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The Lure Crop Alternative¹

Steven D. Fairaizl and William K. Pfeifer²

Abstract.--Lure crops are proposed as an alternative to scaring waterfowl. The lure crop works on the principle of permitting waterfowl to feed undisturbed for the duration of the damage season in an unharvested field of their choice thereby utilizing trampled grain. Waterfowl from adjacent areas are encouraged to use the lure crop through the use of scaring devices placed in protected fields. General criteria for implementation of a lure crop project and specific criteria for lure crop purchases are presented. Factors contributing to a successful lure crop and problems which reduced lure crop effectiveness are identified. Benefit/cost analysis of lure crops was completed.

INTRODUCTION

The conflict between waterfowl and North Dakota farmers was recognized around 1905 when the prairies were plowed and seeded. The problem escalated in 1936 when the marshes of Lower Souris National Wildlife Refuge were restored. By 1939 an estimated 200,000 ducks were present on the refuge and severe depredations to shocked grains occurred (Hammond 1961). Numerous isolated instances of depredations, such as these, occurred in the early 1900's but not until the mid-1940's did they generally become widespread. The problem intensified during the war years because of an inadequate supply of ammunition, fewer people hunting less than in normal times, gas, tire and auto rationing, shortage of farm help during the harvest season, cultivation of increased acreages of marginal and submarginal lands, and the rising prices of commodities (Day 1944).

Literature reviews indicated waterfowl depredations to small grains were caused primarily by one or more of the following factors: delayed spring planting, reduced plant growth rate, or wet fall weather conditions. The agricultural practice of swathing grain, instead of straight combining, increased the vulnerability of crops to waterfowl damage.

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Depredations continued into the 1950's when the problem was termed a limiting factor in waterfowl management (Munro and Gollop 1955). An anti-duck sentiment began developing in the North Dakota agricultural community and farmers threatened to take matters into their own hands. For example, organizations such as the Souris Duck Control Association were formed to deal with the depredation problem. This organization advocated compensatory legislation, duck sterilization, population reductions and wetland drainage. In an attempt to curb these threats, the U.S. Fish and Wildlife Services (FWS), in the 1950's, began scaring ducks from unharvested small grain fields (Hammond 1950)³. Scaring produced limited results in the early part of the damage season or during severe damage seasons because alternative feeding sites into which birds could be chased were minimal. Furthermore, scaring birds from field to field caused inefficient food utilization and increased trampling damages.

Scaring was supplemented by feeding stations established on refuges. The stations worked well in reducing depredations as long as weather conditions allowed vehicle access to maintain a sufficient daily food supply. These two techniques were extensively utilized until the early 1970's.

Due to the limited effectiveness of these projects, the agricultural community requested a study of new approaches for resolution of the problem. Consequently, a three-year lure crop pilot study was established in 1975 to be tested in Bottineau, Nelson and Ramsey Counties of North

³Hammond, M.C. 1950. Waterfowl damage and control measures, lower Souris refuge and vicinity 1950. Unpublished report. U.S. Fish and Wildlife Service.

Dakota. In subsequent years the study was expanded to include the entire state and extended until three years of usable data had been collected.

The basic concept of the lure crop technique was to purchase the crop in a field which had been selected by the birds and where a feeding pattern had been established, thereby allowing birds to congregate and feed undisturbed. Waterfowl feeding in surrounding small grain fields were induced into the lure crop and allowed to feed until the damage potential passed. This process increased feeding efficiency and reduced trampling.

In 1975 and 1978 the project was funded at the \$300,000 level. The 1976, 1977, 1979 and 1980 projects had an operational budget of \$125,000 to \$150,000. From 1975 to 1978 complete expenditures of annual funds did not occur for the following reasons: (1) populations of mallards and pintails, the species which are responsible for most depredations, were low in some counties during harvest; (2) heavy rains in southern Canada delayed harvest and slowed migration into North Dakota; (3) refuge feeding programs kept ducks from entering fields outside the refuge boundary; (4) warm, dry weather allowed for an early harvest; (5) landowners were unwilling to sell a crop to FWS; and (6) an increase of straight combining and grain dryers reduced the length of time the grain was susceptible to waterfowl damage.

During 1979 and 1980 a combination of late spring planting and fall rains produced severe depredations which resulted in numerous opportunities for lure crop purchases and data collection.

METHODS

Lure Crop Purchase

Beginning in early August ground and aerial surveys were conducted to monitor the build-up in local waterfowl populations. Field observations were initiated after a concentration of several hundred field-feeding ducks were located or a complaint received. Data were gathered on numbers and species of birds in the area, length of time birds had been feeding in the field, distance birds were coming to feed, harvest and weather conditions, and land ownership. After contacting the landowner, the options of purchasing the grain as a lure crop field⁴ or providing extension services for scaring the ducks were discussed.

