Rappahannock River Valley NWR

Breeding Grassland Bird Report 2007-2010

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Oct 2010 (draft)

Dickcissel singing at Wilna (Sandy Spencer)

I. Introduction and Purpose

The Rappahannock River Valley National Wildlife Refuge (RRVNWR) has had a grassland component of its habitat inventory since at least 1996 when the first unit, the Tayloe tract, was acquired. Over the years, as new tracts were added to the refuge, crop fields were evaluated for their potential for restoration into grasslands. The refuge currently manages about 550 to 600 acres of grassland habitat. During the refuge Comprehensive Conservation Plan (CCP) process (2006-2009), we laid out goals and objectives for making grasslands one of the focal habitat types during the next 15-year management horizon. We established a goal of 60% use by grasshopper sparrows of the short-grass fields on a 5-year average with a targeted density of one pair for every 4-8 acres or better (, based on their breeding habitat requirements (Helzer and Jelinski 1999, Vickery et al. 1999, Askins 2002, Davis 2004). The justification for grasslands in this largely forested portion of the United States was based primarily on historical data, which showed that grassland obligate species and early succession, open habitats had occurred here. It is also based on the ability of the refuge to acquire and manage such habitats at a scale that most landowners in the refuge boundary cannot afford; and on the need for protected habitat for grassland bird species experiencing declines.

During the point count surveys for the jointly sponsored U.S. Fish and Wildlife Service (FWS) and U.S. Geological Survey (USGS) Region 5 Grassland Bird Study (GBB 2001-2003) and other formal and informal observations, it became apparent that the grasshopper sparrow is one of the most locally common grassland obligates for which the refuge could make a regional contribution. The species is of conservation concern according to the Bird Conservation Region 30 Plan (ACJV 2007) and the Virginia wildlife action plan (VDGIF 2007). Since grasshopper sparrow breeding requirements are narrow, the species was selected as an umbrella species to guide our grassland management, in the hopes that other grassland obligates would also benefit.

The Wilna and Hutchinson tracts provide the largest, contiguous grasslands and thus are our prime grasslands and the subject of this survey report. All fields are roughly similar with respect to minimal size (>25 acres or more), possess a low perimeter- to- interior ratio (adjacent fields can support each other in this respect), they occur in similar landscape setting (adjacent to agricultural or forest land), and have similar soil properties. The fields at Hutchinson and Wilna are under different management objectives. Hutchinson's 202 acres of grasslands support the refuge CCP's tallgrass objectives for grassland generalists that require this structure, and for this reason the northern bobwhite is a target species. These fields were planted in 2001 in Indiangrass, big bluestem, switchgrass, Eastern gamagrass, and native flowers. Wilna's 293 grassland acres are either fallow or planted in shortgrass or tallgrass species. Restoration plantings (from former crops) took place in 2004. The breakdown is as follows: 181 acres fallow; 57 acres in shortgrass species (little bluestem, sideoats grama, and sand lovegrass), and 55 acres in tallgrass species (Indiangrass, big bluestem). The fallow and planted shortgrass fields (238 acres) serve the refuge's shortgrass objectives, using grasshopper sparrow as the focal species.

In order to determine the extent we are supporting our targeted species and to measure responses to habitat management, point count surveys in the grasslands are performed. Unfortunately, not all grasslands managed by the refuge could be surveyed due to resource constraints.

Basic questions that the refuge must address relative to management for breeding grasshopper sparrows are as follows:

- How does the relative importance of each field compare with respect to abundance and density?
- What is the trend in grasshopper sparrow abundance since the earlier surveys (from 2002)?
- To what extent is the refuge meeting the BCR 30 goal of 0.14 breeding individuals per acre?
- What percent of our grasslands are being used for breeding territory and to what extent is the refuge meeting its goal of 60% use of the grasslands?
- Within fields, are grasshopper sparrows demonstrating a selection preference?
- Are there any significant differences between fallow fields and those planted in warm season grasses with respect to selection by grasshopper sparrows for breeding territories?

We previously measured the distribution and density of breeding grassland obligates during the three years of the Region 5 Grassland Breeding Bird study with respect to different management regimes (prescribed fire, mowing, passively managed) and noted that passively managed fields contain fewer grassland obligates. We have not since invested in a block design for such an analysis because site conditions here are so unfavorable for grassland management. We have observed that forgoing even one year of disturbance results in woody, vine, and briar encroachment from the surrounding forest edges, reduces the amount of grass coverage, reduces the amount of fuel for prescribed fire and reduces our ability to set back encroachment. We have also observed that prescribed fire alone is not sufficient for controlling trees, especially if only dormant season burns. Conditions for burning are generally only favorable during the winter when the fuel is dry (an exception to this was, 2005 when we conducted a fall burn). Dormant season fires are patchy, generally only top-kills the above-ground biomass; the trees resprout in the growing season

The grasslands in this report have been treated with prescribed fire three or four times depending on when they came out of crop production—2000, 2001, or 2004, with at least two years between treatment. In addition, fields would be spot-mowed as needed in the fall or late winter to set back woody encroachment, especially fallow fields near their forest edges. Regardless of management method, we strive to ensure that fields devoted to short-stature grasses for grasshopper sparrows are in that condition at the onset of the breeding season. We accomplish this through prescribed fire, bush hogging, and spot mowing where too tall, rank or shrubby.

Grasshopper Sparrow at Wilna (John Drummond)

This report reflects point count survey work that was conducted through the years 2007 -2009, and a follow up survey in 2010 that included territory mapping of the grasshopper sparrow with associated vegetation characterization. It focuses on grasshopper sparrow (a focal species), eastern meadowlark, dickcissel and northern bobwhite.

This report will serve as a baseline from which to evaluate in the long term the effectiveness of our efforts to maintain grass-dominated fields (by any method) using the distribution and density of grasshopper sparrows during the breeding season as a measure.

II. Methods

2007 -2009 Surveys

Point counts were used to monitor breeding bird use at established in the grassland fields at the Wilna and Hutchinson tracts. All surveys were conducted between the last week of May and mid-June, during the first 4 hours from sunrise, and all points were visited twice during the survey season. The standard FWS single-observer, 5-minute protocol was used so that the data could be used for both local and regional analyses in the FWS. This 5-minute protocol, had 2 distance radii (0-50m and 50-100m), and 2-time periods (0-3 min. and 3-5 min). However, in 2009, a new 10-minute protocol (Knutsen 2008) was adopted by the FWS which has 1-minute increments, and 4 distance radii, which will allow time-removal analysis to provide detection estimates. (The expectedly higher counts from the 2008 protocol will be corrected for in the analysis).

