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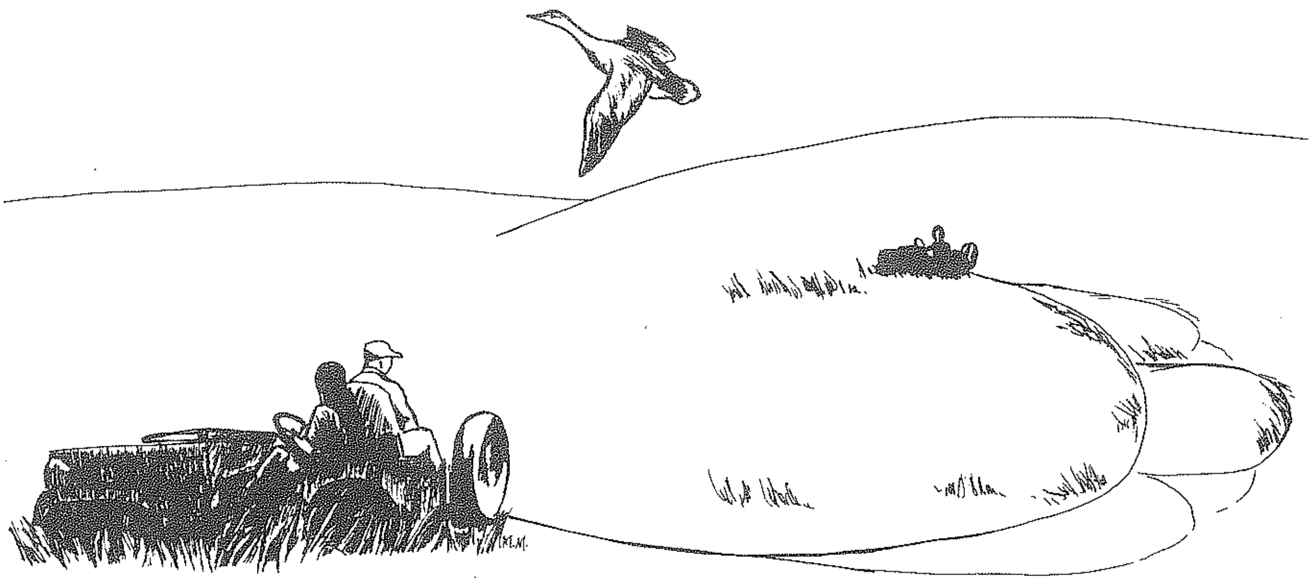

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CONSTRUCTION AND OPERATION OF CABLE-CHAIN DRAG FOR NEST SEARCHES

By

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ABSTRACT

A list of materials necessary to build and use a 53-m-long cable-chain drag is presented. Techniques are described for searching, finding, and marking nests in a typical area of grassland.

During nine nesting seasons, 7,894 nests representing 32 species were found by searching fields with cable-chain drags. Only 2% of the nests were damaged while searching; most of this damage was caused by the searcher or the vehicle, and not by the drag.

The rate of nest abandonment caused by cable-chain searching was estimated to be less than 1%. Reflushing efficiency ranged from 25% for green-winged teal (Anas crecca) to 100% for shorebirds. Other uses of the cable-chain drag are also discussed.

INTRODUCTION

Since 1967, biologists at the U. S. Fish and Wildlife Service's Northern Prairie Wildlife Research Center have used cable-chain drags (Higgins et al. 1969) to find nests of waterfowl and upland birds. To date, we have not found a more economical or efficient method to find an adequate sample of bird nests in the variety of grassland habitats that exist in the prairie pothole region. Other investigators have also successfully used this method for research and management purposes. For example, Oetting and Dixon (1975) used a 69-m cable-chain drag towed between two Bombardier J-5 crawler tractors to obtain nesting data at Oak Hammock Marsh in Manitoba; personnel at Benton Lake, Medicine Lake, and Bowdoin National Wildlife Refuges in Montana have used data from cable-chain nest searches to evaluate waterfowl, upland game, and deer use in various managed habitats. Wildlife biologists have used drags to find nests of prairie grouse in western North Dakota (G. D. Kobriger and S. C. Kohn, personal communication), in northwestern Minnesota (W. D. Svedarsky, personal communication), and in southeastern

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North Dakota (L. Manske, personal communication). A cable-chain drag was also used to search big sagebrush (Artemesia tridentata) areas in the Malta District of Montana for duck nests.

