

Conservation Biology Research Grants Program  
Division of Ecological Services  
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A STUDY OF PRAIRIE AVIFAUNA  
IN  
NORTHWESTERN MINNESOTA

CHAPTER 1. BIRD ABUNDANCE AND DISTRIBUTION  
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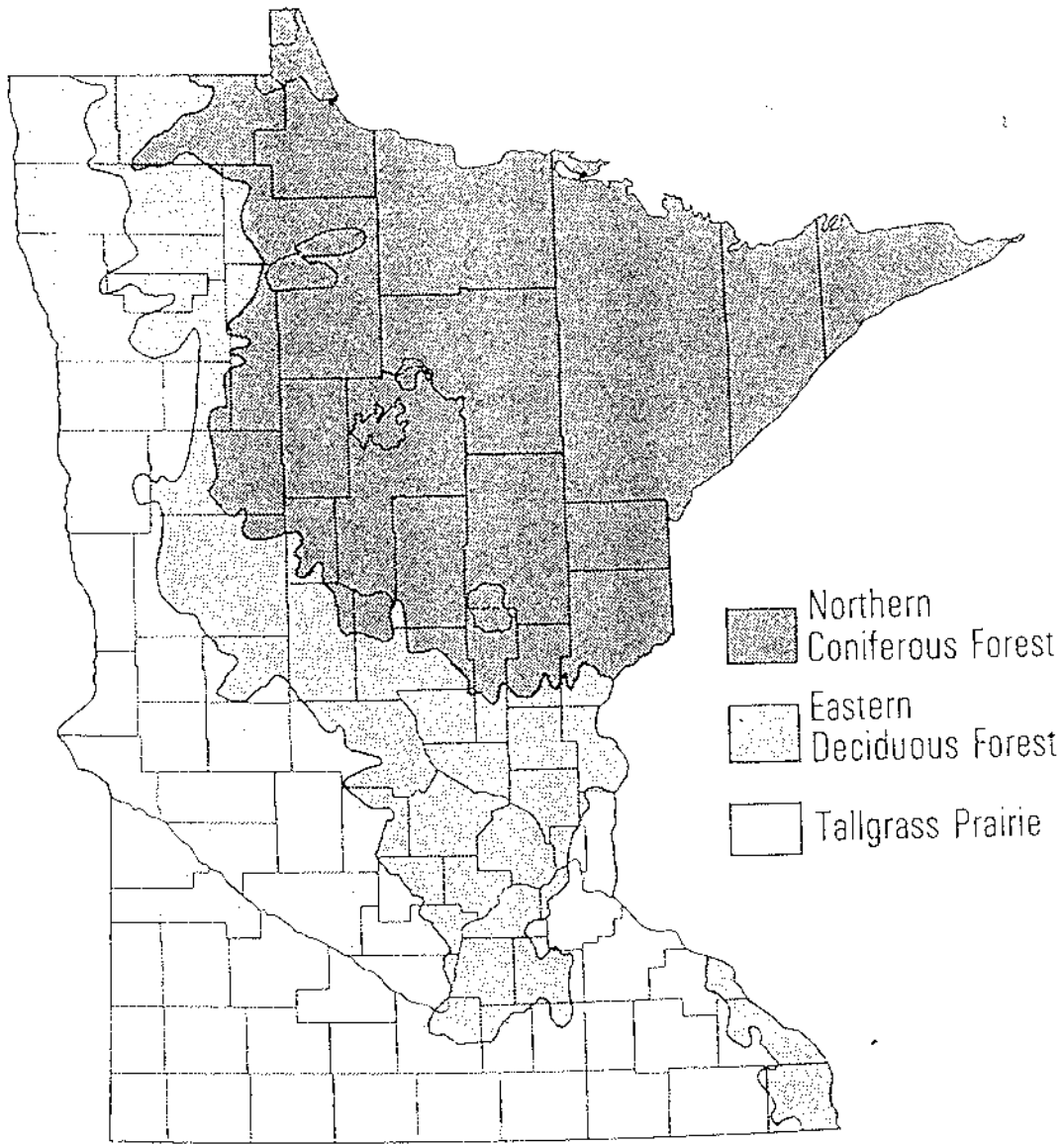


Figure 2.  
MN presettlement

Source: Coffin &  
Pfammuller, 1988

(Bison bison), the large native grassland herbivores, have been virtually eliminated from their original tallgrass prairie range. Native herds of these animals are extirpated in Minnesota (Nordquist and Birney, 1988). Bird species associated with prairie have also suffered marked declines (Green, 1988). Over 60 percent of Minnesota's endangered and threatened birds are associated with prairie; and over half of the bird species given special concern status by the State of Minnesota are considered grassland species (Pfannmuller and Coffin, 1988; MDNR, 1986). Overall, 42% of Minnesota's rare species depend on the tallgrass prairie habitats (Moore, 1988).

The prairie that remains is not immune to further loss. Some of these remnants are lost as ~~sources~~<sup>to</sup> of gravel<sup>runing</sup>. In addition, as advances in machinery become available and ~~agricultural lands become~~<sup>dd</sup> ~~increasing less~~<sup>lose</sup> productive<sup>ly</sup>, the areas of prairie once considered too wet or unprofitable to plow are converted to agricultural crops. Some grasslands are also lost to woody invasion. Prior to settlement, these lands were kept open by wildfire and heavy grazing by large native herbivores. Today, both of these influences have been lost. Non-native grasses are used as forage for the domesticated herbivores now present in the U.S. and fire-suppression is currently endorsed. As a result of these influences and pressures, native prairie is still endangered.

What remains of Minnesota's tallgrass prairie is in various stages of protection. Some native prairie land is owned by private individuals, with no assurance that it will ~~not be developed~~<sup>be preserved</sup> in<sup>to</sup> the future. There are a few programs in Minnesota that provide

protection for native prairie lands while allowing them to remain in private ownership. These are the RIM Prairie Bank Easement and Native Prairie Tax Exemption (MDNR, n.d.). These programs are temporary agreements, however, and may not always be renewed by the landowner. Therefore, they provide only ephemeral protection for prairie lands, subject to economic and other pressures. Some parcels are fully protected from development because they are owned by private conservation organizations or the state or federal government. Moore estimated (1988) that two-thirds of the prairie existing in Minnesota today is not protected.

A major problem in the conservation of any ecosystem is the limitations imposed by size. In the case of the native prairie ecosystem this problem is of special concern because most native prairie today exists in small scattered remnant patches. Small parcels of any ecosystem can provide for the protection and management of many plant species and some small animals which are relatively sedentary and/or require relatively small areas for their continued existence (Simberloff and Gotelli, 1984; Pyle, et al., 1981; Terbough, 1975; Robinson, 1986). However, these small parcels are not effective for conserving larger mammalian species that require large home ranges, more wide-ranging species such as many birds, and/or sparsely distributed species (Frankel and Soule, 1981; Terbough, 1974, 1975; Diamond, 1975, Soule, et al., 1979). These small parcels of habitat also do not afford adequate protection for organisms which are considered "interior" species. These are organisms which require the most "pristine" of conditions of a habitat, and cannot tolerate edge. Rare species may also be

excluded from these small parcels if they only exist in very small isolated populations that are outside the boundaries of reserves (Higgs and Usher, 1980). It is usually true that the population dynamics and locations are the least known for rare species. The conservation of larger parcels of ecosystems can solve many of these problems.

One of the largest areas of contiguous native tallgrass prairie remaining in Minnesota is located in Wilkin County near the town of Rothsay, Minnesota. Prior to settlement, at least 90 percent of Wilkin county was covered by native prairie (Figure 3). The prairie near Rothsay makes up the majority of the native prairie that remains in Wilkin county today (Figure 4) (MDNR, 1988). This area is approximately 8,000 acres in size and consists of a mosaic of wet prairie, mesic prairie, and prairie wetland communities. Minnesota's Natural Heritage Program (1987) reports that the "Rothsay Prairie Landscape", due to its size, is one of the few places left in North America that has the ability to support the rare habitats, flora, and fauna characteristic of the northern tallgrass prairie ecosystem. About one-half of the Rothsay Prairie Landscape is owned either by the Minnesota Department of Natural Resources or the Minnesota Chapter of the Nature Conservancy. The other half is owned by private individuals who are using it for harvesting hay or grazing cattle.

Insights into the contributions that Rothsay Prairie Landscape can make to the conservation of biological diversity can be gained through a detailed survey of the area's flora and fauna. As part of

Figure 3

Source: MDNR

*Wilkin County in the 1850s — the extent of native tallgrass prairie before intensive settlement. (Light gray areas represent dry prairie and savanna, medium gray areas represent wet prairie, and black indicates floodplain forest).*

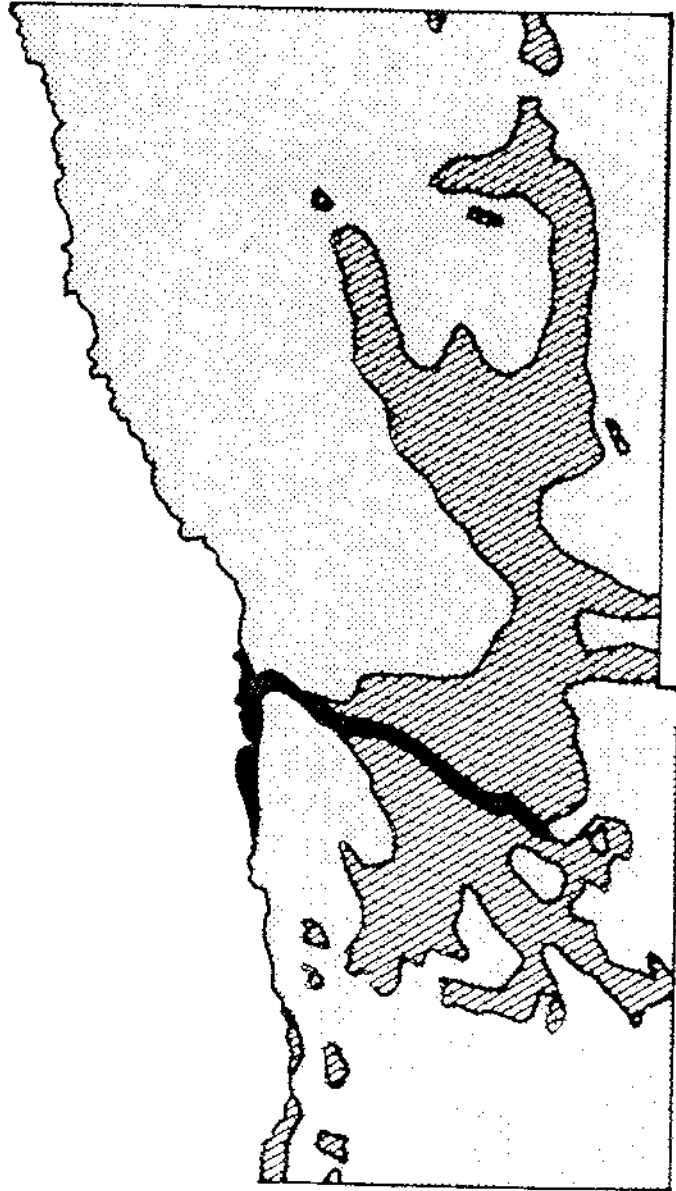
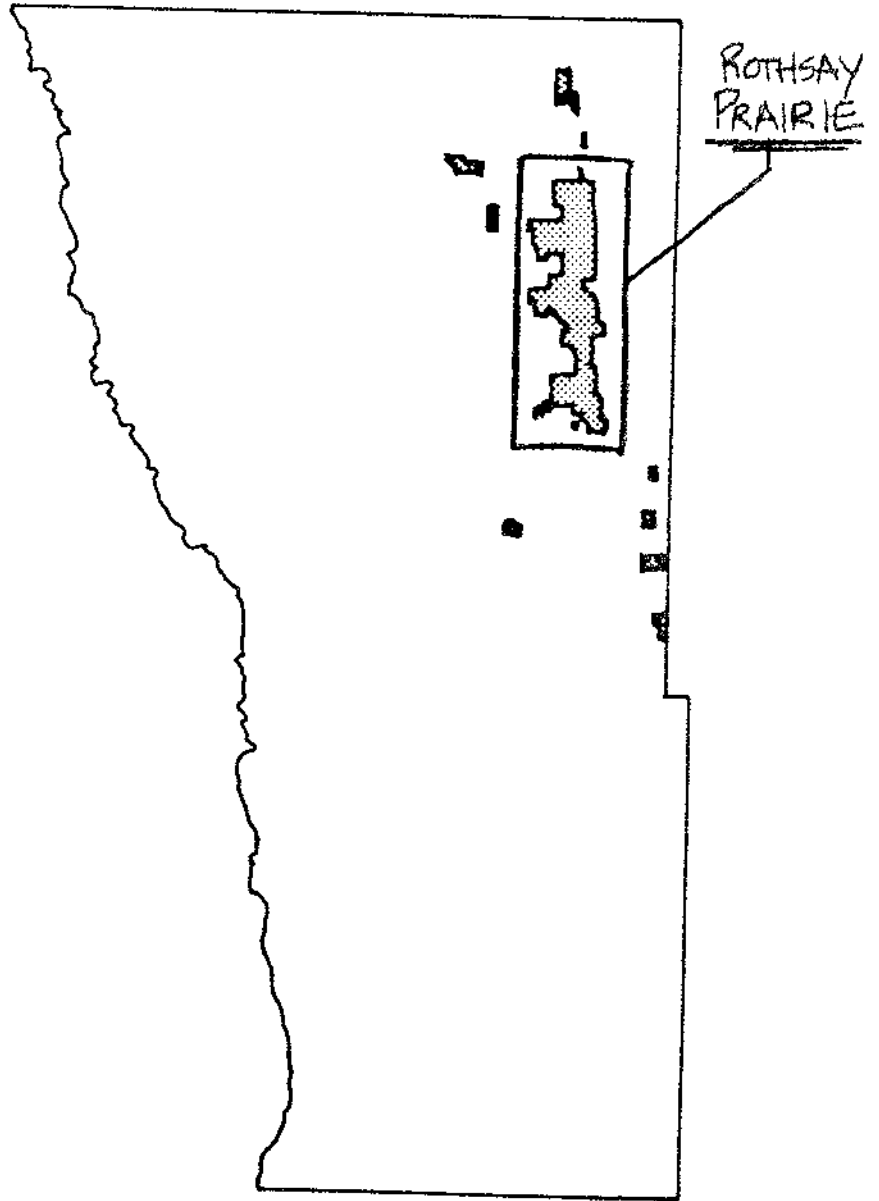


Figure 4

Source: MDNR

*Wilkin County today  
— the total remaining  
native prairie habitat  
as determined by the  
Minnesota County  
Biological Survey.  
(Gray indicates  
remaining native  
prairie.)*





Minnesota's County Biological Survey, the vegetation of this area was surveyed and categorized into community types in 1987. In addition, a broad-brush survey of birds and small mammals was conducted on the site during the 1988 field season. However, as of 1989, no detailed study of the wildlife using the area had ever been made. Prairie avifauna is an interesting case. Many of Minnesota's birds designated as Special Concern Species by Minnesota are associated with the prairie ecosystem (Table 1). In addition, many grassland birds require large areas for breeding (e.g., greater prairie chicken) and foraging (e.g., Northern harrier) or are sparsely distributed across Minnesota (e.g., sharp-tailed sparrow, Henslow's sparrow). A detailed characterization of the birds using the Rothsay Prairie Landscape is necessary to determine the value of managing a large parcel of native tallgrass prairie in Minnesota.

Under contract with Minnesota's Nongame Wildlife Program, a detailed study of the birds present on the Rothsay Prairie Landscape was designed and undertaken in 1989. The goal of this research was to characterize the avifauna present within the native prairie near Rothsay, Minnesota, and ultimately identify management options to enhance the opportunities for prairie avifauna on the area. The specific objectives of this research were:

(1) to determine the distribution and abundance of bird species occurring on the Rothsay study area.

(2) to determine if there was an association between habitat structure, vegetative community type, or management regime and the presence of bird species using the area.

(3) to identify management options to maximize the abundance and distribution of prairie avifauna present in the study area, emphasizing species designated as Special Concern in Minnesota.

