Wild turkeys and agriculture in northeastern Iowa

by

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INTRODUCTION

Wild turkey (Meleagris gallopavo) populations are flourishing throughout agricultural regions of the Midwest due to successful reintroduction programs (Clark 1985). The successes are due largely to the turkeys' ability to thrive in what was once considered "marginal" habitat, including the highly agricultural state of Iowa (Little 1980), where only 4% of the land area is forested (Thomson and Hertel 1981). Along with increasing turkey populations, there are an increasing number of unsubstantiated reports of spring and fall turkey damage to corn, soybeans, alfalfa, and oats in several states including Iowa (DeWaine Jackson, Iowa Department of Natural Resources, pers. comm., August 1988).

Since 98% of Iowa is privately owned (Huemoller et al. 1976), turkeys are dependent upon the private land-owner/operators for the majority of their habitat. Some landowners have expressed concern about perceived agricultural losses from turkeys. State wildlife agencies, on behalf of turkey hunters and others, wish to maintain high density turkey populations on these private lands. Wildlife managers find themselves in a challenging situation, managing a highly sought after game bird as a public resource on private lands where its presence is sometimes considered potentially damaging to agricultural crops.

The publicity and attention created by the real or

perceived turkey damage could, at the least, influence management decisions (Craven 1989:113). Therefore, wildlife managers desire sound biological data concerning turkey-crop interactions before making decisions on population levels and establishing hunting regulations. The objectives of this study were to survey landowner/operator attitudes towards wild turkeys and perceptions of turkey damage, and to determine the extent of turkey use of corn and oats in a mixed forest-agriculture ecosystem.

STUDY AREA

The northeastern section of Iowa, including Winneshiek County, has the highest turkey densities in the state (DeWaine Jackson, unpub. data) living in a fragmented mixture of agricultural fields and hardwood forests. Habitat interspersion, high turkey density, and turkey use of agricultural fields have combined to produce numerous vocal complaints by farm operators about turkey damage to agricultural crops.

The state-owned Coon Creek Wildlife Management Area (CCWMA) was chosen as the study site because of its mixture of forest and agricultural fields and large numbers of turkeys present. CCWMA is located on the Upper Iowa River on the Winneshiek/Allamakee county line, and is included in the "driftless" region of northeastern Iowa, southeastern Minnesota, and southwestern Wisconsin. This region is characterized by deep, narrow, V-shaped valleys and long, angular ridges, with maximum relief approaching 110 m (Little 1979:2). Deciduous forest surrounds agricultural fields of 1.2-6 ha that are leased to private farmers. In 1990, the area was approximately 65% deciduous forest, 13% corn, 8% hay and oats, and 14% idle or abandoned fields.

The forests of the driftless area are characterized by elm-ash-cottonwood bottomlands, and upland mixed hardwoods. These forests can be classified by 5 dominance types: Quercus

alba, Q. rubra, Acer saccharum, Tilia americana, and Pinus strobus (Cahayla-Wynne 1976, Glenn-Lewin et al. 1984). A more detailed description of these dominance types and their associated species may be found in Cahayla-Wynne (1976) and Glenn-Lewin et al. (1984).

Climate is characterized by warm, humid summers and cold winters. The monthly mean temperatures for Cresco (the nearest recording station) range from -10 C in January to 22 C in July. Normal annual precipitation is 86 cm; mean annual snowfall is 102 cm (Ruffner 1980).

METHODS

Landowner/Operator Survey

In February 1990, a mail survey with cover letter (Appendix A) was distributed to 475 randomly chosen landowner/operators in 4 northeastern Iowa counties (Winneshiek, Allamakee, Clayton, and Fayette) to determine their perceptions of turkey and other wildlife damage, their levels of tolerance for turkey damage, and the amount of turkey hunting allowed on their land. A second mailing was sent to those who did not respond within 4 weeks. Results from the 2 groups of respondents were compared using the Frequency Procedure (SAS Institute 1985:945-958), and then combined for further analysis.

Spring Corn and Oats

Wild turkeys were trapped by rocket net on CCWMA from January to March 1990. These turkeys were fitted with 7g radio transmitters (Telemetry Systems Inc., Mequon, WI) attached backpack-style with 1/4" diam. shock cord. The fate of these transmittered birds is reported in Appendix B.

Each year, crop fields (2 corn and 2 oat in 1989, 1 corn and 2 oat in 1990) that had evidence of turkey activity (tracks, droppings, feathers, etc.) were chosen for assessment of time and activity of turkeys. Fields were observed during 8 randomly chosen 2-hour time blocks beginning at sunrise and

ending at sunset. Each field was observed in all 8 blocks before observation blocks were again randomized. Observations in each field began within 5 days of planting as follows: corn, 4 May 89 to 17 June 89 and 26 April 90 to 14 July 90; oats, 26 April 89 to 17 June 89 and 26 April 90 to 15 July 90. Blinds that concealed observers were used to minimize disturbance. Time in the field of each individual turkey was recorded continuously.

Four corn fields in 1989 and 5 in 1990 were randomly chosen to determine extent of turkey damage. Each field was divided into 10-row-wide concentric zones that followed the field outline. Next, 10 transects were randomly located starting at the field edge and extending inward perpendicular to the direction of the rows. One 10-m long by 2-row-wide plot was randomly placed within each zone, starting at, and perpendicular, to the transects. Each zone had 10 plots, and fields had 20 to 50 plots, depending on field width.

Once a week, from 26 May 89 through 17 June 89 and from 25 May 90 to 18 June 90, the number of plants sprouted or grazed (or otherwise damaged) within each individual 10 m X 2 row plot was recorded. Also, presence of turkey and/or deer sign was noted. The percentage of damaged or removed seeds or seedlings per field, week, and distance class was then determined and analyzed using the GLM Procedure (SAS Institute 1982:139-200).

