A Survey of Beaver Impoundments and Landowner Beaver Control Strategies in Mississippi

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Abstract: In 1997, a statewide inventory in Mississippi estimated the number and area of beaver (*Castor canadensis*) impoundments ≥0.4 ha in size. Data were compared with an identical survey performed in 1977. Number and area of impoundments in 1997 (1,783 and 11,728 ha, respectively) decreased from 1977 (2,739 and 28,768 ha, respectively). Landowners were mailed a questionnaire concerning the effectiveness of various methods for killing and disposing of beavers. Beaver meat and pelts were discarded by 87.8% of the landowners. Of the 9,332 beaver known to be killed in 1996 statewide, 67% were killed by USDA Wildlife Services personnel. Only 16% and 18% of landowners, respectively, fished their impoundments or managed them for waterfowl.

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During the 1990s, beaver control efforts in Mississippi have been intensified by government agencies and landowners. Our objectives for this study were to determine trends in beaver activity in Mississippi during the past 2 decades and to assess landowner beliefs, attitudes, and efforts in addressing beaver activity.

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personnel from the USDA Natural Resources Conservation Service, USDA Wildlife Services, and Mississippi Cooperative Extension Service for their efforts in locating and estimating areas of beaver impoundments throughout the state of Mississippi.

Methods

Phase I

Phase I of our study was conducted using the same procedure as Arner et al. (1967). Road maps (scale of .5 inches to a mile) for each county in Mississippi were sent to Natural Resources Conservation Service, Mississippi Cooperative Extension Service, and Wildlife Service personnel statewide. A letter accompanying the maps gave the reason for the inventory and requested appropriate personnel from each agency to 1) locate on each county map all beaver impoundments $\geq$0.4 ha, 2) estimate the area of water impounded by beaver through the use of recent aerial photographs and/or land management data bases, and 3) include the name and address of the landowners. The completed maps were sent to the project leader at Mississippi State University where they were cross-referenced according to county. One map was made for each county showing all beaver impoundments located by personnel from the 3 agencies.

To ascertain the accuracy of pond area estimates given by cooperating agency personnel, 25% of the impoundments were randomly selected for area determination by Mississippi State University researchers through field and aerial photo inspection. Ponds were selected from 15 counties in the 2 physiographic regions with the largest number of reported beaver impoundments. In this sample, a comparison was made between area estimates given by federal agencies and the areas obtained by Mississippi State University investigators using a dot grid overlay with the most recent aerial photographs available. The Wilcoxon signed-rank test (Daniel 1990) was used to compare the 2 area estimates.

Phase II

A mail-out questionnaire (Appendix) was sent to all landowners (836) whose address, impoundment location, and area estimates were supplied to Mississippi State University investigators. Of the 836 questionnaires mailed, 88 were returned due to wrong address, resulting in 748 questionnaires assumed to have reached the correct landowner. Landowners returned 247 questionnaires, a return rate of 33%. Response data were entered and summarized using dBASE IV. Paired comparisons of beaver inundated acreage between 1977 and 1997 were accomplished using the Wilcoxon signed-rank test.

Results and Discussion

Phase I

According to estimates by cooperating federal agencies, in 1997, 1,783 beaver ponds inundated an estimated 11,728 ha in Mississippi. The number of beaver ponds

in Mississippi significantly decreased ($P < 0.001$) in 1997 (1,783) compared to 1977 (2,739) (Table 1). Surface area impounded by beaver was also significantly ($P < 0.001$, df = 1) smaller with 11,728 ha reported in 1997 compared to 28,768 ha in 1977.

We believe that control methods by Wildlife Services personnel operating in 50 counties in Mississippi, the Mississippi Department of Wildlife, Fisheries, and Parks personnel, and many landowners have caused this decline. Personnel from wildlife services reported killing 6,300 beaver in Mississippi in 1996 (Phil Mastrangelo, pers. commun.), while the Mississippi Department of Wildlife, Fisheries, and Parks reported killing 2,500 beaver over the last 4-year period on the Tennessee-Tombigbee Waterway (Jerry Hazelwood, pers. commun.).

Phase II

Responses to our questionnaires indicated a general belief that beaver activity across the state was increasing, with 70.4% of respondents indicating beaver activity has increased since 1994, 69.9% indicating activity has increased since 1995, and 67.2% indicating it has increased since 1996. The perception by the majority of landowners of increasing beaver activity for each of the 3 study years is contradictory to estimates given by cooperating federal agencies, which showed a decrease in number and area of beaver impoundments. We believe that the landowners' perception may have been induced by their frustration at economic losses incurred due to beaver activity. Additionally, landowners indicated that economic losses on their land from beaver activity were mainly due to flooding of timber (55.3%) and girdling of timber (24.2%).

Survey questions queried landowners about methods of beaver control. The most common was trapping (71.9%) while shooting (69.1%) ranked a close second (percentages can exceed 100% because landowners could select more than one method). When trapping was the major control method, landowners used conibears (69.0%) and snares (19.3%). When asked to rate the effectiveness of control methods used, responses varied greatly. For instance, 21 landowners rated the conibear trap the most effective method; however, 32 landowners rated it the least effective method. The snare was rated the most effective method by 8 respondents, whereas 22

Table. 1. Comparison of number and area (ha) of beaver ponds from 6 physiographic regions reported in 2 studies in Mississippi (1977 and 1997).