The present paper summarizes 9 years of nest searching with cable-chain drags and describes improved techniques developed while systematically searching numerous fields.

Materials for Cable-Chain

In addition to standard field equipment, the following items are usually needed by each search crew of two drivers and a spotter: a cable-chain drag, two vehicles (preferably four-wheel drive); slow-moving-vehicle signs; two flexible 38-mm (1.5-inch) ID rubber radiator hoses (15 cm long) for egg candling (Weller 1956); and a tow chain or rope at least 5 m long. A spare parts and tool kit is also needed at times to repair the drag.

Materials for a 53-m-long cable-chain drag (Fig. 1) include 54.3 m of 1.6-cm (5/8-inch) cable, 81.2 m of 0.6 cm (1/4-inch) chain, 10 cable clamps, and four swivels (Fig. 2). We generally used a 53-m-long drag (Fig. 3), but the length is optional depending on its intended use. For instance, a 16-m length is more practical for searching narrow strips of cover along secondary road right-of-ways, whereas a cable-chain drag longer than 53 m would be more practical in a large area of flat to slightly rolling terrain with few or no obstacles. We recommend that a spotter accompany each vehicle if the drag is longer than 53 m or when searching cover taller than 1 m.

Search Techniques

A general survey should be made of the physical characteristics of each field to be searched, either from aerial photographs or by cruising the perimeter just before searching. Usually the search should begin parallel to the longest straight edge of a field (Fig. 4). Search time will be shortened with proper alignment and interval (Fig. 5) between the vehicles on the first and subsequent laps.

Before beginning a search, the cable-chain drag is stretched between the vehicles and all twists or entanglements are removed. Preferably, the crew leader (also the recorder) should drive the vehicle on the left accompanied by the spotter (Fig. 6). This arrangement, plus the assistance of the driver in the other vehicle, will usually make it possible to find nests of flushed birds by triangulation.

When the dragging units approach the end of the field, the inside or pivot vehicle (Fig. 4) should slow down until the other vehicle enters the turn causing the cable-chain to go slack. Then the pivot vehicle makes a U-turn and waits in the same tracks until the other vehicle has attained the proper interval and alignment.

Both drivers and the spotter must constantly be alert for twists, entanglements, excessive bagging, excessive stretching, and improper alignment in the cable-chain drag. Twists most commonly occur during turnarounds or after the drag has flipped over a rock, tall shrub, or other

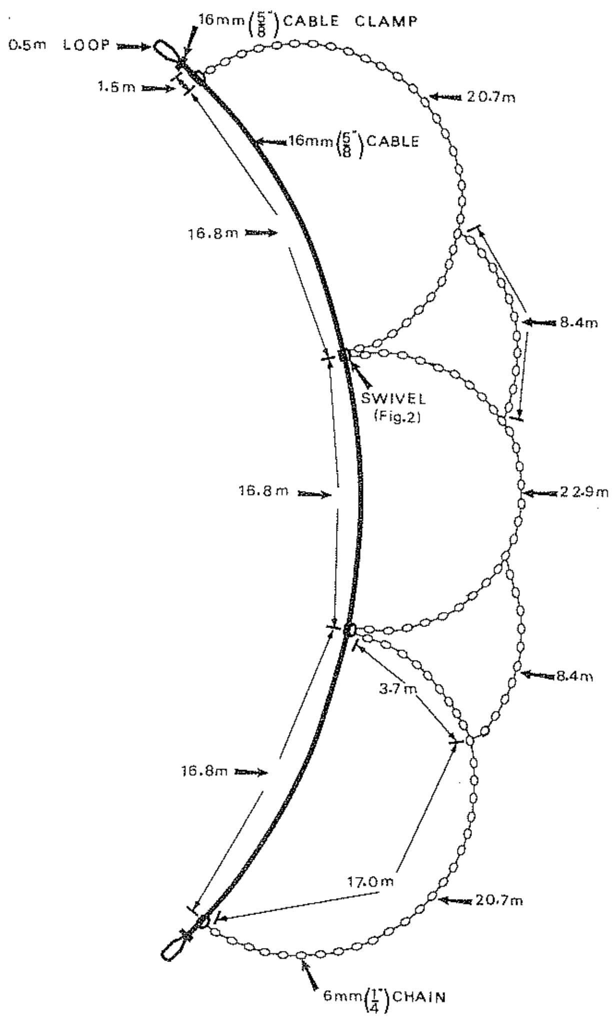

Fig. 1. Dimensions of a 53-m-long cable-chain drag.

