Grassland bird surveys at Badger Army Ammunition Plant

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Introduction

Badger Army Ammunition Plant (BAAP) in Sauk County, Wisconsin, is an inactive base in the process of closure and transfer. Previous studies found significant populations of several grassland bird species at BAAP (Thompson and Welsh 1993, Mossman 1999). The grassland areas at BAAP include mostly non-native plant communities dominated by cool season grasses. Some grassland areas are leased for grazing providing income to run the Natural Resource programs at BAAP and Twin Cities AAP (Minnesota). This study was initiated to compare grassland bird use of grazed and ungrazed grassland habitats at BAAP. Specific objectives were to (1) compare bird use of conventional pastures (cattle in pasture continuously) and rotationally grazed pastures in which cattle are in a pasture 1 of every 3 weeks (2) compare bird use of ungrazed habitats including old hayfields, old pastures, and prairie restorations (plantings of native grassland species), and (3) compare nesting success of grassland birds among these 5 grassland habitats.

Study Site

BAAP is described in detail by Thompson and Welsh (1993) and Mossman (1999).

Methods

Bird surveys – Birds were counted at 32 variable-distance point counts (Figure 1). Points were located to maximize the area of grassland within 100-m radius and to include as few buildings as possible. At each point all birds seen or heard were counted for 5 minutes. Birds observed were categorized according to distance from the point count center: <25m, 25-50m, 50-100m, 100-200m, >200m. Birds seen flying within 200m were noted but not included in density estimates. All counts were conducted between 5:00 AM and 10:00 AM local time. Counts were conducted June 6-7, June 20, and July 11. Data from within 100m were used in statistical analyses while data from within and beyond 100m were used to compile total species list. Species with fewer than 25% of observations within 100m were excluded from density analyses.

Vegetation measurements – Structural features of the vegetation at points were measured in within a week of each point count. A combined height/density measurement, referred to as visual obstruction, was taken with a Robel pole (Robel et al. 1970). The Robel pole is 1.5 m tall and marked with 10-cm wide alternating black and white bands. The pole is viewed from 1m above the ground 4m from the pole and the lowest division between black and white bands is recorded as the estimate of visual obstruction. This number is highly correlated with plant biomass between the viewer and the pole and thus represents the amount of vegetation in that area (Robel et al. 1970). Visual obstruction readings are taken from 4 equally spaced points around the pole (roughly north, south, east and west) at 4 randomly-chosen locations in each 100-m radius point count location. These 16 visual obstruction readings were averaged and referred to below as "Robel" values. Leaf litter depth in cm was taken at the same 16 locations as the visual obstruction readings and averaged. The maximum height of vegetation with 0.5 m of the pole was recorded at each of the 4 random locations used for the Robel measurements.

The number of shrubs (defined as woody plants < 3m tall regardless of species) and trees (> 3m) was counted within each 100-m radius point count location. I used a rangefinder to estimate the distance of each shrub and tree. Portions of two points were mowed before the third round of measurements so those data were excluded from the analyses.

Nest Monitoring – Nests were located by rope-dragging and intensive searching. Active nests were monitored every 3-4 days. Searching was primarily in the 100-m radius point count areas. Nest data was summarized by calculating the daily survival probability to account for different nests being found at different stages of the nesting cycle (Mayfield 1975). The daily survival probability was then used to calculate the probability of a nest surviving 22 days, a time typical for passerine nesting (Ehrlich et al. 1988). We also monitored 29 nest boxes intended for bluebirds. These boxes were monitored weekly.

Statistical analyses - Data were analyzed with the Systat 8.0 statistical package (SPSS 1998) and other sources (Zar 1999). Points where no birds of a particular species were recorded within 100-m were listed as 0 in the data sets. Abundance (#birds/pt) and richness (#sp/pt), and vegetation measurements for the three time periods were compared among grassland habitat types with repeated measures analysis of variance tests (ANOVA). This test compares the change in a variable over time among treatments. If the repeated measures ANOVA was statistically significant, each census period was tested separately to determine which grassland habitats differed from the others. ANOVA tests were also done on average number of species and individuals per point from the three survey periods. Each species was classified in terms of reliance on grassland habitat as either obligate grassland (O), secondary grassland (G2), or non-grassland (NG) species as defined by Sample and Mossman (1997) and Herkert (1993). Additional ANOVA analyses were done for the number of species and individuals in each of these three categories. Any significant ANOVA was followed by Bonferroni pairwise comparisons. This procedure accounts for multiple comparisons (when doing many tests on one data set with alpha = 0.05, 5% of tests could be significant at random) and is thus a conservative measure of the differences among the individual categories.

Bird-habitat associations were examined at the general level with Pearson's correlations. This test compares the change in one variable (for example vegetation density) with the change in another (for example abundance of a bird species) and calculates the probability the two variables are correlated. Note that a significant correlation does not show that the change in one variable causes the change in the other, but only that the two variables are related.

Results

Bird surveys – 71 species were observed during the point counts (Table 1). Several species were observed only (8 species) or primarily (6 species) as flyovers and several were observed only beyond 100m (20 species). Of these 34 species only vesper sparrow (2 observations) and American kestrel (14 observations) could be considered grassland species in the sense that they frequently occur in or utilize grassland habitats (Sample and Mossman 1997). The remaining 26 species were forest or woodland-dependent species, aerial species such as swallows and turkey vulture, human commensal species such as rock dove, or species in transit such as great blue heron and sandhill crane. Because the purpose of this project was to compare bird use of grassland habitats within fairly small pastures and because point counts are not well suited to survey aerial and/or distant species, these 34 species excluded from the analyses that follow.

The species encountered most frequently within 100m radius included bobolink (139), savannah sparrow (129), red-winged blackbird (79), eastern meadowlark (71), sedge wren (59), and European starling (59). All other species were much less common with fewer than 20 individuals per species observed (Table 1) or 0.4 birds per point (Table 2). Of these species, all are obligate grassland birds except red-winged blackbird (which originally nested in marshes and wetlands rather than prairies and grasslands) and European starling (which nests in buildings and tree cavities and was observed mainly foraging, perching, or flying through point count locations). Note that these point counts probably underestimate the abundance of starlings relative to the other species because counts were not done in starling nesting habitat.

Several species are considered species of management concern (Sample and Mossman 1997). These species include sedge wren, clay-colored, field, vesper, grasshopper, Henslow's, and savannah sparrows, dickcissel, bobolink, and eastern and western meadowlarks. In fact, red-winged blackbird and starling were the only common species observed in grassland that were not species of management concern (although starling might deserve "concern" as a pest species). In addition, upland sandpiper, also a species of management concern, was observed several times over the summer but not during the point counts.

Vegetation measurements – The five grassland habitats fell into two categories, grazed and ungrazed. Pastures under conventional grazing and rotational grazing were more similar to each other than either was to any of the ungrazed habitats (old hay, old pasture, restorations). This difference was consistent for all three vegetation measures (maximum height, robel, and litter). The grazed habitats tended to have lower, less dense vegetation with less litter, on average, than any of the ungrazed habitats (Figure 2). The maximum height and Robel values for grazed areas also tended to be more variable than those for the ungrazed habitats particularly later in the summer (Figure 2).

