October 1973

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Richard A. Hunt
Wisconsin Department of Natural Resources

James G. Bell
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Richard A. Hunt and James G. Bell
Wisconsin Department of Natural Resources
Horicon, Wisconsin 53032

On December 5, 1965 the Governor of Wisconsin signed into law a statute permitting claims against the State for damages to crops by wild geese and ducks. This law had been rushed through the legislature in the wake of a rash of crop depredation complaints caused by Canada Geese in their off-refuge feeding flights from the Horicon National Wildlife Refuge. This paper reviews our experiences with waterfowl depredations in the development of a cooperative program by State and Federal wildlife agencies that has held a potentially serious wildlife problem to a minimum of financial losses and public relations concern.

Background on Crop Damages by Wildlife

Wildlife damages to planted crops have been a problem for man since he began an agrarian culture. And, unless “Silent Spring” or other major catastrophies occur, it is likely to be a problem as long as there are free-roaming wildlife. In the United States recognition of crop damage by birds developed in the late 1800's concerning economic losses in grain due to English Sparrows. Blackbirds became a problem in the early 1900's with the development of rice culture. Passage of the Migratory Bird Treaty Act in 1918 established basic responsibility for crop depredations by migratory birds in what is now the Bureau of Sport Fisheries and Wildlife in the U.S. Department of the Interior. Section 10 of the Treaty directs this agency to investigate complaints and authorize control measures.

Actual payments for wildlife damage date to the early 1930's. State legislatures initially recognized deer damages and authorized use of license revenues from hunting for payments. There are at least 11 states that now compensate for losses caused by a variety of species of wildlife (Table 1). Wisconsin has had a long and expensive history with big game animals. Since 1931, 9,833 claims were paid totalling $1,099,000.00. In the 1972-73 fiscal year alone there were 103 claims in 33 counties for $48,284.23. Bear damage has also been significant with 2,478 claims for $156,700.00. This history of deer and bear compensation was an important factor in establishing our waterfowl damage law.

Waterfowl depredations were not of serious consequence until 1943 when Mallards and Pintails caused an estimated $900,000.00 loss in rice fields in California. These species plus Widgeon, Coots and geese were also involved in truck crop damages in California and Washington. Colorado and Idaho

Table 1. States and Wildlife Species Involved in Crop Damage Payments

State	Species
Colorado	Deer, other ungulates, bear, cougar, bison, turkey
Massachusetts	Deer
New Hampshire	Deer, bear, upland game birds
Pennsylvania	Bear
Utah	Deer, other ungulates, upland game birds
Vermont	Deer, bear
Virginia	Deer, bear (County funds)
Washington	Deer, other ungulates
Wisconsin	Waterfowl, deer, bear
Wyoming	Waterfowl, other migratory birds, deer, other ungulates, bear, upland game birds.

Species	
Bear	Colorado, Massachusetts, New Hampshire, Utah, Vermont, Virginia, Washington, Wisconsin, Wyoming
Deer	Colorado, New Hampshire, Pennsylvania, Vermont, Virginia, Wisconsin, Wyoming
Other Ungulates	Colorado, Utah, Washington, Wyoming
Upland Game Birds	New Hampshire, Utah, Wyoming
Waterfowl	Wisconsin, Wyoming
Other Migratory Birds	Wyoming
Bison, Cougar, Turkey	Colorado

Table 2. Crops Available to Geese on Horicon National Wildlife Refuge

	Corn in Acres	Alfalfa in Acres	Green Wheat in Acres
1965	567	553	374
1966	255	530	45
1967	387	554	480
1968	390	570	700
1969	445	565	665
1970	420	410	718
1971	540	427	205
1972	645	416	216

reported Mallards causing losses in corn. Over the course of 20 years, control methods have been developed that involve lure crops, aerial herding and scare techniques.

In the mid-1950's field feeding Mallards and Pintails became a very serious problem for grain farmers on the U.S. and Canadian prairies. In Minnesota and North Dakota, National Wildlife Refuge developed cropping programs and direct feeding to lure ducks from private lands. In Canada the damages were most severe. Manitoba authorized early September shooting in 1957-58. Alberta and Saskatchewan also issued kill permits. State and USFW personnel went to Canada to assist on control programs. Most of these efforts were of limited value.