Oat damage was recorded in a similar manner to corn, but

with changes to accommodate the larger numbers of plants and the lack of obvious rows. Fields were divided into 10-m wide concentric zones. Ten random transects were drawn perpendicular to the field edge. A 1 m^2 plot was then randomly located along each transect within each zone. Four oat fields were measured in 1989; only 1 was measured in 1990 as the farmer changed his plans at the last minute. All data for oats were combined. Data were collected from 5 May 89 to 22 May 89 and from 28 April 90 to 25 May 90.

Digestive crops from hunter-shot turkeys were collected during the spring hunting seasons. Contents were rinsed and air-dried for at least 24 hours before weighing. Results are presented in Appendix C.

Fall Corn

Six mature corn fields were randomly chosen each year to evaluate the extent of turkey damage to fall corn. Two randomly located points were the beginning of 2 transects extending inward perpendicular to the direction of the rows. Perpendicular to each transect, a 10 m long plot was located at every other row starting with the first row on the field edge and continuing to the 19th row (25th in 1989) from the edge, or to half the width of the field, whichever was less. Plots were then grouped by distance from the edge using 3 plots per class. Thus, Class 1 included the 10 m plots from rows 1, 3, and 5; Class 2 included rows 7, 9, and 11, and so

on. Analysis was based on data from these classes.

Within each distance class, number of ears present, number of damaged ears, and species group believed responsible were recorded. Species groups included "Deer" (Odocoileus virginianus) and "Turkey and other" in 1989; categories in 1990 included "Deer," "Raccoon," (Procyon lotor) and "Turkey and other." The "Turkey and other" category was necessary as it was impossible to distinguish damage by turkeys, other birds, and sometimes squirrels. Deer damage was readily identifiable as an ear with the end bitten off, cob and all (pers. obs.). Raccoon were assumed responsible if the entire ear was missing from inside the leaves that normally enclose the ear, and not found immediately beneath the stalk.

Since proportions (percentages) are not normally distributed, all spring corn, spring oat, and fall corn data were transformed using the formula:

$$p' = \frac{1}{2}\left[\arcsin\left(\sqrt{\frac{X}{n+1}}\right) + \arcsin\left(\sqrt{\frac{X+1}{n+1}}\right)\right]$$

(Zar 1984:240), where p' is the transformed proportion, X is the number of seedlings grazed or ears pecked at, and n is the number of seedlings or ears available. Data were analyzed using the GLM Procedure (SAS Institute 1982:139-200). All means and standard errors reported were from untransformed data.

RESULTS

Landowner/Operator Survey

A total of 337 questionnaires was returned, 255 from the first mailing, 82 from the second. Not all respondents answered all 15 questions. Chi-square tests showed no differences in responses between the 2 groups or the counties surveyed, so data were pooled.

Eighty-two percent of the respondents (271/337) had turkeys on their land; 64% of these (174/271) reported damage by turkeys. Based on 337 respondents, the percentage of turkey and deer complaints were similar (52% to 54%). However, deer damage complaints are likely underestimated because many farmers without turkeys or turkey damage did not respond to the deer questions. Of 158 respondents with turkey damage, 97% also reported deer damage; of 62 without turkey damage, 87% reported deer damage. This difference is not significant ($P = 0.056$), though it might have been had more of those without turkey damage answered this question. Other species cited as problems included racoon, beaver, squirrels, and blackbirds.

Turkeys reportedly damaged corn more often than any other crop (Table 1). The low percentage for soybeans parallels the relative scarcity of soybeans in the survey area. Damage to each crop varied by season (Fig. 1).

Landowners estimated their economic losses to turkeys by

Table 1. Percentage of northeastern Iowa landowner/operators (n=152) reporting 6 types of damage associated with wild turkeys. Respondents could choose more than 1 answer

Crop/type of damage	% of respondents	95% C.I.
Corn	88	83-93
Oats	42	34-50
Hay	24	17-31
Hunter damage/ harrassment	13	8-18
Soybeans	7	3-11
Other	1	0-3

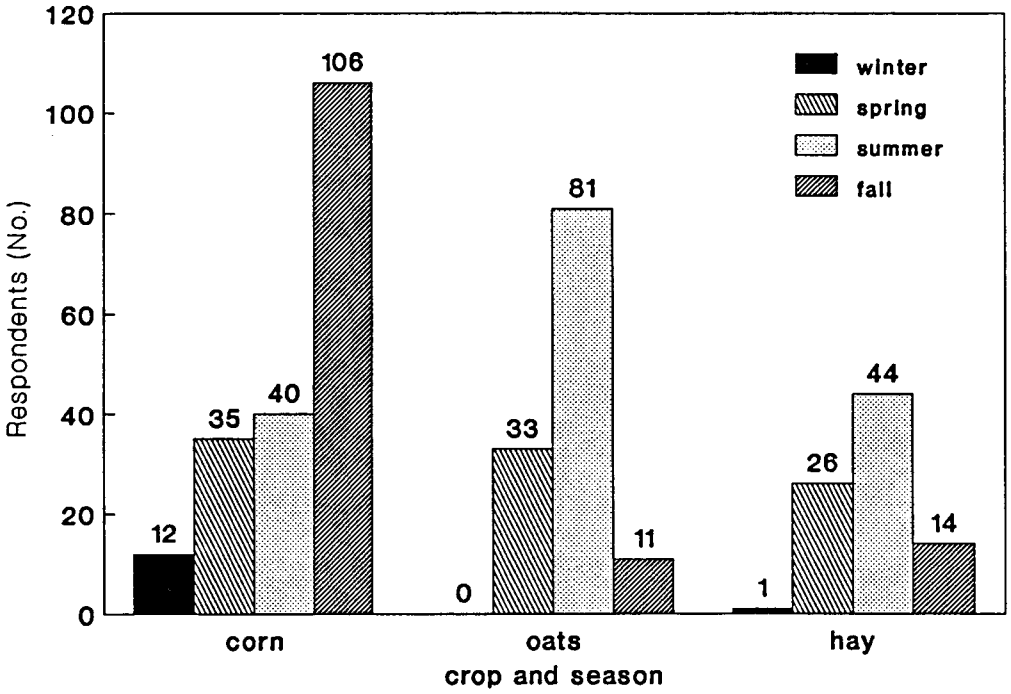

Fig. 1. Seasonal incidence of wild turkey damage to 3 major crops based on landowner/operator survey in northeastern Iowa, 1990