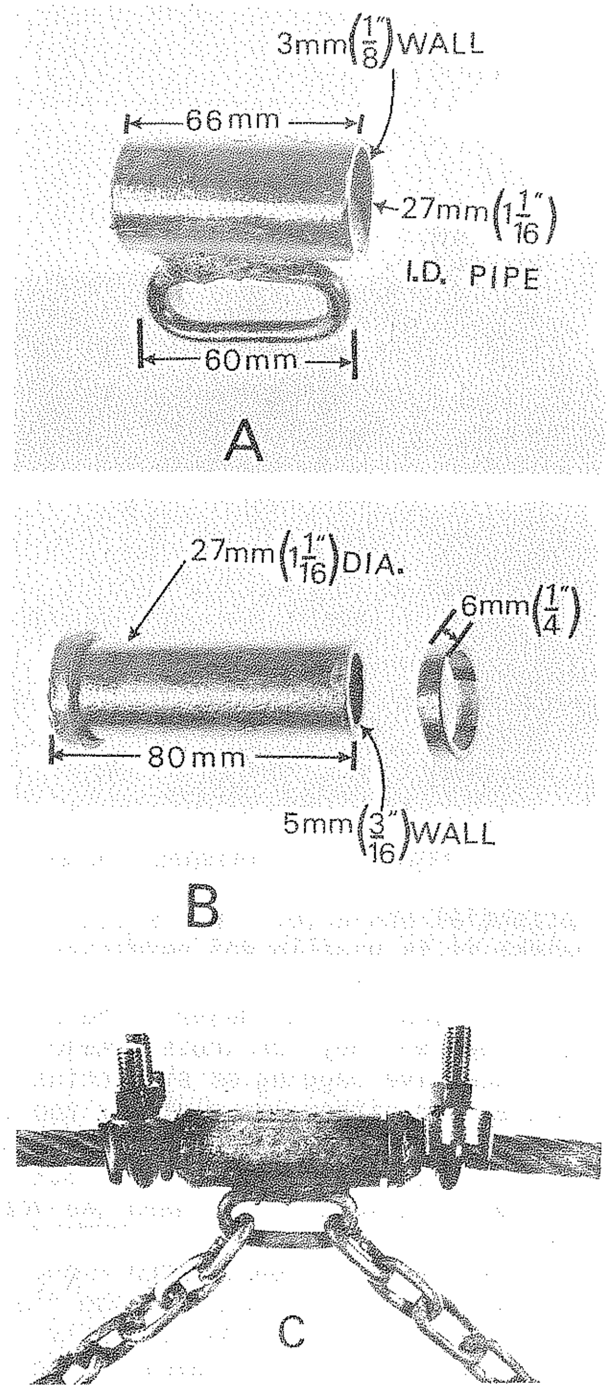

Fig. 2. Dimensions of swivel (A), sleeve (B), and assembled swivel and sleeve on cable with chain attached (C).