Prior to 2006, all bird survey points were randomly distributed across the refuge without regard to habitat type. In 2006, a habitat-based design was piloted and became fully implemented in 2007. Existing points were kept and new ones added to fill in uncovered areas. Points within 50 meters of non-grassland were dropped or acreage prorated.

Sixteen survey points are distributed throughout 8 fields of approximately 293 acres of grassland at Wilna. Ten points occur in fallow fields, and 6 in grassland restoration fields planted in 2004. Although the intention was to place these latter 6 points only in shortgrass fields, the restoration plantings did not respond well in the locations for 3 of these point such that the vegetation became quite tall during the surveys (Points 104 , 108, and 110). Half of Field 8 was planted in little bluestem , partridge pea and Illinois bundleflower in 2004, but did not establish well and now resembles a fallow field dominated by pokeberry and partridge pea. Point 110 is a traditional point that existed before restoration plantings but the vegetation there remained short due to hydrology until recent years. This may influence density results. All of Hutchinson's 9 points occur in fields planted in 2001 with big bluestem, Indiangrass, switchgrass, and a wildflower mix totaling about 202 acres. Figures 1 and 2 below show the distribution of points for both tracts.

All point count data was entered into the Breeding Bird Point Count Database (USGS Patuxent Wildlife Research Center, Version 2.0). I used the FWS Bird Survey Tool (Sutherland 2008) which imports selected parameters (bird species, point locations) from the point count database into a GIS (ArcGIS 9.3, ESRI). The tool also provides average counts per point, high counts, and standard deviation. Student's t-test was used to test for significant differences between fallow and planted fields with respect to average number of birds per point.

Density per year was calculated by two methods: taking the sum of the averages per point per year and dividing by the total field acreages for planted and fallow, or dividing by the area actually surveyed. Density per field per year is similarly calculated—taking the sum of averages per point in each field and dividing by the acreage for that field.

Area actually surveyed is defined as the area within the 100 meter buffer of each survey point converted to acres, or 7.763 acres. Point 104 is transected by a hedgerow and field road, and so its acreage is prorated by half. The total area surveyed for 15.5 points is thus 120.32 acres. One hundred meters is a conservative estimate for the farthest distance from the survey point at which grasshopper sparrows can reliably be identified by the primary observer. Certain wind and visibility conditions allowed

Grasshopper Sparrow at Wilna (Sandy Spencer)

detections at further distances. Since the Hutchinson tract only had one grasshopper sparrow in all three years of surveys, the density and area calculations pertain only to Wilna. Figure 1 shows the 100m buffers around each point at Wilna.

Grasshopper Abundance Trends Since 2002

We also wish to understand how grasshopper sparrows have fared over the longer term, since grassland management began at the refuge. This is somewhat challenging since different survey protocols and points distributions have been used over the years, and new fields became enrolled in grassland management over the years. To adjust for this, I compare the results of surveys conducted during two years of the Region 5 Grassland Breeding Bird (GBB) study with the results of the surveys conducted after implementing the habitat-based point distribution protocol in 2006, as these data may represent the "best gathered" data. The GBB used a double-observer protocol and enough points per field to achieve nearly 100% coverage of the fields. The habitat-based protocol, although it uses only a single-observer, also had increased points to achieve greater field coverage, as compared to the randomly placed points. (For this reason, 2004 – 2005 not included in the trend analyses).

Territory Mapping of Grasshopper Sparrows and Vegetation Survey 2010

During the breeding season of 2010, I redistributed the survey points in the grasslands at Wilna to evaluate if the goal of 60% use by breeding grasshopper sparrows in the shortgrass fields was being met. The previous point distribution covered only 40-50% of the fields. Twenty-eight points with 100 meter buffers were placed in the same 8 fields, plus one additional field (Field 6/7). Points were arranged so as to achieve nearly 100% coverage of each field. The 100m radius also serve as the maximum safe observation distance from each point. Tallgrass fields (planted) were not surveyed as they have become dense monocultures.

Approximate locations and boundaries of grasshopper sparrow breeding territories, territory defense and pairing behavior (chasing, singing, display, interaction), and occurrences around each observation point were noted on field maps. Each point was visited three times between June 3 and July 8, and a range of 10 -20 minutes spent at each point. Observations from all three visits were then reconciled to determine the actual number of individual grasshopper sparrows associated with each count circle. Grasshopper sparrows observed in the areas between circles were assigned to the nearest circle and included in that circle's total. Figure 3 below shows the distribution of the 28 territory mapping points in 2010.

Surveys to characterize the height-density and percent forb, grass, and tree-shrub coverage within the 100m buffer of each territory mapping point was conducted shortly after the breeding season (July and August). We measured the average height- density using the Robel pole for visual obstruction (Robel et

al. 1970). The value associated with each territory mapping point was the average of readings from four directions (90, 180, 270, and 360 degrees) surrounding each point, viewed from a distance of 4 m and a height of 1 m (Young and Hutto 2002).

A modified version of the Daubenmire Canopy Coverage Method (Daubenmire 1959) was used to characterize the composition and dominance values of grass, forbs and tree. One modification was the use of circular plots (100 m radius around each territory mapping point) instead of rectangular shapes along a transect. Each circular plot was divided into quarters, NW, SW, SE and NE. This greatly increased the efficiency of survey time and ease of relating the data to the same plots on which territory mapping was conducted. The caveat however, was that it is more difficult to see the entire area at once. Another modification was that surveying took place in only one season (summer). This means that plants whose maximal development would occur outside of the survey period would likely be missed. This was not considered to be a very important factor since the objective was to measure the structure and composition as close to the breeding season as possible. Another modification was collapsing the dominance classes into fewer categories: 0-25%, 25-50%, 50-75%, and 75-100%--again to maximize efficiency. Finally, plant identification was only to the type-level—grass, forb, or woody (trees and shrubs), not species or family level. This information will later be visualized in a GIS and be used to differentiate and characterize the fields with respect to grasshopper use.