The first resource agency to authorize payments for crop damages by waterfowl was Wyoming in 1943. State personnel there assist in control efforts on private lands. In the period 1965-69, five claims were paid totalling $2,103.00. Saskatchewan issued crop insurance in 1953 and it has been of some success. In 1966, over 800 farmers were insured for 2½ million dollars. Premiums totalled $51,000.00 but payments were $148,000.00. Alberta established crop damage payments in 1961 with the use of hunting license money. Losses may be from 3 to 6 million dollars annually but insured crops total only about 35 percent. From 1961-68, payments were made on 2,705 claims for $1,123,00.00. The problem in Canada has not diminished to acceptable levels and this could be the limiting factor in the size and management of future continental waterfowl populations.

Waterfowl Depredations History in Wisconsin

Records of crop losses were occasionally investigated by U.S. Game Management agents and state wardens and managers in the late 1940's and early 1950's in association with two small flocks of wintering giant Canada Geese *(B.C. maxima)* in Rock and Waushara Counties. These geese occasionally fed in shocked or standing corn fields during periods of deep snow. Scare techniques were effective as these flocks were very wild from persistent hunting pressure and lack of large refuge areas. Direct feeding near the open water roosts was not accepted by the birds. It was also common for farmers to accept some loss of corn as a “way of life” in the areas frequented by these winter flocks.

Spring time complaints were sometimes received on new grain seedings and new alfalfa growth by both local giant Canadas and migratory flocks. In wet spots, trampling and puddling does occur but browse by geese is not a loss factor. Geese have been accused of pulling up alfalfa plants but investigations have shown these situations to be “frost heave.”

For the record, ducks (Mallard) have caused only one bonafide depredation case before our 1965 law. This was in a temporarily flooded barley field near Horicon in 1955. Whistling swans, a common spring migrant, were involved in a small loss of spring grain in a flooded field in Manitowoc County (1955). Scare techniques were successful in keeping birds out after several acres of damage in both cases. For all practical purposes, depredations were of no significance until Horicon Marsh became a major goose concentration site.

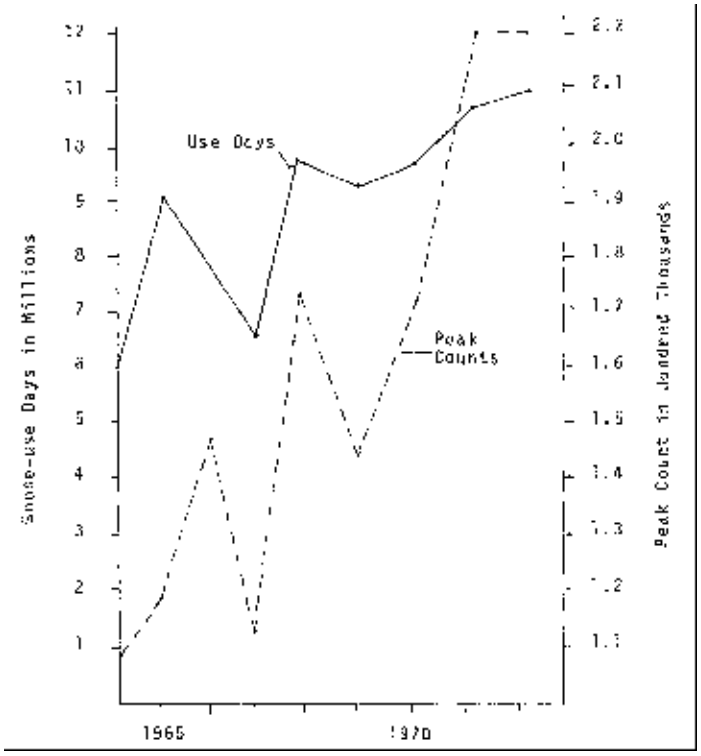

Figure 1. Autumn Canada goose-use days and peak fall count Horicon National Wildlfie Refuge, Wisconsin, 1965-1972.

