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Mallard use of small wetlands during the crop damage season

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Abstract

The relationship between Mallard feeding activity in wetlands and their tendency to feed in fields was investigated by monitoring afternoon and evening activities on a sample of wetlands, 14 to 60 ha, during the 1978 crop damage season. We first observed field feeding on 15 August, but some flocks apparently fed exclusively in wetlands as late as 28 August. The mean index for wetland feeding (% of time spent feeding in wetlands) was 46.3 (SD 16.8, range 22–74) when Mallards did not feed in fields, but only 4.4 (SD 5.2, range 0–19) for flocks that also fed in fields. From this we estimated that field-feeding flocks obtained approximately 9% of their food from wetlands. After adjusting for flocks that did not immediately start field feeding, it was estimated that wetlands contributed 30% of the Mallards' food during the 7-week crop damage season. We concluded that preservation of wetlands that attract Mallards would be useful in terms of crop damage protection because wetland foods buffered the impact of crop damage. The ducks probably would eat more grain if forced to concentrate on fewer wetlands.

Introduction

A relationship between crop damage by waterfowl and the proximity of large wetlands is well known (Stephen 1961, Renewable Resources Consulting Services Ltd. [RRCS] 1969). However, the relationship between food resources in wetlands and the feeding ecology of ducks during the crop damage season is poorly understood. There are conflicting opinions concerning the influence of natural food resources on the field-feeding tendencies of ducks (Hochbaum 1944, Leitch 1951, Bossenmaier and Marshall 1958, Hammond 1961). Apart from their obvious attraction for ducks, little is known about the role that wetlands play in the crop damage problem.

Most studies of crop damage have emphasized large wetlands with associated severe, chronic duck damage (e.g., MacLennan 1973). These are the areas where conventional control programs such as lure crops, bait stations, and scaring are feasible in terms of cost/benefit. However, damage also occurs in the vicinity of many smaller wetlands. Such damage, as evinced from compensation and insurance claims, involves a relatively small number of fields near any given wetland, and does not occur with the regularity characteristic of that around traditional "problem" wetlands.

In this study we investigated the relationship between Mallard feeding activity in wetlands and the incidence of field feeding during the crop damage season. We wished to determine: (1) if food in small wetlands (as reflected by feeding activity) influences the amount of grain eaten by Mallards, and (2) if wetlands differ in their ability to keep Mallards from field feeding.

Study area and methods

We identified 113 wetlands, 20 to 80 ha in area, on 1:50 000 topographic maps in a 48-township block (about 4630 km²) in the aspen parkland east of Saskatoon (Fig. 1). The minimum size of 20 ha was used because the distribution of crop damage claims indicated that damage was seldom associated with smaller wetlands. A maximum of 80 ha would facilitate counts and activity observations. The wetlands were visited during the summer and evaluated for study purposes. Because they seldom attract Mallards, we eliminated those that were dry or nearly so and those that were obviously saline. A few were rejected because they were overgrown with emergent vegetation or because their size and shape would make activity monitoring difficult. To the remaining 32 wetlands, we later added three that were under 20 ha, but which attracted Mallards during the study period. This was done to compensate for the low number of the original wetlands that attracted Mallards.

Mallard activity on 17 wetlands (14–60 ha) was sampled from 9 August through 23 September 1978. The original plan to monitor 12 wetlands on a weekly basis was modified because Mallards stopped using some wetlands, making it necessary to switch to new ones. Also, some visits were missed because of impassable roads. We monitored Mallard activity during afternoon and evening, commencing, on the average, about 5½ h before dusk and ending at dusk. This allowed us to sample feeding activity on the wetland and to determine if the birds left the wetland, presumably to feed in fields, because afternoon flights to fields occur within 4 h (usually much less) of sunset (Hochbaum 1955, Sowls 1955, Bossenmaier and Marshall 1958, Winner 1959, Farney 1975). On the basis of published and unpublished literature on Mallard field-feeding behaviour, and personal communication with experienced waterfowl biologists, we assumed that Mallard flocks not field feeding during the afternoon or evening had not done so in the morning either. To eliminate the possibility of confusing late broods with post-fledging flocks, we arbitrarily used 20 Mallards as the minimum number present to qualify for monitoring.