A comparison with the previous years' surveys of grasshopper sparrow with respect to their use of the grasslands at Wilna is in progress at this writing and will be appended to this report at a later date.

Northern Bobwhite Surveys at Hutchinson 2010

As with grasshopper sparrows above, survey points were redistributed and added at the Hutchinson grasslands in order to obtain better information about Northern bobwhite use of these fields. Two observers were used for detection and directional mapping. Points 1-7 were visited 5 times from June 23 – July 15, and points 8-14 were visited four times during the same period. We believe this represents the peak calling period for bobwhite quail in this part of Virginia. Surveys were conducted from 6:00 am until 10:00 am

Figure 4 below shows the distribution of the northern bobwhite survey points at Hutchinson in 2010. A more detailed description of the protocol and the survey data is appended to this report.

Figure 1: Distribution of bird survey points in grassland at Wilna tract including 100 meter buffer

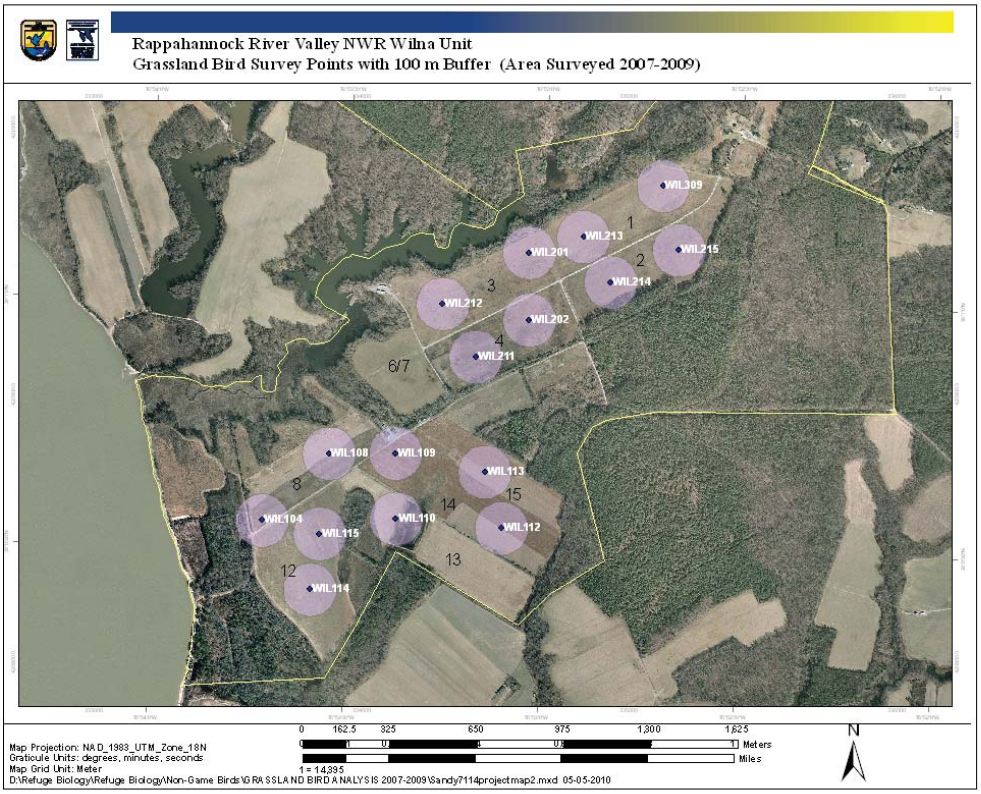


Figure 2: Distribution of bird survey points 2007 - 2009(green dots) in grassland at Hutchinson tract.

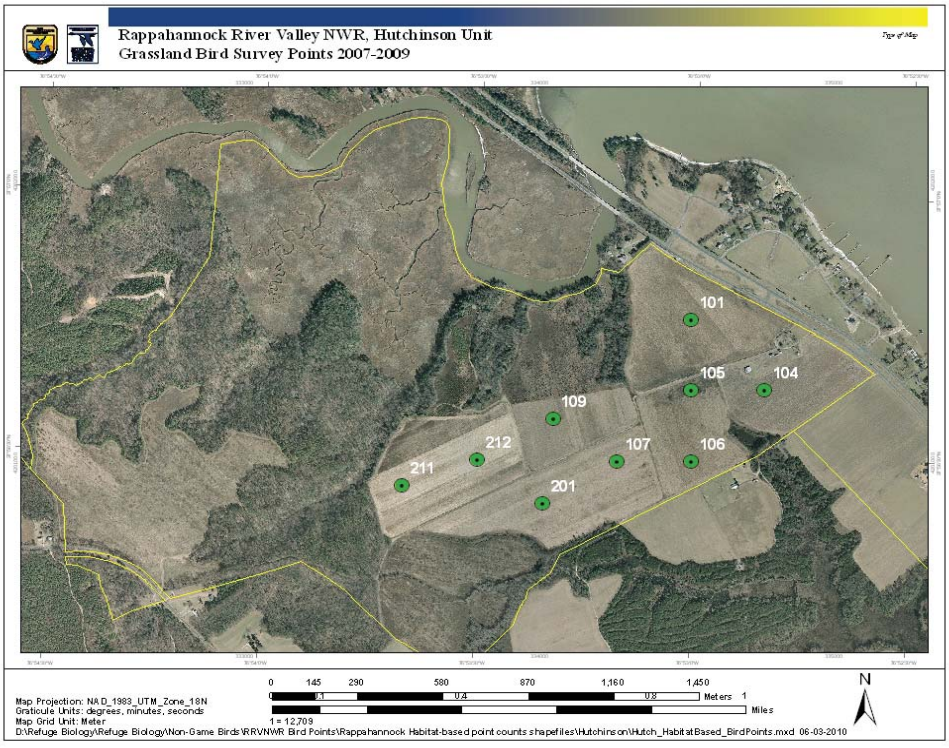


Figure 3: Distribution of territory mapping points at Wilna 2010 (including 100m buffer)