Animal Damage Control (ADC) personnel had the responsibility for purchasing and releasing lure crop fields and personnel of the Agricultural

⁴For the purpose of this report, the term "lure crop field" implies ownership of grain only, not ownership of land.

Stabilization and Conservation Service (ASCS) appraised the selected field for yield and acreage. The value of the crop was determined by the current inbound elevator price minus the shipping charges. During the 1979 grain handlers' strike, lure crop contracts were based on Minneapolis or Duluth prices rather than the suppressed prices at local elevators. The contract was then completed and the area posted as a "LURE CROP". Adjacent landowners were advised how to scare birds from their unharvested fields into the lure crop.

The lure crop was released when harvest operations in the surrounding area were 75-80 percent complete and the weather conditions became favorable for resuming harvest. All lure crops were released and scaring devices placed in the field prior to the opening of waterfowl hunting season. This procedure prevented a large kill on opening day and allowed hunting by local sportsmen to resolve, by scaring, any later complaints which arose. Upon release of the field, observations were made on the amount and condition of the remaining grain. If mechanically possible, the landowner was required to harvest the lure crop. Salvaged grain was sold at a local elevator, the amount received deducted from the original contract price, and the difference paid to the farmer. If the field was not harvestable, \$5 per acre was deducted from the contract price in lieu of normal harvesting costs. Some salvaged grain was of feed grade quality and was not accepted at the local elevator. In these cases, FWS stored this grain on a nearby National Wildlife Refuge for wildlife feed and the farmer received the full contract price.

In 1979 two harvested fields were rented and baited. Grain was trucked into the field, spread into windrows, and decoys added to attract ducks. Under a special contract, the landowner received a fee of between \$250-\$350, depending on field size, for the use of his field. Baited fields were released ten days prior to the opening of hunting season in compliance with federal hunting regulations.

Evaluation Procedures

Characteristics of lure crop fields and daily observations were recorded on two separate data sheets. The lure crop data sheet was completed at the time of purchase and daily observation forms were completed each time the field was visited.

During 1979 and 1980, 30 lure crops were selected for evaluation based on the following criteria: (1) expected to hold a minimum of 2,000 ducks; (2) available for sampling before more than two days damage occurred; (3) regular shape and uniformity with respect to yield; and (4) subject to daily observation without disturbing the feeding ducks.

Upon release, lure crops purchased in 1979 were divided into damaged and undamaged strata based on field observations. In fields where

damage was 100 percent, no stratification was possible. Within each stratum, grain kernels from 20 six-inch-square samples were collected. In 1980, samples were also taken at the time of purchase and only ten samples were collected from each stratum or from the total field. These samples were used to determine the extent of damage caused by ducks feeding in a lure crop field.

RESULTS

Total costs of the North Dakota lure crop pilot project incurred from 1975-1980 totaled \$289,493.95 (Table 1). Relatively dry weather conditions during the years 1975-1978 resulted in the purchase of one lure crop in 1976 and six in 1978. Late spring planting and fall rain, however, resulted in severe deprecations and the

purchase of 34 lure crops in 1979 and 21 in 1980. Between 1976 and 1980, 16 barley, 24 spring wheat and 20 durum crops were purchased (Table 2). During 1979, two harvested fields were rented and baited (Table 3).

The 1979 and 1980 evaluation was designed to measure the amount of damage caused by ducks feeding in a lure crop, quantify trampling damage, and calculate a benefit/cost ratio. In the lure crops used for this evaluation, damage caused by feeding ducks ranged from 2-100 percent in barley fields, 43-100 percent in wheat fields and 52-100 percent in durum fields. In 47 percent of evaluated fields grain damage was 100 percent because ducks ate and trampled all available grain, making harvest mechanically impossible. All of this damage was attributable to ducks because weather conditions cleared and adjacent fields were harvested.

Table 1. Summary of North Dakota Lure Crop Expenditures from 1975 to 1980

Year	No. of Lure Crops Purchased	Acres	Net Cost of Lure Crops	Administrative Costs	Evaluation Costs	Total Expenditures
1975	0	0	0	0	**\$30,000.00	\$30,000.00
1976	1	35	\$5,502.50	*	**	5,502.50
1977	0	0	0	0	**	0
1978	6	180	19,157.52	*	0	19,157.52
1979	34	1,020	90,542.21	\$28,519.00	0	119,061.21
1980	21	778	86,058.22	24,714.50	5,000.00	115,772.72
Totals	62	2,013	\$201,260.45	\$53,233.50	\$35,000.00	\$289,493.95
Averages	10	336	\$33,543.41	\$8,872.25	\$5,833.33	\$48,248.99

*Administrative costs of \$8,100 in 1976 and \$14,500 in 1978 were taken from operational Animal Damage Control funds.
 **The 1975 \$30,000 appropriation was spent between September 1975 and May 1977.