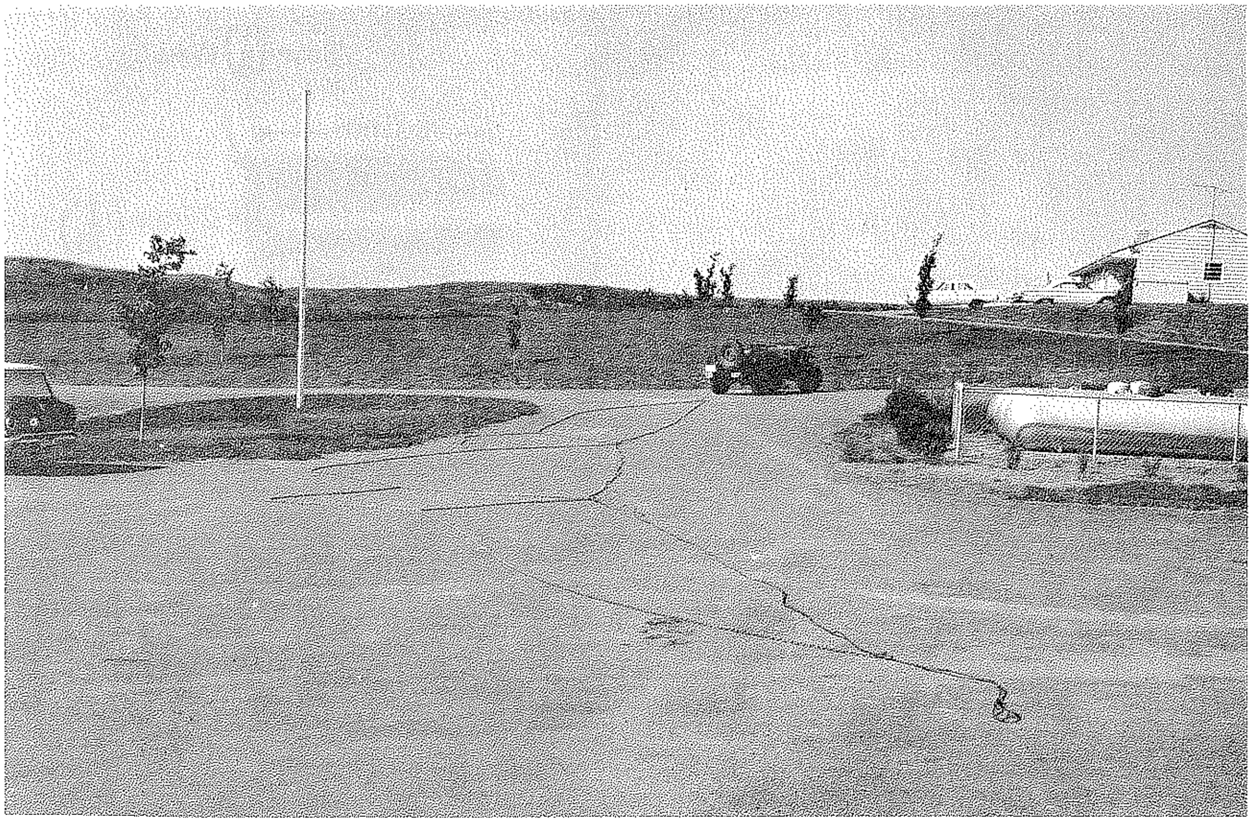

Fig. 3. A finished cable-chain drag ready for field use.

substantial obstacle. Twists can usually be corrected by untangling the chains; it is usually not necessary to remove the cable from the vehicles. Entanglements are usually caused by catching loose pieces of wire, dead brush, or tree limbs in the chains. These objects should always be removed immediately because they can cause damage to eggs if towed over nests.

Excessive bagging or stretching in the cable-chain occurs when the two vehicles are either too close or too far apart. The interval between vehicles can be adjusted without undue disturbance of the vegetation by stopping and allowing the outside vehicle to back up and resume the proper interval. Improper alignment occurs when one vehicle gets too far ahead or behind the other.

Both drivers should watch along the drag as much as possible and still maintain a straight course in the field. We have found that one's ability to do both these things simultaneously diminishes greatly with an increase in vehicle speed. Search speeds should be held between 3 and 10 km/h.

The spotter is a key man in the search operation and his main job is to watch constantly along the cable-chain drag for flushing birds. When a bird flushes, the spotter must fix on the flush site and never take his eyes off the spot until the nest has been found or the site has been thoroughly searched. The drivers are responsible for species identification while the bird is in flight and the spotter must avoid the natural tendency to follow the flight of a bird. If in-flight identification is not made, the species can be identified at the nest from size and color of eggs, down, or breast feathers (Broley 1950). Orientation toward the spot where the bird flushed is aided by noting a specific nearby plant, rock, or other landmark. If both