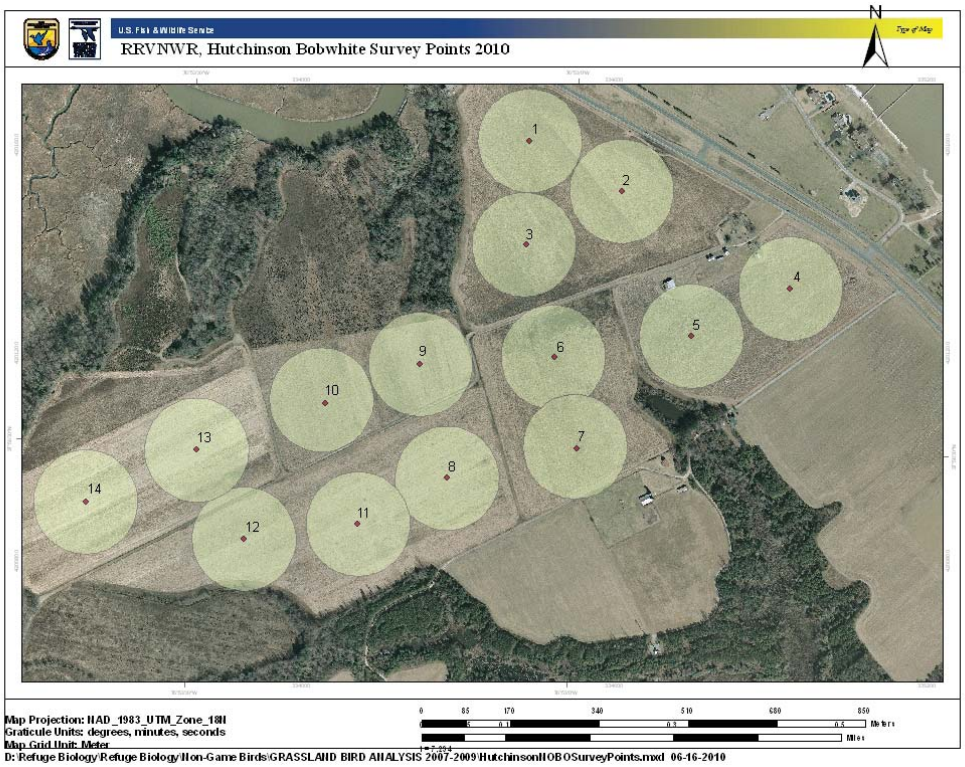
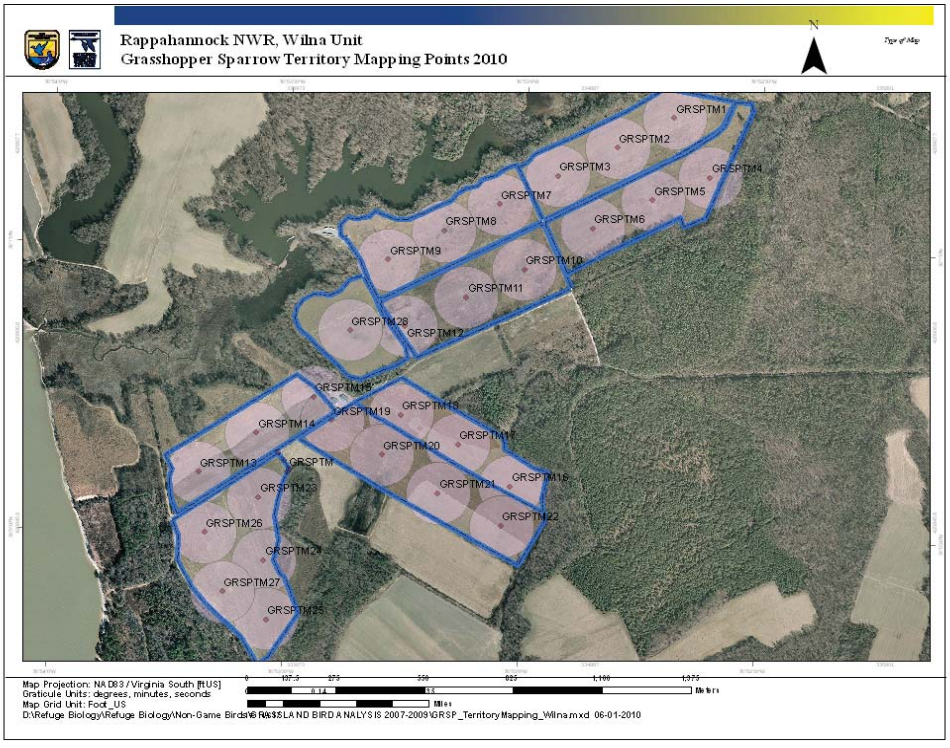


Figure 4: Northern bobwhite quail survey points at Hutchinson 2010



III. Results

Because the Hutchinson fields only had one grasshopper sparrow once during the 2007-2009 surveys, and few or no occurrences of dickcissel and eastern meadowlark, it was dropped from the analysis for these species. The grasslands on this tract are dominated by tall grass species and so the vegetation structure is not suitable breeding habitat for these species. Conversely, because the Wilna fields had an insufficient sample size of detections of bobwhite quail, results for this species will only be presented for the Hutchinson tract.

Average Counts for Grasshopper Sparrow, Eastern Meadowlark, Dickcissel

Figures 5-7 show the highest counts over the course of 2 visits for each point each year for three species of grassland obligates--grasshopper sparrow, eastern meadowlark and dickcissel at Wilna.