The general trends in vegetation measures are summarized in Figure 2 and the specific results of ANOVA tests on the vegetation data are given in Tables 3A-F. Maximum height of the vegetation differed significantly among the 5 grassland habitats. Vegetation height increased significantly over the summer, but the rate of change did not differ significantly among the 5 grassland types (Table 3A). Height differed significantly among the 5 grassland types during each measurement period (Table 3A). In late May the restorations had taller vegetation, on average than both conventionally grazed ($P = 0.002$) and rotationally grazed ($P= 0.21$) pastures, but none of the other pairwise comparisons were significantly different. In mid-June conventionally grazed pastures had shorter vegetation than restorations ($P < 0.001$), old pastures ($P < 0.001$), and old hay fields ($P < 0.001$), and rotationally grazed pastures had shorter vegetation than restorations ($P = 0.005$) and old pastures ($P = 0.037$). In mid-July both conventionally and rotationally grazed pastures had shorter vegetation than restorations ($P < 0.001$, $P = 0.001$, respectively), old pastures ($P < 0.001$, $P < 0.001$), and old hay fields ($P < 0.001$, $P = 0.004$). At no time period did conventional and rotational pastures differ in vegetation height. Similarly, the three ungrazed habitats never differed from each other.

The variation in height differed among the 5 grassland types, mainly because grazed habitats were more variable in height than ungrazed habitats in mid-July (Table 3B). At this time vegetation height in conventional pastures was more variable than that in old pastures ($P = 0.02$)

and vegetation height in rotational pastures was more variable than that in old hay fields (P = 0.024), and old pastures (P = 0.003).

The robel values (visual obstruction) differed significantly among the 5 grassland types and among the three measurement periods. The rate of change also differed significantly among the 5 habitats (Table 3C). In late May restorations had higher Robel values than either conventional (P = 0.001) or rotational pastures (P = 0.004). In mid-June, conventional pastures had lower Robel values than old hay fields (P = 0.001), old pastures (P <0.001), or restorations (P < 0.001), and rotational pastures had lower Robel values than old pastures (P = 0.023) or restorations (P = 0.001). Robel values increased more for old hay and old pastures than for the other habitats (Figure 2). In mid-July both conventional and rotational pastures had lower Robel values than restorations, old pastures, and old hay fields (all six tests P < 0.001). As with maximum vegetation height, Robel values fell in two distinct groups representing grazed and ungrazed habitats.

The variation in Robel values differed among the 5 grassland habitats later in the season (Table 3D). In mid-June rotational pastures were more variable than restorations (P = 0.022) but none of the other pairwise comparisons were significantly different. In mid-July, both conventional and rotational pastures were more variable than restorations (P = 0.007, P = 0.011, respectively), old pastures (P < 0.001, P = 0.001), and old hay fields (P = 0.002, P = 0.003).

Litter depth and the rate of change in litter depth differed significantly among the 5 grassland types (Table 3E). Litter depth differed significantly among the 5 grassland habitats in each of the measurement periods. In late May conventional pastures had less litter than old pastures (P = 0.44) or restorations (P=0.005) and rotational pastures had less litter than restorations (P = 0.033). In mid-June, both conventional and rotational pastures had less litter than restorations (P < 0.001, P = 0.045, respectively), old pastures (P = 0.016, P = 0.045), and old hay fields (P = 0.009, P = 0.024). Similarly leaf litter in mid-July was lower in both conventional and rotational pastures than in restorations (P < 0.001, P < 0.001, respectively), old pastures (P = 0.006, P = 0.007), and old hay fields (P = 0.04, P = 0.045). Variation in litter depth did not differ significantly among the 5 grassland habitats (Table 3F).

The number of trees or shrubs did not differ among the 5 grassland habitats (Figure 3). Restorations and old hay fields had higher averages than the other habitats primarily because of one point in each habitat that was adjacent to pine plantations (points 8 and 40). In addition, the restorations, especially points 6 and 7, were surrounded by woods.

Bird-Habitat Relationships – The bird communities of the 5 grassland habitats can be divided into three categories: grazed habitats, previously grazed or mowed habitats, and restorations (Table 4). Both conventional and rotational pastures were dominated by savanna sparrow, with lower abundances of starling, eastern meadowlark, and bobolink. The most common species in old pastures and old hay fields were bobolink and red-winged blackbird, followed by savannah sparrow, eastern meadowlark, and sedge wren. Sedge wren and song sparrow were the most common species in restorations. Western meadowlark and grasshopper sparrow occurred only in grazed areas. Sedge wren and Henslow's sparrow occurred only in ungrazed areas. Bobolink occurred in grazed and previously grazed/mowed habitats (but not in restorations) reaching substantially higher abundances in old pasture and old hay than in either type of grazed grassland. European starling also occurred in both grazed and previously grazed/mowed habitats with higher abundances in grazed areas.

The number of species or individuals of birds did not differ significantly among the five habitats when all birds are considered. However, the five habitats did differ in the number of species and individuals of obligate grassland species, secondary grassland species and non-grassland species (Table 5). The number of obligate grassland species differed among the 5 habitats ($F = 4.16$ df = 4, 28, $P = 0.009$) but the number of individuals of obligate grassland species did not ($F = 1.83$ df = 4, 28, $P = 0.15$). More obligate grassland species occurred in old pastures than in restorations ($P = 0.01$) or conventional pastures ($P = 0.05$). Both the number of secondary grassland species ($F = 4.03$ df = 4, 28, $P = 0.01$) and individuals ($F = 3.03$ df = 4, 28, $P = 0.03$) differed among the 5 habitats. Restorations had more secondary grassland species than old pastures ($P = 0.01$) or rotational pastures ($P = 0.03$), and more secondary grassland individuals than rotational pastures ($P = 0.02$). The number of non-grassland individuals differed among the 5 habitats ($F = 2.6$ df = 4, 28, $P = 0.05$) but the number of non-grassland species did not ($F = 1.97$ df = 4, 28, $P = 0.13$). Conventional pastures had more non-grassland individuals than old pastures ($P = 0.05$), primarily because of the high abundance of starlings in or near conventional pastures (Table 4).

The numbers of obligate grassland species and individuals were negatively correlated with the numbers of trees and shrubs (Table 6). In contrast, the numbers of non-grassland species, and secondary grassland species and individuals were positively correlated with the numbers of trees and shrubs. This result is not surprising because many non-grassland and secondary grassland species nest in trees or shrubs. Correlations between the vegetation measurements and individual species of obligate grassland birds are summarized in Table 7. No two species show the same pattern of significant correlations.

Nest Monitoring - We found 60 nests of 15 species. Several of the nests apparently were never active, or were still active at the end of the project so data from 50 nests are reported here (Table 8). Sample sizes are rather small so comparisons among species and habitats were made with caution and detailed analyses were not attempted. Daily nest survival was higher in grazed than in ungrazed habitats, primarily because daily survival was low for nests in old pastures compared to the other four habitats. The low survival of nests in old pastures was a result of low survival of red-winged blackbird nests. Savannah sparrow and bobolink had higher survival than the other species and following from that, obligate grassland species had higher daily nest survival than secondary grassland species. No nests contained brown-headed cowbird eggs.

Thirteen (45%) of the 29 nest boxes were used by bluebirds, 5 (17%) by house wrens, and 4 (14%) by tree swallows. One box (3%) was used by bluebirds then usurped by house wrens. The remaining 6 boxes (21%) were not occupied by birds. Bluebirds used 9 boxes successfully and fledged 15 young with another 21 young near fledging at the end of the project. Bluebird nesting attempts failed in 5 boxes. Tree swallows fledged 13 young and house wrens 7. For comparison, 27 bluebird nest boxes at Savanna Army Depot were used by: bluebirds, 12 (44%), house wrens, 2 (7%), and tree swallows, 4 (15%), bluebirds then house wrens 6 (22%), and tree swallows then bluebirds 2 (7%). One box was not occupied. The boxes fledged 85 bluebirds, 20 house wrens and 26 tree swallows. The box designs were different at the two sites, most boxes at SAD had predator guards, and the boxes at SAD were monitored for 6 months rather than 2 at BAAP. These differences likely account for most of the difference in nest success between the two sites.