Table 2. Summary of North Dakota Lure Crops Purchased from 1975 to 1980

	No. of Fields	Size (Acres)	Yield (Bu/Acre)	Cost/Bu	Total Payment	Reductions	Net Payment
Barley							
Total	16	576.0	688.9	\$40.19	\$56,020.18	\$9,502.10	\$46,518.08
Average		36.0	43.1	2.51	3,501.26	593.88	2,907.38
Spring Wheat							
Total	24	629.37	836.42	92.00	87,519.40	5,111.97	82,407.43
Average		26.22	34.85	3.83	3,646.64	213.00	3,433.64
Durum							
Total	20	572.8	682.8	89.19	80,127.62	8,392.68	71,734.94
Average		28.6	34.1	4.46	4,006.38	419.63	3,586.75

Table 3. Summary of 1979 North Dakota Baited Fields

County	Size (Acres)	Cost	Grain Deposited (Bu)
Benson	50	\$250.00	400
Burke	185	350.00	80
Total	235	\$600.00	480
Average	118	\$300.00	240

The damage factor used to quantify trampling losses was defined as the total damage, which included trampling and eating, caused by ducks, divided by the amount of grain eaten by ducks. Thus the damage factor is $D = \frac{T+E}{E}$ where T=amount of grain lost to harvest by trampling and E= amount of grain eaten.

Studies conducted by Hammond (1961), Sugden and Georzen (1979) and observations from the 1979 lure crop project were used to estimate damage factors in the following example. Based on a consumption rate of 115g/bird/day (Sugden 1979), an average 1979 lure crop yield of 35 bu/a and life of 30 days, and the observation that birds were scared from unharvested fields about every two days (Duncan and Zahn, pers. comm.), the following conclusions were drawn: For field sizes of 10-50 acres and flock sizes of 100-10,000 birds, damage factors would range from 2.5-3.15 for barley. In fields with 1,000 ducks, which is the average number in a lure crop field at the time of purchase, the damage factor would be 3. This means that if a lure crop had not been purchased in this area, the dollar value of damage to small grain would have been three times as great as the purchase cost.

Data on the amount of total damage caused by ducks were used to calculate the benefit/cost ratio. Costs were defined as the amount of funds expended on personnel, logistics, equipment, administration and field purchases. Benefits were defined as the dollar value of total damage ducks would have caused without a lure crop field. By dividing the total losses due to depredations (92,027.05) by the net cost of the fields plus administrative costs (\$137,654.38) and multiplying by a damage factor of 3, a benefit/cost ratio of 2:1 was calculated for the North Dakota lure crop pilot project.

The number of complaints a lure crop field prevented were estimated by two methods. First, 62 complaints produced the purchase of 60 lure crops and two baited fields. The depredating flocks associated with these lure crops produced an additional 85 complaints before the fields could be purchased. Therefore, a total of 147 complaints were actually resolved by lure crop purchases. Secondly, 30 complaints could have potentially been resolved by the purchase of each lure crop field. This estimate is based on data which indicated that in 77 percent of the reported complaints, ducks were allowed to feed in a field for two days or less. These data are substantiated by the following field observations. In the Mud Lake area during 1979, five complaints were received concerning the same flock of birds over a ten-day period. On the 11th day a lure crop field was acquired and complaints ceased. During 1978 in the Kulm area, approximately 80 complaints were received involving four flocks of ducks in a 20-day period. In some cases, ducks had only alighted in a field before being frightened while in other cases ducks were in the field one to two days (Duncan and Zahn, pers. comm.).

Based on a 60-day damage season and the observation that ducks generally are not allowed to spend more than two days in a field before being frightened, a depredating flock could damage 30 fields. Therefore, a minimum of 147 and a maximum of 1,860 complaints were resolved by the purchase of 60 lure crops and the rental of two baited fields. These data indicated that the purchase of a lure crop stopped all waterfowl depredation complaints in the surrounding area.