The number of Mallards primarily engaged in each major activity was recorded at 2-min intervals. Thus, an "observation" was one duck observed for 2 min. Activities included swimming, sitting on the water, loafing, preening, flying, and the following feeding activities: tipping up, ducking the head and neck, feeding near the water surface, and feeding on mud flats. The percentage of observations that involved wetland feeding provided an index of the proportion of diet taken from the wetland. To illustrate, when there was no field

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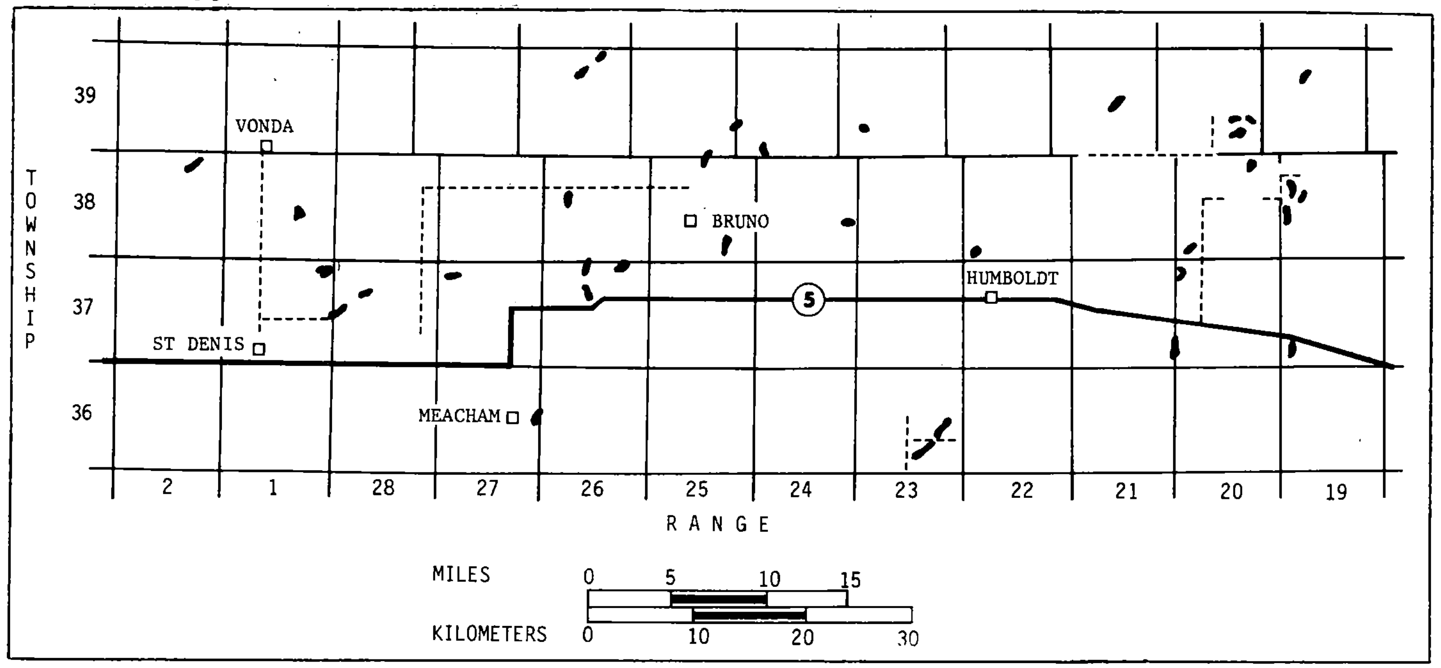
Figure 1
Distribution of study wetlands. Dashed lines show transects for monitoring grain fields



feeding, the index (% of activity that was wetland feeding) reflected a diet composed entirely of wetland foods. Decreases in the index that accompanied field feeding represented corresponding decreases in the use of wetland foods. If birds left a wetland, presumably to feed in fields, they were included as non-wetland feeders in subsequent 2-min observation totals used to calculate the wetland-feeding index. In 11 of 40 instances when birds left, we could see them feeding in fields. When monitoring large flocks (e.g., >100), it was impossible to count individuals engaged in each activity, so numbers were estimated and emphasis was placed on feeding versus non-feeding. Thus, we made no distinction between loafing and preening birds. Likewise, in larger flocks (e.g., >1000), no differentiation was made between feeding methods.

