Evaluation of Snares, Leg-hold, and Conibear Traps for Beaver Control

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Abstract: From December 1981 through July 1983, No. 2 Kleflock snares, No. 4 Victor leg-hold traps, and No. 330 Conibear traps were evaluated for beaver (*Castor canadensis*) control in Mississippi. No. 330 Conibears captured more ($P < 0.10$) beavers than did snares in dive sets and more ($P < 0.01$) beavers than any other set-type combination tested. The number of non-target species captured in snares was less ($P < 0.01$) than the number captured in either of the other devices. Economic analyses of vehicle, labor, and equipment costs/beaver captured showed No. 330 Conibears to be the least costly to use, No. 2 Kleflock snares were next, and No. 4 Victor leg-hold traps were most expensive.

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Between 1966 and 1977, the number of beaver impoundments increased 300% in Mississippi (Arner and Dubose 1978) at an average annual rate of 11.5%. During this period, the estimated loss of production from beaver caused flooding 23,346 ha of timberland, 5,696 ha of crop land, and 86 ha of pasture land was valued at $22,229,888, which represented an average annual loss of $2,469,987 from Mississippi's agricultural economy (Dubose 1978).

Complaints of beaver damage from landowners have increased in Mississippi and other southeastern states (Arner 1964). Chemosterilants (Gordon and Arner 1976), alligators (*Alligator mississippiensis,* Arner et al. 1980), poisons (Hill 1976), and traps (Hill 1976) have been tested as possible con-

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trol methods for beavers in the Southeast. Of these, only trapping has been effective in eliminating beavers from a watershed (Hill 1976).

There are a number of beaver trapping devices commercially available. The most often used devices are the No. 2 Kleflock snare, the No. 4 Victor leg-hold trap, and the 330 Conibear trap. Each of these devices is capable of catching beavers. However, the relative effectiveness of the 3 devices has not been adequately studied.

In this study, the No. 2 Kleflock snare, the No. 4 Victor leg-hold trap, and the 330 Conibear trap were compared under field conditions from 1981 December through 1982 July. The relative effectiveness, selectivity, cost effectiveness, and fur damage were determined for each device.

Methods

Trapping was conducted on the Noxubee and Panther Swamp National Wildlife Refuges and Choctaw Wildlife Management Area. Noxubee National Wildlife Refuge is located in Oktibbeha, Winston, and Noxubee counties in East-central Mississippi. The Talking Warrior and Chinchahoma Creek drainages and Green Timber Reservoirs 1 and 3 were used as trapping areas. Panther Swamp National Wildlife Refuge is located in Yazoo County in the Delta region of West-central Mississippi. Trapping was conducted along Deep Bayou and a number of associated oxbow lakes. Choctaw Wildlife Management Area, located in Choctaw and Winston counties of East-central Mississippi, is leased from the USDA Forest Service by the Mississippi Department of Wildlife Conservation. The area lies in the Tombigbee Unit of the Tombigbee National Forest.

No. 2 snares, No. 4 Victor traps, and 330 Conibear traps were obtained from the Woodstream Corporation, Lititz, Pennsylvania. Snares were equipped with a snare lock and a swivel. No. 4 Victor double long-spring traps were factory equipped with a slide lock for making drown sets. The 330 Conibear traps were "Series 2." All 3 devices were used in slide and broken dam sets, but only snares and conibears were used in dive sets. Each set was constructed as alike as possible to insure technique uniformity. All trapping was performed by the senior author and all devices were used without modification.

Slide sets were constructed where beavers traveled from 1 pond to another or to a feeding area. Snare slide sets were suspended over the center of the slide at a point where the water was about 5 cm deep. The 25.4 cm loop was suspended about 2.54 cm off the bottom of the slide. Snares were anchored to a heavy stake driven deep into the ground.

Snares were suspended and anchored in dam sets the same way as in slide sets except they were placed upstream from and in front of a small breach in the dam formed by removing a small amount of material from the top of the dam allowing water to trickle through.

Snare dive sets were made where well-used beaver runs went under suitably sized logs. Snares were anchored to the log with a strong wire. A small staple driven into the log suspended the snare directly over the center of the beaver run. A hairpin clipped over the snare cable between the staple and the anchor point held the 25.4 loop in place.