TABLE 1. SPECIAL CONCERN SPECIES ASSOCIATED WITH PRAIRIE ECOSYSTEM

- \*\*\*American bittern (*Botaurus lentiginosus*)
- \*\*Northern harrier (*Circus cyaneus*)
- \*Greater prairie-chicken (*Tympanuchus cupido*)
- \*Yellow rail (*Coturnicops noveboracensis*)
- \*Sandhill crane (*Grus canadensis*)
- \*Upland sandpiper (*Bartramia longicauda*)
- \*Marbled godwit (*Limosa fedoa*)
- \*Wilson's phalarope (*Phalaropus tricolor*)
- \*Short-eared owl (*Asio flammeus*)
- \*\*\*Henslow's sparrow (*Ammodramus henslowii*)
- \*Sharp-tailed sparrow (*Ammodramus caudacutus*)

- \* Listed as "Special Concern Species" by Minnesota <sup>DNR F.W.S.</sup>
- \*\* Listed as "Species of Management Concern" by U.S. ~~government~~
- \*\*\* Listed as Special Concern by Minnesota and of Management Concern by Federal government

all others listed as special concern by the State of Minnesota

## METHODOLOGY

Information on bird presence on the Rothsay prairie study area was gathered using a technique similar in design to the Breeding Bird Survey (BBS) (Robbins and VanVelzen, 1967, 1969; Erskine, 1970, 1973; Smith, 1973). Instead of roadside counts, however, this research used timed point counts of birds at listening stations placed systematically along transects which traversed the study area. The transects were traveled <sup>by</sup> on foot. Bird activity ~~was~~ recorded within a 100 m. radius from each listening station. <sup>was recorded</sup>

Breeding status on the study area was inferred from the presence of singing males, individuals carrying food, and individuals carrying nest material. Breeding status was confirmed when nests or young were located.

The methodology for this research was developed and refined through a literature review and on-site testing of the method prior to the field season. Based on this, it was decided that three minutes was the appropriate time period to obtain an accurate account of the birds using each plot. In addition, it was determined that a one to two-minute "cool down" period for the birds after arrival of the observer at the site was sufficient to return the plot to pre-observer conditions. Further, it was verified prior to data collection that a 100 meter radius circle would afford a characterization of all birds within the plot by sound. While the vocalizations of certain species (e.g., western meadowlark, greater prairie chicken, and upland sandpiper) could be heard from beyond the boundaries of a plot of this size, practice prior to the data collection procedures allowed familiarization with the loudness of

the songs and calls of such birds located both inside and outside a plot. Thus, any confusion that this may have caused during the regular field season was alleviated. In addition, it was ascertained and field-verified, that a separation distance of 400 m. between listening stations would eliminate double-counting of birds in adjacent plots. This gave a 200 m. effective separation distance between adjacent plots.

Based on the determination of this separation distance, the plots were systematically placed along transects traversing the study area. Transects were placed to maximize coverage of the study area and allow reasonable access to starting points. The length of the transects was determined by: (1) the amount of prime bird observation time available; and (2) the estimated time it would take to travel between stations on foot and gather the data at each station. In temperate climates prime bird observation hours begin about 1/2 hour before sunrise and continue into the midmorning hours when bird singing activity will dramatically decrease. The time when bird activity decreases beyond that which allows an accurate estimation of bird numbers varies due to many environmental factors, such as windspeed, temperature, and light intensity. These factors cannot be controlled by a researcher. One source of variation that can be accounted for, however, is that the time bird activity ceases beyond an acceptable level appears to be particular to a site and season. Based on the experiences of biologists who surveyed this area for birds as part of the Minnesota County Biological Survey in the summer of 1988, the hour of 10:00 a.m. was chosen as a cutoff time for prime bird observations. A conservative interpretation of

these time constraints, and those imposed by foot travel between plots and data collection procedures, dictated the establishment of a maximum of 16 plots along each transect. This would make the maximum length of a transect 4 miles.

The number of transects that could be laid out across the study area was based on: (1) the number of times a plot needed to be repeated in order to accurately characterize all breeding birds present therein; (2) the effective field season length; and (3) an estimation of the number of field days that may be lost due to bad weather. It was decided to use repetitive measures to more accurately characterize the birds using the study area. In addition, based on a review of recorded breeding seasons and actual breeding records of the birds expected to be encountered on the site, it was determined that the effective season length for this study area was early to mid-May through June. Further, the employment of a field assistant would allow two transects to be completed per day. With these facts in mind, it was decided to place ten transects within the study area, which would be repeated six times. Barring any loss of days afield due to inclement weather, all ten transects could be completed in five days. An extra two days per ten transects were allowed for inclement weather delays.

The transects and stations were laid out on USGS topographic 7.5 minute quadrangles (Figure 5). Table 2 lists the transects by name. The transects and station locations were then paced off in the field and the listening stations were marked with surveyor's

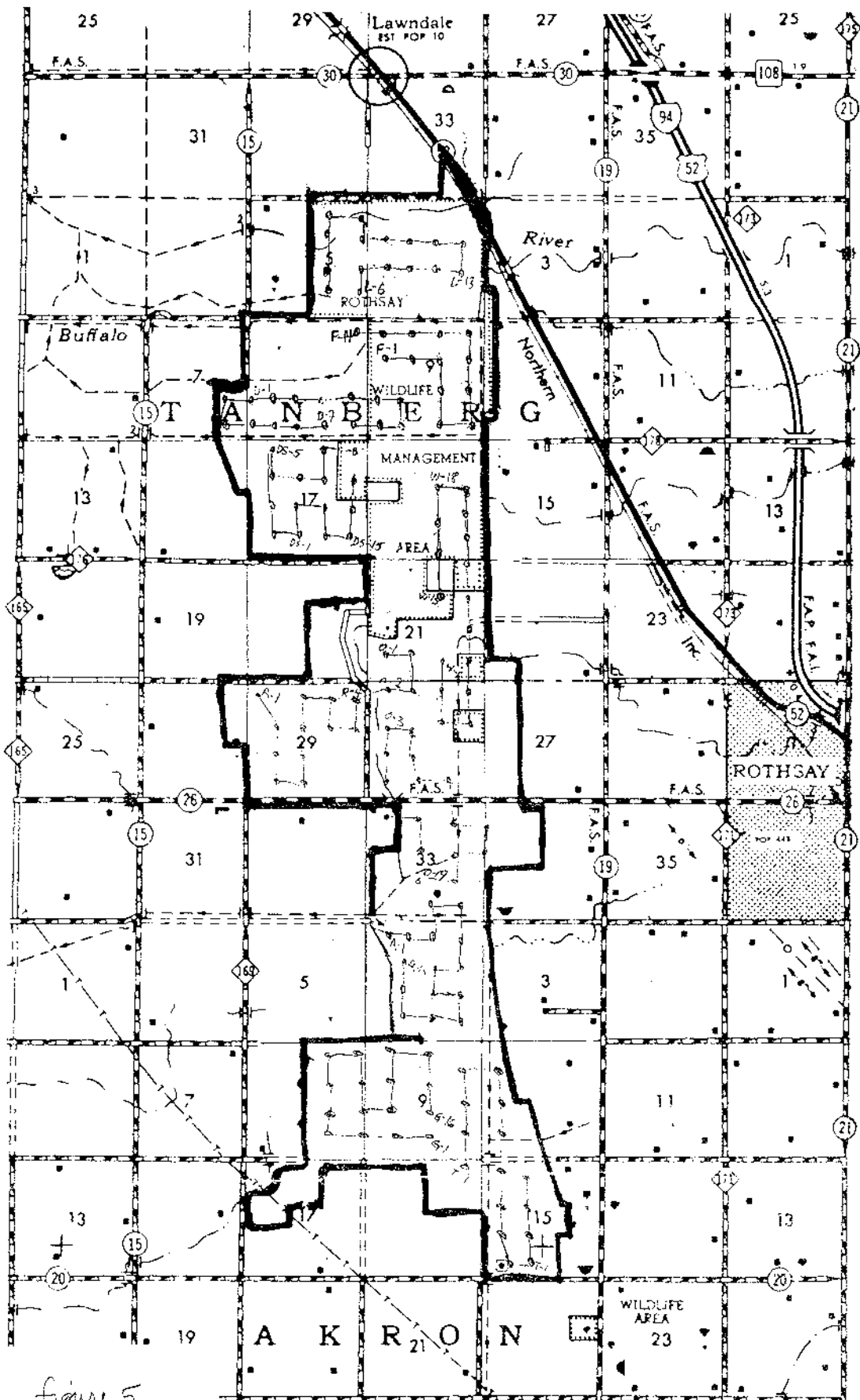


Figure 5  
Location of  
Transects

TABLE 2. TRANSECT SUMMARY

| <u>TRANSECT NAME</u> | <u>PLOTS</u>                         | <u>OWNERSHIP</u>                                  |
|----------------------|--------------------------------------|---|
| Town Hall (T or 20)  | T-1 thru T-15                        | TNC and private                                   |
| Anna Gronseth (G)    | G-1 thru G-16                        | TNC and private                                   |
| Aetna (A)            | A-1 thru A-15                        | Aetna Insurance Co.<br>and private<br>individuals |
| Ouse (O)             | O-3 thru O-6,<br>O-10 thru O-19      | Private   |
| WMA (W)              | W-1 thru W-3,<br>W-6 thru W-18       | MDNR and private                                  |
| Ralph & Roberta (R)  | R-1 thru R-12,<br>O-1, O-2, O-7, O-8 | Private   |
| Dow South (DS)       | DS-1 thru DS-15                      | Private and MDNR                                  |
| Dow (north) (D)      | D-1 thru D-16                        | Private and MDNR                                  |
| Fen (F)              | F-1 thru F-15                        | MDNR  |
| Ladwig (L)           | L-1 thru L-16                        | MDNR  |

flagging. The flagging was tied to vegetation for a majority of the stations. However, due to the extreme shortness of the grasses within a large native prairie hay field, nine stations were marked by attaching the flagging to 4-foot high, 1/2-inch dowels that were placed into the ground at the station. Immediately after the stations were marked, a handsketched map of each plot was drawn including any distinguishing features of the plot. This information was transferred to data sheets prepared for the plots and was used to aid in the field verification of station locations. In addition, the stations were located on 1980 aerial photography of the study area (approximate scale: 1 mile = 3 1/4"). After the field season, a new set of air photos of the study area was taken (approximate scale: 1 mile = 8"). The plots were then located on xerox copies of these photographs to help in potential future relocation attempts.

The collection of bird distribution and abundance data started approximately 1/2 hour before sunrise and continued until the entire transect was completed. After arriving at a plot, the observer used a few minutes to collect information on the environmental conditions at the plot. This allowed the birds using the plot to settle down and return to "normal" conditions prior to the recording of their activity by the observer. The following data were recorded: 1) transect name; 2) plot number; 3) observer; 4) date; 5) time; 6) cloud cover; 7) air temperature; 8) wind speed; and 9) wind direction. Cloud cover was categorized into the following categories: clear, clear with fog, mostly clear (high clouds or less than 15% clouds), partly cloudy (20-50% clouds), mostly cloudy (greater than 50% clouds, but not totally overcast), overcast, light rain/mist, and



rain. Air temperature was measured by a pocket field thermometer. Wind speed was measured with a hand-held windmeter.

After recording this information, the observer recorded every bird seen or heard within the plot during a three minute time interval. Using the listening station as the center for a visual north-south and a east-west crosshair, each plot was divided into four quadrants. The following data were recorded for each individual bird in the plot: (1) species; (2) sex (all singing birds were recorded as males); (3) activity at the time it was recorded and throughout the three minute interval (e.g., singing, calling, foraging, etc.); (4) basis of identification (i.e., vocalization, field markings, or both); and (5) estimated location of the bird within its respective quadrant. Birds flying over the plot within the timed interval were also recorded.

Nine and a half transects on the study area were repeated six times during the field season. The other one-half of one transect (i.e. plots L-9 through L-16) was repeated four times during the season. Repetition of transects decreased the bias that a single sampling event could introduce into the data. It also revealed the dynamics of the breeding season. To reduce observer bias, observers alternated surveys of each transect. In addition, a transect was run both forwards and backwards to reduce bias that may have been introduced by the time of day when a certain plot was visited. Some bird species stop singing very early in the day and may not be encountered at a plot sampled even during the later hours of the "prime" singing time. Although this method did not allow much variation in the time at which the plots toward the center of the

transects were visited, the concern was mostly for those plots located at the ends of the transects.

The presence of several avian species of concern to the U.S. or Minnesota governments on the Rothsay study area was anticipated prior to the field season. These species were those associated with the grassland ecosystem and are listed in table 1. Due to their status, an extended sampling method undertaken to locate these special concern species on the study area. This extended sampling plan supplemented the regular sampling method of three-minute point counts at the plots. The extended method consisted of recording any sighting, sign or vocalization of a special concern species in at least five additional situations from the regular methodology: (1) from the listening stations inside the plot, but before or after the timed interval; (2) from the stations, but outside the plot before, during, or after the three-minute timed interval; (3) along the transects; (4) on the study area but not on the transects; (5) outside the study area anywhere traveled in the vicinity of Rothsay.

A review of the natural history of the special concern species prior to the field season revealed at least three species would still probably not be accurately characterized using the extended sampling method. Therefore, additional methods were devised to characterize the presence of short-eared owls, sharp-tailed sparrows, and yellow rails. The short-eared owl is a crepuscular raptor which does most of its hunting at dawn and dusk (Johnsgard, 1979; Clark, 1975; Roberts, 1936). During the day the owls roost and the extended sampling method would not capture their presence

anytime after the first couple of plots on any given transect. Samplers were on the study area beginning transects at one-half hour before sunrise, and therefore, could observe any foraging activity by the owls at dawn in the immediate vicinity of these plots. This, however, would not give extensive coverage of the study area. Therefore, many evening drives around the study area were performed. During these drives, the area was scanned for short-eared owls foraging during their evening active period.

Sharp-tailed sparrows and yellow rails are considered erratic singers, and mainly nocturnal (Johnsgard, 1979; Coffin and Pfanmuller, 1988; Ekert, 1983). Because of this, a sampling method during the day would not adequately characterize the presence of these species. To try and capture the presence of these species, a trial night transect was performed in the area of the study site determined to have the best habitat for these species on June 2, 1989. Some researchers believe these species inhabit similar habitats (e.g., Hanowski and Niemi, 1986). The night transect was performed from 1/2 hour prior to sunset until midnight on the Anna Gronseth Nature Conservancy Preserve. This area had been noted in the past as habitat for both of these species (Ekert, 1983; Janssen, 1987) and both species had been encountered at plot G-1 prior to this date during this field season (see results). The transect was begun at plot G-1 and recorded playbacks of singing males of both species were also used to elicit response from territorial males of these species.

In addition to collecting information on the abundance and distribution of birds on the Rothsay area, data was gathered on the

habitat afforded by this study area. Habitat measurements were recorded within each circular plot at the beginning and end of the season. These included: (1) average grass height; (2) grass density; (3) percent of plot covered by grass; (4) percent of plot covered by trees; (5) percent of plot covered by shrubs; (6) distance to nearest woody vegetation from the sampling station in each quadrant of the plot; (7) type of nearest woody vegetation (e.g. single tree or shrub, grove of trees, clump of several shrubs, etc.); and (8) height of woody vegetation. In addition, the percent of plot covered by forbs was measured at the end of the season. Ocular estimates were used to make rough measurements of the percent coverage of the plot by the various vegetation types.

The U.S. Fish and Wildlife Service (1981) outlined many of the methods used to measure these habitat structural values. Average grass height was estimated to the nearest tenth of a meter by eye with the aid of a rod graduated in decimeters placed in four random locations within the plot. If the grass was less than 0.5 meters high, its height was estimated to the nearest centimeter. The density of grass was measured using Robel's method (Robel, 19##). One measure was taken in each quadrant of the plot at a randomly chosen location. These measures were then averaged to give a final measure of average grass density. Distance to the nearest woody vegetation was paced off if it fell within the plot and the height estimated. If the nearest woody vegetation was outside the plot boundaries, ocular estimates were used to determine the distance to the woody vegetation and its height.

In addition to measuring these habitat structure variables in each plot, some insight into the floristics of vegetation within the plots was afforded by Robert Dana, a botanist employed by the Minnesota Department of Natural Resources, Natural Heritage Program. Mr. Dana categorized each plot into vegetative community types according to Minnesota's Preliminary Community Classification System (Wendt, 1984). Based on previous experience and records of the survey he conducted at the site in 1987, air photos were interpreted to covertype the entire study area prior to the collection of bird data at the study site. This helped to place the transects for this study in a manner representative of the covertypes present on the site. After the bird data were collected, covertypes were field-verified within the plots established for this research by the same botanist. The dominant grasses and forbs within each plot were also recorded at this time.