Weather and road conditions permitting, we counted Mallards each week on wetlands not being monitored for activity. To estimate the proportion of grain fields vulnerable to duck damage (i.e., in swath), we monitored 157 wheat and barley fields each week along six transects distributed throughout the study area (Fig. 1). Notes on harvesting activity were made daily while in the field.

Results and discussion

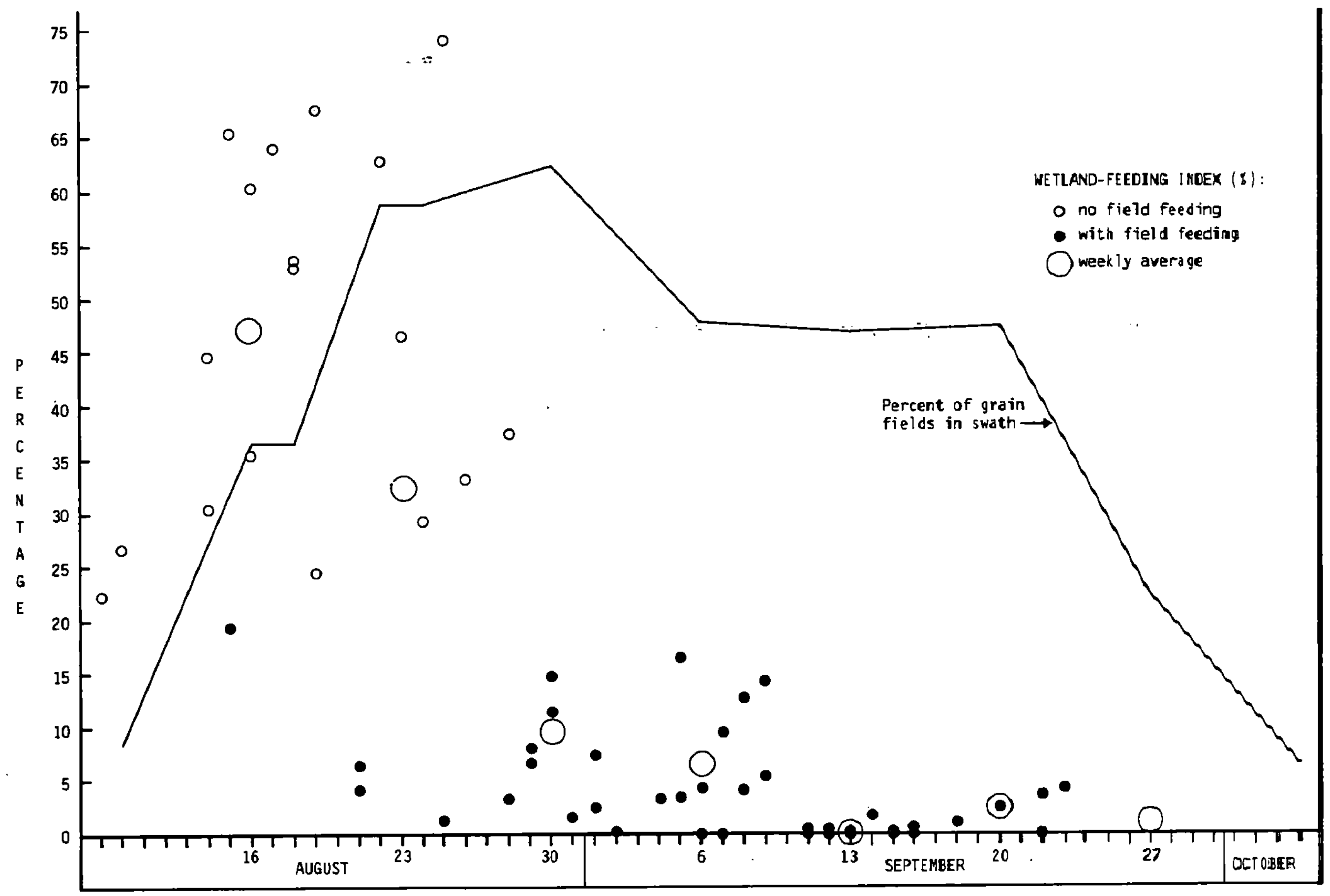
From counts on 35 study wetlands and several additional wetlands, we estimated that the total population in the area was between 12 000 and 18 000 Mallards. No marked change in overall numbers was evident from mid August to late September, but the numbers of Mallards on study wetlands varied widely in space and time. Less than 50 were seen on 12 wetlands, 50–100 on 6, 100–200 on 4, 200–500 on 9, 500–1000 on 1, and 1000–1700 on 3 wetlands. Numbers on one wetland increased from 25 during mid August to about 1700 in late September. In contrast, numbers on another decreased from about 1200 to less than 20 in the same period. Erratic use also was noted on several non-study wetlands.