Additions to BAAP species list- Seven species observed during this project had not been recorded in previous surveys. Bell's vireo and yellow-breasted chat were observed throughout the summer on the northeast side of BAAP. One male chat was seen repeatedly in the shrub thicket north of and across the gravel road from point 8 (Figure 1). The vireos were seen east of point 7, north of point 9, and southeast of point 10. Bell's vireo is a species of management concern in Wisconsin (Sample and Mossman 1997). Because these birds were outside our point count areas we did not look for or find any nests. One common nighthawk was seen at point 14 during the mid-June point count (June 20). Nighthawks usually nest on the ground in places such as on the gravel ballast of abandoned railroad tracks or parking lots. They also nest on flat roofs. The remaining four species were observed at the pond and marsh east of point 40: one pied-billed grebe on June 20, one male blue-winged teal on June 7, one sora rail on May 21 and June 20, and several marsh wrens on July 11. All of these species were expected to occur at BAAP eventually (Mossman 1999).

Discussion

Grassland bird habitats – Based on the vegetation measurements two general grassland habitats were present: grazed and ungrazed. The bird communities, however, separated into three categories: grazed cool-season grasses, ungrazed cool-season grasses, and plantings of native species with warm season grasses and forbs. These results suggest that (1) both the structure of the vegetation as well as the plant species composition are important for grassland bird habitat selection and (2) rotational grazing did not significantly alter the habitat in grazed pastures.

That plant species composition is a significant factor for grassland bird habitat selection is somewhat contrary to conventional wisdom. Most previous studies indicate that vegetation structure is far more important than species composition (Herkert et al. 1993). This idea is certainly true when different species have the same growth form or when different management practices produce different vegetation structure from the same plant species. The difference between the bird communities of grazed and ungrazed pastures illustrates the second point perfectly. On the other hand, a common expectation in ecology is that diversity begets diversity. In other words, areas with differing plant species composition should also have different bird communities. One possible explanation for this pattern is that vegetation structure is auto-correlated with species composition. In this study, the restorations clearly had different species composition from old pastures and hay fields but vegetation structure did not differ statistically. However, in Figure 2 it appears that vegetation measurements in old pastures and old hay fields are nearly identical while those from restorations are slightly different. Thus, while this study suggests that plant species composition is an important factor in grassland bird habitat selection a larger sample size of sites is needed to separate the effects of structure and diversity.

The lack of a clear effect of rotational grazing on either the vegetation structure or the bird communities contradicts is similar to previous studies in Wisconsin. Renfrew and Ribic (2001) found no difference in bird communities between rotational and conventional pastures. Temple et al. (1999) found more species and higher densities of grassland birds in rotational pastures than in conventional pastures but the stocking rates of cattle on their study plots in conventional pastures (and thus the effect of grazing on the vegetation) was considerably higher than in rotational pastures. Thus, the type of grazing system is not as important as how the grazing is carried out.

Management Recommendations – BAAP supports sizable populations of several grassland bird species of management concern. These species range from western meadowlark and savannah sparrow that tend to occur in grazed areas to bobolink, sedge wren, and Henslow's sparrow which occur in tall dense ungrazed areas to clay-colored sparrow which nest in shrubs within or adjacent to grasslands. Thus, a range of grassland types is necessary to maintain the diversity of grassland birds at BAAP. In some ways management of BAAP is a trade-off among (1) management to increase grassland birds, (2) management to decrease invasive plant species (primarily thistle, but Russian olive is a potential problem as well), and (3) gaining income to support natural resource programs. The range of habitats required by grassland birds suggests a partial solution to this dilemma in the sense that all three competing interests can be accommodated to some degree.

Grazing should be continued at BAAP but rotational grazing, at least as it was conducted in 2002, may not be worth the extra work for the contractor. It may be, however, that a different number of cattle, pasture size, or rotation schedule would yield different vegetation structure in conventional and rotational pastures. One option would be to divide the rotational grazing area into smaller paddocks so that longer regrowth periods are possible. Trampling of nests can be a problem in intensively grazed pastures (Belanger and Picard 1999) and trampling was the main cause of nest failure for meadowlarks in this study. The time for incubation and fledging is 20-25 days for most passerines (Ehrlich et al. 1988) so a period of 3-4 weeks with no grazing may be more beneficial than only 2 weeks. Rotational grazing may have other benefits, such as erosion control or nutrient cycling, not measured in this study.

Another option would be to rest different pastures each year. Bobolinks in particular would benefit from this strategy but some less common species such as dickcissel and Henslow's sparrow would probably benefit also. In addition, starlings tended to be much less common in old pastures (and old hay fields) than in grazed pastures. Starlings nest in the abandoned buildings and may be more abundant in the grazed areas because of the proximity of the grazed areas to many buildings. Low-intensity late season (July – Sept) grazing supported higher densities the following year than other management regimes for 4 of 5 grassland bird species in central Illinois (Walk and Warner 2000). One pasture at BAAP that was grazed late (point 32) had notably high numbers of red-winged blackbirds but few other species.

The areas planted to native prairie species supported different bird species than the other ungrazed habitats (old hay fields and old pastures). If and when additional areas are restored to native prairie vegetation, the different habitat requirements of various grassland birds should be considered. A range of vegetation heights, and densities, litter depths, and species compositions should be attempted. Grazing and prescribed burns should be part of the restorations although grazing may not be practical in all sites. Because much of the area identified for prairie restoration by Luthin (1999) is in the region of BAAP that probably would normally be wooded, prescribed burns to limit woody encroachment need to be implemented on a much wider scale than currently is the case. An increase in burning, however, might be detrimental to grassland birds requiring dense vegetation and an accumulation of litter (Swengel and Swengel 2001).

Haying of old pastures is an alternative to burning and would also provide some income lost from areas not grazed. From the bird perspective such mowing should occur after late July. Mowing for weed control usually occurs in late June to early July. A compromise date would be approximately July 10. For all types of grassland, larger blocks of habitat generally support more diverse bird communities, and contiguous areas of grassland are much better from a management perspective than isolated blocks. For these reasons, it may be beneficial to phase out row crops in the northern section of BAAP or replace them with hay instead of corn or soybeans. Several grassland species of management concern that do not currently occur at BAAP, such as short-eared owl and northern harrier, could be attracted if larger contiguous expanses of grassland were available.

Future Studies –

1. A monitoring program would be beneficial in tracking bird abundances over time. A series of annual surveys using the same methods and locations along with vegetation measurements is recommended. The points used in this study could be the basis for continued monitoring. Additional points in new prairie plantings and perhaps also in oldfields and shrublands could be established.

2. A different schedule, pasture size, and/or stocking rate for rotational grazing could be attempted to produce two different grazed habitats. The effects of rotational grazing on grassland birds could then be reassessed.

3. Nest searching and monitoring proved to be difficult and time intensive. A more thorough nest success survey would probably require a field crew of at least 4 people.

4.The effects of buildings on grassland bird have been suggested by previous studies. Thompson and Welsh (Thompson and Welsh 1993) noted that upland sandpipers tended to be found in areas with fewer buildings. The same trend has been noted at Savanna Army Depot in northwestern Illinois (Wenny 2001). The point count locations in this study were specifically located to avoid buildings so the data cannot be used to draw conclusions about avian responses to buildings. Examining the effects of buildings would involve an expansion of the monitoring suggested above and/or an entirely new study design.