Figure 5

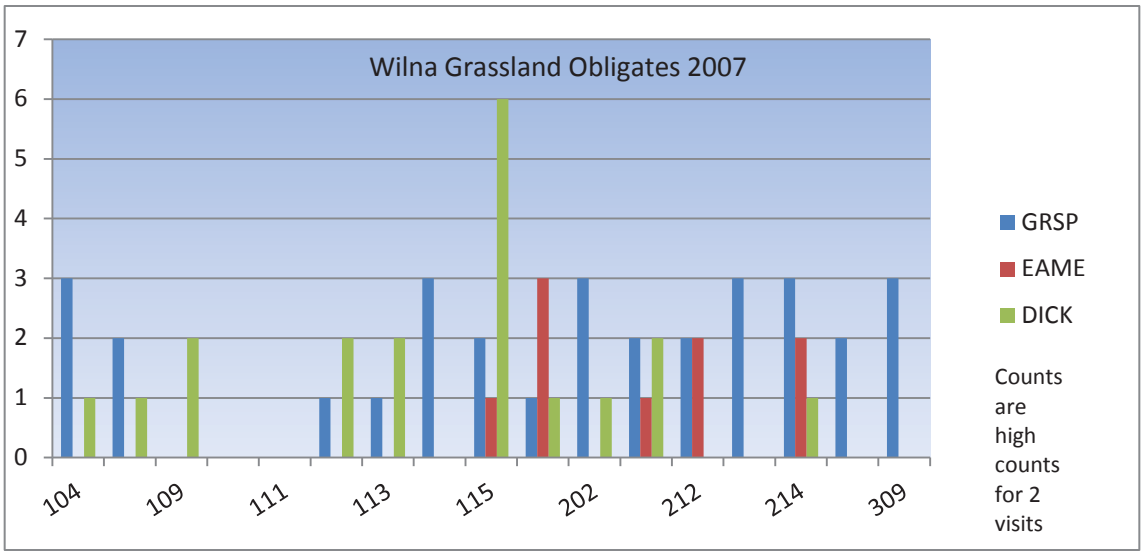


Figure 6

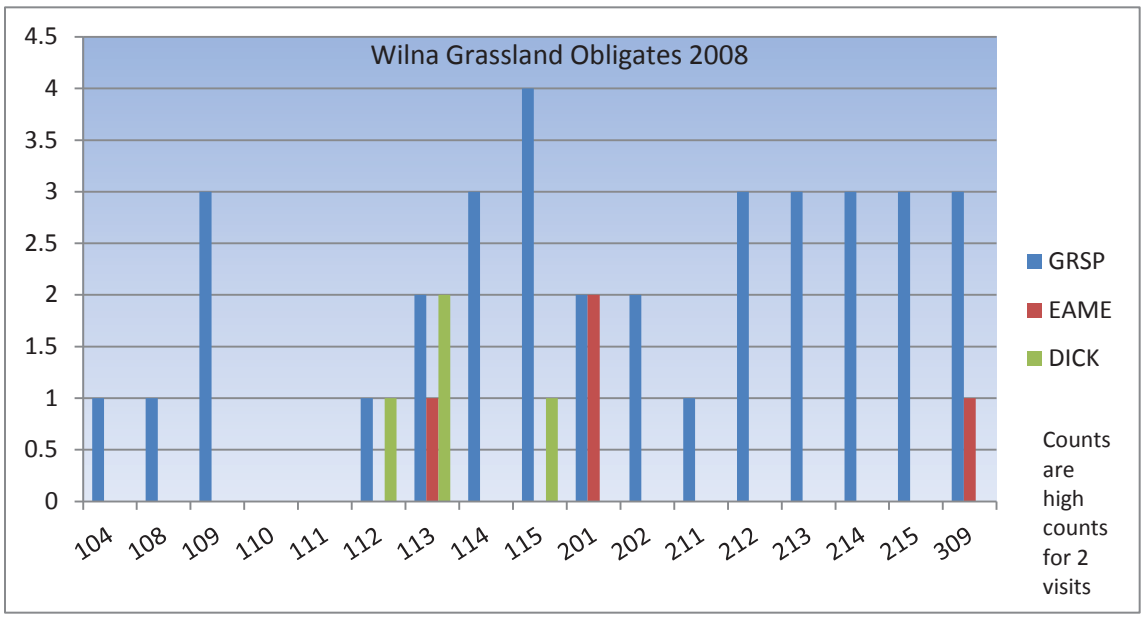
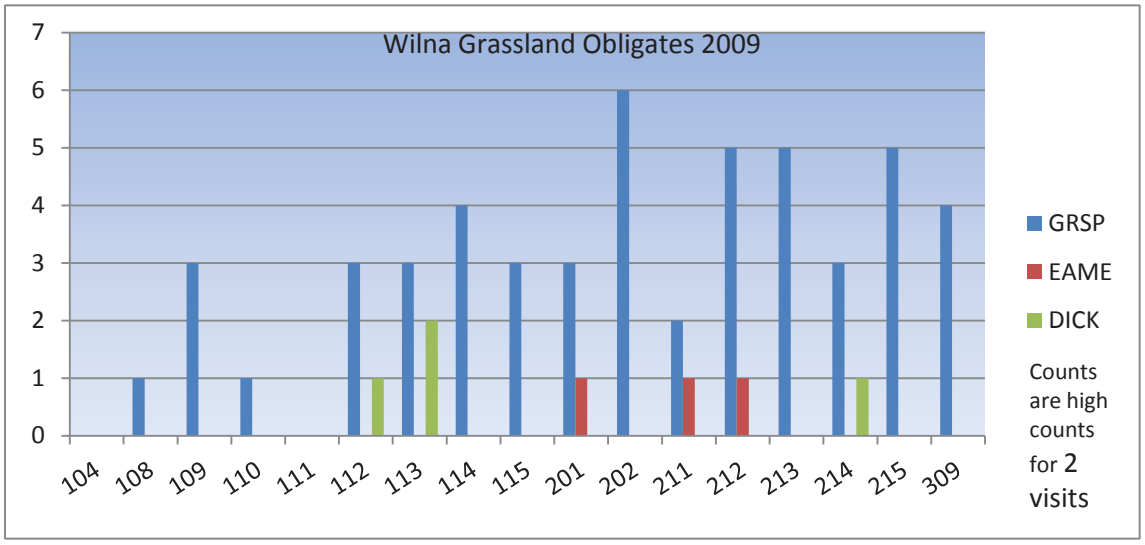