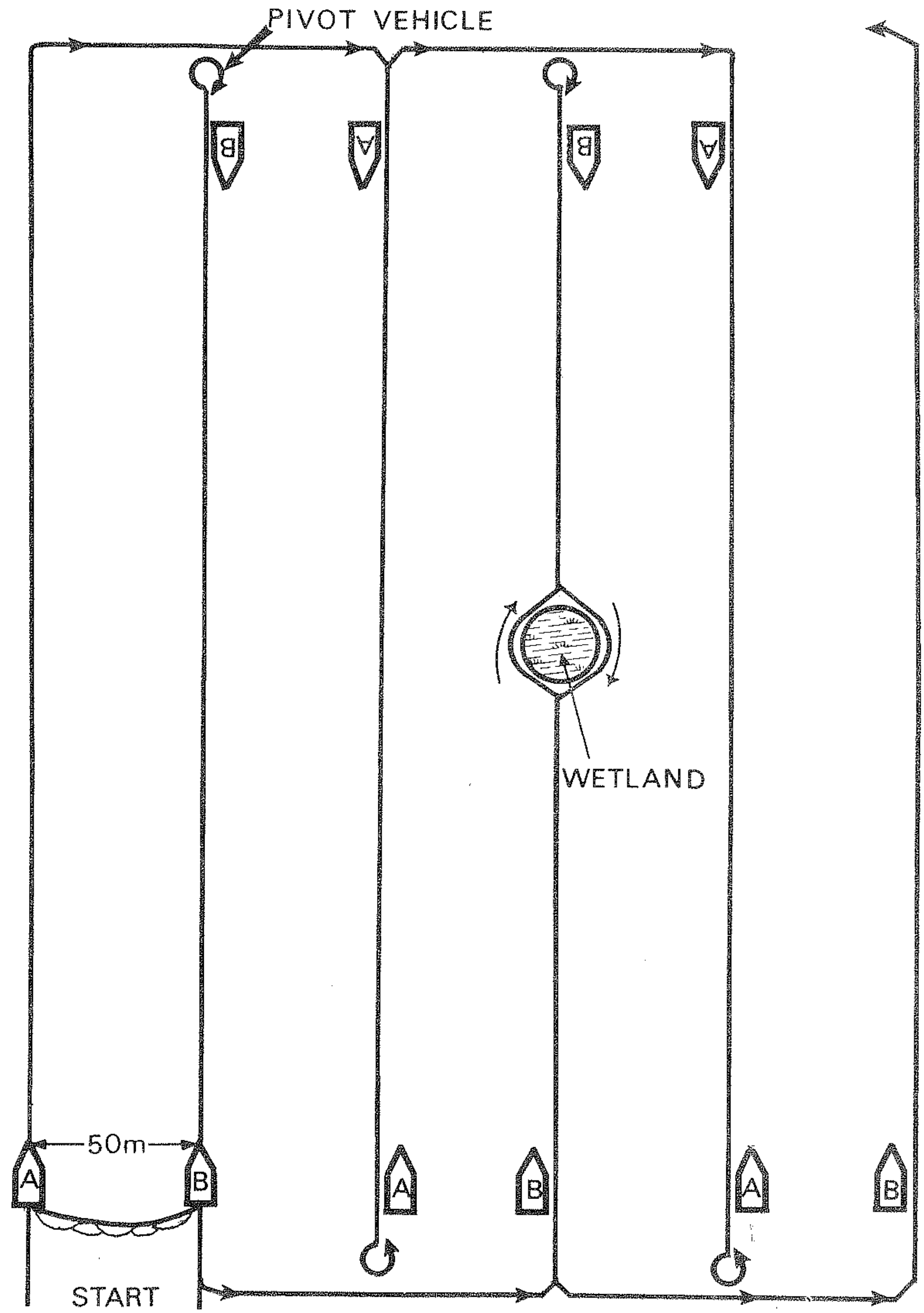

Fig. 4. A diagramatic search pattern of a hypothetical field.