choosing 1 of 5 alternatives. Respondents that did not choose 1 of the answers provided were assumed to have lost $0. Forty-three percent of the 337 respondents estimated their losses from $1-500, and 5% estimated losses at > $500 (Fig. 2). A similar survey of Wisconsin farmers found similar estimated losses (Craven 1989) (Fig. 2).

Fifty-six respondents (17%) in Iowa reported some gain from the presence of wild turkeys, though not necessarily financial. Benefits listed included insect control, sport hunting, or an appreciation of wildlife in general. Some landowners listed turkeys as both a nuisance and a benefit - turkeys may eat some corn, but may also control some grasshoppers.

Landowners were asked to indicate the methods they used to reduce turkey damage. The vast majority said they did nothing, while none said they called the Department of Natural Resources or Extension Service for advice (Table 2).

Increasing the turkey harvest one way or another was the most popular solution for reducing turkey damage (Table 3). Additional solutions suggested by respondents included lowering license fees, allowing >1 turkey per license, and issuing more free landowner licenses. Relocation of turkeys and monetary compensation received less support as solutions to turkey damage.

Not surprisingly, landowners reporting turkey damage had different attitudes toward the current turkey numbers than did

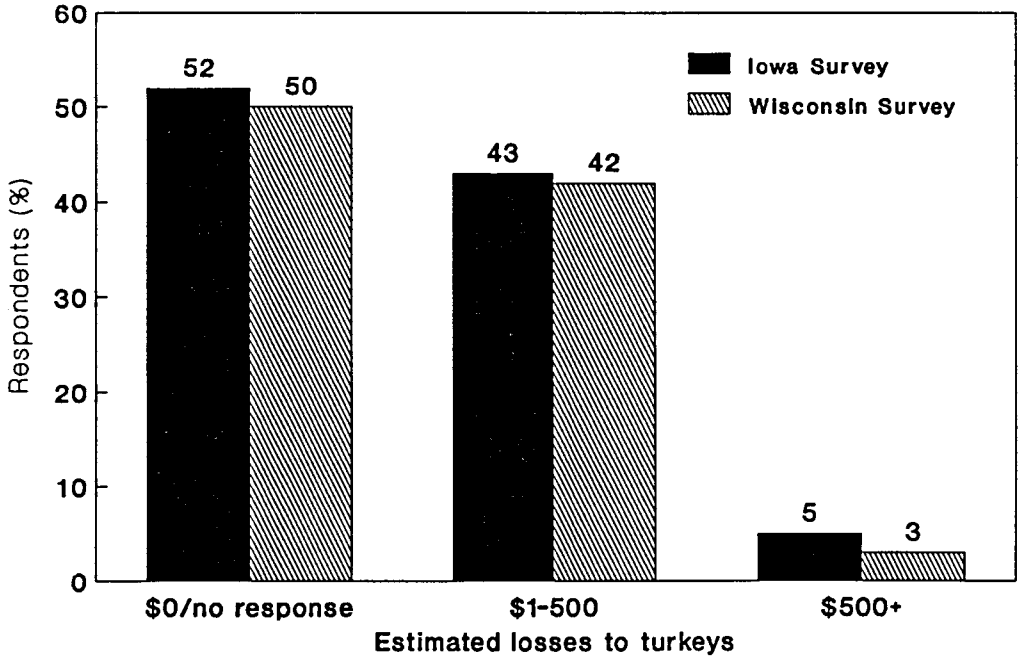

Fig. 2. Landowner/operator estimates of financial loss to wild turkeys based on surveys in northeastern Iowa and southwestern Wisconsin. Respondents in Iowa who did not answer this question were assumed to have lost $0. Five percent of Wisconsin respondents reported turkeys as a benefit, and were not included in this figure. (n=337 for Iowa, n=279 for Wisconsin). Wisconsin data from Craven (1989)

Table 2. Percentage of northeastern Iowa farm owner/operators (n=198) indicating methods of controlling turkey damage. Respondents could choose more than 1 answer

Method	% of respondents	95% C. I.
Do nothing	73	67-79
Encourage hunting	28	22-34
Scare with exploders, etc.	4	1-7
Other	2	0-4
Call DNR or Ext. Ser.	0	0

Table 3. Percentage of northeastern Iowa farm owner/operators (n=170) indicating preferred solutions to turkey damage. Respondents could choose more than 1 answer

Solution	% of respondents	95% C. I.
Increase fall harvest	47	40-59
Increase spring harvest	41	34-48
Longer seasons	34	28-41
Monetary compensation	31	24-38
Other	23	17-29
Trap/relocate	13	8-18

those without turkey problems (χ^2 = 23.3, 2 d.f. P < 0.001, Fig. 3). Those with turkey damage felt there were too many turkeys. Also, the 2 groups of respondents felt differently about the changes between 1988 and 1989 in the amount of turkey damage (χ^2 = 35.1, 2 d.f., p < 0.001, Fig. 4). Those with turkey damage felt that damage had increased, while those without felt it had stayed the same. Many respondents commented that turkeys were not a problem now (at current numbers), but they expect problems if the population increases.