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Table 1. List of all species observed during 3 sets of 5-minute point counts at 32 points at Badger Army Ammunition Plant, May – July 2002. Column 2 lists the degree of dependence on grassland: O = obligate grassland species, G2 = secondary grassland species, NG = non-grassland species. Columns 3-7 list the number of individuals of each species observed at five distances from point center. Column 8 lists the number of flying birds seen within 200 m radius. Last column lists the percentage of birds observed with 100-m radius, not counting flyovers. See Appendix 1 for full names of all species.

SPECIES	TYPE	<25M	25-50M	50-100M	100-200M	>200M	FLYOVER	TOTAL	% in 100m
AMCR	NG	0	0	0	3	22	3	28	0.0
AMGO	G2	0	7	4	3	0	26	40	78.6
AMKE	G2	0	0	0	13	2	1	16	0.0
AMRO	NG	3	3	9	17	4	5	41	41.7
BAOR	NG	0	2	3	7	1	0	13	38.5
BARS	NG	0	1	1	0	0	30	32	100.0
BCCH	NG	0	0	0	2	0	0	2	0.0
BEVI	NG	0	0	0	2	1	0	3	0.0
BGGN	NG	0	0	1	0	0	0	1	100.0
BHCO	G2	5	1	3	8	0	5	22	52.9
BLJA	NG	0	0	1	5	6	0	12	8.3
BOBO	O	25	61	53	38	3	20	200	77.2
BRTH	NG	0	0	2	6	2	0	10	20.0
CAGO	NG	0	0	0	0	0	30	30	0.0
CCSP	G2	1	3	12	6	0	0	22	72.7
CEDW	NG	0	0	0	0	0	4	4	0.0
CHSP	NG	0	0	6	7	1	0	14	42.9
CHSW	NG	0	0	0	0	0	1	1	0.0
CLSW	NG	0	0	5	0	0	3	8	100.0
COGR	G2	0	0	0	2	0	19	21	0.0
COHA	NG	0	0	0	0	0	1	1	0.0
CONI	G2	0	0	1	0	0	0	1	100.0
COYE	G2	1	1	8	7	2	0	19	52.6
DICK	O	0	1	1	0	0	0	2	100.0
EABL	G2	0	2	4	10	2	0	18	33.3
EAKI	G2	2	0	13	13	1	0	29	51.7
EAME	O	0	7	64	80	26	1	178	40.1
EAPH	NG	0	3	2	13	2	0	20	25.0
EATO	NG	0	0	1	3	1	0	5	20.0
EAWP	NG	0	0	0	2	0	0	2	0.0
EUST	NG	2	8	49	102	12	97	270	34.1
FISP	G2	0	0	2	15	16	0	33	6.1
GCFL	NG	0	0	0	0	1	0	1	0.0
GNHE	NG	0	0	0	0	0	1	1	0.0
GRCA	NG	1	0	3	5	0	0	9	44.4
GRSP	O	0	3	1	0	1	0	5	80.0

Table 1. Continued

SPECIES	TYPE	<25M	25-50M	50-100M	100-200M	>200M	FLYOVER	TOTAL	% in 100m
GTBH	NG	0	0	0	0	1	10	11	0.0
HESP	O	1	1	5	1	0	0	8	87.5
HOFI	NG	0	0	0	0	0	3	3	0.0
HOLA	O	0	0	1	3	0	0	4	25.0
HOWR	NG	0	1	4	10	4	0	19	26.3
INBU	NG	0	0	4	7	1	1	13	33.3
KILL	G2	0	1	1	3	4	5	14	22.2
MALL	G2	0	0	0	0	0	1	1	0.0
MODO	G2	0	0	8	13	12	3	36	24.2
NOCA	NG	0	0	1	5	2	0	8	12.5
NRWS	NG	0	0	0	0	0	4	4	0.0
RBGR	NG	0	0	3	1	1	0	5	60.0
RBWO	NG	0	0	0	6	10	0	16	0.0
RHWO	G2	0	0	1	0	2	0	3	33.3
RNPH	G2	0	0	1	2	7	0	10	10.0
RODO	NG	0	0	0	2	3	2	7	0.0
RTHA	G2	0	0	0	1	9	3	13	0.0
RWBL	G2	6	28	45	41	8	16	144	61.7
SACR	NG	0	0	0	0	2	12	14	0.0
SAVS	O	26	35	68	20	0	1	150	86.6
SCTA	NG	0	0	0	1	0	0	1	0.0
SEWR	O	16	22	21	10	0	0	69	85.5
SOSP	G2	7	9	27	24	5	0	72	59.7
TRES	NG	0	0	0	6	0	5	11	0.0
TUVU	NG	0	0	0	1	4	7	12	0.0
VESP	O	0	0	0	1	1	0	2	0.0
WAVI	NG	0	2	1	1	1	0	5	60.0
WEME	O	1	0	5	11	7	0	24	25.0
WIFL	G2	1	0	2	5	1	0	9	33.3
WITU	NG	0	0	0	2	6	0	8	0.0
WOTH	NG	0	0	0	0	2	0	2	0.0
YBCH	NG	0	0	1	1	0	0	2	50.0
YBCU	NG	0	0	0	0	1	0	1	0.0
YSFL	NG	0	0	0	3	1	0	4	0.0
YWAR	NG	0	0	2	2	1	0	5	40.0
Grand Total		98	202	450	552	202	320	1824	49.9

Table 2. Average number of birds per point listed alphabetically within each of three categories. The six most common species are in bold.

SPECIES	50M	100m	Total
Obligate Grassland Species (O)			
BOBO	0.87	**1.40**	1.82
EAME	0.07	**0.66**	1.60
GRSP	0.03	0.04	0.05
HESP	0.02	0.07	0.08
SAVS	0.62	**1.28**	1.48
SEWR	0.38	**0.59**	0.69
WEME	0.01	0.06	0.24
Secondary Grassland Species (G2)			
AMGO	0.07	0.11	0.14
BHCO	0.06	0.07	0.12
CCSP	0.04	0.13	0.18
COYE	0.02	0.10	0.17
EABL	0.02	0.06	0.16
EAKI	0.02	0.13	0.26
FISP	0.00	0.02	0.31
KILL	0.01	0.02	0.08
MODO	0.00	0.08	0.32
RHWO	0.00	0.01	0.03
RNPH	0.00	0.01	0.08
RWBL	0.30	**0.66**	1.08
SOSP	0.13	0.32	0.57
WIFL	0.01	0.03	0.09

SPECIES	50M	100m	Total
Non-grassland Species (NG)			
AMRO	0.04	0.11	0.32
BAOR	0.02	0.04	0.10
BLJA	0.00	0.01	0.11
BRTH	0.00	0.01	0.07
CHSP	0.00	0.06	0.11
EAPH	0.01	0.01	0.14
EATO	0.00	0.01	0.04
EUST	0.10	**0.56**	1.47
GRCA	0.01	0.04	0.09
HOWR	0.01	0.05	0.14
INBU	0.00	0.03	0.10
NOCA	0.00	0.01	0.07
RBGR	0.00	0.03	0.05
WAVI	0.02	0.03	0.05
YBCH	0.00	0.01	0.02
YWAR	0.00	0.02	0.04

Table 3. Results from repeated-measures ANOVA tests and subsequent one-way ANOVAs on the vegetation measurements. Each box first lists the repeated-measures ANOVA which includes a comparison between the 5 grassland types (Between) and a comparison within each group over the three measurement periods (Within). This second comparison includes an examination of the change in the variable over time and an interaction term that compares the change in the variable over time among the 5 grassland types. If the repeated measures ANOVA yielded statistically significant results ($P < 0.05$) then one-way ANOVA tests were used on each measurement period separately to further compare the 5 grassland types. The three measurement periods were early late May, mid-June and mid-July. Post-hoc Bonferroni tests were used for pairwise comparisons for any significant one-way ANOVA (reported in text).

