AN INVESTIGATION OF TECHNIQUES USED TO DISCOURAGE REBULIDING OF BEAVER DAMS DEMOLISHED BY EXPLOSIVES

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ABSTRACT

One hundred seventeen beaver dams were partially or wholly demolished with explosives from April through August between 1982 and 1984. These dams were of two types; shallow water dams found in areas of flat terrain, and deep water dams found in major creek channels or in areas of hilly terrain. Following demolition, various treatments were applied to the dam sites to try to retard rebuilding. Our conclusions are that deep water dams can be removed more effectively than shallow water dams and that late summer removals were rebuilt less frequently than early and mid-summer removals. Also, certain types of repellents may be effective at reducing the frequency of rebuilding.

INTRODUCTION

Louisiana, like most southeastern states, has experienced a substantial increase in beaver (Castor canadensis) numbers during the last 20 years. In the early 1900's trapping reduced beaver populations to the point that by 1919 the trapping season was closed. In 1930 populations were limited to a five parish area in south-central Louisiana (Arthur 1931). Live trapping and redistribution from this area began in 1938 and soon damage complaints became common (Dahlen 1939). As the number of complaints increased, the Wildlife and Fisheries Department had no alternative but to step up the live-trapping program and move beaver to unpopulated areas of the state (Harris 1954). By the mid-1950's, populations had risen so high in some parts of the state that the trapping season was reopened. However, low pelt prices offered little incentive to the trapper and trapping harvests declined in subsequent years. Populations continued to rise and by 1958 beaver were abundant in nine parishes and present in 23 others (Noble 1958). While no current population data is available, there is little doubt that beaver are now firmly established in all parishes of the north one-half of Louisiana, as evidenced by large numbers of farmland and timberland damage reports.

The information presented in this paper was collected from a 5 parish area in north-central Louisiana on lands owned by individuals, timber companies or municipalities. On many of these areas attempts had been made to remove beaver by trapping but most of these had failed. For a variety of reasons, these landowners needed to dewater their land and secured the help of the authors. The types of dams, times of dam removal, and treatments applied to damsites were not part of a designed experiment but predicated on immediate need by the various landowners. This study, therefore, will report only on trends and observations.

METHODS

Between the last week of April and the first week of August in 1982, 1983, and 1984, one hundred and seventeen beaver dams were partially or wholly demolished with Dupont Tovex TR-2 water gel explosives. Summer removal of dams is favored in Louisiana because of low water levels in rivers and bayous and dryer soil conditions which allow timber harvest or similar activities on poorly drained sites. Holes 7.62 cm in diameter were made in each dam approximately 1.5 m apart and to a depth sufficient to reach a compression pan. The Tovex cartridges were loaded into each hole and tamped down. Depending on the size of the dam and the depth to a hard compression pan, the amount of explosives used varied from 2.27 kg to 34.01 kg per dam. For each hole, one Tovex cartridge was pierced and

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a 50 grain-per-foot detonating cord approximately .6 m in length was looped through it to serve as a propagator for the other cartridges in the hole. All propagator cartridges were then linked to one another by a 50 grain-per-foot detonating cord. A #6 blasting cap was taped to the detonating cord and initiated with a powder type fuse.

Two types of dams were blown in this study and are henceforth referred to as deep water dams and shallow water dams. Deep water dams are those typically found in rolling or hilly terrain and are usually constructed in creek channels. These dams are usually quite tall, sometimes 5 m in height, but not very long. Shallow water dams are built in areas of little topographic relief such as in a swamp or slough. These dams are not often associated with a definable creek channel, rarely over 1 m in height, and in order to impound water must be quite long. Eighty-eight deep water dams and 29 shallow water dams were blown during the course of this study.

Following dam removal, some of the damsites were treated in ways designed to see if rebuilding activities could be discouraged. Thirty-one damsites were not treated and for this report, are considered to be controls. On the remaining 86 damsites, nylon twine was strung across each site approximately .5 m above the water once the water level above the damsite equalized with that below the damsite. If the dam was a deep water dam, the twine was run across the creek channel from bank to bank. If the dam was a shallow water dam, the twine was run across the hole blown in the dam. On 12 damsites untreated rags were attached to the twine at .91 m intervals while on 23 damsites rags soaked in human sweat were affixed at .91 m intervals. On 34 damsites rags soaked in Thiram 80 (80% tetramethylthiuram disulfide solution) were attached to the twine at .91 m intervals. Thiram 80 has been identified as an effective taste repellent for beaver when applied to saplings (Denton 1967) and was considered to be a good representative of a taste-type repellent. On 17 damsites 113.4 g cakes of perfumed paradichlorobenzene were attached to the twine at .91 m intervals. Paradichlorobenzene was chosen as a scent type repellent because of its reported effectiveness for repelling rodents such as rats and mice from grain elevators and storage bins. Once the dams were blown, damsites and waterways within approximately 2.589 km^2 were checked at 2 week intervals for at least 2 months for signs of rebuilding activity or new dam construction.