Background about Horicon Marsh

Horicon Marsh is a 30,000 acre (predominantly cattail) marsh located in Dodge and Fond du Lac Counties in east central Wisconsin. The southern one-third is in State ownership and is a major public hunting and fishing site. The northern 21,000 acres is the National Wildlife Refuge. Numerous publications have been written about the large Canada Goose concentrations, harvest and management problems in the area (key references are Green 1968-72 Unpubl.; Hunt *et al* 1962; Reeves *et al* 1968; Brakhage *et al* 1971). In brief, from 1950 through 1959 our intent was to increase goose numbers and harvest by improving food conditions on the refuge and manipulating regulations to take advantage of more geese. Both efforts worked well. There were only 10,000 geese on the refuge in 1950 but peak levels increased to about 100,000 in 1960. Harvest increased from a few thousand in 1950 to about 30,000 in 1959. An actual over-kill occurred and drastic reductions in harvest were instituted via a quota system (Nelson 1961). Quotas gradually increased from 7,000 in 1960 to 20,000 in 1970 and 16,000 in 1971 through 1973. Management efforts in recent years have attempted to reduce the size and rate of harvest; efforts almost exactly opposite those in the 1950's. Techniques have included reduced food production, manipulation of aquatic habitat to make it unattractive, changing hunting regulations to increase exposure to shooting, massive direct feeding of corn, intensive air and ground hazing of geese on the refuge and a one-goose-per-season limit allotment of annual quotas. None of our efforts can be considered a success for the goose population continued to increase to an all time peak of 227,000 in 1971 and the one goose limit distributed on a lottery basis has essentially eliminated the traditional methods of goose hunting by hunters who were goose hunters. We learned how to attract and harvest geese in excess, but not how to reverse the processes to desired levels. Figure 1 and Tables 2 and 3 summarize some background information.

Pre-Damage Law Depredations

Because of the long (70 days) hunting period and heavy hunting pressure in the year 1950-56, few geese were feeding off the refuge. Occasional pre-hunting damage occurred in corn and buckwheat fields but farmers tolerated this for revenue from hunters attracted to such fields. Even thouqh delayed openings for shooting were used in the years 1957-60, as a way to encourage off-refuge feeding, no important increases in damage were reported. Farmers took some protective measures themselves to scare geese but hunting revenue was of more value in most cases where geese were eating their crops.

After the harvest quota system was established in 1960, farmer attitudes changed. Several factors were involved. While the number of geese that could be harvested was drastically reduced, the daily rate of kill remained high, averaging about 1,000 geese per day in most years. This resulted in very short hunting seasons. In the years 1960-64, days of hunting respectively were: 10, 19, 8, 36 (shooting hours 9:00 a.m. - 2:00 p.m. for most of season), 12. These short seasons not only reduced the amount of revenue for many farmers but it also allowed the geese unlimited freedom to feed outside the refuge until final departure in late November and often into late December. Significantly too, more and more geese were stopping in the refuge area during migration. Thus the farmer had some justification for requesting assistance in protecting his crops from a wildlife resource that had been attracted by

Table 3. Wisconsin Canada Goose Hunting Statistics

Horicon Zone	1965	1966	1967	1968	1969	1970	1971	1972	1973
Season Length (days)	13	2½	58	23	16	16	18	18	18
Periods of Hunting	1	1	7*	3	2	2	1	1	1
Opening Date	Sept. 25	Oct. 8	Oct. 14	Oct. 12	Oct. 18	Oct. 17	Oct. 14	Oct. 14	Oct. 11
Applications	No limit	No limit	20,984	24,479	29,393	34,737	47,000	54,709	49,017
Tags Issued	No limit	No limit	16,500	18,000	21,000	28,500	24,000	24,000	28,000
Quota	11,000	8,000	15,000	15,000	17,000	20,000	16,000	16,000	16,000
Harvest	13,354	9,617	11,659	13,169	14,752	17,283	16,999	12,501	
Outside Zone									
Season Length (days)	70	70	70	70	70	70	70	70	70
Opening Date	Oct. 9	Oct. 8	Oct. 7	Oct. 5	Oct. 4	Oct. 3	Oct. 2	Oct. 7	Oct. 1
Applications **	No limit	No limit	23,364	26,597	44,794	59,621	Permit not required beginning 1971		
Permits Issued	No limit	No limit	27,938	33,080	53,187	65,858	--	--	--
Quota	None	6,090	5,000	5,000	8,000	15,000	12,000	12,000	12,000
Harvest ***	18,446	21,608	4,189	9,012	17,183	8,544	32,700	22,440	
TOTALS									
Hunters	No limit	No limit	52,047	51,047	74,187	94,358	--	--	--
Quota	11,000	4,000	20,000	20,000	25,000	35,000	28,000	28,000	28,000
Harvest	31,800	1,193	15,839	22,208	31,935	26,347	49,699	34,941	

* Set at six periods and 51 days. Low harvest permitted 7th period and 7,500 more tags.

** 1967 - Two tags per hunter statewide; 1968 - Four tags per hunter statewide; 1969 and 1970 - Permit required but no season limit; 1971 - Permit dropped.