Spring Corn and Oats

Over the 2 years, wild turkeys were present in the corn and oat fields approximately 1% of the observation time (Table 4). When present, turkeys were observed pecking at the ground, but never appeared to scratch up seeds or seedlings or to graze directly on any seedlings. One hen was observed to uproot a single seedling on 24 May 90 while dusting in a corn field for about 30 minutes. Neighboring plants were not injured.

In 1989, 20 turkeys were observed in the fields. Accurate records for deer were not kept in 1989, but at least 8 were seen grazing on corn and oat seedlings. In 1990, 7 turkeys and at least 23 deer were seen in the fields during observation periods. Deer were observed grazing on both corn and oat seedlings. Gray squirrels (Sciurus carolinensis) were

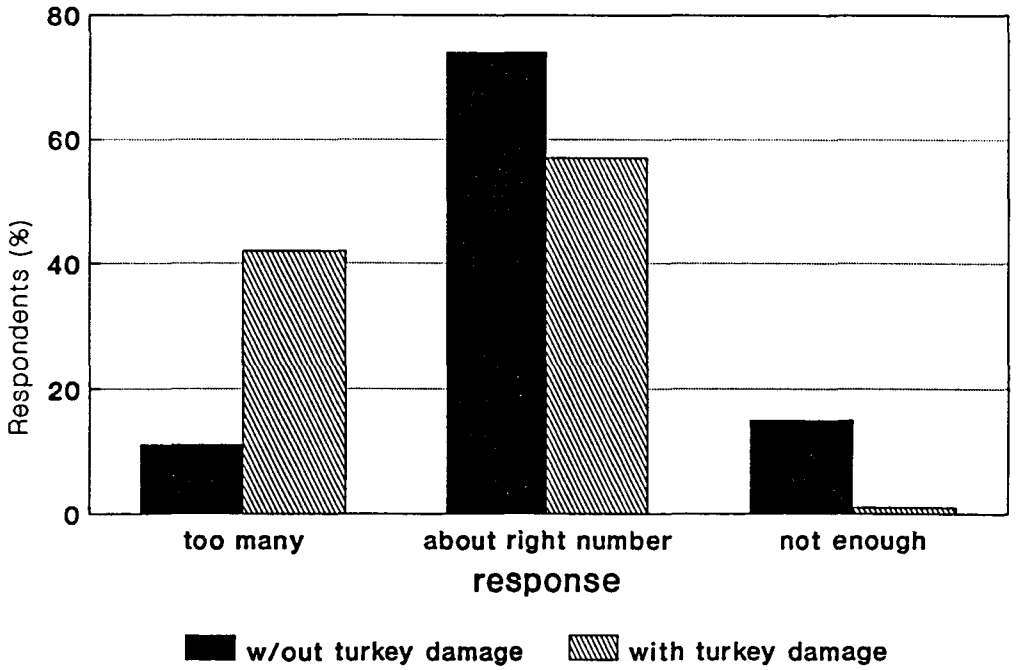

Fig. 3. Attitudes of northeastern Iowa landowner/operators toward current numbers of wild turkeys in their area. Respondents were asked whether they felt there were too many, not enough, or about the right number of turkeys. Respondents were divided into 2 groups - those reporting crop loss to turkeys and those not

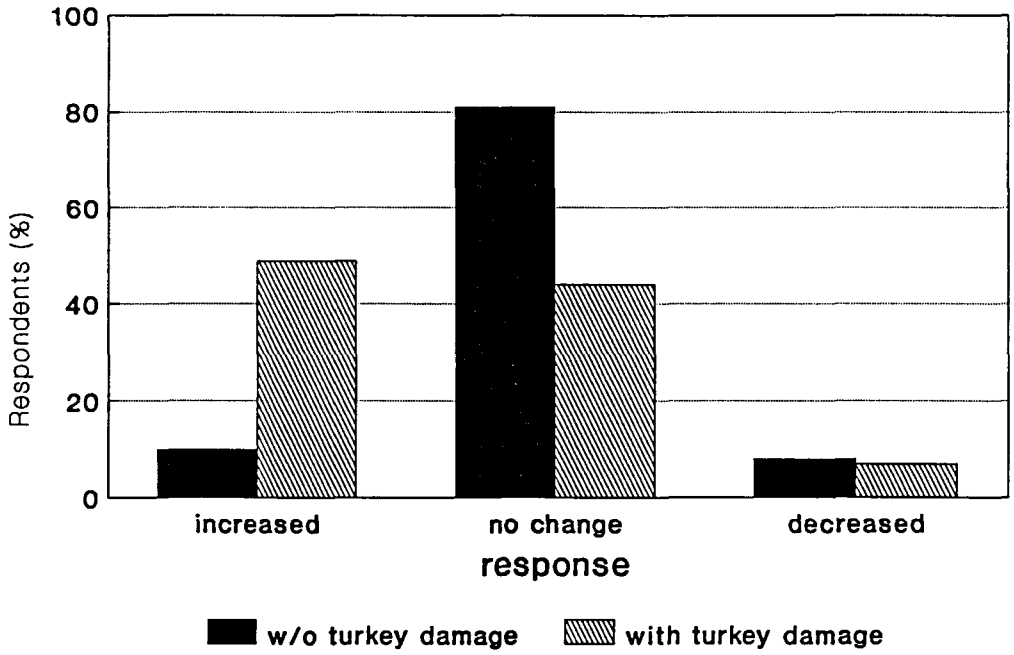

Fig. 4. Perceptions of changes in the extent of wild turkey damage to crops in northeastern Iowa in 1990. Respondents were asked whether they felt that wild turkey damage had increased, stayed the same, or decreased in the last 2 years. Respondents are divided into 2 groups - those reporting turkey damage and those not

Table 4. Observations of wild turkeys in corn and oat fields during spring and early summer on CCWMA 1989, 1990

	1989	1990
Time of field observation (min.)	13,620	11,515
Turkeys observed (total min.)	107	144
Percent	0.93	1.25
Turkeys observed from:	15 Apr-20 Jun	21-29 May

also seen to uproot several seedlings. Grazing, clipping, or uprooting of seedlings by turkeys did not occur during observations in either year.