RESULTS

Rebuilding Frequencies

Of the 29 shallow water dams removed with explosives, 2 were not checked for rebuilding activity, 1 was not rebuilt, 1 was rebuilt on a new site and 25 were rebuilt on the same site. Of the 88 deep water dams blown, 5 were not checked for rebuilding activity, 21 were rebuilt on a new site, 27 were rebuilt on the same site and 35 were not rebuilt. These values, expressed as percentages, are presented in Figure 1.

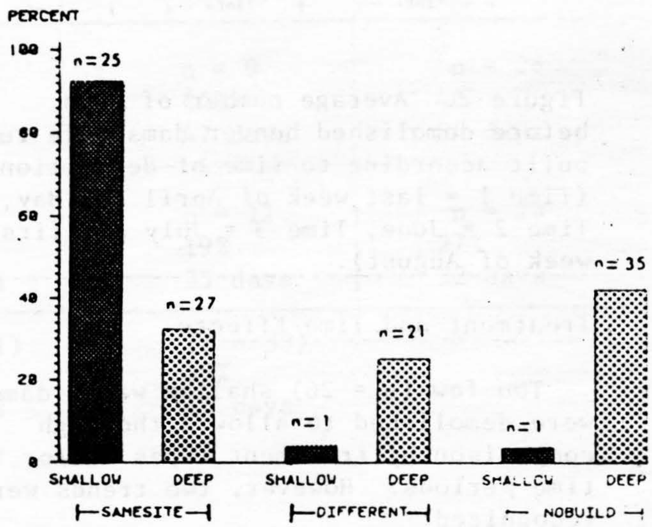

Figure 1. Percentages of shallow and deep water beaver dams rebuilt following explosive demolition.

Rebuilding Times

To determine if the number of days taken to rebuild a blown dam was associated with time of summer demolition, removal dates were placed into 3 categories(early, mid, and late summer). Within each of these categories the average number of days to rebuild was compared. Time of demolition didn't seem to affect rebuilding times for either shallow or deep water dams, however, considerable differences were noted in all 3 time categories when rebuilding times of shallow water dams were compared to deep water dams (Figure 2).

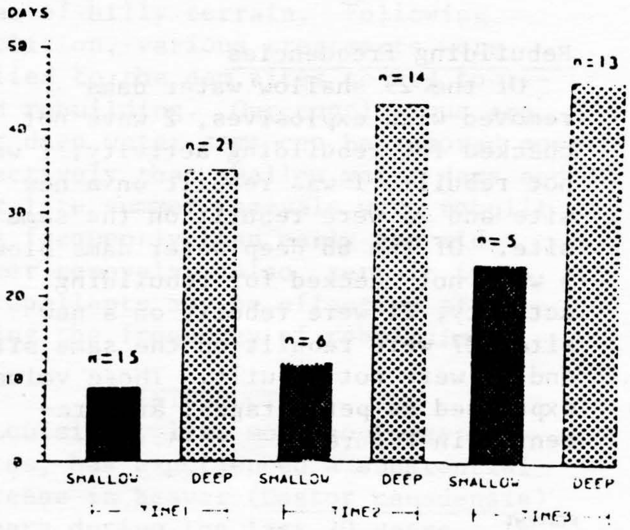

Figure 2. Average number of days before demolished beaver dams were rebuilt according to time of demolition. (Time 1 = last week of April and May, Time 2 = June, Time 3 = July and first week of August).

Treatment and Time Effects

Too few (n = 26) shallow water dams were demolished to allow a thorough comparison by treatment types and/or by time periods. However, two trends were recognized:

(1) At the damsites that received no treatment (control) there was more time between demolition and rebuilding in mid and late summer ($\bar{x}$ = 22.5 days, range = 11 - 58 days, n = 6), than in early summer ($\bar{x}$ = 2.5 days, range = 2 - 4 days, n = 7).

(2) For dams blown in the early summer months, untreated damsites (control) were rebuilt quicker ($\bar{x}$ = 2.5 days, range = 2 - 4 days, n = 7), than damsites that received deterrent treatments ($\bar{x}$ = 14 days, range = 7 - 24 days, n = 8).

Rebuilding frequencies and times for deep water damsites were compared by demolition date and type of deterrent treatment applied. While a lack of experimental design and small sample size prohibited statistical analyses of these data, some trends were observed (Table 1). There did not seem to be any effect of rebuilding time caused by either time of demolition or type of treatment. The number of dams rebuilt, however, was considerably lower if demolition took place later in the summer. There is also evidence to suggest that some deterrent treatments, particularly Thiram 80 or Paradichlorobenzene, could deter rebuilding. However, the degree of interaction between time and treatment cannot be addressed by these data.