*** Harvest based on tag returns through 1970. USF & W statewide kill minus Horicon Zone tag returns used in 1971 and 1972.

intent and which had numerically exceeded wildlife agency ability to contain or control. Damage complaints most often were directed to the Horicon Refuge office - “those geese are federal birds so they can take care of them” was the common opinion. Assistance was provided in the form of advice and demonstration of scare techniques. Complaints investigated in the period 1960-64 were: less than 10, 7, 17, 15, 6, respectively; with the exception of four involving new alfalfa growth and two in buckwheat, corn was the crop being damaged.

Damage Law Depredations Period

Several factors were involved in Wisconsin becoming only the second state to pay for waterfowl crop damages in 1965. Crops were planted on schedule in the general area around the Horicon Refuge and growing well in late summer. Then in late August and early September, rainfall totalled 15 inches by the time the first migrant geese arrived on September 12th. It had been our intent to open goose hunting on September 25th to put early gunning pressure on the geese, hopefully to move some birds on south and reduce depredations. Unfortunatley a spectacular migration occurred on September 25-26 and peak numbers of geese (121,000) were present before October 5th. The quote of 11,000 (kill totalled 13,319) was taken in only 13 days and the season closed (October 7th). Wet weather continued with 10 more inches of rain by late November. A killing frost did not occur until early November. Thus corn harvest was extremely late; normally it starts in the first 7-10 days of October and is often two-thirds finished by November 1. Faced with these conditions, farmers could not keep geese out of many fields. Complaints were numerous to both State and Federal agencies. About 18 ton of ear corn and 8.6 acres of chopped green corn were rapidly consumed. Shelled corn was obtained from federal storage bins and fed at the rate of about 1,000 bushels per day. In total, 468 tons of shelled corn were used. Total cost of the feed was $52,000.00. From 40,000 - 50,000 geese were utilizing the food but there was little noticeable influence on off-refuge flights. State pilots used three aircraft in flying 101 hours chasing geese from complaining farmers' fields. Aerial hazing was only effective in getting geese to return to the refuge when direct feeding was in progress. Damage complaints where assistance was provided rose to 92.

As so often happens, political pressure developed when significant financial losses were occurring in an agricultural situation. Local legislators moved swiftly to provide State aid to the farmers. And, justly so since this was not an “act of god” but rather, a problem related to wildlife management, or as viewed by many, “mis-management.” The current law in Wisconsin dates from 1967 and reads as follows:

> Section 1. 20.280(1)(ue) Wild duck and goose damage. A sum sufficient for the payment of wild duck and goose damage claims under s. 29.594 (1) and (3).

Section 2. 29.594 (1) of the statutes is amended to read:

> 29.594 (1) Any owner or grower of crops on any agricultural land, except lands under state or federal control, may claim damage to such crops caused by wild ducks or geese, by filing a verified statement of his claim with the natural resources board within five days after such damage allegedly occurred. Such claim shall certify that the damage was

caused on agricultural lands to crops or to old or new seedings except unharvested sweet corn or any crops on farms where any crops are planted or manipulated for purposes of attractinq wild ducks or geese or crops not harvested in accordance with normal agricultural practices. However, if the condition causing damage is in the nature of a continuing trespass or depredation, the claimant may, in lieu of a claim, file with the natural resources board within five days from the time such damage first occurs, a notice of claim, stating the nature of the condition and that damages will be claimed as soon as the total damage can be ascertained. In such case, the claimant, if he has co-operated with the natural resources board to prevent or alleviate the damage by dispersal of waterfowl or other means, shall be entitled to recover the total damages but not to exceed $1,500 sustained during the continuance of the condition but not beyond six months after the date of the notice, provided he files a verified statement of his claim with the natural resources board within ten days after the abatement of the condition but not after six months of the date of the notice if the condition persists. No person shall be entitled to damages under this section caused by wild ducks or geese in any area during the open season for shooting same in such area unless such open season is subject to provisions limiting the number of hunters. Any owner or occupant of agricultural lands shall deduct from his claim any amounts received by both the owner and occupant for hunting or shooting rights upon said lands during said crop season.

(2) The natural resources board shall investigate and settle all claims. In all cases where the natural resources board and claimant cannot agree upon the amount of the damage, the natural resources board shall, upon not less than ten days written notice to such claimant, apply to a county judge of the county wherein the claimant resides, to try and determine all issues. At the time set, such judge shall hear the parties, and in such manner as he determines, inform himself in respect to the matter, and within five days make his award in writing and file the same. All witnesses necessary to such proceedings shall receive the same pay as witnesses in a court of record. The findings and awards of the judge are subject to review on petition of either party under ch. 227.

(3) This act shall apply to damage occurring during the 1967 open season for wild ducks and geese, and thereafter.