Table 3A. Test on maximum height among the 5 grassland habitats

Test	Comparison	Source	SS	df	MS	F	P
Height	Between	Type	459.74	4	114.94	14.18	**0.000**
		Error	210.79	26	8.11		
	Within	Height	197.62	2	98.81	35.52	**0.000**
		Height*Type	30.95	8	3.86	1.39	0.223
		Error	144.68	52	2.78		
Height1		Type	172.32	4	43.08	5.63	**0.002**
		Error	214.10	28	7.65		
Height2		Type	186.47	4	46.62	15.35	**0.000**
		Error	85.06	28	3.04		
Height3		Type	187.62	4	46.90	21.07	**0.000**
		Error	57.89	26	2.23		

Table 3B. Test on coefficient of variation of maximum height among the 5 grassland habitats

Test	Comparison	Source	SS	df	MS	F	P
HeightCV	Between	Type	0.246	4	0.062	3.65	**0.017**
		Error	0.439	26	0.017		
	Within	HeightCV	0.033	2	0.017	1.975	0.149
		HeightCV*Type	0.083	8	0.010	1.232	0.300
		Error	0.436	52	0.008		
HeightCV1		Type	0.045	4	0.011	0.708	0.593
		Error	0.440	28	0.016		
HeightCV2		Type	0.051	4	0.013	1.282	0.301
		Error	0.276	28	0.010		
HeightCV3		Type	0.212	4	0.053	6.435	**0.001**
		Error	0.214	26	0.008		

Table 3C. Test on Robel measurements among the 5 grassland habitats

Test	Comparison	Source	SS	df	MS	F	P
Robel	Between	Type	582.45	4	145.61	16.72	**0.000**
		Error	235.11	27	8.71		
	Within	Robel	173.60	2	86.80	40.85	**0.000**
		Robel*Type	59.47	8	7.43	3.48	**0.003**
		Error	115.50	54	2.14		
Robel1		Type	181.05	4	45.26	6.68	**0.001**
		Error	189.73	28	6.78		
Robel2		Type	173.71	4	43.43	14.98	**0.000**
		Error	81.16	28	2.90		
Robel3		Type	311.60	4	77.90	26.05	**0.000**
		Error	80.75	27	2.99		

Table 3D. Test on coefficient of variation of Robel among the 5 grassland habitats

Test	Comparison	Source	SS	df	MS	F	P
RobelCV	Between	Type	0.577	4	0.144	7.4124	**0.000**
		Error	0.526	27	0.019		
	Within	RobelCV	0.013	2	0.006	0.927	0.402
		RobelCV*Type	0.107	8	0.013	1.9454	0.072
		Error	0.371	54	0.007		
RobelCV1		Type	0.116	4	0.029	2.015	0.120
		Error	0.403	28	0.014		
RobelCV2		Type	0.101	4	0.025	3.752	**0.014**
		Error	0.188	28	0.007		
RobelCV3		Type	0.461	4	0.115	9.944	**0.000**
		Error	0.313	27	0.012		

Table 3E. Test on litter depth among the 5 grassland habitats

Test	Comparison	Source	SS	df	MS	F	P
Litter	Between	Type	316.60	4	79.15	16.33	**0.000**
		Error	130.87	27	4.85		
	Within	Litter	6.50	2	3.25	2.48	0.094
		Litter*Type	27.35	8	3.42	2.61	**0.017**
		Error	70.81	54	1.31		
Litter 1		Type	50.61	4	12.65	5.67	**0.002**
		Error	62.50	28	2.23		
Litter 2		Type	98.56	4	24.64	16.25	**0.000**
		Error	42.47	28	1.52		
Litter 3		Type	191.84	4	47.96	12.81	**0.000**
		Error	101.11	27	3.75		

Table 3F. Test on coefficient of variation of litter depth among the 5 grassland habitats

Test	Comparison	Source	SS	df	MS	F	P
LitterCV	Between	Type	0.173	4	0.043	1.118	0.369
		Error	1.049	27	0.039		
	Within	LitterCV	0.078	2	0.039	2.407	0.100
		LitterCV *Type	0.040	8	0.005	0.3078	0.960
		Error	0.877	54	0.016		

Table 4. The 10 most abundant species in each of the grassland habitats at Badger Army Ammunition Plant, summer 2002. More than 10 species are listed for some habitats in the case of ties.

Conventional	Birds/ point	Rotational	Birds/ point	Old Pasture	Birds/ point	Old Hay	Birds/ point	Restorations	Birds/ point
SAVS	1.88	SAVS	2.28	BOBO	3.83	BOBO	1.33	SEWR	1.93
EUST	1.58	EAME	0.94	RWBL	1.25	RWBL	1.22	SOSP	1.27
BOBO	0.67	EUST	0.50	SAVS	1.08	EAME	0.89	RWBL	0.87
EAME	0.67	BOBO	0.39	SEWR	0.75	SAVS	0.72	CCSP	0.67
SOSP	0.29	WEME	0.17	EAME	0.54	SEWR	0.61	COYE	0.47
EAKI	0.25	AMRO	0.11	EUST	0.17	SOSP	0.33	HESP	0.27
AMRO	0.21	KILL	0.11	HESP	0.13	EUST	0.22	AMGO	0.20
BHCO	0.21	MODO	0.11	AMGO	0.08	AMGO	0.11	AMRO	0.20
EABL	0.21	BHCO	0.06	EAKI	0.08	CHSP	0.11	EAKI	0.20
AMGO	0.17	COYE	0.06	AMRO	0.04	COYE	0.11	EAME	0.20
BAOR	0.17	EABL	0.06	EAPH	0.04			GRCA	0.20
MODO	0.17	EAKI	0.06					INBU	0.20
		GRSP	0.06						

Table 5. Summary of point count results among the 5 grassland habitats. For each habitat the columns list the average and standard deviation for the variables listed in the first column. The variables are divided into three sections. The top section lists the average and cumulative (total) number of species and individuals over the three point counts. The second section lists the average number of species and individuals for three categories of birds: O, obligate grassland species; G2, secondary grassland species; NG, non-grassland species. The third section lists the average number of individuals for selected species. These values are individuals observed within 100m radius unless the species abbreviation is followed by 'tot' in which case the values are for unlimited distance counts. Variables that differed among habitats are in bold. Within each row, average values followed by the same letter are not significantly different.