Presence or absence of turkey tracks was not related to damage in either year. The presence of deer tracks was positively associated with seedling damage in 1990 (Table 5).

The overall mean percentage of damaged oat plants was 0.88% (+/- 0.13 SE) per 1 m^2 plot. In 1989, an average of 0.59% (+/- 0.072 SE) of corn seedlings in each 10 m X 2 row plot was damaged by wildlife. In 1990, the average was 0.36% (+/- 0.042 SE) plants damaged per plot. Seventy-two plants were grazed below the first leaf base (and not expected to survive) and marked for further study in 1990. Ten of these (4.4%) died before the end of sampling (18 June); the remainder had recovered and were healthy on 18 June.

Fall Corn

During the week before each field was harvested in 1989 (17 Oct or 24 Oct), a total of 3,206 mature ears of corn was examined for damage. Seventy-four ears (2.31%) received turkey damage; 109 (3.40%) were damaged by deer. Of the turkey-damaged ears, 57 were found in the first distance class (rows 1,3,5), 10 in the second, 7 in the third, and 0 in the fourth. A total of 3,938 ears was examined for damage in 1990 before the fields were harvested. Thirty-four (0.86%) of these ears were damaged by "turkey and other," 37 (0.94%) by

Table 5. Relationship between presence or absence of wildlife sign (tracks, feathers) and presence or absence of damaged corn seedlings in newly planted corn fields on CCWMA in 1989 and 1990. Number of 10m X 2-row plots falling within each category is shown

	1989					
	Turkey only		Deer only		Both	
	Sign	No sign	Sign	No sign	Sign	No sign
Damage	15	158	122	158	56	158
No damage	6	58	59	58	19	58
n		237		397		285
d.f.		1		1		1
χ^2		0.029		1.56		0.010
$P > \chi^2$		0.865		0.211		0.922

	1990					
	Turkey only		Deer only		Both	
	Sign	No sign	Sign	No sign	Sign	No sign
Damage	25	239	229	239	70	239
No damage	4	18	70	18	22	18
n		286		556		340
d.f.		1		1		1
χ^2		1.69		27.93		19.09
$P > \chi^2$		0.19		< 0.001		< 0.001

deer, and 55 (1.40%) by raccoon. Fifteen of the turkey-damaged ears were found in the first distance class, 11 in the second, 7 in the third, and 1 in the fourth.

The ears damaged by turkeys had missing kernels only; the remainder of each of these ears was harvested. On average, 68% (+/- 37% SD) of each individual ear was missing in 1989, 54% (+/-31% SD) in 1990.

Analysis of variance for the transformed data in 1989 showed no difference in the average percentage of ears damaged by turkeys among the 6 fields ($P = 0.81$). The overall mean of turkey-damaged ears for the 6 fields was 1.14% (+/- 0.26 SE). There were no differences between the 2 weeks (1.21% +/-0.38 SE vs. 1.05% +/-0.32 SE, $P = 0.099$), and the field-week interaction was insignificant ($P = 0.99$). Distance classes within individual fields showed significantly different average percentages of ears damaged by turkeys ($P = 0.005$), with the first class the most damaged in each individual field and overall ($P < 0.05$, Fig. 5). Numbers of ears available also varied by distance class (Fig. 5).

Analysis of 1990 data also showed no significant difference between fields ($P = 0.52$). The overall mean percent of damaged ears for the 6 fields was 2.06% (+/- 1.03 SE). The field-week interaction was not significant ($P = 0.52$), but there was a significant difference in the average percentage of ears damaged by turkeys among the 6 weeks ($P = 0.0001$, Table 6). Distance classes within individual fields

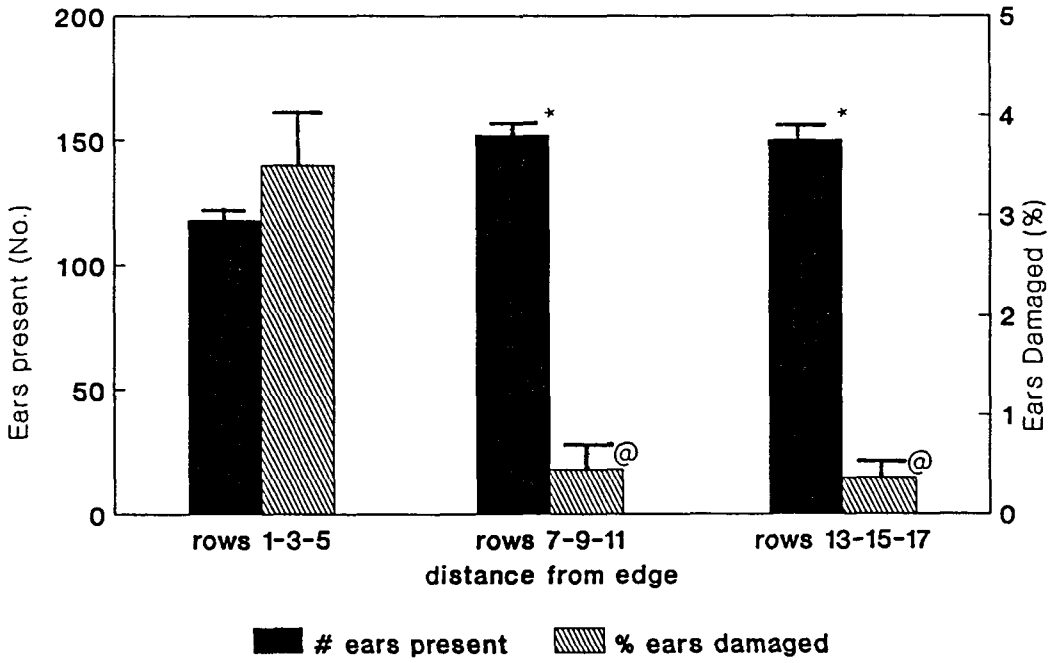

Fig. 5. Numbers of ears of corn available and percent of ears damaged by "turkey and other" by 3-row distance class on CCWMA in 1989. Means are shown + 1 SE. * indicates means of ears present that are not significantly different between classes at P = 0.05. @ indicates means of ears damaged that are not significantly different at P = 0.05