Grain swathing started about 9 August, and by 15 August about one-third of the wheat and barley fields was swathed (Fig. 2). For data analyses, we have designated the 7-week period, 13 August through 30 September, as the "crop damage season". The 1978 season was longer than average due to prolonged wet weather between 15 August and 18 September.

We monitored Mallard activity on 17 wetlands, 1 to 7 times each, for a total of 58 times. Maximum numbers present varied from 21 to about 1400, and averaged about 182. The mean wetland-feeding index was 46.3 (SD 16.8, range 22–74) during 18 times when they did not feed in fields (Fig. 2). Reasons for the wide differences in wetland-feeding intensity prior to field feeding were not determined. There was no evidence that flock size or feeding methods were involved. We found some indication that feeding intensity varied between wetlands, but insufficient observations were available for valid comparisons. Undoubtedly wetlands vary in the kinds and abundance of foods available to the ducks and it seems reasonable that this would be reflected in feeding intensity.

Field-feeding Mallards were first noted on 15 August near a study wetland as well as one other place. Apparently, not all flocks immediately started to feed in fields when swathed grain became available; some remained on wetlands during late August, almost 2 weeks after the first field feeding was

Figure 2
Wetland-feeding indices (%) for Mallards with and without field feeding, and percentage of grain fields in swath during the 1978 crop damage season. Mean wetland-feeding index for the last week, 24-30 September, is the average of the previous two weeks



observed (Fig. 2). We gained the impression that Mallards would start field feeding sooner if a field adjacent to their wetland was swathed. The relationship seems reasonable and is consistent with observations by Bossenmaier and Marshall (1958) and MacLennan (1973) who stated that Mallards preferred fields closest to their resting lakes early in the season. If, in fact, nearby swathed grain stimulates initial field-feeding flights, leaving such fields until last could reduce the impact of local flocks on crop damage.

During 16 times that we were able to record all activities when Mallards did not field feed, the average percentages of pooled observations were: tipping up, 18; ducking head and neck, 20; feeding near the surface, 7; feeding on mud flats, 3; swimming, 10; sitting on the water, 10; loafing, 26; preening, 5; and flying, 1. Feeding intensity by birds that did not go to fields (Table 1) increased in late afternoon and evening ($P<0.001$). As might be expected, wetland feeding decreased in late afternoon and evening when flocks also fed in fields ($P<0.001$). Field feeding tended to replace wetland feeding.

Table 1
Hourly trends in wetland-feeding intensity by Mallards, with and without field feeding

Hour	Without field feeding: Total obs.	Without field feeding: % wetland feeding	With field feeding: Total obs.*	With field feeding: % wetland feeding
12-1300	–	–	465	11.0
13-1400	–	–	930	15.3
14-1500	4 811	26.8	144 568	5.0
15-1600	52 881	22.0	242 228	5.5
16-1700	54 852	29.8	267 122	6.4
17-1800	52 101	37.6	277 545	7.2
18-1900	40 445	49.1	290 569	4.5
19-2000	41 036	42.8	242 717	2.2
20-2100	24 551	50.2	53 222	1.5

*Includes birds known or assumed to be field feeding.

During 40 times when Mallards presumably fed in fields, the mean wetland-feeding index was 4.4 (SD 5.2, range 0–19) (Fig. 2). Values plotted in Figure 2 suggest that wetland feeding by flocks that also fed in fields decreased as the season progressed. Because wetlands were not monitored on consecutive days, we do not know how often flocks had fed in fields prior to our first observation of this event. Ten wetlands were monitored two or more times with an interval of 4 to 10 days ($\bar{x} = 6.7$) between the first and second visits. The wetland-feeding index was higher seven times during the first visit, lower twice, and similar once. The mean for 10 first visits was 10.4%, and for the second visits, 3.9% ($P<0.01$, Wilcoxon two-sample test). Decreased wetland feeding with a concurrent increase in field feeding is to be expected as late-hatched young and adult females join field-feeding flocks (Hochbaum 1944). (A few young on the area were still flightless in late August.) On several occasions, ducks observed feeding in wetlands included some that also fed in fields as well as some that did not leave the wetland. Proportions of either group could not be measured.

