Trapping was perceived as ineffective for controlling damage by 85% of the respondents using leghold traps and 80% of those using Conibear traps. Breaking beaver dams was also viewed as an ineffective control of beaver damage. Of respondents with beavers on their property, 78% had broken beaver dams. However, 91% of these landowners reported that breaking the dams without using additional measures did not control damage. Twelve percent said that breaking dams controlled damage when combined with trapping, but 23% found this combination to be ineffective.

Trapping was permitted by 44% of all surveyed landowners. Respondents with beavers permitted trapping more often than those without beavers (69% versus 28%; $\chi^2 = 269.0$, 1 df, $P < 0.001$). Thirty-five percent of landowners with beavers who permitted trapping required trappers to harvest beavers in exchange for trapping privileges. Professional trappers provided control services in Arkansas, but only 26% of respondents knew such services were available. Landowners with beavers were more likely than those without beavers to know about these services (33% versus 20%; $\chi^2 = 44.7$, 1 df, $P < 0.001$). Few (6%) landholders with beavers on their property had ever hired a beaver contractor.

Of landowners with beavers, 25% stated that they would pay for beaver

removal. Landowners who had tried controlling beavers were more likely to pay for beaver control than those who had not tried control (49% versus 8%; χ^2 = 125.3, 1 df, P < 0.001). Willingness to pay for beaver control was also associated with education (χ^2 = 23.9, 3 df, P < 0.001), income (χ^2 = 29.2, 5 df, P < 0.001); and place of residence (χ^2 = 20.8, 3 df, P < 0.001). Landholders most willing to pay for beaver control had at least some college education, were urban residents and had annual incomes greater than $25,000. Respondents were willing to pay an average price for control of $38.95/ha or $8.54/beaver.

Of all landowners surveyed, 26% were aware that government agencies offered programs to help landowners control beaver damage. This level of awareness did not differ by presence or absence of beavers (χ^2 = 2.14, 1 df, P = 0.144), education (χ^2 = 4.74, 3 df, P = 0.192) or income (χ^2 = 9.25, 5 df, P = 0.099). Fifteen percent of all respondents knew that help was available through the Arkansas Game and Fish Commission (AGFC). This level of awareness did not differ by presence or absence of beavers (χ^2 = 0.07,1 df, P = 0.794). Awareness of the AGFC Nuisance Animal Control Program differed, however, by education (χ^2 = 14.97, 6 df, P = 0.021) and income (χ^2 = 26.58, 10 df, P = 0.003). Respondents most often aware of this program had some college education (24% versus 16% for others) and annual household incomes between $15,000 and $20,000 (27% versus 18% for others). Only 3% of those with beavers had used the AGFC Control Program. Landowners perceived that they could receive help through agencies such as the U. S. Fish and Wildlife Service (5%), the Soil Conservation Service (6%), the USDA Forest Service (2%), the Cooperative Extension Service (5%) and the Arkansas Forestry Commission (2%). Formal assistance programs, however, are not sponsored in Arkansas by these organizations. Some (< 3%) respondents reported receiving assistance from each of these agencies.

Most respondents (90%) agreed that government agencies should provide some services to landowners with beaver-related problems. Landowners most often agreed that agencies should distribute information on controlling beavers and demonstrate beaver removal (Table 2). Free traps and reimbursement for damages were the services least requested from agencies. Respondents also suggested that agencies provide a bounty on beavers (1%) and that harvest regulations be liberalized (< 1%). Respondents with beavers were more likely than those without beavers to agree that landowners should be reimbursed for damages, that beavers

Table 2. Percentage of respondents in Arkansas agreeing that certain services should be provided to landowners by government agencies, 1984.