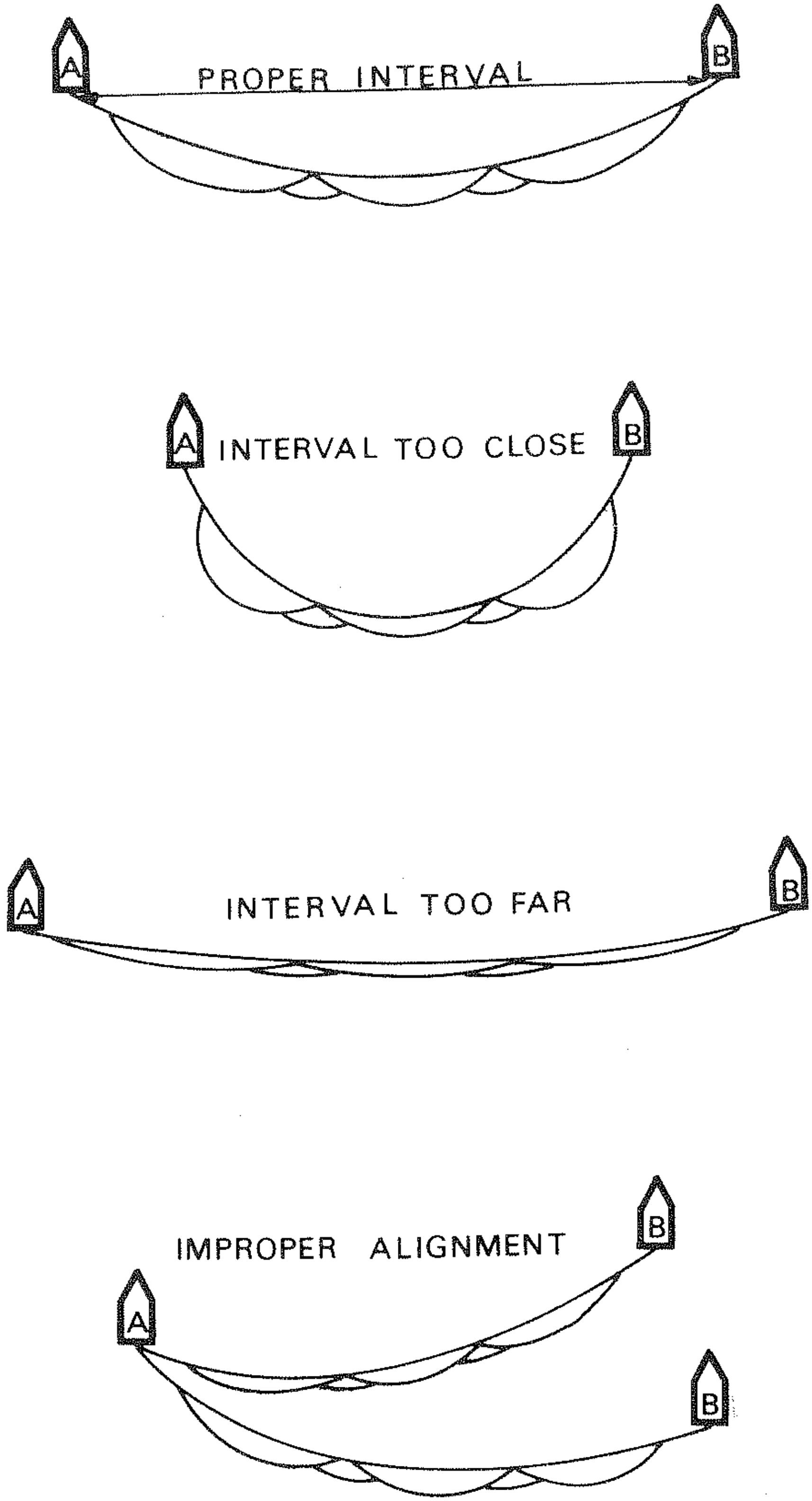

Fig. 5. Examples of proper and improper interval and alignment while towing a cable-chain drag in field searches.

Fig. 6. A crew of two drivers and a spotter searching for duck nests in a mixture of grasses, forbs, and low forms of brushy cover with a cable-chain drag.

vehicles are stopped immediately when a bird is flushed, the nest will usually be close to the drag and the spotter will be better able to maintain his orientation on the nest site. If the other driver has marked the spot of the flushed bird, he should remain in his vehicle and concentrate his attention on the site until the recorder finds the nest. The spotter and one driver should seldom leave their vehicles until the nest is found.

The recorder should avoid excessive disturbance of the vegetation around the nest site by walking part of the way to the probable nest site on the forward side of the cable-chain drag. Advance of the drag will subsequently obliterate much of the recorder's trail as dragging resumes. The recorder can usually find the nest by following vocal or hand-signal directions from the spotter and driver of the other vehicle. Because nests are often well concealed, the recorder should step carefully until the nest is found.