Field data were compiled using dBase IV software and analyzed with SPSSX (Statistical Package for Social Scientists), residing on the University's VAX/VMS computer. Each bird observation was the central component of a computer data record that also contained the environmental and habitat variables for the plot where the bird was located. Once entered, the data was searched for errors and cleared of erroneous variable values. The data was then separated into breeding and nonbreeding records for the birds. Individuals were considered to be breeding if any of the following types of records were documented for the species: unseen/seen singing male, male/female carrying food, male/female carrying nest material, nest with eggs/young, young with/without an adult. Bird records not

meeting these criteria were considered nonbreeding records.

The distribution of the bird species was examined by performing frequencies analyses on the number of birds recorded, the number of plots each species was recorded in, and the weekly variation in bird numbers recorded. The relative abundance of the birds on the area was determined by a frequencies analysis of the total number of birds recorded throughout the season. These figures allowed three different categorizations of the birds which were recorded on the Rothsay study area.

Total number of records for each bird were used to classify the species into rough abundance groups. These groups (from most abundant to least abundant) are: (1) abundant; (2) common; (3) uncommon; and (4) rare. The definitions for these terms are the same as those used by Janssen (1987) when he speaks of migration patterns. They are applied here to bird records documented on the study area during the field season. The term abundant refers to birds with season counts of more than 250 individuals. Common is the term used for bird species having 26 to 250 records for the season. Birds with 6 to 25 records for the season are categorized as uncommon. Finally, the term rare was used to describe bird species with 5 or less records for the season. These abundance categories were applied separately to the breeding and nonbreeding in plot records for each species. Therefore, each species could have two abundance categories based on their activity when they were recorded in the study plots. No attempt was made to assign abundance categories to flyover records.

The temporal patterns of the bird records were examined and each species categorized according to their breeding status on the Rothsay study area. The categories were: breeder, visitor, accidental, and migrant. A bird was categorized as a breeder if it met two criteria: (1) it was regularly recorded on the site; and (2) it was performing an activity from which breeding status could be inferred or breeding on the site was confirmed by the location of a nest or brood. The visitor classification applied to a bird that was recorded on the site regularly, but not performing any activity from which breeding activity could be inferred. Accidental status was given to a species if only one or two individuals were recorded on the site briefly and sporadically. A species is considered a migrant on the site if it was only recorded once or twice on the site at the beginning of the season, even if it was performing an activity from which breeding could be inferred.

An examination of the spatial distribution of the breeding birds on the Rothsay study area allowed a third classification of each species. The spatial distribution allowed each species to be grouped into rough distribution classes. These classifications are: (1) widespread; (2) moderate; (3) restricted; and (4) local. These categories followed the natural breaks which occurred in the data. Widespread species occurred in more than 60% of the 155 study plots. All but one of these species occurred in over 100 plots. Moderately distributed species were those that were recorded in one-third to one-half of the study plots (i.e., 49 - 77 plots); while restricted species were recorded in 10 to 30 plots (8-20%). A species was classified as having local distribution if it occurred at least one

plot, but less than 10. This is equivalent to less than or equal to 6%.

In addition to these calculations based mainly on frequencies, the density of breeding pairs was also calculated. The density of breeding pairs was calculated two ways. Regardless of the method used each individual breeding record was considered representative of a breeding pair. This is justified because a majority of the records from which breeding is inferred are unseen/seen singing males. Only ~~##%~~<sup>0.05%</sup> of the breeding records are not documented singing males. These records (e.g., male/female carrying nest material or food) are still valid inferences to breeding and due to their small number they should not appreciably overestimate the number of breeding pairs. Also the number of breeding pairs was averaged for the six weeks of the season.

The first method used to calculate density was for the entire study area. This followed the equation:

$$\frac{\text{Average number of breeding records per week}}{\text{Total area of all study plots}}$$

In a more mathematical sense this equation is:

$$\frac{(\text{SUM } b) / 6}{155 (p \times r^2)}$$

where b equals a breeding record, p equals the mathematical constant pi and r equals the radius of each circular plot in kilometers. The



second method calculated the density of breeding pairs within suitable habitat. This assumes that all suitable breeding habitat for each species is occupied at optimal levels. It was calculated by the following equation:

$$\frac{\text{Average number of breeding records per week}}{\text{Total area of study plots within which a species was recorded}}$$

Mathematically this equation is equivalent to:

$$\frac{(\text{SUM } b) / 6}{N (p \times r^2)}$$

where b equals a breeding record, N equals the number of plots within which a breeding record for a bird was documented, p equals the mathematical constant pi and r equals the radius of each circular plot in kilometers.

## RESULTS AND DISCUSSION

### SPECIES OTHER THAN THOSE DESIGNATED SPECIAL CONCERN

This portion of the results will focus on all species recorded on the study area that do not have special concern status (i.e. listed as Special Concern Species by the State of Minnesota or Species of Management Concern by U.S. Federal government). The

species excluded from this section will be addressed in their own section and are listed in table 1.

### Abundance

In addition to those special concern species found on the study area, individuals representing 53 different species, 22 families and 12 orders were identified on one or more study plot at Rothsay Prairie during the 1989 field season (see Table 3). Breeding individuals recorded on the plots belonged to 8 orders, 17 families and 44 species. Individuals of unknown breeding status added 9 new names to the species list at Rothsay; belonging to 6 orders and 9 families. Of these, 4 were "new" orders (not found among breeding birds on-site) and 5 were new families. Additional species were recorded only flying over the plots. Although none of the species that were recorded solely as flyovers was considered to be actively using the site for foraging, these flyover records added 13 new species (not found among those recorded using the plots) to the list at Rothsay. They belonged to 6 orders, and 6 families. Only one new order was introduced with flyovers, and 3 new families.

Abundance categories were assigned to the birds which were recorded in the study plots. Breeding and nonbreeding records were separated and an abundance category was given to both these sets of records. Thus, a species could have up to two abundance classifications. Flyover records were excluded from this classification scheme to concentrate on the birds actively using the area. Abundance categories used were abundant, common, uncommon,

TABLE 3. BIRD ABUNDANCE ON ROTHSAY STUDY AREA

| BIRD SPECIES              | BIRDS RECORDED IN PLOTS |      |              |       | BIRDS RECORDED AS FLYOVERS |      |              |      |
|---------------------------|-------------------------|------|--------------|-------|----------------------------|------|--------------|------|
|                           | SEASON TOTAL            |      | AVERAGE/WEEK |       | SEASON TOTAL               |      | AVERAGE/WEEK |      |
|                           | BR                      | NONB | BR           | NONB  | BR                         | NONB | BR           | NONB |
| DOUBLE-CRESTED CORMORANT  | 0                       | 0    | 0.0          | 0.0   | 0                          | 4    | 0.0          | 0.7  |
| GREAT BLUE HERON          | 0                       | 3    | 0.0          | 0.5   | 0                          | 4    | 0.0          | 0.7  |
| GREAT EGRET               | 0                       | 0    | 0.0          | 0.0   | 0                          | 7    | 0.0          | 1.2  |
| GREEN-BACKED HERON        | 0                       | 0    | 0.0          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| BLACK-CROWNED NIGHT HERON | 0                       | 0    | 0.0          | 0.0   | 0                          | 7    | 0.0          | 1.2  |
| CANADA GOOSE              | 0                       | 0    | 0.0          | 0.0   | 0                          | 8    | 0.0          | 1.3  |
| MALLARD                   | 0                       | 15   | 0.0          | 2.5   | 0                          | 168  | 0.0          | 28.0 |
| COMMON PINTAIL            | 0                       | 0    | 0.0          | 0.0   | 0                          | 8    | 0.0          | 1.3  |
| BLUE-WINGED TEAL          | 0                       | 0    | 0.0          | 0.0   | 0                          | 8    | 0.0          | 1.3  |
| WOOD DUCK                 | 0                       | 0    | 0.0          | 0.0   | 0                          | 1    | 0.0          | 0.2  |
| RED-TAILED HAWK           | 0                       | 1    | 0.0          | 0.2   | 0                          | 1    | 0.0          | 0.2  |
| AMERICAN KESTREL          | 0                       | 0    | 0.0          | 0.0   | 0                          | 1    | 0.0          | 0.2  |
| RING-NECKED PHEASANT      | 3                       | 1    | 0.5          | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| VIRGINIA RAIL             | 2                       | 0    | 0.3          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| SORA                      | 3                       | 0    | 0.5          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| AMERICAN COOT             | 0                       | 1    | 0.0          | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| KILLDEER                  | 23                      | 32   | 3.8          | 5.3   | 2                          | 28   | 0.3          | 4.7  |
| COMMON SNIFE              | 2                       | 1    | 0.3          | 0.2   | 18                         | 4    | 3.0          | 0.7  |
| RING-BILLED GULL          | 0                       | 0    | 0.0          | 0.0   | 0                          | 1    | 0.0          | 0.2  |
| MOURNING DOVE             | 58                      | 6    | 9.7          | 1.0   | 0                          | 49   | 0.0          | 8.2  |
| GREAT-HORNED OWL          | 0                       | 1    | 0.0          | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| NORTHERN FLICKER          | 1                       | 1    | 0.2          | 0.2   | 0                          | 4    | 0.0          | 0.7  |
| BLACK-BILLED CUCKOO       | 4                       | 0    | 0.7          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| EASTERN PHOEBE            | 1                       | 0    | 0.2          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| ALDER FLYCATCHER          | 15                      | 1    | 2.5          | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| WILLOW FLYCATCHER         | 38                      | 0    | 6.3          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| LEAST FLYCATCHER          | 20                      | 0    | 3.3          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| EASTERN KINGBIRD          | 4                       | 11   | 0.7          | 1.8   | 0                          | 6    | 0.0          | 1.0  |
| HORNED LARK               | 3                       | 2    | 0.5          | 0.3   | 4                          | 0    | 0.7          | 0.0  |
| PURPLE MARTIN             | 0                       | 0    | 0.0          | 0.0   | 0                          | 1    | 0.0          | 0.2  |
| CLIFF SWALLOW             | 0                       | 0    | 0.0          | 0.0   | 1                          | 59   | 0.2          | 9.8  |
| BARN SWALLOW              | 0                       | 0    | 0.0          | 0.0   | 0                          | 85   | 0.0          | 14.2 |
| TREE SWALLOW              | 1                       | 3    | 0.2          | 0.5   | 1                          | 14   | 0.2          | 2.3  |
| BLUE JAY                  | 1                       | 0    | 0.2          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| HOUSE WREN                | 6                       | 0    | 1.0          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| SEDGE WREN                | 795                     | 45   | 132.5        | 7.5   | 0                          | 0    | 0.0          | 0.0  |
| MARSH WREN                | 52                      | 1    | 8.7          | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| GRAY CATBIRD              | 11                      | 1    | 1.8          | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| AMERICAN ROBIN            | 16                      | 11   | 2.7          | 1.8   | 0                          | 2    | 0.0          | 0.3  |
| VEERY                     | 18                      | 1    | 3.0          | 0.2   | 0                          | 1    | 0.0          | 0.2  |
| EASTERN BLUEBIRD          | 0                       | 3    | 0.0          | 0.5   | 0                          | 0    | 0.0          | 0.0  |
| EUROPEAN STARLING         | 0                       | 1    | 0.0          | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| RED-EYED VIREO            | 1                       | 0    | 0.2          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| GOLDEN-WINGED WARBLER     | 0                       | 1    | 0.0          | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| YELLOW WARBLER            | 59                      | 5    | 9.8          | 0.8   | 0                          | 0    | 0.0          | 0.0  |
| COMMON YELLOWTHROAT       | 507                     | 54   | 84.5         | 9.0   | 0                          | 0    | 0.0          | 0.0  |
| YELLOW-BREASTED CHAT      | 2                       | 0    | 0.3          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| DICKCISSEL                | 6                       | 0    | 1.0          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| ROSEBREASTED GROSBEEK     | 1                       | 0    | 0.2          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| CLAY-COLORED SPARROW      | 291                     | 26   | 48.5         | 4.3   | 0                          | 0    | 0.0          | 0.0  |
| VEESPER SPARROW           | 2                       | 0    | 0.3          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| SAVANNAH SPARROW          | 1156                    | 281  | 192.7        | 46.8  | 0                          | 0    | 0.0          | 0.0  |
| GRASSHOPPER SPARROW       | 324                     | 1    | 54.0         | 0.2   | 0                          | 0    | 0.0          | 0.0  |
| LECONTE'S SPARROW         | 113                     | 5    | 18.8         | 0.8   | 0                          | 0    | 0.0          | 0.0  |
| SONG SPARROW              | 182                     | 20   | 30.3         | 3.3   | 0                          | 0    | 0.0          | 0.0  |
| SWAMP SPARROW             | 220                     | 19   | 36.7         | 3.2   | 0                          | 0    | 0.0          | 0.0  |
| BOBOLINK                  | 776                     | 381  | 129.3        | 63.5  | 9                          | 78   | 1.5          | 13.0 |
| RED-WINGED BLACKBIRD      | 348                     | 810  | 58.0         | 135.0 | 0                          | 169  | 0.0          | 28.2 |
| WESTERN MEADOWLARK        | 435                     | 68   | 72.5         | 11.3  | 1                          | 25   | 0.2          | 4.2  |
| YELLOW-HEADED BLACKBIRD   | 16                      | 26   | 2.7          | 4.3   | 1                          | 43   | 0.2          | 7.2  |
| BREWER'S BLACKBIRD        | 7                       | 124  | 1.2          | 20.7  | 0                          | 35   | 0.0          | 5.8  |
| ORCHARD ORIOLE            | 1                       | 0    | 0.2          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| NORTHERN ORIOLE           | 3                       | 0    | 0.5          | 0.0   | 0                          | 0    | 0.0          | 0.0  |
| BROWN-HEADED COWBIRD      | 38                      | 152  | 6.3          | 25.3  | 2                          | 203  | 0.3          | 33.8 |
| COMMON GRACKLE            | 0                       | 1    | 0.0          | 0.2   | 0                          | 32   | 0.0          | 5.3  |
| AMERICAN GOLDFINCH        | 10                      | 41   | 1.7          | 6.8   | 2                          | 37   | 0.3          | 6.2  |

BR = RECORDED IN BREEDING STATUS

NONB = RECORDED IN NONBREEDING STATUS

1

Flyover records here do not include flocks of birds  
This is an issue only for Canada geese, mallard, red-winged blackbird,  
yellow-headed blackbird, grackle, and cowbird numbers. Each of these species had  
had from 1 to 7 flocks recorded during the season.

and rare. These are adapted from Janssen (1987) and are listed in decreasing order. Table 4 summarizes the abundance categories for each species. Because this classification is limited to birds recorded within study plots, an abundance category is considered not applicable if no records exist for a species in breeding or nonbreeding status in a plot regardless of its flyover records.

Based on breeding records eight species were categorized as abundant. Three species were classified as abundant based on nonbreeding records. These were birds with more than 250 total season records in a particular breeding status. The most abundant breeding species on the Rothsay study area are: savannah sparrow, sedge wren, bobolink, common yellowthroat, Western meadowlark, red-winged blackbird, grasshopper sparrow, and clay-colored sparrow; respectively. Breeding savannah sparrow records exceeded 1000 for the season. The next three species had between 500 and 1000 season records. Red-winged blackbirds were the most abundant species recorded in nonbreeding status, followed by bobolink, and savannah sparrow. The savannah sparrow was recorded 281 times in nonbreeding status. This compares to the red-winged blackbird which had 810 nonbreeding records. More than twice as many red-winged blackbirds were recorded in nonbreeding status than in breeding status. This is a rare occurrence within the data gathered by this research.