No. 4 Victor traps used in slide sets were placed in front of the slide where the water covered the traps to a depth of approximately 10 cm. The trap was attached to a slidewire anchored by stakes. The slidewire and stakes were positioned so as to prevent the trapped beaver from surfacing. Dam sets were constructed in the same manner and were placed in front of a small breach in the dam.

Conibear traps were used in slide, dam, and dive sets. In slide and dam sets, the trap was placed in the water directly in front of the slide or a breach in the dam with the trigger prongs pointing up and at least half of the trap exposed above the water. The trap was anchored with a strong wire to any available log, stump, bush, or stake. Conibear dive sets were made where beaver runs went under logs. Traps were placed and anchored beneath logs on the bottom of the runs. Detailed descriptions of set constructions can be found in Mason (1983).

Appropriate sets were made at every available location used by beavers in a given colony. The type of trap used in each location was random.

All beavers caught during the study were weighed and sexed. Other data recorded included whether the beavers were alive or dead, the degree of injury inflicted by the snare or trap as determined by gross examination, identity of non-target species captured, mileage, travel time, time spent on each trap line, and time required to make and/or remake each set.

Chi-square tests of independence were used to evaluate associations between trap-set combinations and the number of beavers or non-target species captured. A one-way analysis of variance (Steele and Torrie 1960) was used to test for weight differences between beavers taken in different devices and to test for differences in time required for setting and resetting devices. Differences were considered significant if $P < 0.10$.

Results

Effectiveness

No. 330 Conibears in dive sets captured more ($\chi^2 = 3.04$, df = 1, $P < 0.10$) beavers than did snares in dive sets and more ($\chi^2 = 10.07$, df = 2, $P < 0.01$) beavers than any other set-type combination tested (Table 1). There was no difference in the numbers of beavers captured between other traps and set types.

The number of non-target species captured in snares was less ($\chi^2 = 12.89$, df = 2, $P < 0.01$) than the number captured in either No. 4 Victor or No.

Table 1. Number of beavers captured and number of trap events using 3 devices in 3 set types for 250 trap nights each during field evaluations in Mississippi from 1981 December through 1982 July.

Trap and set type	*N* of beavers captured	*N* of trap events[a]
Snare		
Dam sets	3	45
Slide sets	3	21
Dive sets	7	22
No. 4 Victor		
Dam sets	0	51
Slide sets	5	30
330 Conibear		
Dam sets	3	35
Slide sets	6	10
Dive sets	15[b]	37

[a] A trap event is each occurrence of a sprung trap or a closed snare loop. The trap may contain a captured beaver or a non-target animal, or it may be empty.
[b] Significant ($\chi^2 = 3.04$, df = 1, $P < 0.10$).

330 Conibear traps (Table 2). There was no measurable difference between the number of non-target animals caught in the No. 4 Victors and the number caught in Conibears.

There were no differences between the weights of the beavers captured in dam sets and dive sets using each device (Table 3). However, beavers captured in No. 4 Victor slide sets weighed significantly less than beavers captured in slide sets using snares and Conibears ($F = 3.76$; df = 2, 11; $P < 0.10$). Sample sizes did not permit a robust analysis of captures by sex and weight.

Economics

Dried pelts of snared beavers developed a dark line on the leather side where the snare held the animal, while the pelts of beavers captured in No. 4 Victor and No. 330 Conibear traps showed no visible signs of damage.

No. 330 Conibears require less time ($F = 13.426$; df = 2, 162; $P < 0.05$) to place in new sets than either snares or No. 4 Victors, but require more time ($F = 24.519$; df = 2, 150; $P < 0.05$) to reset when snapped and empty (Table 4). Snares required more time ($F = 14.728$; df = 2, 60; $P < 0.05$) to reset after a capture than No. 4s or 330 Conibears. When times were averaged across all 3 conditions, there were no differences ($F = 1.471$; df = 2, 378; $P > 0.10$) between the devices.

No. 330 Conibears had the lowest cost/beaver captured, followed by snares and No. 4 Victors (Table 5).