	N Ponds reported		Estimated area[a]	
Physiographic region	1977	1977	1977	1977
Black prairie	205	297	1,843	1,804
Delta	381	193	6,812	3,824
Interior flatwoods	82	7	1,062	30
Loess	642	330	7,178	1,212
Lower coastal plain	620	477	2,661	1,965
Upper coastal plain	809	479	9,212	2,894
Totals	2,739	1,783	28,768	11,728

a. Hectares.

rated it the least effective. Shooting during flood stage was rated the lowest by 34, and the highest by 5. Shooting at night was rated the highest by 13 while 38 it the lowest.

Beaver control was conducted by the landowners 55.8% of the time, with 25.4% of the respondents hiring trappers, and 18.9% using Wildlife Services personnel. Landowners were asked to rate the effectiveness of conibear traps when used by them versus the traps' effectiveness when used by professional trappers. Paired comparisons used to detect potential differences in their ratings of the 2 groups showed no significant difference ($P = 0.06$, $F = 3.43$).

Landowners estimated the total number of beaver that they killed to be 2,051 in 1994, 2,499 in 1995, and 2,407 in 1996. Extrapolation of these numbers to estimate the number of beaver killed if every questionnaire recipient ($N = 748$) had answered this question would result in 8,383 killed in 1994, 10,214 in 1995, and 9,947 in 1996. Inquiry about the use of harvested beaver revealed that pelts and carcasses were discarded by 87.8% of landowners.

Most landowners (81.7%) made no attempt to drain their ponds and sow Japanese millet to attract waterfowl. According landowner estimates, only 314 ha out of a total 9,823 ha of beaver impoundments were drained and sown with Japanese millet. Most landowners (83.6%) did not use their beaver impoundments for fishing: 8.2% fished 1–5 times, and 8.2% fished 6 or more times.

Landowner estimates of the area flooded on their property totaled 9,823 ha statewide. These estimates were from results of the questionnaire, and should not be confused with those estimates made by federal agencies in this study or previous studies. Individual estimates of beaver-impounded area on their lands ranged from 0–2,000 ha. Impoundment size averaged 42.2 ha; however, the median and mode for these data were 8.1 ha. In an attempt to obtain a mean closer to the median and mode, analyses were performed only on landowner estimates $\leq$250 ha. The rationale behind elimination of impoundments of >250 ha was based on the observation that 250-ha beaver impoundments are extremely rare; thus, these area estimates are believed to be exaggerated. The adjusted estimates were obtained by excluding all landowner estimates >2 standard deviations from the original mean, resulting in the highest 6 estimates being excluded from a total of 233 (Bruce Leopold, pers. commun.). By excluding the top 6 estimates, the mean impoundment size was reduced to 20.1 ha while the median and mode remained at 8.1 ha.

Conclusions and Recommendations

Combined efforts of government agencies and landowners have been effective in reducing beaver activity during the last 20 years. From landowner and agency estimates of the number of beaver reported killed in 1996, over 67% were killed by Wildlife Services personnel.

One of the more disturbing aspects of beaver control was the discarding of 87.8% of pelts and carcasses by landowners. This is a tragic waste of a natural resource that is unnecessary since southern beaver fur prices have increased to the

highest point in nearly 2 decades and beaver meat is a tasty, high protein, low fat meat that should be made available for human consumption. Seminars in trapping, skinning, and marketing of beaver pelts should be developed.

Another area of concern is the lack of development and management of beaver impoundments as waterfowl or fishing areas, with 82% of landowners not attempting waterfowl management and 84% not fishing in their impoundments. Natural resource agencies could develop seminars and training sessions on the development of beaver impoundments into waterfowl feeding areas. Wildlife Services is ideally suited to assume a lead role in organizing and planning statewide programs on managing beaver and their habitat.

Literature Cited

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Appendix

1) Has beaver activity (i.e. dam building, tree cutting, etc.) *increased, decreased,* or *remained the same* for the years: 1994 _____ 1995 _____ 1996 _____

2) Economic loss from beaver activity has been mainly due to (Underline one) a. Girdling or felling of timber b. Flooding of timber, c. Flooding of roads, d. Other loss _____

3) What methods have you used to remove nuisance beaver from your property? (Underline all that apply) a. Trapping b. Shooting during flood periods c. Shooting at night d. Use of chemicals e. Use of trained dogs f. Others (Please specify) _____

4) If trapping was the major beaver control method, what was the most commonly used trap? (Please underline) a. Conibear trap b. Snares c. Leg-hold traps d. Other (Please specify) _____

5) Rate the effectiveness (1 = very low, 5 = very high) of each of the control methods used on your property. Conibear traps _____ Snares _____ Leg-hold traps _____ Use of chemicals _____ Shooting during flood periods _____ Shooting at night _____ Use of trained dogs _____ Other (Specify) _____

6) Who conducted beaver control o4n your property? (Underline) a. Hired trappers b. USDA Animal Damage Control c. Yourself

7) How were the pelt and carcass disposed of? (Please underline) a. Whole animal thrown away b. Pelts sold to fur buyers c. Meat sold locally d. Other (Specify)_____

8) How many beaver were removed from your property in the last three (3) years? 1994 _____ 1995 _____ 1996 _____

9) Have you tried to drain your beaver ponds and sow Japanese millet to attract waterfowl? Yes No

10) If the answer to number 9 is yes, how many beaver pond acres did you manage for waterfowl? _____

11) Has your beaver pond been used for fishing? a. No b. Fished 1–5 times per year c. Fished 6 or more times a year

12) Estimate how many acres on your property are flooded due to beaver activity. _____