Many more total species were classified abundant in breeding status than nonbreeding status. However, it is interesting to note that all the birds classified as abundant in nonbreeding status were also categorized as abundant in breeding status. This pattern does not repeat itself in the next abundance category. The term common

TABLE 4. Abundance Classifications of Birds on Rothsay Study Area

| SPECIES NAME            | ABUNDANCE                       | ABUNDANCE                           |
|-------------------------|---------------------------------|-------------------------------------|
|                         | Based on<br>Breeding<br>Records | Based on<br>Non-Breeding<br>Records |
| GREAT BLUE HERON        | N/A                             | Rare                                |
| MALLARD                 | Rare                            | Uncommon                            |
| BLUE-WINGED TEAL        | Rare                            | N/A                                 |
| RED-TAILED HAWK         | N/A                             | Rare                                |
| RING-NECKED PHEASANT    | Rare                            | Rare                                |
| VIRGINIA RAIL           | Rare                            | N/A                                 |
| SORA                    | Rare                            | N/A                                 |
| AMERICAN COOT           | N/A                             | Rare                                |
| KILLDEER                | Uncommon                        | Common                              |
| COMMON SNIFE            | * Rare                          | Rare                                |
| MOURNING DOVE           | Common                          | Uncommon                            |
| GREAT-HORNED OWL        | N/A                             | Rare                                |
| NORTHERN FLICKER        | Rare                            | Rare                                |
| BLACK-BILLED CUCKOO     | Rare                            | N/A                                 |
| EASTERN PHOEBE          | Rare                            | N/A                                 |
| ALDER FLYCATCHER        | Uncommon                        | Rare                                |
| WILLOW FLYCATCHER       | Common                          | N/A                                 |
| LEAST FLYCATCHER        | Uncommon                        | N/A                                 |
| EASTERN KINGBIRD        | Rare                            | Uncommon                            |
| HORNED LARK             | * Rare                          | Rare                                |
| TREE SWALLOW            | Rare                            | Rare                                |
| BLUE JAY                | Rare                            | N/A                                 |
| HOUSE WREN              | Uncommon                        | N/A                                 |
| SEDGE WREN              | Abundant                        | Common                              |
| MARSH WREN              | Common                          | Rare                                |
| GRAY CATBIRD            | Uncommon                        | Rare                                |
| AMERICAN ROBIN          | Uncommon                        | Uncommon                            |
| VEERY                   | Uncommon                        | Rare                                |
| EASTERN BLUEBIRD        | N/A                             | Rare                                |
| EUROPEAN STARLING       | N/A                             | Rare                                |
| RED-EYED VIREO          | Rare                            | N/A                                 |
| GOLDEN-WINGED WARBLER   | Rare                            | Rare                                |
| YELLOW WARBLER          | Common                          | Rare                                |
| COMMON YELLOWTHROAT     | Abundant                        | Common                              |
| YELLOW-BREASTED CHAT    | Rare                            | N/A                                 |
| DICKCISSEL              | Uncommon                        | N/A                                 |
| ROSEBREASTED GROSBEAK   | Rare                            | N/A                                 |
| CLAY-COLORED SPARROW    | Abundant                        | Common                              |
| VESPER SPARROW          | Rare                            | N/A                                 |
| SAVANNAH SPARROW        | Abundant                        | Abundant                            |
| GRASSHOPPER SPARROW     | Abundant                        | Rare                                |
| LECONTE'S SPARROW       | Common                          | Rare                                |
| SONG SPARROW            | Common                          | Uncommon                            |
| SWAMP SPARROW           | Common                          | Uncommon                            |
| BOBOLINK                | Abundant                        | Abundant                            |
| RED-WINGED BLACKBIRD    | Abundant                        | Abundant                            |
| WESTERN MEADOWLARK      | Abundant                        | Common                              |
| YELLOW-HEADED BLACKBIRD | Uncommon                        | Common                              |
| BREWER'S BLACKBIRD      | Uncommon                        | Common                              |
| ORCHARD ORIOLE          | Rare                            | N/A                                 |
| NORTHERN ORIOLE         | Rare                            | N/A                                 |
| BROWN-HEADED COWBIRD    | Common                          | Common                              |
| COMMON GRACKLE          | N/A                             | Rare                                |
| AMERICAN GOLDFINCH      | Uncommon                        | Common                              |

\* The abundance category for this species may be more accurately described as uncommon (see text)

was used to refer to species with 26 through 250 total records for the season. Eight species were classified as common based on breeding records and nine species were classified as common based on nonbreeding records. Only the brown-headed cowbird was categorized as common in both breeding and nonbreeding status. All other species classified as common by examining their breeding records were considered uncommon or rare in nonbreeding status with one exception (refer to table 4). This exception is the least flycatcher. An abundance category based on nonbreeding records is not applicable to the willow flycatcher because it was never recorded within a plot in nonbreeding status.

The swamp sparrow was considered the most common breeder on the study area according to the categorization scheme used. This species was followed in the common category by song sparrow, LeConte's sparrow, yellow warbler, mourning dove, marsh wren, brown-headed cowbird, and willow flycatcher. The order of common species recorded in nonbreeding status within the study plots is as follows (from most to least common): brown-headed cowbird, Brewer's blackbird, Western meadowlark, common yellowthroat, sedge wren, American goldfinch, killdeer, yellow-headed blackbird, and clay-colored sparrow.

The next abundance category is uncommon which applies to bird species having six through 25 season records. Eleven species were classified as uncommon based on in plot breeding records. Six species were considered uncommon based on nonbreeding in plot records. The 11 uncommon species based on breeding records are killdeer, least flycatcher, veery, yellow-headed blackbird, American

robin, alder flycatcher, gray catbird, American goldfinch, Brewer's blackbird, house wren, and dickcissel; respectively. The six uncommon species according to the frequency of their nonbreeding records are the following, in decreasing order: song sparrow, swamp sparrow, mallard, Eastern kingbird, American robin, and mourning dove. The American robin is the only species which is considered uncommon on the Rothsay study area based on both breeding and nonbreeding records.

The final abundance category is rare. This term refers to bird species that have from 1 through 5 total season records. There are 17 species classified as rare according to breeding records, and 20 species considered rare based on nonbreeding records (see table 4). Five species are considered rare based on both nonbreeding and breeding records. These are the ring-necked pheasant, common snipe, Northern flicker, horned lark, and tree swallow. Some species classified as rare based on breeding records may actually be migrants through the area. Each species recorded within a plot on the Rothsay area was also given a breeding classification. This was based on their temporal distribution through the season and will be discussed in the following section.

It has been stressed that these abundance categories are based on the data collected for each species within the plot boundaries and neglects the flyover records. The rationale for this is that birds recorded within plot boundaries can more justifiably be considered using that particular plot. Flyover records do not generally allow this interpretation. Two species may be the

exception to this rule. These species are the horned lark and common snipe. Each if these species has a flight song and display used during the breeding season as a method of courtship and territorial advertisement (Ehrlich, et al., 1988). These two species are considered rare based on within plot breeding records. However, if the singing males which were recorded as flying over the plot are included in the abundance classification scheme for these two species, they would be classified as being uncommon based on breeding records. Another exception to this rule may be flyover records of raptors. These species could be deemed to be using the plot if, based on observer judgment, the individual was foraging over the plot. This exception did not occur for any non-special concern species on the Rothsay area.

### Distribution

The distribution of the birds on the Rothsay Prairie Landscape varied both spatially and temporally. An examination of this information, together with density estimates of breeding birds will provide a characterization of the avifauna on the Rothsay Prairie.

### Temporal Distribution

Figure 6 illustrates the temporal distribution of the species on the Rothsay study area throughout the six weeks of the field season. This figure is supplemented by the information contained in Table 5. Many different temporal patterns exist. The challenge is to interpret these patterns into logical conclusions about the species as a whole on the Rothsay study area. The following



FIGURE 6. SUMMARY OF BIRD PRESENCE THROUGHOUT SEASON ON STUDY PLOTS

| BIRD SPECIES            | PRESENCE/ABSENCE |       |       |       |       |       |
|-------------------------|------------------|-------|-------|-------|-------|-------|
|                         | WK 1             | WK 2  | WK 3  | WK 4  | WK 5  | WK 6  |
| GREAT BLUE HERON        | -----            |       |       |       | ----- |       |
| MALLARD                 | -----            |       |       |       | ----- |       |
| RED-TAILED HAWK         |                  | ----- |       |       |       |       |
| RING-NECKED PHEASANT    | -----            | +++++ |       | +++++ |       | +++++ |
| VIRGINIA RAIL           | +++++            |       | +++++ |       |       |       |
| SORA                    |                  |       | +++++ |       | +++++ |       |
| AMERICAN COOT           |                  |       | ----- |       |       |       |
| KILLDEER                | +++++            | ***** | ***** | ***** | ----- | +++++ |
| COMMON SNIBE            | +++++            | +++++ |       |       | ----- |       |
| MOURNING DOVE           | +++++            | ***** | +++++ | ***** | ***** | +++++ |
| GREAT-HORNED OWL        |                  | ----- |       |       |       |       |
| NORTHERN FLICKER        | +++++            |       |       |       | ----- |       |
| BLACK-BILLED CUCKOO     |                  |       |       |       |       | +++++ |
| EASTERN PHOEBE          |                  |       |       | +++++ |       |       |
| ALDER FLYCATCHER        |                  | +++++ | +++++ | +++++ | +++++ | ***** |
| WILLOW FLYCATCHER       | +++++            | +++++ | +++++ | +++++ | +++++ | +++++ |
| LEAST FLYCATCHER        | +++++            | +++++ | +++++ | +++++ | +++++ | +++++ |
| EASTERN KINGBIRD        | *****            | ----- | ----- | ----- | ***** | ----- |
| HORNED LARK             | *****            | +++++ |       |       |       |       |
| TREE SWALLOW            | -----            | ***** |       |       |       |       |
| BLUE JAY                |                  |       |       | +++++ |       |       |
| HOUSE WREN              | +++++            | +++++ | +++++ | +++++ | +++++ | +++++ |
| SEDGE WREN              | *****            | ***** | ***** | ***** | ***** | ***** |
| MARSH WREN              | +++++            | +++++ | +++++ | +++++ | ***** | +++++ |
| GRAY CATBIRD            | +++++            | +++++ | +++++ | ----- | +++++ | +++++ |
| AMERICAN ROBIN          | *****            |       |       | ***** | ***** |       |
| VEERY                   | +++++            | +++++ | +++++ | ***** | +++++ | +++++ |
| EASTERN BLUEBIRD        | -----            |       |       |       | ----- |       |
| EUROPEAN STARLING       | -----            |       |       |       |       |       |
| RED-EYED VIREO          |                  | +++++ |       |       |       |       |
| GOLDEN-WINGED WARBLER   |                  | ----- |       |       |       |       |
| YELLOW WARBLER          | *****            | +++++ | ***** | +++++ | +++++ | +++++ |
| COMMON YELLOWTHROAT     | *****            | ***** | ***** | ***** | ***** | ***** |
| YELLOW-BREASTED CHAT    | +++++            | +++++ | +++++ | +++++ | +++++ | +++++ |
| DICKCISSEL              |                  |       |       |       | +++++ | +++++ |
| ROSEBREASTED GROSBEAK   | +++++            |       |       |       |       |       |
| CLAY-COLORED SPARROW    | *****            | ***** | ***** | ***** | ***** | ***** |
| VESPER SPARROW          | +++++            |       |       |       |       |       |
| SAVANAH SPARROW         | *****            | ***** | ***** | ***** | ***** | ***** |
| GRASSHOPPER SPARROW     | +++++            | +++++ | ***** | +++++ | +++++ | +++++ |
| LECONTE'S SPARROW       | *****            | +++++ | +++++ | ***** | ***** | +++++ |
| SONG SPARROW            | *****            | ***** | ***** | ***** | ***** | ***** |
| SWAMP SPARROW           | +++++            | ***** | ***** | ***** | ***** | ***** |
| BOBOLINK                | *****            | ***** | ***** | ***** | ***** | ***** |
| RED-WINGED BLACKBIRD    | *****            | ***** | ***** | ***** | ***** | ***** |
| WESTERN MEADOWLARK      | *****            | ***** | ***** | ***** | ***** | ***** |
| YELLOW-HEADED BLACKBIRD | +++++            | +++++ |       | ***** | ----- | ***** |
| BREWER'S BLACKBIRD      | *****            | ***** | ***** | ***** | ***** | ***** |
| ORCHARD ORIOLE          | +++++            |       |       |       |       |       |
| NORTHERN ORIOLE         | +++++            | +++++ | +++++ | +++++ | +++++ | +++++ |
| BROWN-HEADED COWBIRD    | *****            | ***** | ***** | ***** | ***** | ***** |
| COMMON GRACKLE          |                  |       |       |       | ----- |       |
| AMERICAN GOLDFINCH      | *****            | ***** | ***** | ***** | ----- | ***** |

+++++ Breeding

----- unknown breeding status

\*\*\*\*\* breeding and unknown breeding status

TABLE 5. Weekly Distribution of Birds on Rothsay Prairie

| BIRD SPECIES              | NUMBER RECORDED PER WEEK |     |        |     |        |     |        |     |        |     |        |     |
|---------------------------|--------------------------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|
|                           | WEEK 1                   |     | WEEK 2 |     | WEEK 3 |     | WEEK 4 |     | WEEK 5 |     | WEEK 6 |     |
|                           | BR                       | NON | BR     | NON | BR     | NON | BR     | NON | BR     | NON | BR     | NON |
| DOUBLE-CRESTED CORMORANT  | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| GREAT BLUE HERON          | 0                        | 2   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 1   | 0      | 0   |
| GREAT EGRET               | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| GREEN-BACKED HERON        | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| BLACK-CROWNED NIGHT HERON | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| CANADA GOOSE              | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 1   | 0      | 0   |
| MALLARD                   | 0                        | 3   | 0      | 6   | 0      | 5   | 0      | 0   | 0      | 1   | 0      | 0   |
| COMMON PINTAIL            | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| BLUE-WINGED TEAL          | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| WOOD DUCK                 | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| RED-TAILED HAWK           | 0                        | 0   | 0      | 1   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| AMERICAN KESTREL          | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| RING-NECKED PHEASANT      | 0                        | 1   | 1      | 0   | 0      | 0   | 1      | 0   | 0      | 0   | 1      | 0   |
| VIRGINIA RAIL             | 1                        | 0   | 0      | 0   | 1      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| SORA                      | 0                        | 0   | 0      | 0   | 2      | 0   | 0      | 0   | 1      | 0   | 0      | 0   |
| AMERICAN COOT             | 0                        | 0   | 0      | 0   | 0      | 1   | 0      | 0   | 0      | 0   | 0      | 0   |
| KILLDEER                  | 5                        | 0   | 3      | 5   | 4      | 7   | 5      | 8   | 0      | 12  | 6      | 0   |
| COMMON SNIPE              | 1                        | 0   | 1      | 0   | 0      | 0   | 0      | 1   | 0      | 0   | 0      | 0   |
| RING-BILLED GULL          | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| MOURNING DOVE             | 8                        | 0   | 8      | 2   | 12     | 0   | 10     | 3   | 10     | 1   | 10     | 0   |
| GREAT-HORNED OWL          | 0                        | 0   | 0      | 1   | 0      | 0   | 0      | 0   | 0      | 1   | 0      | 0   |
| NORTHERN FLICKER          | 1                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| BLACK-BILLED CUCKOO       | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 2      | 0   | 2      | 0   |
| EASTERN PHOEBE            | 0                        | 0   | 0      | 0   | 0      | 0   | 1      | 0   | 0      | 0   | 0      | 0   |
| ALDER FLYCATCHER          | 0                        | 0   | 4      | 0   | 4      | 0   | 5      | 0   | 0      | 0   | 2      | 1   |
| WILLOW FLYCATCHER         | 1                        | 0   | 3      | 0   | 10     | 0   | 8      | 0   | 8      | 0   | 8      | 0   |
| LEAST FLYCATCHER          | 1                        | 0   | 5      | 0   | 1      | 0   | 4      | 0   | 5      | 0   | 4      | 0   |
| EASTERN KINGBIRD          | 1                        | 1   | 2      | 4   | 0      | 1   | 0      | 2   | 1      | 1   | 0      | 2   |
| HORNED LARK               | 2                        | 2   | 1      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| PURPLE MARTIN             | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| CLIFF SWALLOW             | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| BARN SWALLOW              | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| TREE SWALLOW              | 0                        | 2   | 1      | 1   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| BLUE JAY                  | 0                        | 0   | 0      | 0   | 0      | 0   | 1      | 0   | 0      | 0   | 0      | 0   |
| HOUSE WREN                | 2                        | 0   | 1      | 0   | 1      | 0   | 1      | 0   | 0      | 0   | 1      | 0   |
| SEDGE WREN                | 109                      | 12  | 139    | 1   | 127    | 5   | 119    | 15  | 157    | 7   | 144    | 5   |
| MARSH WREN                | 3                        | 0   | 11     | 0   | 15     | 0   | 13     | 0   | 7      | 1   | 3      | 0   |
| GRAY CATBIRD              | 1                        | 0   | 3      | 0   | 4      | 0   | 0      | 1   | 2      | 0   | 1      | 0   |
| AMERICAN ROBIN            | 2                        | 1   | 5      | 5   | 0      | 0   | 3      | 3   | 2      | 1   | 4      | 1   |
| VEERY                     | 2                        | 0   | 4      | 0   | 4      | 0   | 4      | 1   | 1      | 0   | 3      | 0   |
| EASTERN BLUEBIRD          | 0                        | 0   | 0      | 2   | 0      | 0   | 0      | 0   | 0      | 1   | 0      | 0   |
| EUROPEAN STARLING         | 0                        | 0   | 0      | 1   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| RED-EYED VIREO            | 0                        | 0   | 1      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| GOLDEN-WINGED WARBLER     | 0                        | 0   | 0      | 1   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| YELLOW WARBLER            | 7                        | 2   | 9      | 1   | 13     | 0   | 13     | 2   | 8      | 0   | 9      | 0   |
| COMMON YELLOWTHROAT       | 75                       | 4   | 80     | 14  | 85     | 16  | 85     | 3   | 101    | 9   | 81     | 8   |
| YELLOW-BREASTED CHAT      | 1                        | 0   | 1      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |

BR = BREEDING

NON = NON-BREEDING STATUS

## BLE 5. (con't)

| BIRD SPECIES            | NUMBER RECORDED PER WEEK |     |        |     |        |     |        |     |        |     |        |     |
|-------------------------|--------------------------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|
|                         | WEEK 1                   |     | WEEK 2 |     | WEEK 3 |     | WEEK 4 |     | WEEK 5 |     | WEEK 6 |     |
|                         | BR                       | NON | BR     | NON | BR     | NON | BR     | NON | BR     | NON | BR     | NON |
| DICKCISSEL              | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 3      | 0   | 3      | 0   |
| ROSEBREASTED GROSBEAK   | 1                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| CLAY-COLORED SPARROW    | 41                       | 2   | 50     | 4   | 45     | 3   | 56     | 7   | 47     | 7   | 52     | 3   |
| VESEPER SPARROW         | 2                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| SAVANAH SPARROW         | 193                      | 19  | 194    | 9   | 174    | 22  | 198    | 73  | 203    | 67  | 194    | 91  |
| GRASSHOPPER SPARROW     | 36                       | 0   | 50     | 0   | 60     | 1   | 49     | 0   | 65     | 0   | 64     | 0   |
| LECONTE'S SPARROW       | 11                       | 1   | 20     | 0   | 25     | 0   | 16     | 2   | 19     | 2   | 22     | 0   |
| SONG SPARROW            | 19                       | 3   | 29     | 4   | 26     | 4   | 33     | 2   | 29     | 3   | 46     | 4   |
| SWAMP SPARROW           | 20                       | 0   | 33     | 1   | 35     | 7   | 34     | 4   | 48     | 5   | 50     | 2   |
| BOBOLINK                | 176                      | 86  | 183    | 53  | 161    | 32  | 126    | 25  | 79     | 85  | 51     | 100 |
| RED-WINGED BLACKBIRD    | 61                       | 133 | 51     | 138 | 73     | 117 | 64     | 177 | 54     | 116 | 45     | 129 |
| WESTERN MEADOWLARK      | 86                       | 14  | 68     | 7   | 80     | 17  | 79     | 9   | 69     | 10  | 53     | 11  |
| YELLOW-HEADED BLACKBIRD | 1                        | 0   | 7      | 0   | 0      | 0   | 7      | 10  | 0      | 4   | 1      | 12  |
| BREWER'S BLACKBIRD      | 3                        | 16  | 0      | 29  | 1      | 15  | 1      | 29  | 1      | 19  | 1      | 16  |
| ORCHARD ORIOLE          | 1                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| NORTHERN ORIOLE         | 2                        | 0   | 1      | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 0   |
| BROWN-HEADED COWBIRD    | 5                        | 23  | 6      | 24  | 8      | 20  | 4      | 39  | 8      | 26  | 7      | 20  |
| COMMON GRACKLE          | 0                        | 0   | 0      | 0   | 0      | 0   | 0      | 0   | 0      | 1   | 0      | 0   |
| AMERICAN GOLDFINCH      | 3                        | 7   | 4      | 3   | 1      | 3   | 0      | 12  | 1      | 12  | 1      | 4   |

R = BREEDING

NON = NON-BREEDING STATUS

examines each pattern and develops the criteria used to classify each species into breeding categories of: breeder, visitor, or migrant. Table 6 provides a summary of the species which are placed into each category. A discussion of the criteria follows.

The first temporal pattern in the data is the regular occurrence of some species in the plots over the entire season. Some species were recorded in plots every week. These species, and others that occurred at least three of the six weeks are considered breeders or regular visitors on the study area, depending on their recorded breeding status within the plots. Based on this criteria, 29 species are considered breeding birds on the Rothsay study area (refer to table 6). Although nest searching was not a part of this study's methodology, the breeding status of the species ~~preceded~~<sup>followed</sup> by an "\*" was confirmed by locating at least one nest or brood on the site.

One species, the great blue heron is considered a regular visitor to the site based on the aforementioned criteria. It was not recorded as a breeding species by this research's methodology, however, its natural history does not include the defense of territories and the advertising for a mate by vocalizations. Support for the visitor status is gained from the fact that this study area does not contain suitable nesting habitat for great blue herons. This species nests colonially in large rookeries located in trees (Ehrlich, et al. 1988). There are very large large trees on the study area and even fewer large groups of these trees that would be necessary to accommodate a colony.

Strictly using the singing male criteria would also classify the

TABLE 6. Breeding classifications of birds on Study Area

| SPECIES NAME             | BREEDING STATUS     |
|--------------------------|---------------------|
| DOUBLE-CRESTED CORMORANT | none (flyover only) |
| GREAT BLUE HERON         | visitor             |
| GREAT EGRET              | none (flyover only) |
| GREEN-BACKED HERON       | none (flyover only) |
| SNOW GOOSE               | none (flyover only) |
| CANADA GOOSE             | none (flyover only) |
| MAILLARD                 | breeder *           |
| COMMON PINTAIL           | none (flyover only) |
| BLUE-WINGED TEAL         | breeder *           |
| RED-TAILED HAWK          | visitor             |
| AMERICAN KESTREL         | none (flyover only) |
| RING-NECKED PHEASANT     | breeder             |
| VIRGINIA RAIL            | insufficient data   |
| SORA                     | breeder             |
| AMERICAN COOT            | accidental          |
| KILLDEER                 | breeder             |
| COMMON SNIFE             | breeder *           |
| RING-BILLED GULL         | none (flyover only) |
| MOURNING DOVE            | breeder *           |
| GREAT-HORNED OWL         | visitor             |
| NORTHERN FLICKER         | visitor             |
| BLACK-BILLED CUCKOO      | breeder *           |
| EASTERN PHOEBE           | visitor             |
| ALDER FLYCATCHER         | breeder             |
| WILLOW FLYCATCHER        | breeder *           |
| LEAST FLYCATCHER         | breeder             |
| EASTERN KINGBIRD         | breeder *           |
| HORNED LARK              | insufficient data   |
| PURPLE MARTIN            | none (flyover only) |
| BANK SWALLOW             | breeder             |
| CLIFF SWALLOW            | breeder             |
| BARN SWALLOW             | breeder             |
| TREE SWALLOW             | insufficient data   |
| BLUE JAY                 | accidental          |
| HOUSE WREN               | breeder             |
| SEdge WREN               | breeder             |
| MARSH WREN               | breeder             |
| GRAY CATBIRD             | breeder             |
| AMERICAN ROBIN           | breeder             |
| VEERY                    | breeder             |
| EASTERN BLUEBIRD         | visitor             |
| EUROPEAN STARLING        | migrant             |
| RED-EYED VIREO           | migrant             |
| GOLDEN-WINGED WARBLER    | migrant             |
| YELLOW WARBLER           | breeder *           |
| COMMON YELLOWTHROAT      | breeder             |
| YELLOW-BREASTED CHAT     | insufficient data   |
| DICKCISSEL               | breeder             |
| ROSEBREASTED GROSBK      | migrant             |
| CLAY-COLORED SPARROW     | breeder *           |
| VESPER SPARROW           | migrant             |
| SAVANNAH SPARROW         | breeder *           |
| GRASSHOPPER SPARROW      | breeder             |
| LECONTE'S SPARROW        | breeder             |
| SONG SPARROW             | breeder *           |
| SWAMP SPARROW            | breeder *           |
| BOBOLINK                 | breeder *           |
| RED-WINGED BLACKBIRD     | breeder *           |
| WESTERN MEADOWLARK       | breeder *           |
| YELLOW-HEADED BLACKBIRD  | breeder             |
| BREWER'S BLACKBIRD       | breeder *           |
| ORCHARD ORIOLE           | migrant             |
| NORTHERN ORIOLE          | insufficient data   |
| BROWN-HEADED COWBIRD     | breeder *           |
| COMMON GRACKLE           | accidental          |
| AMERICAN GOLDFINCH       | breeder             |

\* Breeding confirmed

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mallard as a visitor to the site. However, this is another species that can be misdiagnosed by a survey following the method of the breeding bird survey because the male does not vocalize to demonstrate breeding status. Other factors recorded during the field season determined that the mallard should be considered a breeding species on Rothsay Prairie. During the season many three bird flights of mallards were recorded as flyovers, a mallard brood was recorded outside the plots but on the study area, and a nest with 7 eggs was located near plot A-4 on June 15, 1989. Therefore, this species is considered a breeder on the site.

A second temporal pattern seen in figure 6 is the recording of a species only during one week during the field season, and generally only as a single occurrence within that week. The following birds fall into this category: red-tailed hawk, American coot, great-horned owl, Eastern phoebe, blue jay, European starling, red-eyed vireo, golden-winged warbler, rose-breasted grosbeak, vesper sparrow, orchard oriole, and common grackle. Due to their transient nature, these species, with two exceptions, will be considered migrants or accidentals to study area depending on when they were recorded during the season. The two exceptions to this are the red-tailed hawk and great-horned owl, which were noted outside study plots on several occasions throughout the season and are therefore believed to be regular visitors or possibly breeders on the site. Any of the other species in this group which were recorded during the first two weeks of the season will be considered migrants. This applies to the European starling, red-eyed vireo, golden-winged warbler, rose-breasted grosbeak, vesper sparrow, and

orchard oriole. The other species in this group recorded after the first two weeks, however, will be categorized as accidentals. This is the case for the American coot, Eastern phoebe, blue jay, and common grackle.

A third temporal pattern is exhibited by individuals in the following species: horned lark, tree swallow, Northern oriole, and yellow-breasted chat. Singing males from these species were recorded only during the first two weeks of the season. The reason for this distribution is not so easily interpreted. These species may be migrants, or they may have stopped singing earlier in the season than other species due to failed breeding or habit. Data is not sufficient to categorize these species.

Individuals of the species Virginia rail, sora, Northern flicker, and Eastern bluebird display a fourth temporal pattern. These species were recorded only twice during the season, but not in successive weeks. The bluebirds were never recorded in breeding status and no nests or young were located for this species. This data tends to support the classification of the bluebird as a visitor on the study site. It is interesting to note, however, that the total records for this species is two individuals. One individual was located during the second week of the season and the other was recorded during the fifth week within the same plot. This may suggest the potential for breeding, but without additional data the status of the Eastern bluebird on the Rothsay study area will be categorized as a visitor.

Singing males were recorded for both soras and Virginia rails,

however. Rails are known to be secretive and sporadic singers. This, in addition to the location of a sora nest on June 13, 1989, at the only site where singing sora males were documented, allows the sora as a breeder on the study area. The interpretation of the data is not as clear-cut for Virginia rails. A total of two Virginia rails were recorded for the entire season and each record was documented in a different plot. Therefore, the data is not sufficient to categorize the Virginia rail's status on the study area. The final species, Northern flicker, has a total of two records for the season. One was recorded in breeding status and the other was not. In addition, each individual was documented in a different plot. This supports the categorization of the Northern flicker as a visitor to the study area.

A final temporal distribution is illustrated by the dickcissel and black-billed cuckoo. Singing males were recorded for both of these species only during the fifth and sixth weeks of the season. It is thought that these two species should be considered breeders on the site despite the short duration of their records. The breeding status determination is supported by the general natural history of these species and observations specific to this study area. Dickcissels are late migrants and breeders (Green and Janssen, 1975; Janssen, 1987). They were first seen in the vicinity of the Rothsay study area on June 4, 1989. At this time most of the other species had been on the study area defending territories for at least two full weeks. Although the first record of a singing male on a plot did not occur until June 19, 1989, the occurrences of this species were then uniform for the remainder of the field



season. The black-billed cuckoo is not consistently considered a late breeder, although Janssen (1987) reports a breeding record in Minnesota as late as September. In further support of its breeding status on Rothsay, a nest with young was found on July 9, 1989 in plot W-9. This confirms its breeding status on the Rothsay Prairie Landscape study area.

In addition to the breeding individuals represented in figure 6, nests were located on the study area for three species not in this figure. These species are: cliff swallow, barn swallow and blue-winged teal. Breeding individuals of these species were never recorded by this research's regular point-count methodology because these species' habits do not allow characterization by this method. However, nests for these species were found outside plot boundaries, but within the Rothsay study area during the course of the season.

This summarizes the breeding status of non-special concern bird species on the Rothsay area. At this point, no attempt has been made to rank the rarity of each species within the breeding categories. The following discussion on the spatial distribution of these birds should help illuminate this aspect of the distribution and abundance of birds on the Rothsay Prairie Landscape.

#### Spatial distribution

In addition to the large variation in temporal distribution exhibited by the bird species on the Rothsay Prairie, they also showed a breadth of spatial distributions. Some species were widely distributed across study area; some rather restricted. This can be

most easily illustrated by examining the total number of plots a species was recorded in. Table 7 presents this information in decreasing order of plots where breeding birds were recorded. Interpretation of this table will concentrate on birds with **breeding status** as measured by this research's methodology.

The five most widely distributed breeding bird species on the site (as measured by the total number of plots in which they were recorded) were: (1) savannah sparrow, (2) bobolink, (3) western meadowlark, (4) common yellowthroat, and (5) sedge wren. All of these species were documented in more than 100 plots. Red-winged blackbirds followed these top five closely. Breeding individuals of this species were recorded in 94 different plots. All six of the above species occurred in more than 60% of the study plots. Therefore, their distribution the study area is considered widespread. A summary of all the distribution classifications for each species is presented in table 8.

The savannah sparrow was the most widespread of all breeding birds on the study area. It was recorded in 83.2% of the 155 study plots. Bobolinks followed closely, occurring in 77.4%, or 120 of the plots. Breeding individuals of the Western meadowlark were recorded in 72.2 percent of the plots, while common yellowthroats occurred in 67.7% of the plots. Sedge wrens were documented in 65.8% of the 155 study plots, and red-winged blackbirds were recorded in 60.6% of the plots. There are at least two possible explanations for the widespread distribution of these species on the Rothsay study area.