Table 2. Number and species of non-target animals captured using 3 devices in 3 set types for 250 trap nights each during field evaluations in Mississippi from 1981 December through 1982 July.

Trap and set type	Species	*N* caught
Snare		
Dam sets	Raccoon (*Procyon lotor*)	1
Slide sets	Snapping Turtle (*Chelydra serpentina*)	1
Dive sets		0
Total		2[a]
No. 4 Victor		
Dam sets	Raccoon	4
	Muskrat (*Ondatra zibethicus*)	3
	Nutria (*Myocastor coypus*)	1
	Barred Owl (*Strix varia*)	1
Slide sets	Great Blue Heron (*Ardea herodias*)	1
	Painted Turtle (*Chrysemys picta*)	1
	Muskrat	1
	Raccoon	1
Total		13
330 Conibear		
Dam sets	Nutria	5
	Raccoon	3
	Snapping Turtle	1
Slide sets		0
Dive sets	Snapping Turtle	3
	Muskrat	1
	Raccoon	1
Total		14

[a] Significantly fewer non-target species were captured with snares than with No. 4 Victors or 330 Conibears ($P < 0.01$).

Discussion

Effectiveness

No. 330 Conibear traps used in dive sets were the most effective of the devices and sets tested. Most of the beavers were caught with snares or Conibears in dive sets, suggesting that dive sets using either snares or Conibears may be more effective for capturing beavers than dam or slide sets. Dam sets made by setting a trap or snare in front of a breach were the least effective because in their attempts to repair the breach, beavers often pushed mud and sticks into the traps and snares causing the devices to trigger prematurely.

A trapping device should not only be effective for capturing the target species, but selective against capturing or injuring non-target species. In this study, snares not only caught fewer non-target animals than either of the other 2 types but tended to capture fewer non-target species in every set-type

Table 3. Weight and sex of beavers captured using 3 devices in 3 set types for 250 trap nights each during field evaluations in Mississippi from 1981 December through 1982 July.

Set and trap type	Sample size	Weights (kg)		Sex ratio (M:F)
		Mean	S.D.	
Dam sets				
Snares	3	19.35	4.093	1 : 2
No. 4 Victor	0	—	—	—
330 Conibear	3	19.81	1.386	2 : 1
Slide sets				
Snares	3	12.70	2,525	1 : 2
No. 4 Victor	5	9.62[a]	7.532	4 : 1
330 Conibear	6	17.99	3.097	1 : 2
Dive sets				
Snares	7	15.55	3.380	4 : 3
330 Conibear	15	14.97	6.303	7 : 8
All sets and traps	42	15.36	5.604	1 : 1

[a] Significantly smaller mean weight of beavers than those caught in snares or 330 Conibears ($P < 0.10$).

Table 4. Average time in minutes required for setting and resetting 3 trapping devices during field evaluations in Mississippi from 1981 December through 1982 July.

Trap type	Setting initially		Resetting empty trap		Resetting after catches		Combined setting and resetting	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Snare	8.79	4.982	1.39	0.875	9.67[a]	3.904	5.58	5.215
No. 4 Victor	9.95	3.082	1.52	0.945	3.23	1.589	5.13	4.558
330 Conibear	5.98[a]	3.624	2.70[a]	1.166	4.74	3.689	4.66	3.388

[a] $P < 0.05$.

Table 5. The cost/beaver when using 3 trapping devices during field evaluations in Mississippi from 1981 December through 1982 July.

Cost items	Snare	No. 4 Victor	330 Conibear
Vehicle[a]	$22.15	$38.40	$12.00
Labor[b]			
Off set site	24.31	42.14	13.17
On set site	3.39	6.27	1.56
Traps	1.96	11.03	5.73
Totals	$51.81	$97.84	$32.46

[a] Vehicle costs = $0.20/mile.
[b] Labor costs = $3.35/hour.

combination. In addition, 50% of the non-target species captured with snares were alive compared to 23% and 14% for No. 4 Victors and Conibears, respectively.