After finding the nest, the recorder counts the number of eggs and candles (Weller 1956) at least two eggs of the clutch (Fig. 7). He then replaces and covers the eggs with down or vegetation, and marks the nest site with a flag. For best results, markers should be placed at a standard direction and distance from nests; we used 3 steps north of nests of large birds in short or sparse cover and 1 step or 1 length of the marker north of nests of small birds or of nests in tall, dense cover. Markers should be anchored firmly so they will not be dislodged by strong winds, perching birds, deer, or livestock. Maintaining nest markers in pastures is difficult because cattle often dislodge flags by pulling or chewing on the flag material (Hammond and Forward 1956). Cattle that are attracted to flags may also trample nests. Two different kinds of markers are usually necessary in pastures. For example, the distance and direction of the nest from a distinctive object is recorded in addition to the flag.

Either the spotter or driver of the other vehicle is responsible for plotting the exact location of the nest on a map. Placement of the nest location on the map is aided if lines are drawn on the map to correspond with the vehicle tracks. Other landmarks such as rock piles, wetlands, brush clumps, or other topographic features are also useful in plotting nests on maps. Each nest should be sequentially numbered and coded to the proper field or pasture. The nest numbers should also be written with waterproof ink on the nest marker.

If a nest cannot be found after a reasonable search effort (3-5 min), the approximate spot should be marked with a flag and the area searched later (2-8 h) on foot in an attempt to reflush the bird. This technique reduces the amount of trampled vegetation around the nest. If the bird does not flush during the second visit, the marker should be removed and no further effort should be made to find the nest. Frequently, hens without nests are flushed early in the nesting season; many of these hens are in the process of selecting nest sites or digging scrapes.

When the principal recorder is the only one to see a bird flush, either the spotter or other driver should follow his directions to search for the nest. If the bird should flush closer to the vehicle opposite the principal recorder and spotter, it is often advantageous for that driver to find and mark the nest. He can either record the data or report it to the principal recorder.

Some studies require repeated searches of the same field during a nesting season. Best results are obtained when the subsequent searches are conducted with the same team in same positions as on the first search; this enables better recall of nests found even when the marker has been removed or has fallen over in the vegetation, or when the nest location was not recorded accurately on the map.

Nests Found

We found 7,894 nests representing 32 species with cable-chain drags during nine nesting seasons (Table 1). The number of nests found annually ranged from 258 to 2,161 and averaged 885. An average of 1,664 nests were found during the 1970-72 nesting seasons when our nest search efforts were most extensive. The most nests found by a single search crew during 10 consecutive hours of dragging was 123.

The 32 species listed in Table 1 are those we selected to record during our studies; this list does not include all species that can be flushed with cable-chain drags. Many passerine birds including western meadowlarks (*Sturnella neglecta*), short-billed marsh wrens (*Cistothorus platensis*), and clay-colored sparrows (*Spizella pallida*) were also flushed from nests, but no records were kept because of the limits of study objectives, time, and manpower. The number of species to be found will also vary by geographical region, time of year, and type and form of nesting cover. Many upland nesting birds are very specific to certain forms of cover.

Fig. 7. A biologist candling a duck egg with a short piece of flexible radiator hose.

Table 1. Number of nests found by cable-chain drags in North and South Dakota and Montana, 1967-75.

Species	Nests
DUCKS	
Mallard (*Anas platyrhynchos*)	1,374
Gadwall (*Anas strepera*)	1,460
American wigeon (*Anas americana*)	89
American green-winged teal (*Anas crecca*)	112
Blue-winged teal (*Anas discors*)	3,171
Northern shoveler (*Anas clypeata*)	326
Pintail (*Anas acuta*)	631
Redhead (*Aythya americana*)	2
Lesser scaup (*Aythya affinis*)	46
Subtotal	7,211
OTHERS	
American bittern (*Botaurus lentiginosus*)	64
Sora (*Porzana carolina*)	1
Wilson's phalarope (*Steganopus tricolor*)	20
Common snipe (*Capella gallinago*)	2
Marbled godwit (*Limosa fedoa*)	18
Western willet (*Catoptrophorus semipalmatus*)	32
Upland sandpiper (*Bartramia longicauda*)	356
Killdeer (*Charadrius vociferus*)	30
Gray partridge (*Perdix perdix*)	4
Greater prairie chicken (*Tympanuchus cupido*)	1
Sharp-tailed grouse (*Pedioecetes phasianellus*)	34
Sage grouse (*Centrocercus urophasianus*)	1
Ring-necked pheasant (*Phasianus colchicus*)	33
Mourning dove (*Zenaida macroura*)	25
Marsh hawk (*Circus cyaneus*)	29
Short-eared owl (*Asio flammeus*)	18
Common nighthawk (*Chordeiles minor*)	5
Bobolink (*Dolichonyx oryzivorus*)	1
Chestnut-colored longspur (*Calcarius ornatus*)	3
Savannah sparrow (*Passerculus sandwichensis*)	1
Baird's sparrow (*Ammodramus bairdii*)	3
Dickcissel (*Spiza americana*)	1
Lark bunting (*Calamospiza melanocorys*)	1
Subtotal	683
Total	7,894