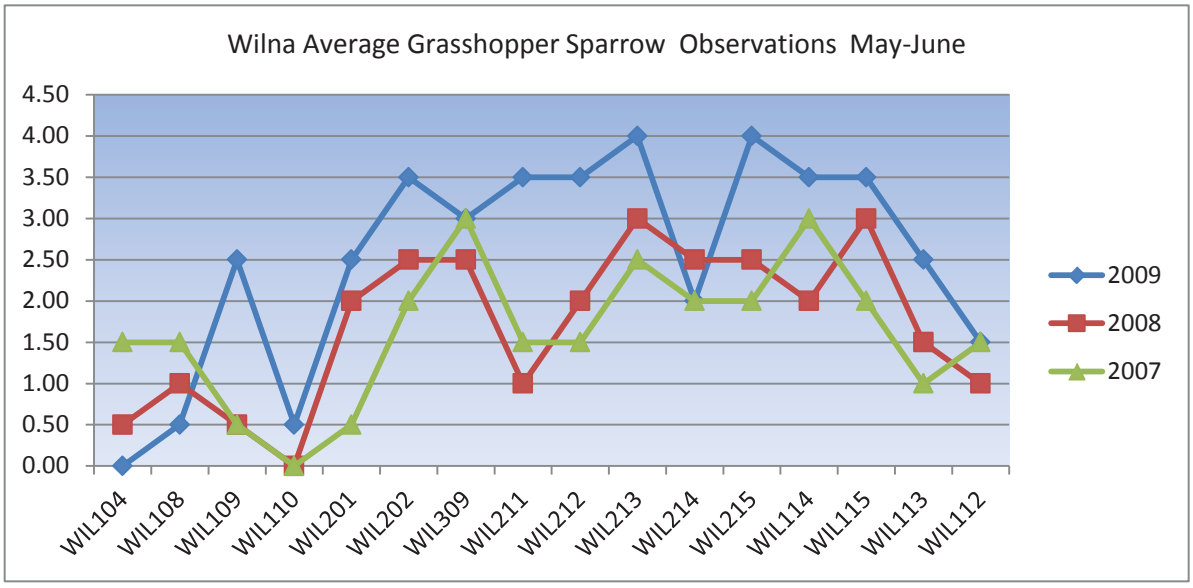
Figure 7



Grasshopper Sparrow Abundance

More grasshopper sparrows were observed across almost all points for year 2009, an effect likely due to the increased time. However, most birds were observed within the first 5 minutes. The increase is thus small, in most cases one more bird. Figure 8 shows the average count per point for the 3 years at Wilna.

Figure 8



Figures 9-11 below provide a visualization of the average counts per point per year. If no data is shown for a given point in a given year, no grasshopper sparrow observations occurred at that point.