TABLE 7. Summary of Spatial Distribution

| BIRD SPECIES            | BREEDING               |                        | NONBREEDING            |                        |
|-------------------------|------------------------|------------------------|------------------------|------------------------|
|                         | TOTAL<br># OF<br>PLOTS | % OF<br>TOTAL<br>PLOTS | TOTAL<br># OF<br>PLOTS | % OF<br>TOTAL<br>PLOTS |
| SAVANNAH SPARROW        | 129                    | 83.22                  | 87                     | 56.12                  |
| BOBOLINK                | 120                    | 77.41                  | 84                     | 54.19                  |
| WESTERN MEADOWLARK      | 112                    | 72.25                  | 40                     | 25.80                  |
| COMMON YELLOWTHROAT     | 105                    | 67.74                  | 41                     | 26.45                  |
| SEDGE WREN              | 102                    | 65.80                  | 32                     | 20.64                  |
| RED-WINGED BLACKBIRD    | 94                     | 60.64                  | 77                     | 49.67                  |
| CLAY-COLORED SPARROW    | 77                     | 49.67                  | 18                     | 11.61                  |
| GRASSHOPPER SPARROW     | 72                     | 46.45                  | 1                      | 0.645                  |
| SWAMP SPARROW           | 58                     | 37.41                  | 14                     | 9.032                  |
| SONG SPARROW            | 55                     | 35.48                  | 11                     | 7.096                  |
| LECONTE'S SPARROW       | 49                     | 31.61                  | 4                      | 2.580                  |
| MOURNING DOVE           | 28                     | 18.06                  | 4                      | 2.580                  |
| BROWN-HEADED COWBIRD    | 22                     | 14.19                  | 48                     | 30.96                  |
| WILLOW FLYCATCHER       | 22                     | 14.19                  | 0                      | 0                      |
| MARSH WREN              | 19                     | 12.25                  | 1                      | 0.645                  |
| YELLOW WARBLER          | 18                     | 11.61                  | 4                      | 2.580                  |
| AMERICAN ROBIN          | 12                     | 7.741                  | 8                      | 5.161                  |
| GRAY CATBIRD            | 9                      | 5.806                  | 1                      | 0.645                  |
| ALDER FLYCATCHER        | 9                      | 5.806                  | 1                      | 0.645                  |
| AMERICAN GOLDFINCH      | 8                      | 5.161                  | 18                     | 11.61                  |
| VEERY                   | 8                      | 5.161                  | 1                      | 0.645                  |
| BREWER'S BLACKBIRD      | 7                      | 4.516                  | 18                     | 11.61                  |
| KILLDEER                | 7                      | 4.516                  | 7                      | 4.516                  |
| LEAST FLYCATCHER        | 7                      | 4.516                  | 0                      | 0                      |
| YELLOW-HEADED BLACKBIRD | 6                      | 3.870                  | 5                      | 3.225                  |
| DICKCISSEL              | 5                      | 3.225                  | 0                      | 0                      |
| BLACK-BILLED CUCKOO     | 4                      | 2.580                  | 0                      | 0                      |
| HOUSE WREN              | 4                      | 2.580                  | 0                      | 0                      |
| EASTERN KINGBIRD        | 3                      | 1.935                  | 5                      | 3.225                  |
| HORNED LARK             | 3                      | 1.935                  | 2                      | 1.290                  |
| RING-NECKED PHEASANT    | 3                      | 1.935                  | 1                      | 0.645                  |
| NORTHERN ORIOLE         | 3                      | 1.935                  | 0                      | 0                      |
| COMMON SNIPE            | 2                      | 1.290                  | 1                      | 0.645                  |
| VESPER SPARROW          | 2                      | 1.290                  | 0                      | 0                      |
| YELLOW-BREASTED CHAT    | 2                      | 1.290                  | 0                      | 0                      |
| VIRGINIA RAIL           | 2                      | 1.290                  | 0                      | 0                      |
| TREE SWALLOW            | 1                      | 0.645                  | 2                      | 1.290                  |
| NORTHERN FLICKER        | 1                      | 0.645                  | 1                      | 0.645                  |
| BLUE JAY                | 1                      | 0.645                  | 0                      | 0                      |
| SORA                    | 1                      | 0.645                  | 0                      | 0                      |
| EASTERN PHOEBE          | 1                      | 0.645                  | 0                      | 0                      |
| ORCHARD ORIOLE          | 1                      | 0.645                  | 0                      | 0                      |
| RED-EYED VIREO          | 1                      | 0.645                  | 0                      | 0                      |
| ROSEBREASTED GROSBEAK   | 1                      | 0.645                  | 0                      | 0                      |
| MALLARD                 | 0                      | 0                      | 7                      | 4.516                  |
| GREAT BLUE HERON        | 0                      | 0                      | 3                      | 1.935                  |
| EASTERN BLUEBIRD        | 0                      | 0                      | 1                      | 0.645                  |
| GOLDEN-WINGED WARBLER   | 0                      | 0                      | 1                      | 0.645                  |
| AMERICAN COOT           | 0                      | 0                      | 1                      | 0.645                  |
| COMMON GRACKLE          | 0                      | 0                      | 1                      | 0.645                  |
| EUROPEAN STARLING       | 0                      | 0                      | 1                      | 0.645                  |
| GREAT-HORNED OWL        | 0                      | 0                      | 1                      | 0.645                  |
| RED-TAILED HAWK         | 0                      | 0                      | 1                      | 0.645                  |

TABLE 8. Bird Distribution Classifications

| SPECIES NAME             | DISTRIBUTION |
|--------------------------|--------------|
| DOUBLE-CRESTED CORMORANT | N/A          |
| GREAT BLUE HERON         | N/A          |
| GREAT EGRET              | N/A          |
| GREEN-BACKED HERON       | N/A          |
| SNOW GOOSE               | N/A          |
| CANADA GOOSE             | N/A          |
| MALLARD                  | local        |
| COMMON PINTAIL           | N/A          |
| BLUE-WINGED TEAL         | local        |
| RED-TAILED HAWK          | N/A          |
| AMERICAN KESTREL         | N/A          |
| RING-NECKED PHEASANT     | local        |
| VIRGINIA RAIL            | local        |
| SORA                     | local        |
| AMERICAN COOT            | N/A          |
| KILLDEER                 | local        |
| COMMON SNIBE             | local        |
| RING-BILLED GULL         | N/A          |
| MOURNING DOVE            | restricted   |
| GREAT-HORNED OWL         | N/A          |
| NORTHERN FLICKER         | local        |
| BLACK-BILLED CUCKOO      | local        |
| EASTERN PHOEBE           | local        |
| ALDER FLYCATCHER         | local        |
| WILLOW FLYCATCHER        | restricted   |
| LEAST FLYCATCHER         | local        |
| EASTERN KINGBIRD         | local        |
| HORNED LARK              | local        |
| PURPLE MARTIN            | N/A          |
| TREE SWALLOW             | local        |
| BLUE JAY                 | local        |
| HOUSE WREN               | local        |
| SEDGE WREN               | widespread   |
| MARSH WREN               | restricted   |
| GRAY CATBIRD             | local        |
| AMERICAN ROBIN           | restricted   |
| VEERY                    | local        |
| EASTERN BLUEBIRD         | N/A          |
| EUROPEAN STARLING        | N/A          |
| RED-EYED VIREO           | local        |
| GOLDEN-WINGED WARBLER    | N/A          |
| YELLOW WARBLER           | restricted   |
| COMMON YELLOWTHROAT      | widespread   |
| YELLOW-BREASTED CHAT     | local        |
| DICKCISSEL               | local        |
| ROSEBREASTED GROSBEAK    | local        |
| CLAY-COLORED SPARROW     | moderate     |
| VESPER SPARROW           | local        |
| SAVANNAH SPARROW         | widespread   |
| GRASSHOPPER SPARROW      | moderate     |
| LECONTE'S SPARROW        | moderate     |
| SONG SPARROW             | moderate     |
| SWAMP SPARROW            | moderate     |
| BOBOLINK                 | widespread   |
| RED-WINGED BLACKBIRD     | widespread   |
| WESTERN MEADOWLARK       | widespread   |
| YELLOW-HEADED BLACKBIRD  | local        |
| BREWER'S BLACKBIRD       | local        |
| ORCHARD ORIOLE           | local        |
| NORTHERN ORIOLE          | local        |
| BROWN-HEADED COWBIRD     | restricted   |
| COMMON CRACKLE           | N/A          |
| AMERICAN GOLDFINCH       | local        |

First, these species may be habitat generalists and thus, have a large range of different habitats that satisfy their life requirements. A second possibility is that these species have very specific habitat requirements and the Rothsay area is representative of their preferred habitat. Additional research was undertaken to determine the habitat associations of the birds breeding on the Rothsay Prairie Landscape area. This will be discussed in a later chapter of this report. A general discussion of population trends and broad habitat statements for these species will be presented here.

The top three species (i.e. savannah sparrow, bobolink, and Western meadowlark) are considered grassland species. For example, Johnsgard (1979) lists all of these species as associated with grassland ecosystem of the Great Plains. Oring (1979) categorizes these three birds as primary species of Minnesota's mesic prairie ecosystem, although not restricted to **native** prairie for breeding.

Nationwide, significant declines have been documented for Western meadowlark populations (Robbins et al., 1986). This same trend has been reported in central North America (Robbins et al., 1986) and Minnesota (USFWS, 1988). Bobolink populations also have documented declines in central North America (Robbins et al., 1986) and Minnesota (USFWS, 1988). According to the U.S. Fish and Wildlife Service (1988), however, this trend is not statistically significant in Minnesota. The savannah sparrow has shown stable populations throughout North America (Robbins et al., 1986) and in Minnesota (USFWS, 1988).

These trends suggest that at least Western meadowlark and bobolink populations are vulnerable. There should be concern for the future of these species. The wide distribution of these species and savannah sparrows across the Rothsay study area suggests that it provides good breeding habitat for these three species. This area may serve as a refugia for the species, where they may potentially breed at optimal levels. It may be one of the few areas in Minnesota and central North America large enough to support viable populations of these species within its boundaries.

The next three most widely distributed species on the study area are the common yellowthroat, sedge wren, and red-winged blackbird, respectively. These birds are generally considered more secondary species of the prairie ecosystem. All three will regularly breed outside this habitat type. In addition, Johnsgard (1979) classified these species as being associated with limnic environments. Oring (1979), however, did categorize sedge wrens and red-winged blackbirds as primary species of Minnesota's wet prairie ecosystem.

The population trends associated with these species are more favorable than those documented for the first three species. The common yellowthroat has shown slight, but significant increases in its populations across the entire North American continent; while its population trend in central North America has been stable (Robbins, et al., 1986). In Minnesota, there has been a documented small, but statistically significant, increase in yellowthroat populations (USFWS, 1988). Sedge wren populations also have shown a significant increase in Minnesota (USFWS, 1988). This increase in

populations of sedge wrens in Minnesota appears to be an anomaly to the overall population trend for this species in North America. Robbins, et al. (1986) reported a decline in populations of this species when trends were analyzed across the entire North American continent, all central North America, and the Great Lakes region. Red-winged blackbird populations have increased significantly continent-wide (Robbins, et al., 1986). An increasing population trend for red-winged blackbirds was also shown by data for Minnesota, although this trend was not significant (USFWS, 1988). Because the Rothsay Prairie Landscape contains a mosaic of the wetter prairie community types and prairie wetlands (MDNR Natural Heritage Program, 1987), it is able to support these species which prefer wetter habitats, as well as the more "traditional" grassland species. It provides important breeding habitat for all of these species.

In addition to the aforementioned six most widely distributed avian species breeding on this area, five species were moderately distributed across the Rothsay Prairie. These species were recorded in one-third to one-half (49 - 77 plots) of the plots on this study area. In decreasing order, these species are: clay-colored sparrow, grasshopper sparrow, swamp sparrow, and song sparrow, and LeConte's sparrow. Three of these five birds are considered grassland species by Johnsgard (1979). This author categorizes the clay-colored sparrow, grasshopper sparrow and LeConte's sparrow as grassland associated species. Johnsgard classifies the swamp sparrow as a species associated with limnic environments and the song sparrow as a species associated with woodlands and forests. Oring (1979),

however, lists four of these species as birds associated with prairie communities in Minnesota. According to his classification system, the LeConte's sparrow is a primary species of wet prairies; the grasshopper sparrow is a secondary species of the mesic prairie; the clay-colored sparrow is a secondary species of dry prairie; and the swamp sparrow is a secondary species of wet prairie in Minnesota. A report from Illinois classifies the song sparrow as a facultive prairie species.

The population trends for these species are varied. The clay-colored sparrow populations have remained stable continent-wide and in Central North America; while showing a significant increase in the Canadian parklands area (Robbins, et al., 1986). A slight decrease in populations of this species in Minnesota was reported (USFWS, 1988), however, this decrease was not statistically significant. The grasshopper sparrow, on the other hand, showed a significant decrease in populations within Minnesota (USFWS, 1988), and throughout its range (Robbins, et al., 1986). These significant decreases in grasshopper populations included continent-wide data, and data from the eastern and central portions of North America. This makes its moderate distribution across the Rothsay area of special importance.

The swamp sparrow has shown a significant increase in population numbers in Minnesota (USFWS, 1988) and Central North America (Robbins, et al., 1986). Continent-wide, the populations of this species appear to be remaining stable (Robbins, et al., 1986). Song sparrow numbers have remained stable in Minnesota (USFWS, 1988)



while showing a significant decline continent-wide in earlier data (Robbins, et al., 1986). Robbins and his colleagues (1986), however stated that this continent-wide decline was due to large, rapid declines in song sparrow numbers in the eastern region overshadowing the more general trend of stable populations as reported from all other regions. It was their opinion that stable populations was a more correct interpretation of the data and that the declines would most probably be short-lived. There is no argument, however, that LeConte's sparrow numbers are declining everywhere but in central North America (Robbins, et al., 1986). The U.S. Fish and Wildlife Service (1988) reported a significant upward trend in LeConte's sparrow populations in Minnesota. These moderately distributed species again seem to represent a wide variety of habitat preferences and population trends. Chapter 2 will address the habitat associations of the breeding birds recorded on the Rothsay Prairie Landscape area.

Six species were recorded in 10 to 30 plots (8 - 18% of the 155 total plots). These species represent the next level of spatial distribution on the Rothsay area and will be categorized as restricted. In decreasing order, these species were: mourning dove, brown-headed cowbird, willow flycatcher, marsh wren, yellow warbler, and American robin. One-half of these six species have had significant trends reported in their populations within Minnesota (USFWS, 1988). As reported by the U.S. Fish and Wildlife Service (1988), both the American robin and willow flycatcher have documented increases in their populations in Minnesota. The American robin population has shown a significant increase

continent-wide and in all regions of North America as well. While the willow flycatcher populations appear to be stable across the continent (Robbins, et al., 1986). A significant downward trend in the populations of the brown-headed cowbird in Minnesota has been reported (USFWS, 1988). Robbins, et al. (1986), however, report a significant increase in the population of the brown-headed cowbird continent-wide and in central North America.

No significant trends have been documented for the mourning dove, marsh wren, and yellow warbler in Minnesota (USFWS, 1988). However, significant increases have been reported for populations of the mourning dove in central and eastern regions of North America (Robbins, et al., 1986). This same source states that there is concern for the continuing decrease in yellow warbler numbers despite the lack of statistical significance attached to the data.

The final category based on spatial distribution of birds for which breeding can be inferred is termed local. These are narrowly distributed species on the site which occurred at less than 10 (i.e. 6%) plots. Twenty-eight species are in this category and are summarized with all the breeding species on Rothsay according to their distribution category in table 8. Some of these species are considered migrants based on their temporal distribution discussed earlier, and therefore a distribution category does not apply. There are a couple of reasons, however, to explain the very narrow distribution of the other species. First, some species may be narrowly distributed due to the paucity of suitable breeding habitat for them on the Rothsay area. Secondly, the methodology chosen for this research may not be adequate to provide an accurate sampling of

some of these species. For example, small birds with faint songs and calls may be overlooked by an observer, or overshadowed by the vocalizations of louder birds. In addition, nocturnal and crepuscular birds would be under-represented by this methodology because their active singing times would be ending as data collection procedures for this methodology are just beginning.

#### Density of Breeding Pairs

The density of breeding pairs was calculated two ways as explained in the methods portion of this report. The density was calculated over the entire study area and within suitable habitat. Table 9 presents this information in decreasing order of density within suitable habitat. The ten species with the highest density within suitable habitat are also the species with the highest density across the study area. The order of the species changes after the first four, however. The species with the highest density of breeding pairs in suitable habitat and across the study area is the savannah sparrow. This species is also considered the most abundant based on breeding records (see table 3), and the most widespread species (see table 7).