Costs

In the process of removing dams with Tovex explosives, costs estimates were derived for various types of dams. Variations in dam composition were noted and these led to variable removal costs. Of the 117 dams blown, 64 were composed primarily of mud, 30 consisted primarily of sticks or limbs and 23 were made of combinations of sticks and mud. For a dam composed primarily of mud, we found that approximately 680 grams of explosive were required for every .305 m of dam height with an ideal spacing of charges being 1.5 m apart. If the dam was primarily of stick composition, 454 grams of explosive were sufficient for every .305 m of dam height at the 1.5 m spacing. The average deep water dam we dealt with was 1.95 m tall and 11.77 m long. The average shallow water dam was .79 m tall and 28.07 m long. When costs were figured for the explosives, detonating cord, fuses and blasting caps, we determined that it cost an average of $82.13 to blow a deep water stick dam and $125.95 to blow a deep water mud dam. To blow a shallow water stick dam the cost was $89.98 and $129.15 for a shallow water mud dam.

Deterrent treatment costs were extremely variable depending on length of the dam. On the average, it cost $11.75

Table 1. Rebuilding frequencies and times for deep water beaver dams as compared by time of demolition and treatment type (Trt. 1 = rag only, Trt. 2 = rag soaked in perspiration, Trt. 3 = rag soaked in Thiram 80, Trt. 4 = paradichlorobenzene cake).

TREATMENTS	DEMOLITION TIME: Time 1 (Last week of April & May)	Time 2 (June)	Time 3 (July & first week of August)	TREATMENT MEANS
Control	n = 8 (1) 100% (2) 27 days (3)	n = 4 100% 33 days	n = 4 75% 29 days	n = 16 94% 29 days
Trt. 1	n = 4 100% 43 days	n = 2 100% 28 days	n = 2 0% -	n = 10 80% 36 days
Trt. 2	n = 5 80% 32 days	n = 2 0% -	n = 7 57% 65 days	n = 14 57% 49 days
Trt. 3	n = 9 44% 49 days	n = 10 50% 64 days	n = 9 44% 47 days	n = 28 46% 54 days
Trt. 4	n = 1 100% 21 days	n = 3 33% 35 days	n = 11 19% 35 days	n = 15 27% 32 days
TIME MEANS	(n = 27) 78% 35 days	(n = 21) 61% 43 days	(n = 33) 39% 46 days	

(1) Number of dams blown
(2) Percent dams rebuilt
(3) Mean days to rebuild

to treat a dam with Thiram (Treatment 3) and $9.26 to treat a dam with paradichlorobenzene cakes (Treatment 4). This was based on spacing the rags or cakes .91 m apart. Costs for treating with rags only (Treatment 1) or rags soaked in perspiration (Treatment 2) were considered to be inconsequential.

DISCUSSION

While some workers have noted the prohibitive costs of "dynamiting" dams (Arner 1964) and the apparent futility of dam removal due to rebuilding (Miller 1977), little attention has been paid to the type of dam removed, time of removal, or subsequent efforts to prohibit rebuilding. Our work suggests that between the two types of dams we identified (deep water and shallow water) there is considerable variability of rebuilding activity following removal. Arner (1964) noted high rebuilding frequencies associated with late summer or fall removal of dams. If the dams he evaluated were shallow water dams in flatland areas then his observations coincide with ours. However, our observations indicate that for minimizing rebuilding frequencies for deep water dams, late summer removals are better than early or mid-summer removals. Additionally, our study suggests that taste and/or scent repellents applied to damsites following dam removal may have some value in reducing rebuilding frequencies. For shallow water dams removal with explosives is probably an impractical approach for dewatering. For situations requiring long term dewatering of such areas, intensive trapping programs such as those suggested by Hill (1976) or perhaps a mechanical dewatering device such as the log drain described by Arner (1963) would be more appropriate. The cost effectiveness of removing shallow water dams with explosives is questionable since the average cost per dam would be between $90 and $130 (less labor) for explosives and an additional $10 to $20 to treat with chemicals. Rebuilding would probably occur in less than two weeks. This would not be sufficient time for most sites to dry to the point where equipment could be used to alter the drainage pattern.

Deep water dam removal presents better possibilities for dewatering. If blown late in the summer and treated with Thiram 80 and/or Paradichlorobenzene, our observations suggest that more than one-third of these dams will not be rebuilt within the same drainage system. At a cost of between $80 and $125 for explosives and $10 to $20 for deterrent treatments, some landowners might find the benefit-cost ratio attractive. Additionally, the average rebuilding time for those dams that are rebuilt (about 35 to 50 days) may provide enough time for a site to dry sufficiently so that equipment can be put on the site for timber harvest, drainage control or whatever the landowner's need might be.

While the findings of this report are certainly not conclusive, we feel that future research efforts could lead to techniques that would successfully displace beaver from certain types of watersheds. Research into refined methods of explosive removal and repellent application should be focused, in our opinion, on those areas where the terrain is rolling or hilly and drainages are confined to readily identifiable creek channels. On flatland sites such as in the major river bottoms of the southeast U.S., research into more effective methods of trapping, poisoning or managing beaver ponds for fish and wildlife habitat would probably yield better results.

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