Effective range of the lure crops extended to a maximum of five miles based on daily observations of the distance birds traveled from the roost to the field. However, the roost being utilized by ducks was located less than one mile from the field in 78 percent of the lure crops. In several cases, ducks switched roosts to a wetland less than a mile from the lure crop field. These observations indicated lure crops with adjacent wetlands were preferred. In one extreme case, a Nelson county lure crop field attracted, on a daily basis, a flock of ducks 16 miles from Stump Lake. The fidelity of ducks for a selected undisturbed feeding site was indicated by many observations of ducks flying over several miles of swathed grain fields to feed in a lure crop.

The number of days a lure crop was utilized by ducks ranged from 0-48. Fields with zero days usage resulted from preselection, by ADC personnel, of a lure crop field. Ducks appear to have their own criteria for feeding site selection and attempts to preselect alternative sites and attract ducks into those fields failed. Several reasons existed which explain the low number of days of utilization. First, some lure crop fields contained an insufficient food supply and a large number of ducks rapidly consumed all available grain. Second, numerous alternative feeding sites were available. Third, vehicular or human harassment disrupted the waterfowl feeding pattern. Fourth, fields purchased late in September could be utilized by ducks for only a short time before being released prior to the opening of waterfowl hunting season. However, ducks could be held for an entire 60-day damage season when allowed to select their own feeding sites and feed undisturbed, given that a large enough lure crop was purchased.

Ducks will often select another swathed field as a feeding site after abandoning a lure crop. This presented two management options. The first was to purchase a replacement lure crop near the original, which produced very limited results. Ducks often required two to three days to select another permanent feeding site and in the process damaged numerous surrounding fields. The second option involved hauling supplemental grain into the original field. This method could not be used in years when fall rains prevented vehicle access to the field.

The percentages of standing, swathed and harvested fields were determined within a three-mile radius of all lure crops purchased from

1976-1980. These data revealed that lure crops were purchased when harvest was 0-85 percent complete. These data were based on small grain only; row crops, such as sunflowers, were excluded. An examination of the relationship between harvest conditions and lure crop effectiveness indicated that all lure crops purchased after the harvest was 50 percent complete could not effectively hold ducks due to the abundance of alternative feeding sites.

The percentage of fall-plowed fields within a three-mile radius of all lure crops was recorded. This revealed that in 88 percent of the lure crops purchased, less than 25 percent of the surrounding fields had been tilled. Fall plowing is defined in this study to be any agricultural practice which results in all available grain being removed. Harvested fields which were tilled once were classified as "harvested fields" because available grain remained, allowing these fields to be used as alternative feeding sites. Fall plowing conditions at the time of purchase ranged from 0-30 percent completed and averaged 13 percent. In 1980, additional data collected from 13 lure crops revealed the amount of fall plowing averaged 10 percent at the time of purchase and 18 percent when lure crops were released. These data indicate that during the damage season, only an additional 8 percent of the surrounding fields were plowed. Data analysis revealed no statistical relationship between fall plowing and lure crop effectiveness.

Hills were a component of 55 percent of the lure crops and 65 percent of the 172 surrounding fields surveyed. Data analysis indicated lure crops did not have a higher probability of having a hill than any of the other surrounding fields. These data imply that hills were not a factor used by ducks when selecting a feeding site.

Grain consumption approached 100 percent in 34 percent of the lure crops. Statistically no relationship existed between the percentage of grain eaten and the effectiveness of a lure crop field. For example, one completely consumed lure crop was ineffective in preventing depredations because the birds abandoned the lure crop and damaged many of the surrounding swathed fields. Conversely, in one lure crop only a small percentage of grain was consumed before the field was released. However, that field was effective in preventing any further depredations in the surrounding area. Factors such as number of days a lure crop was utilized, population size, yield, size of field and alternative feeding sites determined the extent of grain consumption.

Population counts revealed 89 percent of the lure crops contained 2,500 birds or more at the time of purchase or shortly thereafter. In the remaining 11 percent of the fields, population levels were below 500 when purchased and never exceeded 2,500.

Size of lure crops ranged from 6-75 acres and averaged 30 acres. Based on bird use days,

the optimum size of lure crops ranged from 18-42 acres. The number of days depredations were occurring before the purchase of a lure crop ranged from 0-14. In 93 percent of the lure crops, depredations were occurring eight days or less before purchase. Some of this delay was due to the logistics of completing the lure crop agreement.

The following conditions produced optimum results: (1) harvest operations in the surrounding area were 20 percent or less done, (2) at least 2,500 birds were present in field at time of purchase, (3) an adjacent roost, (4) field size between 20-45 acres, and (5) a sufficient amount of grain to hold birds but not an excess which would result in grain spoilage.