The species with the second highest breeding pair density in suitable habitat and across the entire study area is the sedge wren. This species was also categorized as the second most abundant according to breeding records (see table 3). It was classified as widespread based on spatial distribution (see table 8), but was the fifth in this category (see table 7). The sedge wren was followed

TABLE 9. SUMMARY OF DENSITY OF BREEDING PAIRS ON ROTHSAY STUDY AREA  
(listed in decreasing order within suitable habitat)

| BIRD SPECIES            | DENSITY OF BREEDING PAIRS                    |   |                                      |
|-------------------------|--|---|--------------------------------------|
|                         | ENTIRE<br>STUDY AREA<br>(#/km <sup>2</sup> ) | SUITABLE<br>HABITAT<br>(#/km <sup>2</sup> ) | SUITABLE<br>HABITAT<br>(ave. #/plot) |
| SAVANNAH SPARROW        | 39.59  | 47.56                                       | 1.49                                 |
| SEDGE WREN              | 27.22  | 41.37                                       | 1.30                                 |
| BOBOLINK                | 26.57  | 34.32                                       | 1.08                                 |
| COMMON YELLOWTHROAT     | 17.36  | 25.63                                       | 0.80                                 |
| GRASSHOPPER SPARROW     | 11.10  | 23.89                                       | 0.75                                 |
| WESTERN MEADOWLARK      | 14.90  | 20.62                                       | 0.65                                 |
| SWAMP SPARROW           | 7.53   | 20.13                                       | 0.63                                 |
| CLAY-COLORED SPARROW    | 9.97   | 20.06                                       | 0.63                                 |
| RED-WINGED BLACKBIRD    | 11.92  | 19.65                                       | 0.62                                 |
| SONG SPARROW            | 6.23   | 17.56                                       | 0.55                                 |
| KILLDEER                | 0.79   | 17.44                                       | 0.55                                 |
| YELLOW WARBLER          | 2.02   | 17.40                                       | 0.55                                 |
| SORA                    | 0.10   | 15.92                                       | 0.50                                 |
| LEAST FLYCATCHER        | 0.68   | 15.17                                       | 0.48                                 |
| MARSH WREN              | 1.78   | 14.53                                       | 0.46                                 |
| YELLOW-HEADED BLACKBIRD | 0.55   | 14.15                                       | 0.44                                 |
| LECONTE'S SPARROW       | 3.87   | 12.24                                       | 0.38                                 |
| VEERY                   | 0.62   | 11.94                                       | 0.38                                 |
| MOURNING DOVE           | 1.99   | 10.99                                       | 0.35                                 |
| BROWN-HEADED COWBIRD    | 1.30   | 9.17  | 0.29                                 |
| WILLOW FLYCATCHER       | 1.30   | 9.17  | 0.29                                 |
| ALDER FLYCATCHER        | 0.51   | 8.85  | 0.28                                 |
| HOUSE WREN              | 0.21   | 7.96  | 0.25                                 |
| AMERICAN ROBIN          | 0.55   | 7.08  | 0.22                                 |
| EASTERN KINGBIRD        | 0.14   | 7.08  | 0.22                                 |
| AMERICAN GOLDFINCH      | 0.34   | 6.63  | 0.21                                 |
| GRAY CATBIRD            | 0.38   | 6.49  | 0.20                                 |
| DICKCISSEL              | 0.21   | 6.37  | 0.20                                 |
| BREWER'S BLACKBIRD      | 0.24   | 5.31  | 0.17                                 |
| HORNED LARK             | 0.10   | 5.31  | 0.17                                 |
| RING-NECKED PHEASANT    | 0.10   | 5.31  | 0.17                                 |
| NORTHERN ORIOLE         | 0.10   | 5.31  | 0.17                                 |
| BLACK-BILLED CUCKOO     | 0.14   | 5.31  | 0.17                                 |
| YELLOW-BREASTED CHAT    | 0.07   | 5.31  | 0.17                                 |
| VIRGINIA RAIL           | 0.07   | 5.31  | 0.17                                 |
| VESPER SPARROW          | 0.07   | 5.31  | 0.17                                 |
| COMMON SNIPE            | 0.07   | 5.31  | 0.17                                 |
| ROSEBREASTED GROSBEAK   | 0.03   | 5.31  | 0.17                                 |
| EASTERN PHOEBE          | 0.03   | 5.31  | 0.17                                 |
| ORCHARD ORIOLE          | 0.03   | 5.31  | 0.17                                 |
| BLUE JAY                | 0.03   | 5.31  | 0.17                                 |
| NORTHERN FLICKER        | 0.03   | 5.31  | 0.17                                 |
| RED-EYED VIREO          | 0.03   | 5.31  | 0.17                                 |
| TREE SWALLOW            | 0.03   | 5.31  | 0.17                                 |

by the bobolink as the species with the third highest density of breeding pairs in the entire study area and in suitable habitat. The bobolink was also considered the third most abundant species based on breeding records (table 3). It was also considered the second most widespread species on the study area (table 7).

The common yellowthroat was the fourth most dense species based on breeding pairs within suitable habitat and on the whole study area. This species was also the fourth most abundant based on breeding records (table 3) and the fourth most widespread species (table 7). The species which follow these "first four" species based on density do not maintain as much consistency across all the classifications assigned to them within this research. For example, the grasshopper sparrow is the species with the fifth highest density within suitable habitat, but drops to seventh when density is calculated over the entire area. This species was classified as moderately distributed across the study area (table 7), and was the seventh most abundant species on the study area based on breeding records. Further examination shows other examples of this occur. Table 10 provides a summary of the categorizations given to each species recorded on the Rothsay Prairie.

TABLE 10. Summary of ALL Classifications for Rothsay Birds

| SPECIES NAME             | ABUNDANCE<br>(breeding) | ABUNDANCE<br>(nonbreeding) | BREEDING           | DISTRIBUTION |
|--------------------------|-------------------------|----------------------------|--------------------|--------------|
| DOUBLE-CRESTED CORMORANT | N/A                     | N/A                        | none(flyover only) | N/A          |
| GREAT BLUE HERON         | N/A                     | Rare                       | visitor            | N/A          |
| GREAT EGRET              | N/A                     | N/A                        | none(flyover only) | N/A          |
| GREEN-BACKED HERON       | N/A                     | N/A                        | none(flyover only) | N/A          |
| SNOW GOOSE               | N/A                     | N/A                        | none(flyover only) | N/A          |
| CANADA GOOSE             | N/A                     | N/A                        | none(flyover only) | N/A          |
| MALLARD                  | Rare                    | Uncommon                   | breeder            | local        |
| COMMON PINTAIL           | N/A                     | N/A                        | none(flyover only) | N/A          |
| BLUE-WINGED TEAL         | Rare                    | N/A                        | breeder            | local        |
| RED-TAILED HAWK          | N/A                     | Rare                       | visitor            | N/A          |
| AMERICAN KESTREL         | N/A                     | N/A                        | none(flyover only) | N/A          |
| RING-NECKED PHEASANT     | Rare                    | Rare                       | breeder            | local        |
| VIRGINIA RAIL            | Rare                    | N/A                        | insufficient data  | local        |
| SORA                     | Rare                    | N/A                        | breeder            | local        |
| AMERICAN COOT            | N/A                     | Rare                       | accidental         | N/A          |
| KILLDEER                 | Uncommon                | Common                     | breeder            | local        |
| COMMON SNIBE             | Rare                    | Rare                       | breeder            | local        |
| RING-BILLED GULL         | N/A                     | N/A                        | none(flyover only) | N/A          |
| MOURNING DOVE            | Common                  | Uncommon                   | breeder            | restricted   |
| GREAT-HORNED OWL         | N/A                     | Rare                       | visitor            | N/A          |
| NORTHERN FLICKER         | Rare                    | Rare                       | visitor            | local        |
| BLACK-BILLED CUCKOO      | Rare                    | N/A                        | breeder            | local        |
| EASTERN PHOEBE           | Rare                    | N/A                        | visitor            | local        |
| ALDER FLYCATCHER         | Uncommon                | Rare                       | breeder            | local        |
| WILLOW FLYCATCHER        | Common                  | N/A                        | breeder            | restricted   |
| LEAST FLYCATCHER         | Uncommon                | N/A                        | breeder            | local        |
| EASTERN KINGBIRD         | Rare                    | Uncommon                   | breeder            | local        |
| HORNED LARK              | Rare                    | Rare                       | insufficient data  | local        |
| PURPLE MARTIN            | N/A                     | N/A                        | none(flyover only) | N/A          |
| BANK SWALLOW             | ----                    | N/A                        | breeder            | ---          |
| CLIFF SWALLOW            | ----                    | N/A                        | breeder            | ---          |
| BARN SWALLOW             | ----                    | N/A                        | breeder            | ---          |
| TREE SWALLOW             | Rare                    | Rare                       | insufficient data  | local        |
| BLUE JAY                 | Rare                    | N/A                        | accidental         | local        |
| HOUSE WREN               | Uncommon                | N/A                        | breeder            | local        |
| EDGE WREN                | Abundant                | Common                     | breeder            | widespread   |
| MARSH WREN               | Common                  | Rare                       | breeder            | restricted   |
| GRAY CATBIRD             | Uncommon                | Rare                       | breeder            | local        |
| AMERICAN ROBIN           | Uncommon                | Uncommon                   | breeder            | restricted   |
| VEERY                    | Uncommon                | Rare                       | breeder            | local        |
| EASTERN BLUEBIRD         | N/A                     | Rare                       | visitor            | N/A          |
| EUROPEAN STARLING        | N/A                     | Rare                       | migrant            | N/A          |
| RED-EYED VIREO           | Rare                    | N/A                        | migrant            | local        |
| GOLDEN-WINGED WARBLER    | Rare                    | Rare                       | migrant            | N/A          |
| YELLOW WARBLER           | Common                  | Rare                       | breeder            | restricted   |
| COMMON YELLOWTHROAT      | Abundant                | Common                     | breeder            | widespread   |
| YELLOW-BREASTED CHAT     | Rare                    | N/A                        | insufficient data  | local        |
| DICKCISSEL               | Uncommon                | N/A                        | breeder            | local        |
| ROSEBREASTED GROSBEAK    | Rare                    | N/A                        | migrant            | local        |
| CLAY-COLORED SPARROW     | Abundant                | Common                     | breeder            | moderate     |
| VEESPER SPARROW          | Rare                    | N/A                        | migrant            | local        |
| SAVANNAH SPARROW         | Abundant                | Abundant                   | breeder            | widespread   |
| GRASSHOPPER SPARROW      | Abundant                | Rare                       | breeder            | moderate     |
| LECONTE'S SPARROW        | Common                  | Rare                       | breeder            | moderate     |
| SONG SPARROW             | Common                  | Uncommon                   | breeder            | moderate     |
| SWAMP SPARROW            | Common                  | Uncommon                   | breeder            | moderate     |
| BOBOLINK                 | Abundant                | Abundant                   | breeder            | widespread   |
| RED-WINGED BLACKBIRD     | Abundant                | Abundant                   | breeder            | widespread   |
| WESTERN MEADOWLARK       | Abundant                | Common                     | breeder            | widespread   |
| YELLOW-HEADED BLACKBIRD  | Uncommon                | Common                     | breeder            | local        |
| BREWER'S BLACKBIRD       | Uncommon                | Common                     | breeder            | local        |
| ORCHARD ORIOLE           | Rare                    | N/A                        | migrant            | local        |
| NORTHERN ORIOLE          | Rare                    | N/A                        | insufficient data  | local        |
| BROWN-HEADED COWBIRD     | Common                  | Common                     | breeder            | restricted   |
| COMMON GRACKLE           | N/A                     | Rare                       | accidental         | N/A          |
| AMERICAN GOLDFINCH       | Uncommon                | Common                     | breeder            | local        |

## SPECIAL CONCERN SPECIES

There are no species listed as threatened or endangered in Minnesota by the state or federal governments that occur on the Rothsay Prairie Landscape. However, there are species that are designated as special concern. Special concern species within the context of this study are those species which fall into three categories: (1) species that have been given special concern status by the state of Minnesota (MDNR, 1984); (2) species that have been listed as birds of management concern by the United States government (USFWS, 1987); or (3) species which satisfy conditions of both (1) and (2). The future of these species appears tenuous due to their dependence on vulnerable or constricted habitats, population declines, or existence of only remnant populations (USFWS, 1989); or because their habitat requirements are very specific or unique, or the species is very rare in Minnesota (MN State Statute 84.0895). In all cases, it has been determined that these species deserve special attention to prevent their further endangerment. For example, the U.S. Fish and Wildlife Service (1989) states that: "the objective of identifying these species was to initiate actions that prevent them from becoming Federally Threatened or Endangered". Because of this concern, a special effort was made to characterize the existence of those special concern species with the potential of existing on the Rothsay Prairie Landscape. These species were listed in table 1.

There was an extended sampling method undertaken for special concern species to supplement the regular sampling method of three-minute point counts at the plots. The extended sampling method was expanded further for the special cases of short-eared owl, sharp-

tailed sparrow, and yellow rail. The additional methods employed for special concern species are discussed in detail in the previous methods section. Below, the results of this research's efforts regarding special concern species will be outlined on a species-by-species basis.

#### AMERICAN BITTERN

The American bittern is listed by the state of Minnesota as Special concern because of recent widespread declines in the number of birds which have been recorded in suitable habitat throughout the state (Coffin and Pfanmuller, 1988). In 1987 it was also listed by the U.S. Federal government as a "migratory nongame bird of management concern" (USFWS, 1987). This listing was based on the observation that populations of this species were declining throughout the northcentral United States (USFWS, 1989).

Although secretive in their habits, the singing male American bittern has an unmistakable song which can be heard for some distance. A good estimation of bittern use of this study area was obtained by the extended sampling method described earlier. The observations recorded for American bitterns are summarized in **TABLE \*\* and visually represented in Figure XX.**

From the information gained during the field season, there is a strong possibility that this species a regular breeder on the study area. Although, they cannot be considered common on the study area, unseen singing males were recorded in two plots on the study site, from 18 plots, and along many transect routes. The two bitterns



located within study plots were heard on plots T-9 and D-12. The importance of these records becomes more apparent when viewed in the context of the additional information gathered on the study area.

For example, one bittern was seen foraging in the ditch that flows along the west edge of section 28, Township 135 North, Range 45 West (Tanberg township) on June 2, 1989. Another bittern was flushed on more than one occasion from the ditch that flows along the northern boundary of section 17, also in Tanberg township, as samplers approached this area in a vehicle. In addition, bitterns were regularly heard singing from the beginning of the Anna Gronseth transect, the north half of the Town Hall transect, the north half of the WMA transect, and on the east half of the Dow transect, the north half of the Fen transect, the southeast portion of the Ouse transect, and the southeast corner of the Dow South transect.

The location of these observations, and the fact that American bittern songs can be heard for a considerable distance, suggests that some of the observations may be double counts of individuals. The possible pairs of observations where this problem could manifest itself are the following: (1) beginning of Gronseth transect and north half of Town Hall transect; (2) north half of WMA transect and east half of Dow transect; or (3) north half of Fen transect and east half of Dow transect; or (4) a combination of (2) and (3); or (5) southeast corner of Dow South transect and north half of WMA transect. The location of the observations in the southeast corner of the Ouse transect do not seem to exhibit the potential for this problem. Despite this difficulty, the sheer number of observations, and the addition of several noted flyovers both inside and outside

the study plots, supports the determination that American bitterns regularly used the study area and most probably bred there. If double-counting is accounted for, there remain records that corroborate the existence of at least five breeding pairs on the study area.

A review of breeding habitat requirements further substantiates the strong possibility that American bitterns bred within the Rothsay Prairie Landscape. Kantrud and Stewart (1984) reveal that American bitterns breed in semi-permanent wetlands. Ehrlich, et al. (1988) list emergent marshes as breeding habitat for bitterns. Others describe breeding habitat as: "typical cattail, bulrush, or sedge marshes" (Coffin and Pfanmuller, 1988); and semi-permanent ponds, seasonal ponds, and permanent and intermittent streams (Weber, et al. 1982). This study area provides a wide variety of these habitats through its cattail marshes (especially in the Rothsay Wildlife Management Area), fen habitat, wet prairie/sedge meadows (e.g., TNC's Anna Gronseth Preserve), and many ditches.

#### SHORT-EARED OWL

Since 1976, the short-eared owl has been on the Audubon Society's Blue List. In Minnesota, the reason for its listing as a special concern species is based on major declines in its population numbers. Today it is considered uncommon to rare during the breeding season, and most of the recent records indicate its presence in Minnesota is now restricted to northwestern Minnesota (Coffin and Pfanmuller, 1988).

The extended sampling method used for special concern species may not have been adequate to locate this species. This species is a unusually diurnal raptor (Johnsgard, 1979; Clark, 1975; Roberts, 1936) and will hunt during the day. However, it is especially active at dawn and dusk making it more accurately described as a crepuscular species. Samplers were always present on the study area at dawn performing the regular and extended sampling methodology. However, understanding this coverage could not be extensive across the study area, the addition of the evening drives to the sampling method was undertaken. Several drives were taken at dusk around the study area searching for foraging owls. This addition to the extended sampling method should have been adequate to record the use of a majority of the area by short-eared owls. This study method was successful in recording a handful of great-horned owls which are more nocturnal than short-eared owls.

Fieldwork during the regular field season, however, did not reveal any short-eared owls using the study area. One short-eared owl was flushed near plot W-03 on May 17, 1989 while researchers were laying out the transects on the study area. On this date, the owl was pursued and flushed again to confirm its identification. After this date, no short-eared owls were recorded. It is assumed that the identified individual was a migrant. Supporting this determination, Ekert (1983) reported that short-eared owls have been seen in migration on the Rothsay Wildlife Management Area, wherein plot W-03 is located.

From face value, Rothsay Prairie Landscape appears to contain

habitat that meets the descriptions given by many researchers for breeding habitat necessary for short-eared owls. Roberts (1936) reported that short-eared owls nested in low fields and marshes, but were "much more common on the prairies than elsewhere". Coffin and Pfanmuller (1988) in summarizing current literature on the short-eared owl, list native grasslands and marshes as preferred habitats for this species. Prairie, meadow, and marsh are listed as habitat for the short-eared owl by Ehrlich, et al. (1988). Oring (1979) lists the short-eared owl as a secondary species of wet prairie. In addition, Coffin and Pfanmuller (1988) show the north portion of Wilkin county as the southern extent of the breeding range of this species.