On rainy days, Mallards spent more time in fields, and this response was reflected in reduced wetland feeding in our study. During 15 times that rain fell in at least 2 of the hours of a monitoring session (the qualification was used to eliminate isolated showers), the mean wetland-feeding index was 1.5% (range 0–6.4) in contrast to 6.3% (range 0–19.4) for 25 times it did not rain ($P<0.02$, Wilcoxon two-sample test). Ideally, the effect of rain should be measured throughout the day because morning rain also can influence the amount of wetland feeding later in the day.

Assuming 46.3% represents an index of feeding intensity when Mallards did no field feeding, i.e., 100% of their food came from wetlands, then the 4.4% index of wetland feeding when they also fed in fields indicates that they obtained an average of 9.5% of their food from wetlands at that time (4.4/46.3 x 100). However, not all flocks fed in fields when swathed grain became available. By calculating average weekly indices of feeding for all flocks monitored (Fig. 2), we estimated that the overall wetland-feeding index for the crop damage season was 14.2. A comparison of this index with one obtained in the absence of field feeding, indicated that approximately 30% of the Mallards' food came from wetlands during the crop damage season. The balance, 70%, would be grain.

Our study emphasized wetland use, so we could not systematically monitor ducks feeding in fields. Flocks were seen feeding on 19 fields, three of which had been harvested. Thus, not all grain eaten by the Mallards resulted in crop damage.

While it was obvious that food resources in local wetlands buffered the impact of crop damage by field-feeding Mallards, our activity data did not reveal differences among wetlands in their ability to keep Mallards from field feeding that might be attributable to food resources. Whether the imposing task of monitoring a larger sample of wetlands more frequently would elucidate the question is debatable, because other factors affected wetland feeding. Use of wetlands was erratic; flock sizes varied widely both within and among wetlands. Not all flocks began field feeding when grain became available. This suggested differences in wetland food resources, but our few data on feeding intensity in these wetlands indicated that lack of suitable foods did not cause Mallards to start field feeding. We believe that other factors – e.g., proximity of swathed fields, disturbances, and the association with other flocks – were more important. The amount of wetland feeding by individual flocks tended to decrease as the season progressed; after the first week of September, most feeding took place in fields (Fig. 2). Weather also affected the ducks' feeding patterns. Finally, hunting may at times alter feeding patterns (Hochbaum 1955). The hunting season opened 11 Sep. by which time field feeding was well established, so hunting probably had little or no effect on the incidence of field feeding. However, there was some illegal hunting activity prior to then. We believe that any disturbance around wetlands early in the crop damage season increases the chances of field feeding.

Although many of the study wetlands experienced variable use by Mallards, some consistently received negligible use. The reasons, such as lack of shallow feeding areas, seemed apparent in some cases. In others, there was no apparent reason. Identifying the deficiencies in these wetlands might indicate management applications that would make them more attractive to Mallards. However, unless the technique was inexpensive, it could scarcely be justified because relatively few Mallards are attracted to most wetlands in the size range studied. At the most, it would help to disperse the damage accruing from ducks attracted to these wetlands.

Perhaps the most important objective for managing small wetlands used by Mallards during the crop damage season is simply preservation. The notion is paradoxical in that ducks, once attracted to a wetland, eventually cause damage in its vicinity. However, grain farmers do tolerate minimum levels of damage (RRCS 1969); the more widespread the damage, the less impact it will have on individual farms. More important, however, is the food provided by wetlands during the crop damage season. Forced to concentrate on fewer wetlands, the ducks probably would eat more grain. Although we investigated wetlands 14 to 60 ha in area, there is no reason to believe that our results are not applicable to wetlands of most other sizes.

Future research on this problem should emphasize more frequent monitoring of individual wetlands and include full diurnal activity monitoring to determine the pattern of wetland feeding during the crop damage season with greater accuracy. Additional study is needed to clarify the relationship between grain swathing adjacent to wetlands and the initiation of field feeding by local Mallard flocks. Minor changes in harvesting schedules or land use on these fields may yield significant reductions in crop damage.

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