An extremely unusual situation developed in 1980 when an all-time record 30 inches of precipitation occurred during August and September, completely flooding most small grain fields in the northeast quarter of the state. Under these conditions, thousands of highly preferred alternative feeding sites became available and birds could not reliably be attracted and held on a lure crop. Furthermore, inundation results in grain quality deterioration and prevents mechanical access to the field for harvesting. Under these conditions there was no potential for grain harvest and purchase of additional lure crops could not be justified.

Comparative efficiency studies of lure crops versus baited fields were attempted in 1979 and 1980. In 1979, two harvested small grain fields were rented and baited. The first field successfully held 10,000 ducks for 12 days. The second field was rented when the harvest was approximately 60 percent complete and resulted in limited success because of an inability to hold ducks. The 1980 study was aborted because fall rains prevented vehicle access to the prearranged field. This example indicates that when wet conditions restrict access, feeding stations would have limited value in preventing depredations.

Mechanical scaring devices were not as effective as lure crops during the early part of the damage season. Most fields in the depredation area at this time contained either standing or swathed grain both of which are acceptable feeding sites for ducks, but neither are acceptable to the farmer. During the 1980 damage season, harvest in the Devils Lake area was only 40 percent complete when waterfowl hunting season opened. Therefore, during the entire damage season, in this area, alternative feeding sites into which ducks could be scared were practically nonexistent.

DISCUSSION

Analysis of field observations and data collected from the 62 lure crops revealed the following combination of factors produced successful lure crops: (1) resolution of all complaints within a 78.5 square-mile area, (2) lure crops of a sufficient size (50-100 acres) prevented

depredations throughout a 60-day damage season, (3) lure crops which were capable of supporting a minimum population of 2,500 birds were most successful, (4) lure crops purchased early in the damage season when the harvest was less than 50 percent complete were most successful, and (5) with a benefit/cost ratio of 2:1 lure crops proved cost effective.

Several problems were noted which reduced lure crop effectiveness: (1) when fall rains flooded fields or when the harvest reached 50 percent completion, numerous highly preferred feeding sites were created and ducks could not be reliably held in the lure crop; (2) in years with an extended damage season, small lure crops were quickly consumed allowing ducks to enter and damage surrounding fields; (3) lure crops which sustained a high percentage of damage at the time of purchase, were not able to hold birds for the duration of the damage season; (4) lure crops preselected before damage occurred failed because ducks could not reliably be forced into the field; and (5) lure crops which had a small population at the time of purchase did not exceed 2,500 birds during the damage season and were not cost effective. The following factors were investigated and subsequently shown to have no effect on lure crop efficiency: the number of days of use, grain consumption, presence of hills, and fall plowing.

Analysis of the factors contributing to a successful lure crop resulted in establishment of general and specific criteria. The general criteria for implementation of a lure crop project in a state were: (1) the presence of a bird species which can be scared from field to field easily, quickly, and can be prevented from returning; (2) the ability to attract birds to a lure crop and keep them from surrounding fields; (3) a large concentration of birds must exist in the depredation area; (4) crops must be vulnerable to depredations at the time bird concentrations build up; (5) the potential for a long damage season should exist; and (6) damage must be greater than that caused by eating.

Specific criteria established for lure crop purchase were: (1) a minimum of 2,500 ducks must be present in the surrounding area; (2) during a 30-day damage season, lure crops should be no more than 50 acres in size but a 60-day damage season may require the purchase of 100 acres; (3) the number of alternative feeding sites must be minimal; and (4) damage to the field at the time of purchase must be minimal, thereby creating the potential to hold ducks for the duration of the damage season.

This study indicated lure crops were uniquely suited to North Dakota for the following reasons: (1) lure crops were used only for ducks, geese, and cranes, species which were easily frightened and cause more damage by trampling than eating; (2) only small grain which was especially susceptible to rampling was used for lure crops; (3) when fall rains delayed harvest, acceptable alternative feeding sites into which birds could be scared were minimal; (4) the agricultural practice of swathing compounded trampling; and (5) the latitude of North Dakota is such that a delayed small grain harvest coincides with waterfowl migration.

Field observations delineated circumstances under which lure crop purchases should cease. First, a lure crop should not be purchased when weather conditions result in grain deterioration and prevent harvest. Second, when the harvest reaches 50 percent completion supplemental techniques become more effective. Third, lure crops should not be purchased within two weeks of the opening of waterfowl hunting season because creating large artificial concentrations of waterfowl is not desirable at that time.

Baited fields and mechanical scaring devices were ineffective in controlling waterfowl depredations early in the damage season for the following reasons: (1) fall rains prevented mechanical access, (2) numerous alternative feeding sites existed, and (3) preselection of waterfowl feeding sites was ineffective.

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