Table 6. Percentage of corn ears damaged per 3-row distance class by "wild turkey and other" on CCWMA over a 6-week period, 19 Sep.-25 Oct. 1990

Date	No. plots	Mean %	S.E.
19 Sep	40	0.19[b*]	0.083
26 Sep	40	0.39[ab]	0.115
4 Oct	40	0.53[ab]	0.131
11 Oct	36	0.70[a]	0.195
18 Oct	20	0.54[ab]	0.226
25 Oct	20	0.69[a]	0.299

*means with the same letter are not significantly different, $P < 0.05$.

showed significant differences in percent of turkey damaged ears ($P = 0.003$), with the first distance class most damaged in 5 of 6 fields. Overall, percentages of turkey-damaged ears decreased as distance increased ($P < 0.05$, Fig. 6); number of ears available increased as distance increased ($P < 0.05$, Fig. 6).

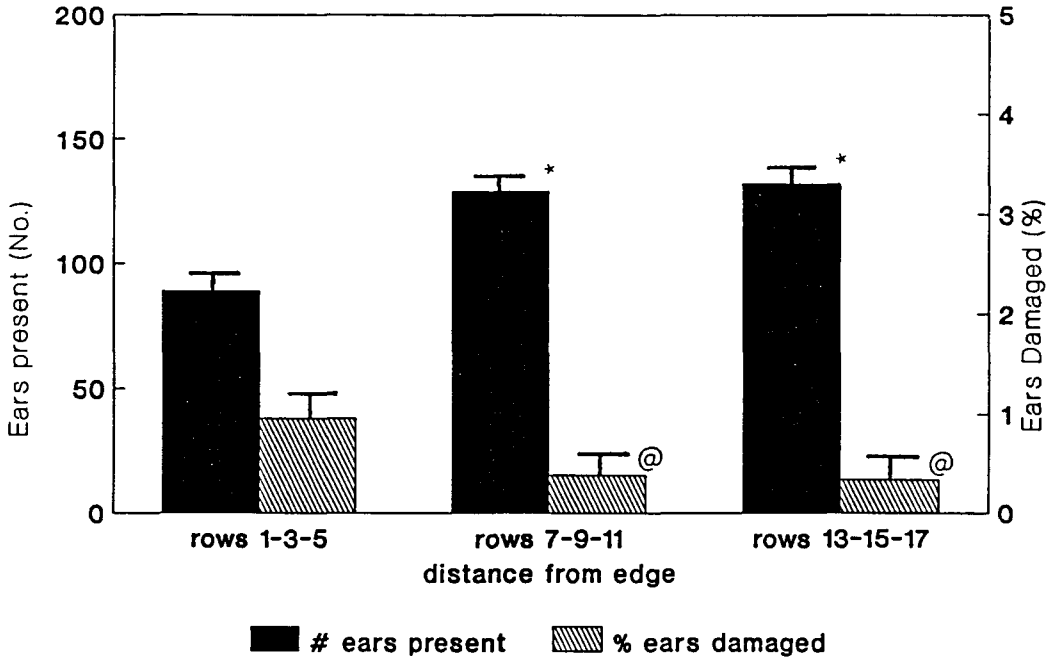

Fig. 6. Numbers of ears of corn available and percent of ears damaged by "turkey and other" by 3-row distance class on CCWMA in 1990. Means are shown + 1 SE. * indicates means of ears present that are not significantly different between classes at P = 0.05. @ indicates means of ears damaged that are not significantly different at P = 0.05

DISCUSSION

Landowner/Operator Survey

Reported losses from the survey should be looked upon with at least some skepticism. Only 14-20% of farmers in Wisconsin felt they could determine the actual amount of damage caused by turkeys (Craven 1989). To inexperienced observers, "turkey damage" is easily confused with other wildlife damage or based on broad assumptions. Phone interviews with 13 of the major complainants in Iowa confirmed a difficulty in defining turkey damage any more specifically than having seen turkeys in the fields. The association between turkey presence and holding turkeys responsible for all damage observed was strong and must be kept in mind when discussing these (or most other) perceived losses.

In both states, fewer than 5% of the respondents felt that turkeys were a major problem. This suggests that although many landowners perceive turkeys as a potential threat to crops, large economic losses (>$500) to an individual are rare.

None of the Iowa survey respondents indicated by selecting offered choices that they would call the DNR or Extension Service for advice. In 1990, the Iowa DNR began keeping formal records of turkey damage complaints, recording such information as location, extent of damage, action taken, and result. These records were similar to the deer records

that have been kept for several years. The biologists received only 4 turkey complaints. This suggests that farmers have little confidence in stopping the damage, or that current levels of damage are not serious enough to warrant any preventative action. Further evidence for these attitudes toward turkey damage was shown by >70% of the respondents in Iowa indicating they did nothing to reduce turkey damage, and only 13 of 313 Wisconsin respondents attempted to reduce the damage themselves (Craven 1989).