Figure 9

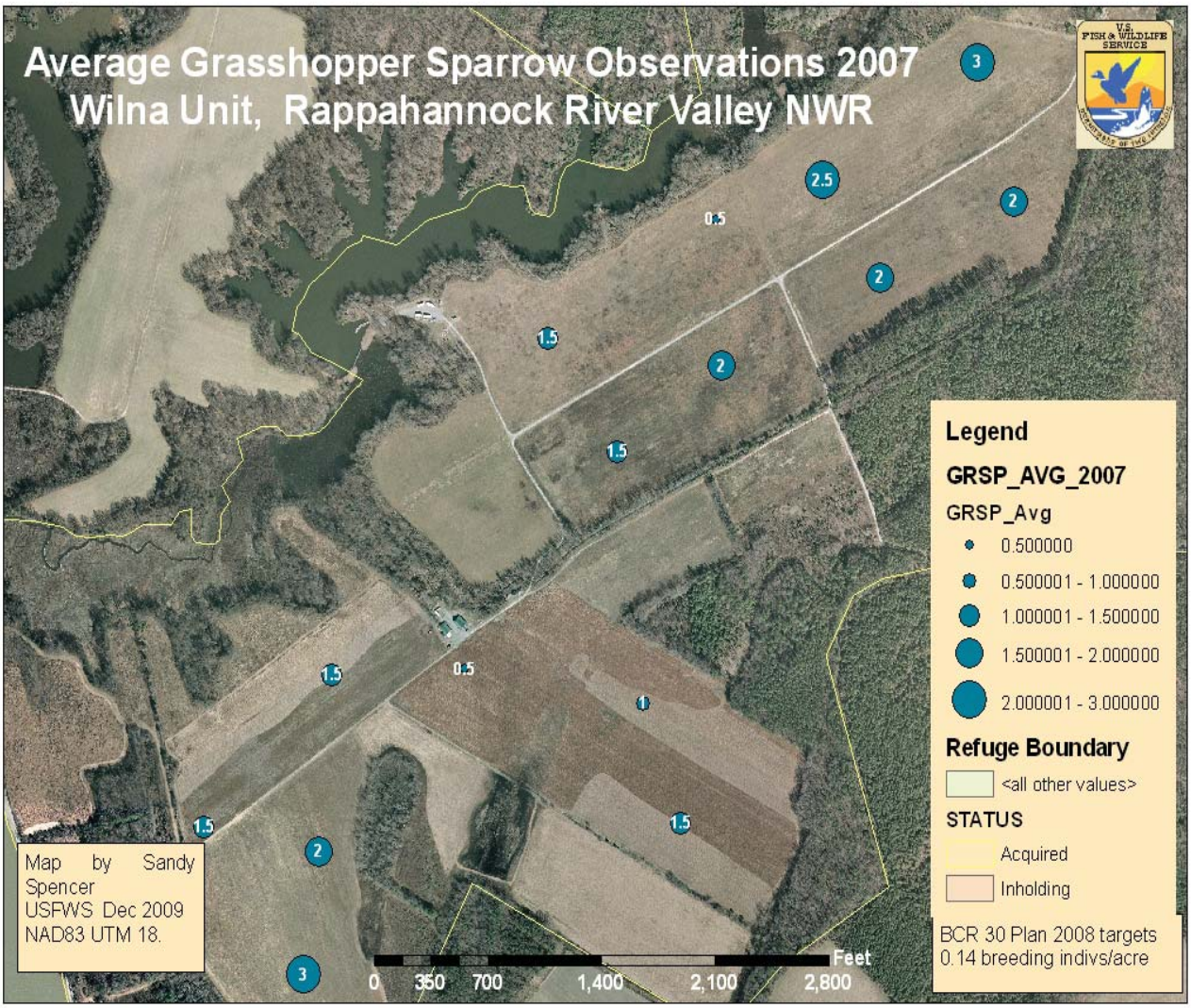


Figure 10

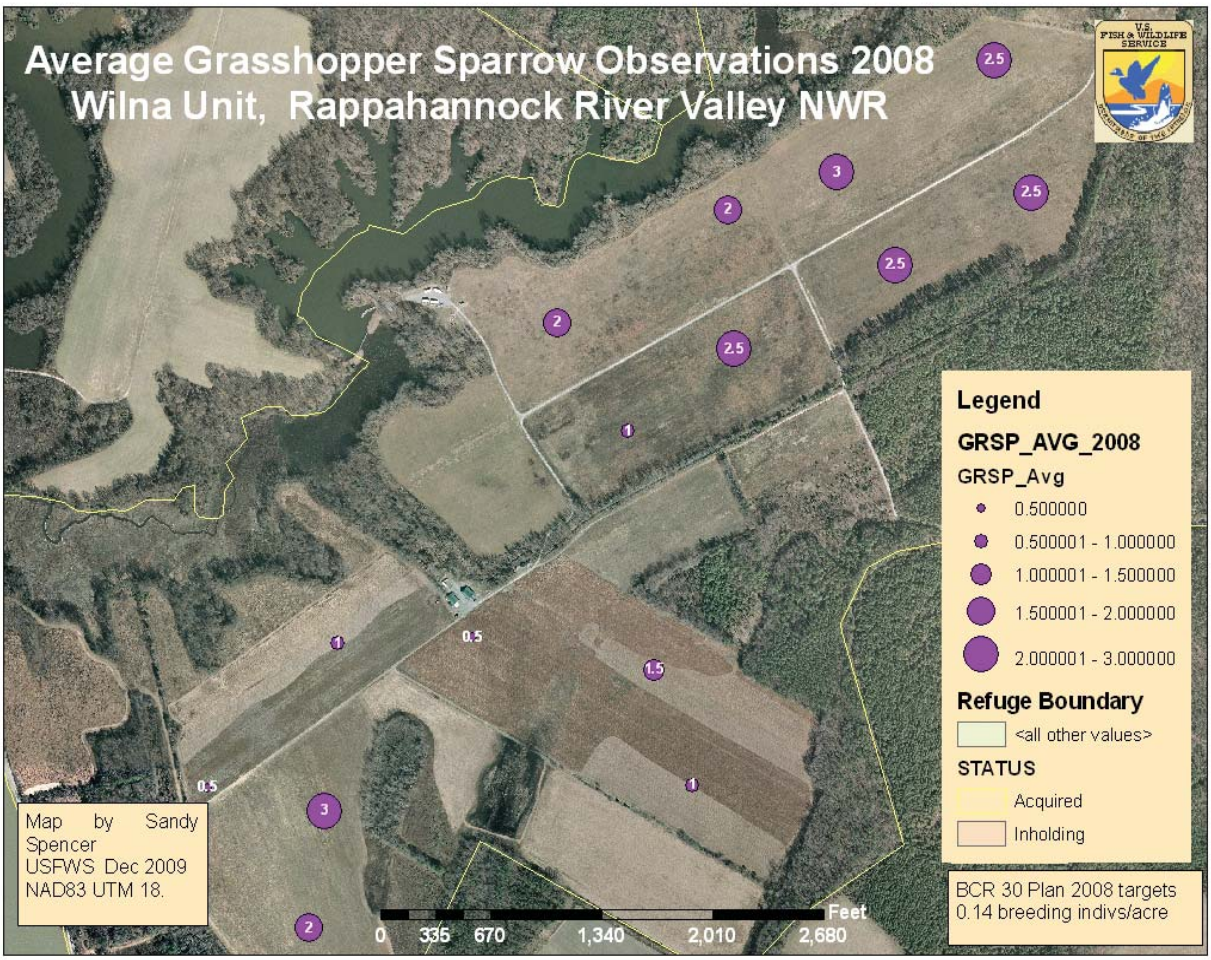

Average Grasshopper Sparrow Observations 2008
Wilna Unit, Rappahannock River Valley NWR
Legend
GRSP_AVG_2008
GRSP_Avg
0.500000
0.500001 - 1.000000
1.000001 - 1.500000
1.500001 - 2.000000
2.000001 - 3.000000
Refuge Boundary
<all other values>
STATUS
Acquired
Inholding
BCR 30 Plan 2008 targets
0.14 breeding indivs/acre
Map by Sandy Spencer
USFWS Dec 2009
NAD83 UTM 18.
0 335 670 1,340 2,010 2,680
Feet