In original 1965 law, damage claims were (1) prohibited during the open hunting season even though hunter numbers were restricted in the intensive management zone by blind spacing of 200 yards between blinds and one blind per 20 acres, and only 2 hunters per blind, (2) limited to a total of $10,000.00 annually, (3) limited to $750.00 per claim and (4) paid if a “notice of claim” form was filed within 10 days. Also, the farmer did not need to cooperate in scaring activities. Two years of experience showed the need for changes made by the 1967 legislature.

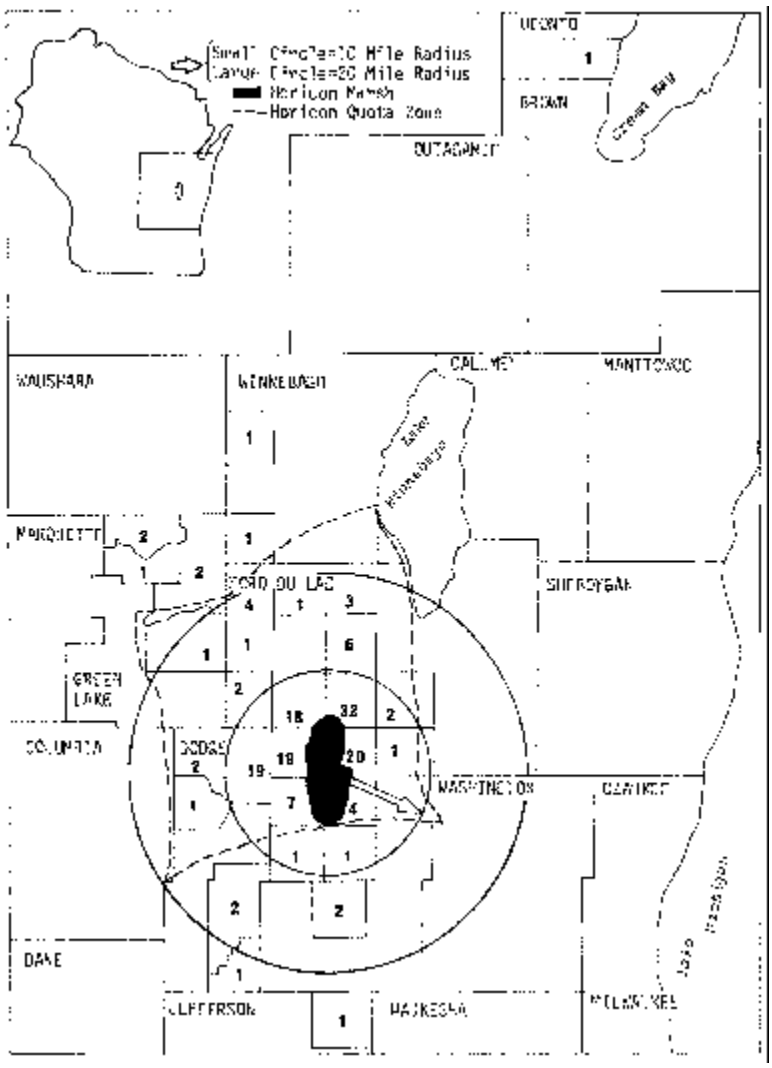

Figure 2. Number and Location by County and Township of Goose Depredation Claims Paid in Wisconsin 1965-72.

Procedures in handling complaints involved prompt field investigation to determine if there was damage covered by the law and establishing that proper forms had been provided. Both State and Federal personnel made the initial contacts. A Federal scare permit was to be signed by the farmer and a “Notice of Claim” form provided (for submission within 5 days). *Only state personnel settled claims.* If damage could be agreed upon on the initial contact, a “Report on Damage” was completed and signed by the farmer. If not, a “Continuing Damage” form was completed. Scare equipment - exploders, shell crackers, cherry bombs and plastic flags - was provided and the farmer required to cooperate in dispersal efforts. Self-help was the general rule but some anti-government farmers refused to cooperate and resulted in dispersal efforts by State and Federal personnel. Settlement of damages is usually less than claimed. Losses are determined from current market value of the crops as they exist in the field. Cases where agreement cannot be reached are referred to the County Judge for a hearing and final settlement. Basic results of the crop depredations by geese in the Horicon area are shown in Tables 4, 5 and 6 and Figure 2. Kill permits were requested in two cases and issued by the State but not the Federal agency. While no geese were officially killed to control depredations, one farmer shot several birds and reported the action.