	Conventional		**Rotational**		**Old pastures**		**Old hay fields**		**Restorations**	
	avg	sd	avg	sd	avg	sd	avg	sd	avg	sd
Avg. Spp.	3.79	2.41	2.78	0.54	2.83	0.71	3.39	0.44	4.27	1.69
Total Spp.	6.88	4.58	4.83	1.60	4.88	1.46	6.33	1.75	8.40	3.85
Avg. Inds	7.42	3.51	4.89	1.39	8.04	3.24	6.06	2.32	7.80	2.06
Total Inds	22.25	10.54	14.67	4.18	24.13	9.73	18.17	6.97	23.40	6.19
O Spp.	2.13b	1.36	3.00ab	0.89	3.75a	1.16	3.17ab	0.98	1.40b	1.14
O Inds	3.60	2.88	3.83	1.03	6.33	3.27	3.56	2.90	2.67	2.60
G2 Spp.	2.50ab	2.62	1.00b	1.10	0.75b	1.04	2.50ab	2.07	4.60a	1.82
G2 Inds	1.46a	2.11	0.44a	0.50	1.42a	1.89	2.00a	1.46	4.07b	2.35
NG Spp	2.25	2.55	0.83	0.98	0.38	0.74	0.67	0.82	2.40	2.61
NG Inds	2.54a	2.97	0.61b	0.80	0.25b	0.58	0.44b	0.58	1.07b	1.14
BHCO	0.21	0.47	0.06	0.14	-	-	-	-	0.07	0.15
BOBO	0.88b	1.11	0.39b	0.39	3.83a	2.60	1.33b	1.35	-	-
CCSP	0.08	0.24	-	-	-	-	0.06	0.14	0.67	1.03
CHSP	0.13	0.17	-	-	-	-	0.11	0.27	0.07	0.15
COYE	-	-	0.06	0.14	-	-	0.11	0.17	0.47	0.18
EABL	0.21	0.25	0.06	0.14	-	-	-	-	-	-
EAKI	0.25	0.39	0.06	0.14	0.08	0.24	0.06	0.14	0.20	0.30
EAME	0.69	0.79	0.94	0.49	0.54	0.53	0.89	0.62	0.20	0.45
EAMEtot	1.77a	0.81	1.83a	0.69	1.83a	1.21	1.78a	0.98	0.53b	0.84
EUST	1.58	2.83	0.50	0.69	0.17	0.47	0.22	0.54	-	-
EUSTtot	2.75	3.96	2.11	2.08	1.13	1.31	0.83	1.30	-	-
FISPtot	0.38	0.42	0.06	0.14	0.08	0.24	0.33	0.67	0.87	0.51
GRSP	0.04	0.12	0.06	0.14	-	-	-	-	0.13	0.30
HESP	-	-	-	-	0.13	0.17	-	-	0.27	0.60
KILLtot	0.13	0.17	0.22	0.27	-	-	-	-	0.07	0.15
MODOtot	0.42	0.35	0.11	0.27	0.21	0.35	0.33	0.42	0.60	0.43
RNPHtot	-	-	-	-	0.08	0.15	0.06	0.14	0.33	0.33
RWBL	-	-	-	-	1.25	1.64	1.22	0.89	0.87	1.41
SAVS	1.88b	1.82	2.28ab	0.83	1.08bc	1.00	0.72bc	0.83	0.13c	0.30
SEWR	-	-	-	-	0.75b	0.75	0.61b	0.44	1.93a	2.51
SOSP	0.29	0.58	-	-	-	-	0.33	0.56	1.27	0.95
WEME	0.13	0.35	0.17	0.41	-	-	-	-	-	-
WEMEtot	0.67	1.43	0.28	0.53	0.08	0.24	0.06	0.14	-	-

Table 6. Pearson correlations between vegetation measurements and number of species and individuals in three grassland bird categories. P-values shown in parentheses; statistically significant correlations shown in bold.

Variable	**Obligate grassland birds**		**Secondary grassland birds**		**Non-grassland birds**	
	Species	Individuals	Species	Individuals	Species	Individuals
Shrubs	**-0.46 (0.007)**	**-0.41 (0.017)**	**0.61 (0.000)**	**0.51 (0.003)**	**0.58 (0.000)**	0.29 (0.097)
Trees	**-0.36 (0.037)**	**-0.34 (0.049)**	**0.46 (0.008)**	**0.48 (0.005)**	**0.48 (0.005)**	0.17 (0.353)
Height	-0.03 (0.870)	-0.03 (0.852)	0.22 (0.212)	**0.39 (0.023)**	-0.17 (0.348)	-0.29 (0.092)
Robel	0.01 (0.980)	0.06 (0.739)	0.20 (0.266)	**0.40 (0.021)**	-0.20 (0.265)	-0.31 (0.081)
Litter	**-0.09 (0.615)**	0.09 (0.618)	0.25 (0.155)	**0.39 (0.025)**	-0.25 (0.154)	-0.31 (0.082)

Table 7. Pearson correlation coefficients between vegetations measurements and abundances of obligate grassland species.

Variable	**BOBO**	**EAME**	**GRSP**	**HESP**	**SAVS**	**SEWR**	**WEME**
Shrubs	-0.22 (0.218)	-0.30 (0.086)	-0.09 (0.607)	-0.07 (0.684)	-0.30 (0.096)	-0.09 (0.606)	-0.08 (0.660)
Trees	-0.20 (0.259)	-0.20 (0.270)	-0.09 (0.606)	-0.09 (0.612)	-0.23 (0.201)	-0.09 (0.640)	-0.08 (0.659)
Height	0.08 (0.466)	-0.16 (0.109)	-0.07 (0.485)	0.18 (0.075)	**-0.49 (0.000)**	**0.57 (0.000)**	**-0.23 (0.023)**
Height CV	-0.10 (0.325)	-0.06 (0.549)	0.30 (0.768)	-0.20 (0.051)	0.17 (0.106)	**-0.48 (0.000)**	0.05 (0.604)
Robel	0.10 (0.333)	-0.13 (0.198)	-0.12 (0.233)	**0.24 (0.020)**	**-0.48 (0.000)**	**0.67 (0.000)**	-0.20 (0.052)
Robel CV	**-0.20 (0.049)**	0.04 (0.685)	0.12 (0.246)	**-0.28 (0.005)**	**0.21 (0.042)**	**-0.60 (0.000)**	0.04 (0.696)
Litter	0.09 (0.405)	-0.15 (0.135)	0.05 (0.647)	0.16 (0.112)	**-0.39 (0.000)**	**0.65 (0.000)**	-0.19 (0.061)
Litter CV	**-0.14 (0.167)**	0.14 (0.173)	**0.21 (0.036)**	0.06 (0.545)	0.05 (0.622)	**-0.03 (0.000)**	-0.03 (0.778)

Table 8. Summary of nest monitoring data. The table is divided into 5 sections, each of which subdivides the same data in different ways. The first section lists the nest data in each of the 5 grassland habitats, and the second by presence or absence of grazing. The third section lists nest data by species (including only species for which 3 or more nests were found) and the fourth section lists the data by degree of dependence on grassland. The columns list the number of nests, number of successful nests, number of exposure days, the daily survival rate, and the probability of survival assuming a 22-day nest period.