Dam sets captured the most non-target animals; dive sets captured the fewest. Raccoons (*Procyon lotor*) commonly use beaver dams for travel routes or for feeding. Nutrias (*Myocastor coypus*) and muskrats (*Ondatra zibethicus*) use beaver dams for feeding and resting. Thus, traps placed on dams are more likely to capture these species.

Snapping turtles (*Chelydra serpentina*) were captured mainly in dive sets, probably because they often used the beaver runs as travel routes.

Of the 2 avian species captured, the great blue heron (*Ardea herodias*) was released unharmed from a No. 4 Victor set in a beaver slide. The other, a barrel owl (*Strix varia*), was found dead in a No. 4 Victor set in a dam. Capturing herons and other wading birds can be avoided by not placing traps in areas of shallow water frequented by these birds. It is extremely uncommon to capture an owl in a water set trap, so precautions to avoid capturing owls may not be necessary.

A larger sample size might have more clearly demonstrated the selectivity of No. 4 Victor traps for beavers of different weights compared to the snares and other traps. During the study, No. 4s were found sprung and empty many times in both dam and slide sets. Even though traps were placed at different depths in the water and in different positions relative to the center of the beaver's expected path of approach to increase the number of beavers captured, the catch using No. 4s remained low throughout the study.

The smallest beaver caught only weighed 8.16 kg. Small beavers were observed passing through snares without being caught so snares with a loop size of 24.5 cm may be selective for larger beavers. Reducing the diameter of loop might reduce this problem.

Economics

The dark line which formed on the leather side of the pelts of snared beavers was caused by the snare bruising the skin. No. 4 Victor and No. 330 Conibear traps did not damage the pelts of the beavers. However, the pelts of beavers captured in the different devices were sold to a knowledgeable raw fur buyer and none of the pelts was reduced in value due to trap related damage.

Analysis of the time data collected on the trapline revealed that only the time actually spent setting and resetting snares and traps could be segregated by trap and set type. Time spent traveling to the trapline and locating sets was independent of the trap or set type.

New sets using snares or No. 4 Victor traps had to be anchored very securely and were time consuming to set. Since 330 Conibear traps did not have to be anchored as securely, they were faster to set than snares and No. 4s. Both snares and No. 4 Victors were quick and easy to reset following

snaps, but Conibear traps were harder and slower to reset when snapped because of the time required to depress the 2 heavy springs. When beavers were captured, snares often were kinked and had to be replaced, making them the most time consuming device to reset following catches. Beavers struggled longer when caught in snares, and the set location often required extensive repair to make it ready for the next beaver. Having snares and sets destroyed by trapped animals is a major disadvantage of using snares.

Cost/beaver caught was used as a means of comparing the devices. The greatest costs in beaver trapping were vehicle expenses and labor costs. Since these costs were basically fixed costs, i.e. the same amount of travel and labor was needed to reach a given trapline regardless of the type of trap used, the efficiency of the devices largely determined the costs of catching a beaver. Conibear traps were superior to the other devices if the cost per beaver captured was the only criterion considered. However, if selectivity against catching non-target species were given a value, snares were more competitive.

Since vehicle and labor costs expended to reach the set sites were from 78% to 90% of the total cost of catching beavers in our study, reducing the distance traveled and the amount of time needed to reach the sites or increasing the efficiency (number of beavers captured/trap night) of the device used would have had the greatest impact on reducing the per-beaver costs. Using snares, No. 4 Victors, and 330 Conibears, the labor cost of setting and resetting the devices and the cost of the devices had the least impact on the total cost. Therefore, in beaver control projects, using local individuals or landowners who do not have to travel far to reach the problem area has economic advantages.

In summary, No. 330 Conibears used in dive sets were more effective in capturing beavers than any other trap-set combination tested. No. 2 Kleflock snares captured fewer non-target species than No. 4 Victors or 330 Conibears. Dive sets were more efficacious in that they captured more beavers and fewer non-target species than dam or slide sets. No. 4 Victor leg-hold traps were the least efficacious. In our study, vehicle and labor cost to reach the trap site represented more than 75% of the cost of capturing a beaver. The cost of the device and the cost of setting or resetting the device had the least impact on the cost/beaver captured. Reducing travel cost is likely to have the greatest impact on reducing the cost of beaver control programs.

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