The most popular solution among respondents in Iowa was an increase in turkey harvest in some way. This was also the case in Wisconsin, where starting a fall season and issuing more spring licenses drew the most positive responses (Craven 1989). More than 95% of those surveyed in Iowa allow turkey hunting on their land. Landowner/operators apparently accept hunting as a useful management tool and seem willing to cooperate with the DNR in encouraging limited hunting.

Spring Corn and Oats

The presence of turkeys or their tracks in fields in spring often leads to turkeys being blamed for damage to corn and oat seedlings. Neither sightings nor tracks were related to damage of spring corn. No evidence of turkeys harming spring corn or oats was found.

The only damage found in the spring study plots both years was grazing, and grazing rarely resulted in the death of the

plants. Virtually all grazing in spring can be attributed to deer, based on observations of both deer and turkeys from the blinds. Within the 10 m X 2 row plots, no plants were found pulled or scratched from the soil by turkeys, and turkeys did not damage any plants while the birds were under observation. Several seedlings not occurring in the plots but in the fields were found dug up and the roots/seed removed. Observations showed that squirrels were responsible.

Wild turkey use of observed fields in this study was extremely limited. However, other studies have found varying degrees of use of crop fields. In western Massachusetts, 45% of all brood locations were in crop fields (mostly hay and pasture) (Vander-Haegen 1987). Minnesota turkeys spent 45% of their diurnal activity in 10-20 m wide strips of corn and alfalfa (Porter 1980). Brooded hens in southern Iowa used hayfields more than expected, but both brooded and broodless hens avoided row crops (L. A. Crim 1981). Broods in Pennsylvania used crop fields infrequently (Hayden 1979). In South Dakota, broods did not use crop fields at all (McCabe and Flake 1985). In southwestern Wisconsin, turkeys used crop fields less than expected and wooded habitats more than expected (Wright et al. 1989).

Insects make up a large part of turkey diet in spring and early summer (Healy 1985). Crops of 4-5 week old poults collected in oat and alfalfa fields in Wisconsin during June and July contained a high ratio of grasshoppers and other

insects to crop plants (Wright et al. 1989). Observed turkeys on CCWMA showed no interest in corn or oat plants, and were probably attracted to the fields by insects.

Turkeys are often blamed for "tunneling" or flattening wide paths in mature oat fields. Turkeys were not seen in mature oat fields in summer, so tunneling could not be confirmed or refuted. However, wind and runoff do produce wide areas of flattened plants (pers. obs.), and may be responsible for at least some of the damage attributed to turkeys.

Fall Corn

As would be expected with prolonged exposure, fall turkey damage increased over the 6-week period in 1990. Assuming all "turkey and other" damage was in fact turkeys, maximum turkey damage would affect 1.5% of the ears for both years combined. Damaged ears were any ears that showed pecking or missing kernels. Approximately 40% of the kernels on each damaged ear persisted. Thus, "turkey and other" damage approximated 0.9% of the ears. Percentages of turkey-damaged ears, as well as actual numbers of turkey-damaged ears, was highest within the first 5 rows from the field edges. Ears located near the edge of a field may be more exposed to wildlife damage because cover and other foods are readily available in the surrounding woods.

Many plants along the edge failed to mature and/or

produce ears. This failure to mature may give a false impression that turkey damage is worse than we were able to document.

On several occasions in 1990, turkeys were seen feeding along the edges of mature corn and hay fields, mostly on ears that had already fallen to the ground. Turkeys are known to feed on corn in fall, although evidence suggests that they eat mostly waste grain, and may prefer waste grain to standing corn when both are available (Wright and Paisley 1990).

Turkeys are suspected of fall damage because they are often seen in or near mature corn fields. However, previous studies of turkey habitat preference in fall suggest that turkeys do not prefer fields with standing corn. Gobblers in southern Iowa used corn fields no more than expected from October to December (G. B. Crim 1981). Adult females and all juveniles used corn fields about equal to availability in October and November, but more than expected in December after corn was harvested (G. B. Crim 1981), indicating a preference for waste corn. Hens in southwestern Wisconsin appeared to use crop fields less than expected from September through November (Wright and Paisley 1990).

SUMMARY

With the increased numbers of reintroduced wild turkeys living near Iowa's farmland, there has been a marked increase in the number of informal landowner/operator complaints of turkey damage to crops. A survey of 337 northeastern Iowa landowner/operators found that 64% of those with wild turkeys on their land felt they had suffered some loss to turkeys. Mature corn was the most often reported crop subjected to damage. Nearly three-quarters of the respondents said they did nothing themselves to reduce losses. Five percent of the respondents estimated their losses at more than $500 annually. Apparently, perceived losses are not serious enough to warrant direct action. An increase in hunting pressure was the most popular suggested solution.

Wild turkeys are often accused of damaging crops in both spring and fall. Farmers working their fields in northeastern Iowa are likely to encounter turkeys at some point, since turkeys are large, travel in flocks, and are active during the day. Because of the high turkey density in the area and their visibility, turkeys may appear to be a threat to crops. However, results of this study suggest that spring damage ascribed to turkeys is caused by other wildlife that is not as visible, such as ground and tree squirrels, or deer. Some turkey damage to mature ears likely does occur, though it appears to be small. Due to the difficulty in

distinguishing turkey damage within the "turkey and other" category, apparent turkey damage may be overestimated. Assuming that all the damage recorded as "turkey and other" was in fact due to turkeys, approximately 1.5% of all ears over the 2 years were damaged by turkeys. Also, since damaged ears still had one-third to one-half of their kernels still intact, actual loss to turkeys is probably less than 0.9% of all ears. Presence of turkeys in fields is not proof of damage, as wild turkeys appear to eat much more waste corn than standing corn.

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APPENDIX A

LANDOWNER/OPERATOR SURVEY

1. Please list the county/township/acreage for the land you own or operate. Also, show with a Y or N if turkeys are present on each tract listed. If you farm any state land, please indicate this with an (S).