A few highlights and related aspects in handling the law are as follows:

1965 Claims totalled $34,949.11 as submitted by the farmers. These were reduced to $17,508.00 upon inspection and agreement with State personnel. Most of these claims were settled after-the-fact of damage since the law did not become official until December 5. There were only 2 claims settled for the maximum amount of $750.00. One claim of $6,358.00 was taken to court and settled three years later for $3,631,00.00. Because final claims exceeded the $10,000.00 appropriations, a factor of 0.8296 was used to settle each claim. Fees from hunting exceeded claims in 4 cases, but this is no measure of damage as many farmers make more money than the damage or accept the geese and light crop losses.

1966 This was the “year of hazing” at Horicon Refuge. Because of the crop losses and large concentration of geese on the refuge, a plan was made to harass the birds and try to move some of them on south. State officials objected and did not cooperate as initially agreed but Federal personnel carried out the plan on the Refuge prior to the hunting season's opening. Geese were kept off the refuge during the day by scaring techniques (mostly exploders), aircraft, boats and manpower, but returned to roost at night. With about 102,000 geese sitting on private land when hunting started, an excessive kill occurred in only 2½ days of shooting and the season was closed. Although there was very limited hunting and a reduced food program on the refuge, only 49 complaints were handled.

1967 A new hunting control system was started involving a one goose-per-season limit for the Horicon goose quota. This system drastically reduced hunting pressure and farmer income from hunting fees. Weather conditions were wet and there was a late frost which delayed corn harvest. Damage complaints were the heaviest on record (170). Two claims exceeded the $1,500.00 limit and 3 claims were settled in court for higher amounts than offered by State fieldmen.

Table 4. Goose Depredations Complaints and Costs in Wisconsin 1965-73*

Year	Number of Complaints	Number of Notice of Claim	Number of Complaints Paid	Amount of Damages Paid	Field Service Costs for State
1965-66					
Fall	91	43	43	$30,946.24**	$1,295.69
Spring	29	11	11	2,682.52	
1966-67					
Fall	49	13	11	1,604.13	$3,318.09
Spring	30	0	0	--	
1967-68					
Fall	123	77	42	7,413.30	$5,573.77
Spring	71	10	9	--	
1968-69					
Fall	97	11	8	1,252.61	$3,609.48
Spring	23	3	0	--	
1969-70					
Fall	134	17	15	2,746.71	$3,336.33
Spring	99	9	7	264.50	
1970-71					
Fall	59	2	2	989.01	$1,373.78
Spring	31	7	76	3,313.80	
1971-72					
Fall	35	5	5	741.60	$1,891.01
Spring	12	2	1	50.00	
1972-73					
Fall	85	19	6	780.67	$768.69
Spring	18	7	0	--	
Subtotal					
Fall	760	173	131	76,477.84	
Spring	157	24	30	6,309.32	
GRAND TOTAL	931	197	161	$34,782.25	$22,056.31

* Complaints handled by Federal personnel at Horicon Refuge are included but cost figures were assumed. Only one complaint (and its claim) is outside the area of influence of geese associated with Horicon Marsh.

** Includes one claim of $3,601.00 awarded by Small Claims Court decision in 1968 on original damage agreement of $6,354.00.

Table 5. Kinds of Crops in Goose Depredations in Wisconsin 1965-73.

Year	Number of Spring Complaints					Number of Fall Complaints					
	Alfalfa Seeding	Mature Alfalfa	Previous Year's Corn	Other Crops*	Total	Standing Corn	Mature Alfalfa	Alfalfa Seeding	Buck-wheat	Other Crops	Total
1965	2				2	93		6	3	1	103
1966			23		23	40		4		3	47
1967	9	1	1		11	150	4	16	8		178
1968	11			2	13	86	5	6	1		98
1969	22		1		23	129	2		3		134
1970	14		5	1	20	57		2			59
1971	8		16		24	93		2			95
1972	8		9	1	18	80			1	1	82
1973	2		9	2	13						
TOTAL	76	1	63	5	145	725	11	36	9	5	786
Percentage by crop	53	1	43	3	100	92	2	5	1	T	100

* Other crops were Spring: 1968 - 1 oats; 1970 - 1 peas; 1972 - 1 sorghum; 1973 - 2 soybeans
Fall: 1965 - 1 soybeans; 1968 - 2 winter wheat and 1 rye; 1972 - 1 oats (by ducks)

Table 6. Comparison of Goose Depredations Complaints and Claims Paid in Wisconsin in Period 1965-1973.*

Type of Crop	Complaints		Claims Paid	
	Number	Percent	Number	Percent
Corn	786	84.7	157	92.6
Alfalfa Seeding	111	12.0	5	3.1
Mature Alfalfa	13	1.4	2	1.0
Buckwheat	9	1.0	2	1.3
Other Crops	9	1.0	1	.6
TOTALS	928	100.1	163	100.0

* Claims were paid on 17 percent of all complaints investigated.