Further examination of sources shows that the absence of this species from the Rothsay study area may not be so surprising. First, Coffin and Pfanmuller (1988) note that the southern boundary of the short-eared owls breeding range delineation in Minnesota is uncertain. Because the Rothsay study area forms a portion of this southern boundary, the presence of breeding short-eared owls within this area is also uncertain. Second, references specific to Minnesota bird distribution show that no historical or present-day breeding records for this species have been listed in Wilkin county (Eliason, 1988; Coffin and Pfanmuller, 1988; Janssen, 1987; Green and Janssen, 1975). Ekert (1983) listed the Rothsay WMA as one place to see short-eared owls during migration; but suggested that this species bred further north in Minnesota ("from Polk county north"). Janssen (1987) lists Wilkin County as a having records of wintering short-eared owls. Finally, the natural history accounts

of this species describe it as an irruptive and nomadic species which searches out locations of high populations of their rodent prey (Clark, 1975; Coffin and Pfanmuller, 1988; Ehrlich, et al., 1988; Roberts, 1936). This suggests that any methodology, regardless of its ability to accurately detect this species, is prone to being as erratic in recording this species as the species itself.

Because of the existence of what appears to be suitable habitat for short-eared owls on the Rothsay Prairie Landscape, it is possible that this species may use the study area during favorable years. However, it was not found breeding on the area during the 1989 field season. Because short-eared owls prefer wetter prairie areas and marshes, it may be important to note that 1989 was the **third year** of an extensive drought that plagued Minnesota until 1990. As a result, Rothsay area may provide more suitable habitat for short-eared owls in a more regular water year.

#### SHARP-TAILED SPARROW

The sharp-tailed sparrow is listed as a special concern species by the state of Minnesota. According to Coffin and Pfanmuller (1988), the reason for this status is the apparent rarity of this species throughout the state, the dependence of this species on endangered habitats, and the substantial lack of information regarding this species' "true" status in Minnesota. It is considered a secondary species of wet prairie, rarely breeding in absence of native prairie (Oring, 1979).

On May 29, 1989 a sharp-tailed sparrow was visually confirmed on the Rothsay study area in plot G-1 outside the regular sampling methodology. The bird was not vocalizing, and it was never relocated during the remainder of the field season. It was recognized, however, that the sampling design even with the addition of the extended sampling plan undertaken for special concern species would not be adequate for sampling sharp-tailed sparrows because they are a mostly nocturnal singers, with a weak and irregular song (Johnsgard, 1979; Coffin and Pfanmuller, 1988; Woofenden, 1956; Murray, 1969; Ehrlich, et al. 1988). Many of these same references also suggest that male sharp-tailed sparrows are semi-colonial, non-territorial, and may not advertise territories, explaining the irregularity of their singing.

Coffin and Pfanmuller (1988) stated that recent efforts focused on locating this species in Minnesota found that males sing most frequently after sunset. Taking this into consideration, an evening transect was undertaken on June 2, 1989 in Anna Gronseth Nature Conservancy Preserve in an attempt to help locate any breeding sharp-tailed sparrows and to test the suitability of such a sampling methodology for this species. Anna Gronseth was chosen as the location of this transect for several reasons: (1) habitat accounts for this species list prairie wetlands, which comprise a majority of the habitat on the Anna Gronseth Preserve; (2) the habitat at this particular area was recommended for sharp-tailed sparrows by Ekert (1983); (3) yellow rails were encountered on this area, and Hanowski and Niemi (1986) found that these two species

often occur in the same wetland complexes; and (4) a sharp-tailed sparrow was located here earlier in the season. Playbacks of songs for this species were also used during this transect in hopes of gaining a response.

No sharp-tailed sparrows were located on this evening transect or at any other time during the season beyond the first siting of the nonvocalizing individual on May 29. The individual located on May 29 was probably a migrant. Thus, from the results this research's efforts, the sharp-tailed sparrow appears to be a rare migrant through the area. Presently there is nothing to suggest it breeds on the area. The Rothsay study area lies at the southern limit of this species' historic breeding range, and as of 1988 northern Wilkin county was no longer considered to be within its present-day active breeding range (Coffin and Pfanmuller, 1988). No breeding records of sharp-tailed sparrows have been reported for Wilkin county, past or present (Green and Janssen, 1975; Janssen, 1987; Coffin and Pfanmuller, 1988). As early as the 1930's, this species was considered a fairly uncommon bird and only well represented in Kittson and Marshall counties, Minnesota (Roberts, 1936).

Based on this, the lack of any additional records for this species on the Rothsay study area during the 1989 field season is not surprising. Additional night transects may be useful to confirm the lack of breeding individuals on the area. Repetition of the night transects in the same area and other suitable areas may be necessary to accurately survey for this species, due to the irregularity of the vocalizations of this species. Other suitable

areas could be located in at least two ways: (1) by looking for places that seem to provide appropriate habitat for this species in Minnesota (e.g., refer to Hanowski and Niemi, 1986; Roberts, 1936; Coffin and Pfannmuller, 1988); and (2) by looking for areas where its reported ecological counterparts have been recorded.

Roberts (1936) noted that LeConte's sparrows and marsh wrens were always found where breeding sharp-tailed sparrows were recorded (while noting that the reverse of this is not always true). Roberts also suggested that rails were "close companions" of the sharp-tailed sparrow. The coexistence of yellow rails and sharp-tailed sparrows in wetland complexes was recently confirmed by Hanowski and Niemi (1986). According to the results of this research, there are other places within the Rothsay Prairie where these conditions exist. Unfortunately, prior to this field season, such detailed information on the habitat or bird distribution and abundance on this area was unavailable. In addition, the morning schedule necessary to characterize the majority of the birds on the Rothsay area did not allow the performance of additional night transects.

#### YELLOW RAIL

The yellow rail is listed by the State of Minnesota as a special concern species due to its dependence on vulnerable habitats, and its limited breeding records and distribution in Minnesota (Coffin and Pfannmuller, 1988). Oring (1979) classifies the yellow rail as a primary species of wet prairie that rarely breeds in



absence of native prairie. The northeastern part of Wilkin county, which includes Rothsay Prairie, is shown within the current breeding range of this species (Janssen, 1987; Coffin and Pfanmuller, 1988). This portion of Wilkin county forms the southern limit of the yellow rail's range in Minnesota. In addition, the Rothsay Prairie Landscape area, especially the Anna Gronseth Nature Conservancy Preserve therein, has been listed as an area where breeding individuals have been located in the recent past (Ekert, 1980 , 1983).

Based on this and the apparent existence of suitable breeding habitat on the Rothsay study area, the extended sampling method was further expanded in an attempt to locate this special concern species on the Rothsay area. Preferred breeding habitat for this species has been described as wet, monotypic stands of sedges with dead grasslike vegetation forming a canopy of sorts (Bart et al., 1984); "sedge meadows and grassy marshes" (Coffin and Pfanmuller, 1988); "fenlike areas or boggy swales" where yellow rails "occupy the densest areas of sedges" (Johnsgard, 1979); "shallow grassy marshes" (Ekert, 1983); "marshes, wet meadows, and other freshwater habitats" (Ehrlich et al., 1988); and "wet meadows and marshes" (Roberts, 1936). The areas of wet prairie, prairie wetlands, and fens existing on the Rothsay study area meet many of these criteria.

It was determined that additional modifications to the extended sampling methodology were necessary to have success locating the birds. This is because this species is secretive and sings mostly at night (Ekert, 1983; Bart et al., 1984; Ehrlich et al., 1988; Coffin and Pfanmuller, 1988). Some of these same references

reported that the yellow rail is an erratic and unpredictable singer. Despite this, Bart et al. (1984) determined that a night strip transect was a practical survey method for this species. In addition, they found that a rail could be heard for more than 1 km. under the best conditions. Bart et al. (1984) also suggested that a single survey could adequately reveal the species if it was present. As a result, a night transect was performed on the Anna Gronseth Nature Conservancy Preserve on June 2, 1989 in an attempt to locate breeding individuals of this species and test the feasibility of this survey method for yellow rails in Minnesota. Playbacks of this species' song were also employed during the duration of this transect in an attempt to provoke a successive response from territorial males on the area.

Anna Gronseth was chosen as the test site for this methodology for many reasons. First, two singing male yellow rails were recorded in plot G-1 on May 10 and 12, 1989 just after sunset. These individuals were first documented on May 10 while researchers were finishing marking this station. Another nonvocalizing individual was flushed near plot G-09 while researchers were laying out the remainder of the stations on the Gronseth transect. Secondly, this area met the criteria for the habitat preferred by this species for breeding. Thirdly, avian species considered ecological counterparts of this species (i.e. sharp-tailed sparrow: reference Roberts, 1936; Hanowski and Niemi, 1986; and sora and Virginia rail: reference Johnsgard, 1979) were recorded on this preserve earlier in the season. The final reason for selecting Anna Gronseth as the area for the night transect is that breeding records

for this species exist for this area (Ekert, 1980, 1983).

The night transect was unsuccessful in recording any yellow rails. An additional evening trip to plot G-1 at sunset on June 6, 1989 also did not succeed in recording any yellow rails. Playbacks of sora and yellow rail songs were used during this trip to elicit response. No vocalizations were recorded. In spite of this, it is thought that yellow rails are breeding in this area of the Rothsay Prairie Landscape. Taking into account the unpredictability of their singing, and the location of singing males at plot G-01 earlier supports this. Based on the results of this research, the presence of breeding yellow rails on the entire study area can tentatively be classified as rare. Additional night surveys of Anna Gronseth and other suitable areas would help understand the true status of yellow rails on this study area.

In addition to Anna Gronseth, there are other areas on the Rothsay Prairie which may provide suitable habitat for yellow rails. These areas could be identified by: (1) looking for places that seem to provide appropriate habitat for this species in Minnesota; and (2) looking for areas within the Rothsay Prairie where its ecological counterparts have been recorded previously. Some additional areas which superficially appear to satisfy habitat requirements of the yellow rail on the Rothsay area are the northeast portion of the Rothsay WMA, the fens and wet areas along the east border of the study area (e.g. plots L-14,15; F-08,09,10; and W-16,17). Although these areas are more remote and difficult to travel through even during the day, night transects performed here

could determine the reality of their suitability for yellow rails. Unfortunately, the performance of additional night transects during the 1989 season was not feasible due to the morning schedule necessary to characterize the majority of the birds utilizing the Rothsay study area.

#### HENSLOW'S SPARROW

Henslow's sparrow is considered a special concern species by the state of Minnesota (Coffin and Pfannmuller, 1988) and a species of management concern by the Federal government (USFWS, 1987). In addition, from 1974 to 1981 it was on the National Audubon Society's Blue List and on their Special Concern list from 1982 to 1986 (Tate, 1981, 1986). The reason for the concern for this species is based on declining populations across the northcentral and entire United States (Hands, et al., 1989). Its distribution in Minnesota is now considered very rare and localized (Coffin and Pfannmuller, 1988). In addition, this species is dependent upon an ephemeral structure within a habitat vulnerable to development.

Habitat for this species has been described as weedy prairies and meadows, neglected grassy fields and pasturelands (Johnsgard, 1979). Hands et al. (1989) describe Henslow's sparrow breeding habitat as mesic grasslands containing a tall, dense forb component. These areas could be uncultivated grasslands or formerly cultivated lands which have been allowed to grow up over several years. These types of area are subject to pressure from continued agricultural development. However, wetter areas seem to be preferred by the

Henslow's sparrow (Johnsgard, 1979; Ehrlich et al., 1988) which may afford them some protection from development because they are not as easily converted to agricultural row crops. Scattered shrubs, standing dead material, and a heavy layer of litter have been shown to be critical components of the habitat (Robins, 1971; Zimmerman, 1988; Hanson, n.d.). In addition, Coffin and Pfannmuller (1988) state that this species requires vegetation that falls within a narrow range of height and density. Therefore an area probably maintains suitable habitat only for a couple of years. An area of appropriate habitat used the previous year may be abandoned by Henslow's sparrows the next (Coffin and Pfannmuller, 1988; Zimmerman, 1988). This fact makes locating suitable habitat for this species difficult.

In addition to the difficulties identifying the habitat for this species, Henslow's sparrows have a brief, feeble, insect-sounding song that is easily overlooked. Roberts (1936) states: "the ordinary two-syllabled song, tsee-wick, is so weak and fine that one is not quite sure, even when close by, that he has really heard anything". Also, many researchers have reported that the species does not sing constantly (Johnsgard, 1979; Hanson, n.d.; Zimmerman, 1988). The species is rarely seen unless the male is defending its territory from an elevated song perch (Roberts, 1936). It feeds on the ground (Hands, et al., 1989), spends most of its time on the ground, and characteristically runs along the ground (Roberts, 1936; Ehrlich, et al., 1988). All of these things present difficulties in locating Henslow's sparrows.

In spite of these difficulties, the extended sampling method

was determined to be a good method to locate this species on the study area. Because the transects were representative of the study area, both in terms of habitats and areal extent, it was felt if habitat for this species existed on the site it would be sampled. Also, Henslow's sparrows have been recorded in Wilkin county in the early 1980's (Ekert, 1983). In addition, although its breeding range in Minnesota is difficult to delineate, Green and Janssen (1975) placed Wilkin county well within this species' range. This source also listed Wilkin county as a place where inferred breeding records had been obtained (Green and Janssen, 1975; Coffin and Pfanmuller, 1988).

Two singing male Henslow's sparrows, which were also visually verified based on field markings, were recorded during the 1989 field season. These two males remained on the study area and continued singing throughout the breeding season. One male was recorded at plot D-14 during weeks 1, 2, 4, and 5. The other singing male was recorded at plot A-08 during weeks 2, 5, and 6. A ditch approximately bisected plot A-08 and as a result this plot provided habitat for many red-winged blackbirds. There is a strong potential that the Henslow's sparrow at plot A-08 was present throughout the season despite its absence from records during weeks 1, 3, and 4. The inconspicuous nature of this species due to its small size and subtle song could have rendered it virtually "invisible" in the presence of the ever-present, highly vocal red-winged blackbirds. Although no Henslow's sparrow nests were found during the season, and the presence of females or juveniles was never recorded, the data collected during the 1989 field season are sufficient to infer

that Henslow's sparrows were breeding on the Rothsay Prairie Landscape Unit. Therefore, Henslow's sparrows should be considered rare breeders on the study area.

#### WILSON'S PHALAROPE

The Wilson's phalarope has special concern status in Minnesota. It is associated with prairie wetlands (Coffin and Pfanmuller, 1988; Hayman, et al., 1986) and rarely breeds in the absence of native prairie (Oring, 1979). Its association with the highly threatened habitat of native prairie places this species at risk. A review of historical accounts and present-day records for this species in Minnesota suggest its populations have been declining statewide (Coffin and Pfanmuller, 1988). In 1979, Oring considered it rare in Minnesota.

Suitable breeding habitat for this species is variously described as shallow ponds surrounded by wet meadow vegetation (Coffin and Pfanmuller, 1988); wet prairie (Oring, 1979); prairie marshes (Hayman et al., 1986); and freshwater marshes, sloughs, and wet prairies, occasionally saline (Ehrlich et al., 1988). Johnsgard (1979) stated that a major requirement for suitable habitat was the presence of wet meadow vegetation near open water. Oring (1979) lists this species as a secondary species of the wet prairie ecosystem in Minnesota and stated that it will rarely breed without native prairie.

Prior to the 1989 field season the mosaic of wet prairie, prairie wetlands, and mesic prairie habitats existing on the Rothsay Prairie Landscape Area was determined to potentially meet the habitat conditions necessary to support this species. In addition, it was verified that Wilkin County was well within the currently accepted breeding range of this species although breeding has not been confirmed there (Coffin and Pfannmuller, 1988). Further, a pair of Wilson's phalaropes was recorded in both Town Hall and Anna Gronseth Nature Conservancy Preserves in 1980 (Ekert). These Nature Conservancy prairie parcels fall within the boundaries of the Rothsay study area. The extended sampling method developed for special concern species was determined to be adequate to record the presence of this species on the study area. However, a repeated roadside survey of many shallow ponds in the vicinity of the study area was also performed in an attempt to locate any phalaropes in the nearby area. This was more intentional than the fifth component of the extended sampling plan as defined in the methods section of this report.

Results from the extended sampling plan are summarized in **table \*\***. From this data it is evident that Wilson's phalaropes are regular migrants in the vicinity of the Rothsay study area and rare breeders on the study area. The presence of breeding Wilson's phalaropes on the study area is somewhat surprising considering the ephemeral nature of the open water ponds on the study areas. drought- may provide better habitat in a year with normal precipitation



Coffin and Pfannmuller, 1988).

Eastern subspecies, Heath hen (*Tympanuchus cupido cupido*) is now extinct. The dark race from southeast Louisiana to eastern Texas, Attwater's prairie-chicken, (*Tympanuchus cupido attwateri*) is listed as endangered by the U.S. government. Lesser prairie-chicken and greater prairie-chicken appear threatened (Ehrlich et al., 1988).

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