COUNTY	TWP	ACREAGE	TURKEYS?
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

2. For this past year (1989), list the following:
   Number of acres that are forested?_____.
   Number of acres in oats?_____.
   Number of acres in corn?_____.
   Number of acres in soybeans?_____.
   Number of acres in hay?_____.
   Number of acres in other crops?
   crop_____ acres_____.
   crop_____ acres_____.

If there are wild turkeys on any of the land you farm please continue. If not, or you are not sure, please return the survey.

3. Who do you allow to hunt turkeys on your property? Circle all that apply.
   a) all general public who ask permission
   b) limited general public who ask permission
   c) friends and family
   d) family only (including yourself)
   e) no one

4. Approximate number of persons, including yourself and your family, who hunt turkeys on your land each year (circle one for each season):

SPRING	FALL
a) 100+	a) 100+
b) 75-99	b) 75-99
c) 50-74	c) 50-74
d) 25-49	d) 25-49
e) 1-24	e) 1-25
f) 0	f) 0

5. Estimated number of turkeys taken from the land you operate during 1989 in SPRING____ FALL____.

6. Have you experienced any problems from the presence of wild turkeys? YES NO

If YES, please answer all that apply:

a) Hunter damage/harassment
b) corn damage by turkeys bu. lost_____
c) soybean damage by turkeys bu. lost_____
d) oat damage by turkeys bu. lost_____
e) hay damage by turkeys tons lost_____
f) other damage (please explain)_____

7. Please indicate when the majority of each type of damage associated with turkeys occurs. (check all that apply)

a) hunter damage/harassment winter__ spring__ summer__ fall__
b) corn: winter__ spring__ summer__ fall__
c) soybeans: winter__ spring__ summer__ fall__
d) oats: winter__ spring__ summer__ fall__
e) hay: winter__ spring__ summer__ fall__
f) other: winter__ spring__ summer__ fall__

8. What methods do you use to reduce losses due to turkeys? (circle all that apply).

a) scare the turkeys using exploders, scarecrows, etc.
b) encourage hunting
c) call DNR or extension for advice
d) nothing
e) other_____.

9. What solutions to turkey damage would you like to see? (circle all that apply).

a) increase fall harvest
b) increase spring harvest
c) monetary compensation
d) longer seasons
e) trap/relocate turkeys
d) other (please explain)_____.

10. What is your best estimate for economic loss due to turkeys?

a) 0
b) $1-50
c) $51-250
d) $251-500
e) other $_____

11. What is your best estimate for economic gain due to turkeys?

a) 0
b) $1-50
c) $51-250
d) $251-500
e) other $_____

12. How do you feel about the current numbers of turkeys?

a) too many
b) about the right number
c) not enough

13. In the last two years (1988 and 1989), how has the amount of crop damage caused by turkeys changed? Circle one.

a) increased
b) stayed the same
c) decreased

14. Do you experience crop damage from other wildlife?
YES NO.
If YES, please list animals, crop, and approximate dollar amount lost.

ANIMAL	CROP	VALUE
_____	_____	$_____
_____	_____	$_____
_____	_____	$_____

15. Any other comments regarding turkeys?

Dear Landowner/Farm Operator:

The Iowa Cooperative Fish and Wildlife Research Unit, in cooperation with Iowa State University, the National Wild Turkey Federation, the Cooperative Extension Service, the Iowa DNR, and the U.S. Fish and Wildlife Service, is conducting research on the interactions of wild turkeys and crops in northeastern Iowa.

As you may already know, wild turkeys have been reintroduced throughout much of the state, and have reached sufficient numbers to allow both spring and fall hunting seasons. We are interested to learn about farm operator/turkey interactions as they might influence turkey management. Most of Iowa's wild turkeys spend their time on private land, with the landowner as host. Your thoughts and opinions concerning Iowa's largest game bird are important.

By taking just a few minutes to complete the attached questionnaire, you will be helping to formulate management policies. Your input is important and useful as advice in the setting of local, state, and national policies. Your completed survey is important even if you do not have wild turkeys on your land.

We will be happy to address any comments or questions you may have. Thank you for your time and participation.

APPENDIX B

FATE OF RADIOED TURKEYS

Due to an extremely mild winter with little snowfall, only 9 turkeys were caught on the CCWMA in 1990 - 7 females, 2 juvenile males. All were marked with colored patagial tags in addition to the radios. All 9 were released in an abandoned field about 100 yards from the capture site.

One male was shot by a hunter; the other was present on the study area only occasionally. Four females were believed to have died shortly after release. Locations for these individual birds were consistently in the same area, and 3 of the 4 transmitters were recovered. The transmitter on 1 other female appeared to fail, as the signal got weaker over several days until it was gone. The fate of the sixth female is uncertain. She probably left the study area, since her signal was picked up infrequently and never was strong enough to get more than 1 bearing. Data obtained from the 2 remaining turkeys, 1 male and 1 female, were insufficient for analysis.

APPENDIX C
CROP CONTENTS OF HUNTER-SHOT TURKEYS

Item	Frequency	Weight (g)	% by weight
Corn	11	114.1	88
Grass/greens	23	3.5	6
Non-crop seeds	7	4.2	3
Oat seeds	4	3.5	3
Insects	4	0.6	-
Other	1	0.5	-

Twenty-nine crops were collected - 5 in 1989, 24 in 1990. Four crops received on 1990 were empty. Crops were received between 19-26 April 1989, and 9 April to 1 May 1990. Some oat fields in the area had been planted during the time crops were collected. However, oat seeds were not dirty, and may have been picked up from a small pile of spilled seeds. Corn was not planted until after hunting season had ended. None of the corn in the crops was seed corn, which is usually colored red or purple. Therefore, all corn in the crops appears to be waste grain from the previous years' harvest.