	Nests	**Successful nests**	**Exposure days**	**Daily survival**	**P(survival) 22 days**
Conventional	4	3	49	0.979	0.627
Rotational	6	4	74	0.973	0.548
Old Pasture	17	5	187	0.936	0.233
Old Hay	8	4	81	0.951	0.331
Restorations	15	9	156	0.962	0.426
Grazed	10	7	123	0.976	0.586
Ungrazed	40	18	424	0.948	0.309
BOBO	5	3	75	0.973	0.548
CCSP	3	2	8	0.875	0.053
EAME/WEME	8	2	67	0.910	0.126
RWBL	16	4	182	0.934	0.223
SAVS	7	6	100	0.990	0.802
Obligate (O)	22	12	256	0.961	0.417
Secondary (G2)	25	10	261	0.943	0.275
Non-grassland (NG)	3	3	30	1.000	1.000
Total	50	25	547	0.954	0.355

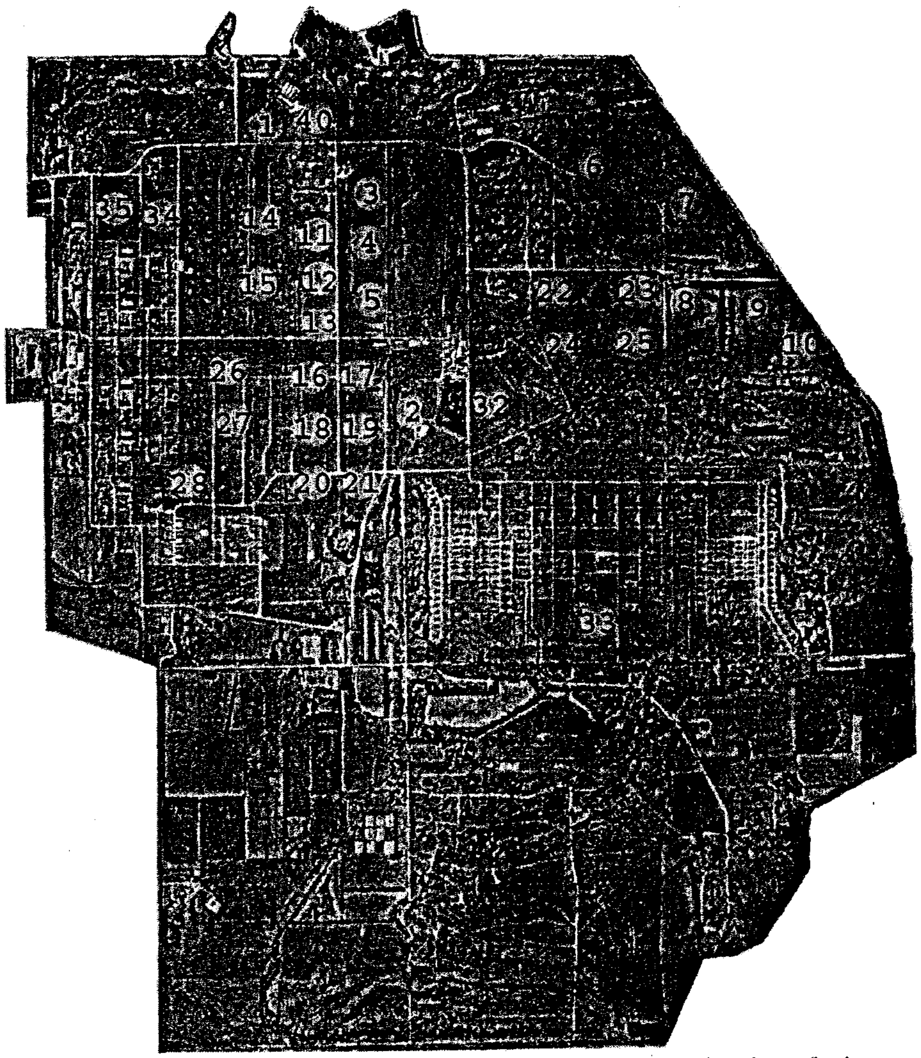

Figure 1. Map of Badger Army Ammunition Plant showing approximate locations of point counts. Five habitats were surveyed May-July 2002: old hay fields, points 1-5, 40; prairie restorations, points 6-10; old pasture (grazed in 2001 but not in 2002), points 11-15, 32, 34, 35; rotational grazing, points 16-21; conventional grazing, points 22-28, 33.

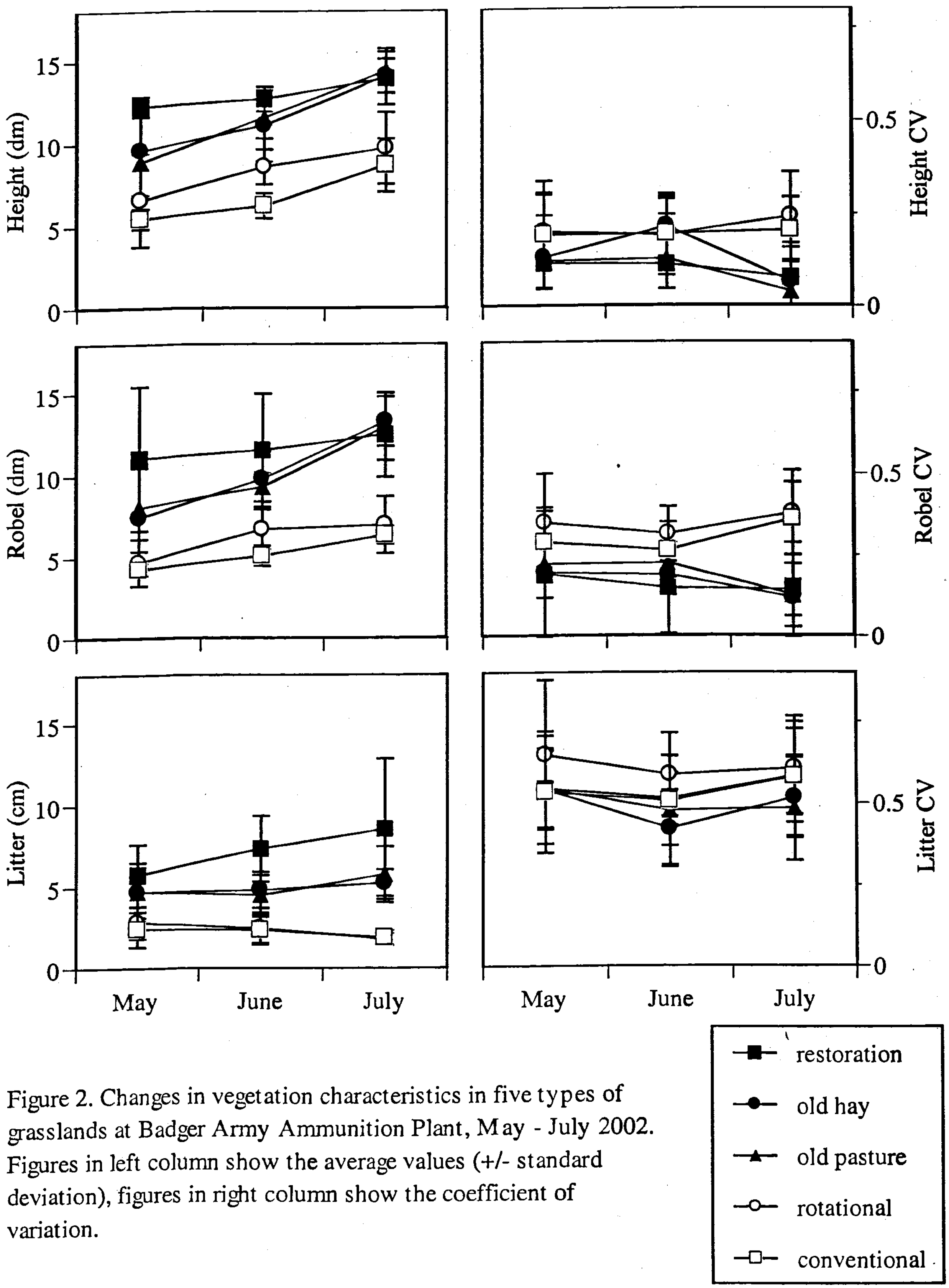

Figure 2. Changes in vegetation characteristics in five types of grasslands at Badger Army Ammunition Plant, May - July 2002. Figures in left column show the average values (+/- standard deviation), figures in right column show the coefficient of variation.