1968 Although the fall weather was dry and an early corn harvest oocurred, the peak goose count rose to 172,000 and complaints were common. Actual damage was low on only 8 claims.

1969 A major breakthrough in public attitude and acceptance of government concern and willingness to help the farmers developed as a result of three meetings with farmers in late summer. Federal Wildlife Extension Specialist Oner Swenson organized and obtained help of others to sell the need for cooperation of farmers and wildlife agencies. Local farmers were advised to make immediate requests for help when geese first landed in their fields. Calls to either State or Federal offices were referred to radio-equipped trucks. Complaints were often answered in minutes and seldom took more than one day. While corn harvest was late, due to climatic factors, and complaints high (134), claims were not high (17 paid).

1970-72 No major damages have occurred sonce the system for prompt response to complaints was developed. Most farmers now recognize the need for early scare techniques and they readily utilize the assistance program available.

An Overlook at Goose Depredations and Its Future in Wisconsin

Goose depredations, with the exception of one case involving a local flock of giant Canadas, have not been a problem except at Horicon Marsh. Although there are several thousand geese using each of over a dozen state-owned waterfowl projects, hunting pressure and monetary return from hunting fees apparently control the crop damage situation. The potential for complaints does exist and some real damaqes can be expected as management success increases goose numbers and farmers become familiar with the opportunity to recover damages.

At Horicon a high threat potential will probably always exist for several reasons.

1. The local farm economy is geared to dairy cattle crops of alfalfa hay, high-yield corn production and an abundance of natural blue-grass-sedge marsh pasture.

2. Canada Geese are much like a cow, being an upland grazer with a preference for alfalfa and grass as browse and field corn where ever and whenever it is available.

3. Current goals in the Mississippi Valley Canada Goose Population (Hanson and Smith 1950) are a fall flight of 400,000 and a winter flock of 300,000. About 80 percent of the fall flight passes through eastern Wisconsin with most of them stopping at Horicon Refuge. The State satellite goose projects have not influences the Horicon concentration and probably will not even at peak development.

4. During spring migration Canada Geese are as numerous as in fall, but they do spread out over a larger area. This strong spring use builds the tradition to return in fall. In years when corn has been unharvested over winter, depredations can occur. The abundance of browse and corn available in spring is highly significant in the ecology of the goose and its survival on the breeding range.

5. Hunting, as it evolved under the one-goose-per-season limit and harvest quota system, has lost its influence as a factor in regulating off-refuge feeding activities. The geese have almost free reign of the entire Horicon Zone from arrival in mid-September to departure in December.

6. Goose behavior has changed drastically in recent years as a result of refuge management. At Horicon refuge the birds now do not even hesitate to land and feed in standing corn fields. Frequent use of exploders for depredations control has reduced wariness to gunshot-like noises. Feeding activities in crop fields in close association to the non-consumptive bird watchers, photographers, etc. is also reducing fear of man. All of these factors contribute to our difficulty in scaring geese and keeping them out of crop lands needing protection.

7. Food resources on the refuge are probably adequate to support a fall goose population of about 50,000 birds. Current peak couns are over 4 times this level. Any plan to increase the Mississippi Valley Goose Population probably will result in an even larger number of geese at Horicon.

The Future

A few alternatives relate to possible solution of depredations at Horicon:

1. A drastically reduced goose population is probably the best answer. Not many options to do this are untried. The combination of less sanctuary, greater disturbance both on and off the refuge, and less food and water have not been treid for an entire season or several seasons in a row. The consequences of pushing 150,000 or so geese out on private land are a big unknown if the geese failed to move on south immediately.

2. An increased refuge food supply might have some affect but the geese cause depredations within a short time after arrival under an abundance of food in the sanctuary area. More acres could be farmed, more land purchased and direct feeding increased over the 1965 level. The result may very well be one of attracting and holding an even larger number of geese.

3. Provide other forms of financial relief for farmers if possible. A Federal assistance program like the State law has merit but could become a drain on funds if extended to other refuges and other wildlife species like blackbirds. Crop insurance has not been acceptable due to high premiums in a high risk area. Tax relief has not been explored nor has subsidized assistance been considered for exploders or use of surplus grain in repayment of losses.