Service	With beavers	Without beavers	Total
N	678	890	1,568
Distribute information on controlling beavers	41.3	45.8	44.2
Show landowner how to remove beavers	36.7	42.6	40.4*
Remove beavers at no charge	36.6	17.8	24.8**
Remove beavers for a fee	14.7	10.4	12.0**
Sell landowner traps at cost	11.8	11.3	11.5
Provide no services	7.5	12.0	10.3**
Reimburse landowner for damages	16.1	4.9	9.1**
Give landowner traps	8.8	7.3	7.9*

* Percentages of respondents with and without beavers differ at the 0.05 level.
** Percentages of respondents with and without beavers differ at the 0.001 level.

should be removed at no charge, that beavers should be removed for a fee, that landowners should be given traps and that agencies should show landholders how to remove beavers (Table 2).

Landowner reports in this study of beaver presence, land flooded and financial losses are similar to landowner reports from other southern states (Table 3). Girdled timber was the damage most cited in Arkansas, Alabama (Hill 1976), South Carolina (Woodward et al. 1976) and North Carolina (Woodward et al. 1985). Respondents in Arkansas had tried controlling beaver populations less often than landowners in other states (Table 3). Of those trying control, however, landowners in Arkansas tried trapping, shooting, and hiring professional trappers more often than landowners in North or South Carolina. Arkansas residents reported benefits from beavers less often than residents of South Carolina or North Carolina. Provision of a duck hunting area was cited as a benefit in Arkansas less often than in North or South Carolina.

CONCLUSIONS

Beaver populations and resulting damage are present in every county of Arkansas. If damages reported by surveyed landowners are representative of damages throughout the state, the estimated flooded area is approximately 342,000 ha. Cumulative and annual economic losses to landowners may be

Table 3. Reported beaver damages, benefits, and control methods from landowner surveys in the southeastern United States.

	Study[1/]		
Landowner Reports	South Carolina	North Carolina	This Study
BEAVER DAMAGES			
Respondents with beavers	25%	43%	36%
Of respondents with beavers:			
land flooded	<1%	<1%	4%
annual dollars lost/landowner	$1,635	$1,307	$1,299
cumulative dollars lost/landowner	$9,090	$8,020	$5,712
CONTROL METHODS			
Landowners trying control	52%	51%	47%
Of landowners trying control:			
landowners trying trapping	48%	62%	67%
landowners trying shooting	50%	50%	59%
landowners hiring trappers	1%	NR[2/]	4%
Of landowners trapping:			
landowners trying Conibear traps	40%	48%	55%
landowners trying leghold traps	60%	52%	49%
BENEFITS			
Landowners with beavers:			
receiving aesthetic enjoyment	24%	27%	14%
receiving use of a duck hunting area	24%	29%	6%

1/South Carolina - Woodward et al. (1976); North Carolina - Woodward et al. (1985); 2/Not reported.

as great as $117 million and $23 million, respectively. This represents a major negative economic impact in a state heavily dependent upon its natural resources.

Although many Arkansas respondents with beavers wanted populations to decrease, a majority were tolerant of up to $1,000 estimated damage. Many respondents were either unwilling to pay for beaver control or willing to pay fees far less than their estimated losses. Control measures such as trapping that have been used successfully elsewhere (Hill 1976) were often perceived as ineffective. These responses probably represent frustration and unfamiliarity with successful control techniques.

Few respondents knew which government agencies provided control assistance. The AGFC control program was not well known among landowners and not often used. Most respondents, however, suggested that some form of help should be provided. Several respondents stated that the state wildlife agency should provide assistance because it reintroduced beavers into Arkansas. Information and education services, however, were requested by respondents more often than financial assistance or reimbursement. Some landowners said they wanted help in contacting professional trappers or wanted to be loaned traps. The state wildlife agency could provide these services.

Beaver populations and damage will probably continue to expand in Arkansas unless pelt prices increase or landowners are more effectively assisted in their control efforts. A coordinated assistance program among agencies such as the AGFC, the Arkansas Forestry Commission and the Cooperative Extension Service might assure greater success of control efforts. Assistance programs should emphasize providing technical assistance in the form of information, inspection and demonstration. Landowners need to be more fully informed of services that professional trappers can provide, of possible contractural arrangements and of where these services are available. In any assistance program, landowners should be informed of the benefits that beaver populations may provide.

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