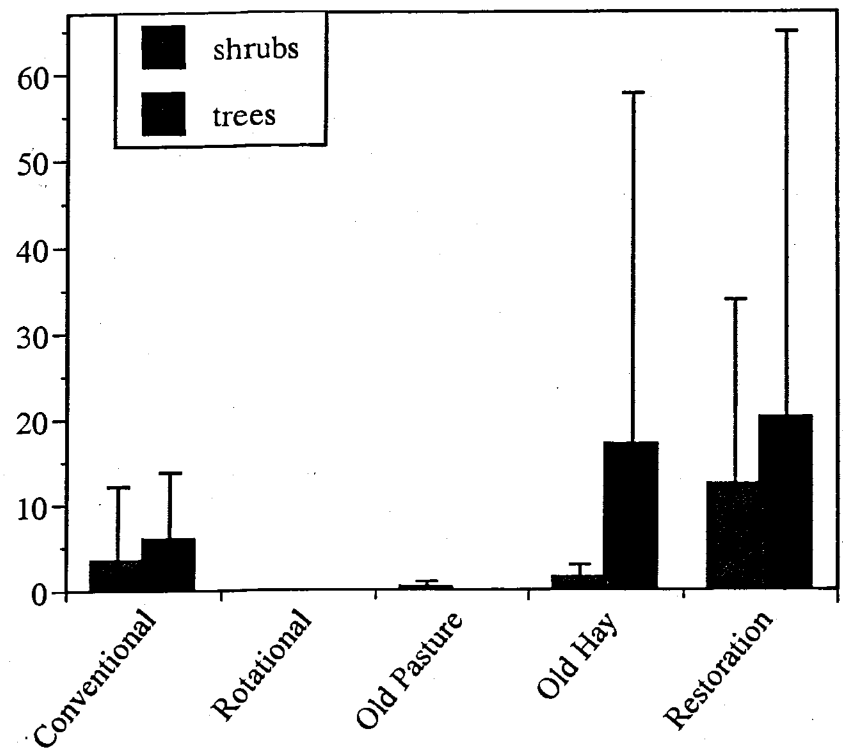

Figure 3. Number of trees and shrubs (average + 1SD) in the 5 grassland habitats at Badger Army Ammunition Plant, summer 2002

Appendix 1. Scientific names of birds mentioned in this report. Listed Alphabetically by species code. Species of management concern in Wisconsin are in bold. WL = Species on the Audubon watch list. T = listed and threatened in Wisconsin. I = introduced species. CP = Conservation priority species for US fish and Wildlife Service Region 3.

SPECIES	Common Name	Scientific Name
AMCR	American Crow	*Corvus brachyrhynchos*
AMGO	American Goldfinch	*Carduelis tristis*
AMKE	American Kestrel	*Falco sparverius*
AMRO	American Robin	*Turdus migratorius*
BAOR	Baltimore Oriole	*Icterus galbula*
BARS	Barn Swallow	*Hirundo rustica*
BCCH	Black-capped Chickadee	*Poecile atricapillus*
BEVI	**Bell's Vireo (WL, T)**	***Vireo belli***
BGGN	Blue-gray Gnatcatcher	*Polioptila caerulea*
BHCO	Brown-headed Cowbird	*Molothrus ater*
BLJA	Blue Jay	*Cyanocitta cristata*
BOBO	**Bobolink (CP)**	***Dolichonyx oryzivorus***
BRTH	Brown Thrasher	*Toxostoma rufum*
CAGO	Canada Goose	*Branta canadensis*
CCSP	**Clay-colored Sparrow**	***Spizella pallida***
CEDW	Cedar Waxwing	*Bombycilla cedrorum*
CHSP	Chipping Sparrow	*Spizella passerina*
CHSW	Chimney Swift	*Chaetura pelagica*
CLSW	Cliff Swallow	*Hirundo pyrrhonota*
COGR	Common Grackle	*Quiscalus quiscula*
COHA	Cooper's Hawk	*Accipiter cooperii*
CONI	Common Nighthawk	*Chordeiles minor*
COYE	Common Yellowthroat	*Geothlypis trichas*
DICK	**Dickcissel (WL, CP)**	***Spiza americana***
EABL	Eastern Bluebird	*Sialia sialis*
EAKI	Eastern Kingbird	*Tyrannus tyrannus*
EAME	**Eastern Meadowlark (CP)**	***Sturnella magna***
EAPH	Eastern Phoebe	*Sayornis phoebe*
EATO	Eastern Towhee	*Pipilo erythrophthalmus*
EAWP	Eastern Pewee	*Contopus virens*
EUST	European Starling (I)	*Sturnus vulgaris*
FISP	**Field Sparrow**	***Spizella pusilla***
GCFL	Great Crested Flycatcher	*Myiarchus crinitus*
GNHE	Green Heron	*Butorides virescens*
GRCA	Gray Catbird	*Dumetella carolinensis*

Appendix 1. continued

SPECIES	Common Name	Scientific Name
GRSP	**Grasshopper Sparrow (CP)**	***Ammodramus savannarum***
GTBH	Great Blue Heron	*Ardea herodias*
HESP	**Henslow's Sparrow (WL, T, CP)**	***Ammodramus henslowi***
HOFI	House Finch	*Carpodacus mexicanus*
HOLA	Horned Lark	*Eremophila alpestris*
HOWR	House Wren	*Troglodytes aedon*
INBU	Indigo Bunting	*Passerina cyanea*
KILL	Killdeer	*Charadrius vociferus*
MALL	Mallard	*Anas platyrhynchos*
MODO	Mourning Dove	*Zenaida macroura*
NOCA	Northern Cardinal	*Cardinalis cardinalis*
NRWS	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
RBGR	Rose-breasted Grosbeak	*Pheucticus ludovicianus*
RBWO	Red-bellied Woodpecker	*Melanerpes carolinus*
RHWO	Red-headed Woodpecker (WL)	*Melanerpes erythrocephalus*
RNPH	Ring-necked Pheasant (I)	*Phasianus colchincus*
RODO	Rock Dove (I)	*Columba livia*
RTHA	Red-tailed Hawk	*Buteo jamaicensis*
RWBL	Red-winged Blackbird	*Agelaius phoeniceus*
SACR	Sandhill Crane	*Grus canadensis*
SAVS	**Savannah Sparrow**	***Passerculus sandwichensis***
SCTA	Scarlet Tanager	*Piranga olivacea*
SEWR	**Sedge Wren (CP)**	***Cistothorus platensis***
SOSP	Song Sparrow	*Melospiza melodia*
TRES	Tree Swallow	*Tachycineta bicolor*
TUVU	Turkey Vulture	*Cathartes aura*
UPSA	**Upland Sandpiper**	***Bartramia longicauda***
VESP	**Vesper Sparrow**	***Pooecetes gramineus***
WAVI	Warbling Vireo	*Vireo gilvus*
WEME	**Western Meadowlark**	***Sturnella neglecta***
WIFL	Willow Flycatcher	*Empidonax traillii*
WITU	Wild Turkey	*Meleagris gallopavo*
WOTH	Wood Thrush (WL, CP)	*Hylocichla mustelina*
YBCH	Yellow-breasted Chat	*Icterina virens*
YBCU	Yellow-billed Cuckoo	*Coccyzus americanus*
YSFL	Northern Flicker	*Colaptes auratus*

YWAR	Yellow Warbler	*Dendroica petechia*