Nest Damage

Of 7,894 nests, 159 (2%) were damaged (Table 2). Of the damaged nests, 66 had some eggs cracked or crushed, 74 had all the eggs cracked or crushed, and at 19 nests (0.2%) the hen was injured or killed. Most of this damage was caused by persons stepping on nests or by driving the vehicle over the nests or birds. Very little damage was actually caused by the cable chain.

Table 2. Types of nest damage attributable to cable-chain drag operations, 1967-75.

Type of damage	Number of nests	Percent of 7,894 nests
Some eggs cracked or crushed	66	0.84
All eggs cracked or crushed	74	0.94
Hen injured or killed	19	0.24
Total	159	2.02

These figures are undoubtedly low because of undetectable damage that can occur at nests when the incubating or laying bird is absent or does not flush, when the hen is crushed instantly by drag vehicles, or when the hen is slightly injured but is capable of flying away. However, if the search techniques described earlier are strictly followed, damage to nests and hens will be low.

Our highest rate of egg damage was to nests of killdeer and nighthawks because both species select nesting sites nearly or totally devoid of vegetation. In most forms of cover used by upland nesting birds the vegetation usually supports the cable chain over the nest and hen (Fig. 8).

Abandonment

The rate of nest abandonment by hens during our studies averaged about 2%. Of this 2%, we did not know what amount was attributable to the cable-chain drag, to our own activities at the nest, or to other natural causes such as predation. Our opinion is that abandonment resulting directly from the cable-chain drag operation is small, probably less than 1%. This opinion was supported in one of our studies when the number of searches over one area was increased from the usual 2 to 4 times to 12 times and the rate of abandonment was still only 3%. With 12 searches, at intervals of 1 week, some hens were flushed five to six times.

Fig. 8. This cable-chain drag is supported above a sharp-tailed grouse nest by the surrounding grassy cover.

Reflushing Efficiency

Reflushing efficiency was calculated as the percentage of hens that were reflushed from attended nests which were found during a previous search. Mean reflushing efficiency was 77% for ducks, 43% for upland game birds, and 86% for shorebirds and wading birds (Table 3). Among ducks, reflushing efficiency averaged 93% for mallard, gadwall, wigeon, and pintail and 69% for green-winged teal, blue-winged teal, and shoveler. The sample size was small for upland game birds, but the average efficiency of 43% for them may be close to realistic because of their innate character of holding tight to the nest (sharp-tailed grouse) and to hold tight or run some distance away from the nest before flushing (ring-necked pheasant). The high reflushing efficiency (86%) for shorebirds and wading birds was related to nest site selection. Except for American bitterns, all of these species tend to nest in short cover.

Other Uses

Our primary use of the cable-chain drag was to find bird nests, but we learned that the drag could also be used to find fawns of white-tailed deer (Odocoileus virginianus) and broods of ring-necked pheasants, gray partridge, sharp-tailed grouse, and upland sandpipers. Thus, data about reproductive success and habitat preferences of other species can also be collected with the aid of a drag.

Table 3. Reflushing efficiency of the cable-chain drag, 1967-75.

Species	Attended nests	Hens flushed	Percent efficiency
DUCKS			
Mallard	23	22	96
Gadwall	55	50	91
American wigeon	5	5	100
American green-winged teal	4	1	25
Blue-winged teal	189	133	70
Northern shoveler	10	7	70
Pintail	13	12	92
Subtotal	299	230	77
UPLAND GAME BIRDS			
Sharp-tailed grouse	5	2	40
Ring-necked pheasant	2	1	50
Subtotal	7	3	43
SHOREBIRDS AND WADING BIRDS			
Upland sandpiper	29	24	83
Western willet	2	2	100
Marbled godwit	1	1	100
Wilson's phalarope	2	2	100
Killdeer	1	1	100
American bittern	2	2	100
Subtotal	37	32	86
Total	343	265	77

Acknowledgements

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