Each goose damage claim costs the State about $216.00 but probably totals $350.00 including the entire Federal effort. The average cost over 8 years is about $10,000.00 annually. Looking at it in another way, it suggests a cost of from $.50 to $1.00 per bird harvested, a modest sum for Wisconsin for such a sought-after resource. Keep in mind that the Federal government finances the Horicon Refuge goose management program.

In all probability, we will have to live with current or even higher Canada Goose populations and our crop damage law even though it is unsound management. Biologically there are too many geese in the Horicon Refuge area. However, when considering the number of bird watchers, photographers and sightseers that enjoy the resource (they outnumber hunters several fold), the present cost of crop damage is a small expenditure. Some other major factors, like a disease outbreak, probably will be the incentive that directly forces a reduction in geese at Horicon and indirectly reduces the depredation potential.

Selected References on Waterfowl Crop Depredations

Bossenmaier, E.F. and W.H. Marshall. 1958. Field feeding by waterfowl in southeastern Manitoba. Wildlife Monographs, No.1.

Day, A.M. 1944. Control of waterfowl depredations. T.N.A.W.C. 9:281-287.

Farms, R.E. 1969. Crop insurance for waterfowl. T.N.A.W.C. 35. In press.

Griffeth, R.E. 1964. Forage and truck crops. Waterfowl Tomorrow: pp. 445-452.

Hammond, M.C. 1964. Ducks, grain and American farmers. Waterfowl Tomorrow: pp. 417-424.

Hochbaum, H.A., S.T. Dillon, and J.L. Howard. 1954. An experiment in the control of waterfowl depredations. T.N.A.W.C. 19:176-181.

Horn, E.E. 1949. Waterfowl damage to agricultural crops and its control. T.N.A.W.C. 14:577-585.

Horn, E.E. and L.L. Glasgow. 1964. Rice and waterfowl. Waterfowl Tomorrow: pp. 435-443.

Jahn, L.R. 1969. Migratory bird crop depredations: a naturalist's view of the problem. Migratory bird crop depredations workshop, July 15-16, University of Maryland. Multilith 33p.

Jakimchuk, R.D. 1970. An analysis of agricultural damage by waterfowl in Alberta. T.N.A.W.C. in press.

Kalmback, E.R. 1935. Protecting grain crops from damage by wildfowl. Wildlife Research and Management leaflet, BS-13.

Maier, W.W. 1953. Ducks and grain. T.N.A.W.C. 18:111-117.

Munro, D.A. and J.B. Gallop. 1955. Canada's place in flyway management. T.N.A.W.C. 20:118-125.

Paynter, E.L. and W.J.D. Stephen. 1964. Waterfowl in the Canadian breadbasket. Waterfowl Tomorrow: pp. 409-416.

Scouler, L. 1952. Crop depredations by waterfowl. T.N.A.W.C. 17:115-123.

Wagar, J.V.K. 1946. Colorado duck damage, grain crop problem. T.N.A.W.C. 11:156-160.

Wildlife Management Institute. 1968. Organization, authority and programs of state fish and wildlife agencies. Wildlife Management Institute, Washington, D.C.

Literature Cited

Brakhage, G.K., H.M. Reeves, and R.A. Hunt. 1971. The Canada Goose Tagging Program in Wisconsin. Trans. N. Am. Wildl. Rat. Resour. Conf. 36:275-295.

Hanson, H.C. and R.H. Smith. 1950. Canada Geese of the Mississippi Flyway. I11. Nat. Hist. Surv. Bull. 25, Art. 3:67-210.

Hunt, R.A., J.G. Bell, and L.R. Jahn. 1962. Managed Goose Hunting at Horicon Marsh. Trans. N. Am. Wildl. Nat. Resour. Cong. 27:91-106.

Nelson, H.K. 1961. New Approaches in Canada Goose Management. Mid-West Wildl. Conf. Lincoln, Neb. Dec. 4-6, 1961. 24pp. (Multilith).

Reeves, H.M., H.H. Dill, and A.S. Hawkins. 1967. A Case Study in Canada Goose Management: The Mississippi Valley Population. In, Canada Goose Management. Dembar Educ. Res. Serv. Inc. Madison, Wis. 195pp.

Green, W.E. 1968-72. Wildlife Management Study Reports: The Phenology of the Fall Migration of Canada Geese in Dodge and Fond du Lac Counties, Wisconsin, and its Relation to Agricultural Crops. Unpublished U.S. Fish and Wildl. Services, Div. of Refuges, Federal Bldg. Fort Snelling, Twin Cities, Minn.