Figure 11

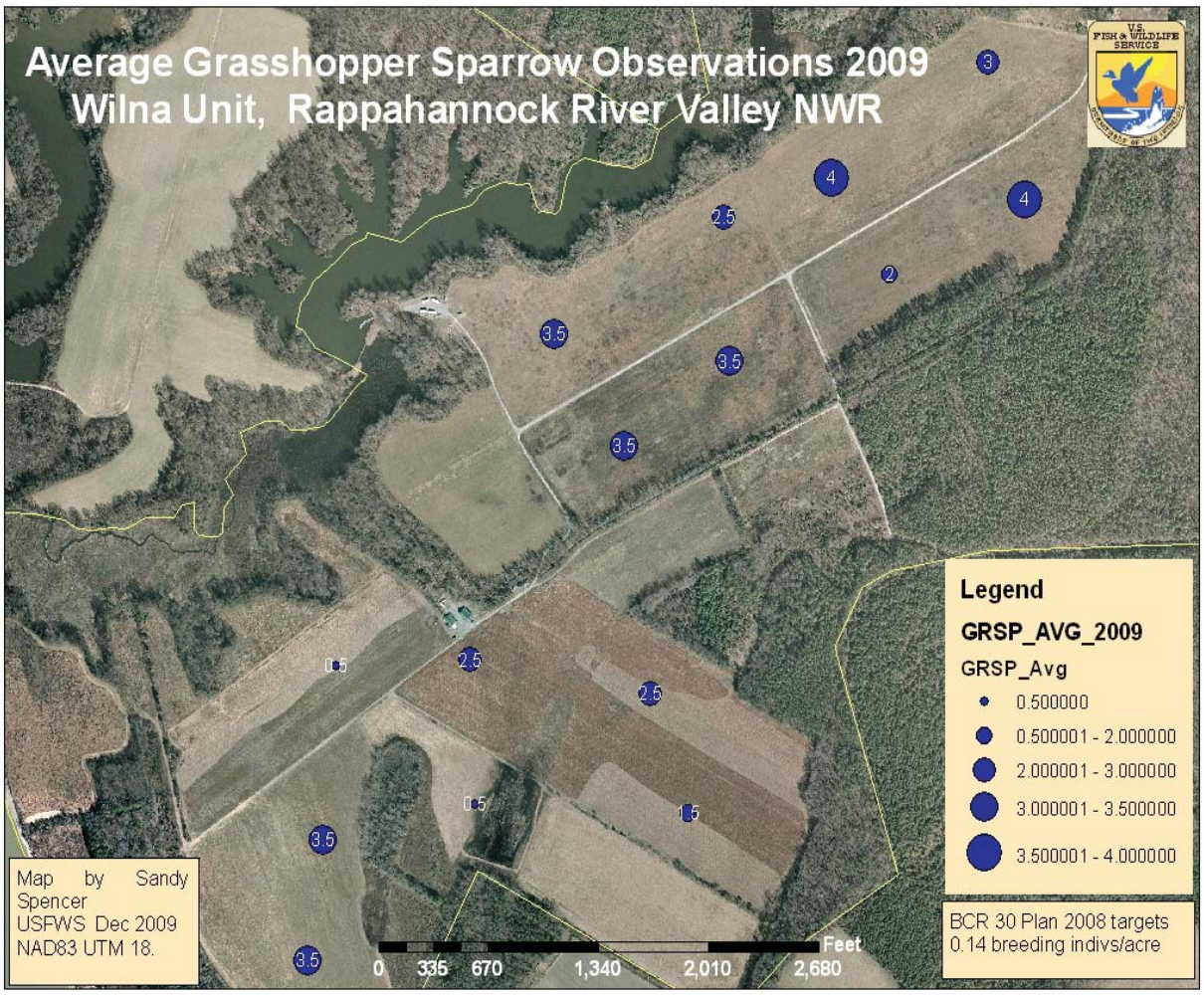
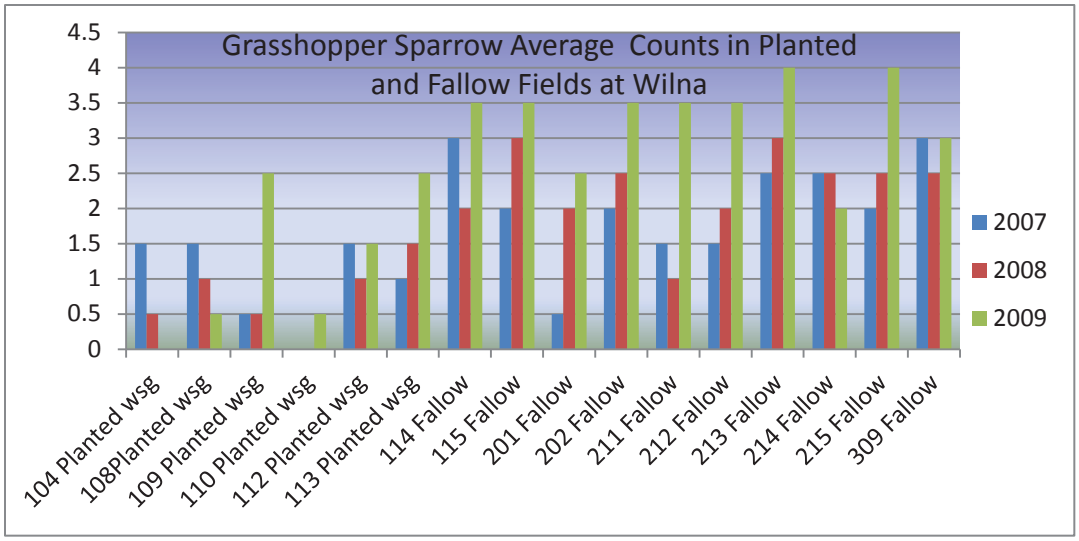

Average Grasshopper Sparrow Observations 2009
Wilna Unit, Rappahannock River Valley NWR
U.S. FISH & WILDLIFE SERVICE
3
4
4
2.5
2
3.5
3.5
3.5
2.5
2.5
1.5
1.5
3.5
3.5
Legend
GRSP_AVG_2009
GRSP_Avg
0.500000
0.500001 - 2.000000
2.000001 - 3.000000
3.000001 - 3.500000
3.500001 - 4.000000
Map by Sandy Spencer
USFWS Dec 2009
NAD83 UTM 18.
BCR 30 Plan 2008 targets
0.14 breeding indivs/acre
0 335 670 1,340 2,010 2,680
Feet

Table 1 and Figure 12 below shows the average count of grasshopper sparrows per point per year and the respective vegetation in the field in which the point occurs. The fields planted in warm season grasses have 6 points , while the fallow fields have 10. Overall however, the acres per point is similar between the two types using the acreages of the entire fields, not just the area of 100m radius around each point (16.4 acres per point in fallow, 18.5 acres per point in planted). The sum of averages in the table below provides a rough estimate of the GRSP population at Wilna each year, ranging from 26 in 2007 to 41 in 2009 for the total grasshopper sparrows in all fields. These are likely underestimates as the more secretive females are less detectible.

Table 1: Vegetation structure and GRSP averages per point per year. (WSG = warm season grass)

POINT	VEGETATION	2007	2008	2009
104	Planted wsg	1.5	0.5	0
108	Planted wsg	1.5	1.0	0.5
109	Planted wsg	0.5	0.5	2.5
110	Planted wsg	0	0	0.5
112	Planted wsg	1.5	1.0	1.5
113	Planted wsg	1.0	1.5	2.5
Sum of averages planted		6	4.5	7.5
114	Fallow	3.0	2.0	3.5
115	Fallow	2.0	3.0	3.5
201	Fallow	0.5	2.0	2.5
202	Fallow	2.0	2.5	3.5
211	Fallow	1.5	1.0	3.5
212	Fallow	1.5	2.0	3.5
213	Fallow	2.5	3.0	4.0
214	Fallow	2.5	2.5	2.0
215	Fallow	2.0	2.5	4.0
309	Fallow	3.0	2.5	3.0
Sum of averages fallow		20.5	23	33.5
Sum of averages all points		26.5	27.5	41

Figure 12: GRSP averages (y axis) per year per point in planted and fallow fields



With respect to average grasshopper sparrow observations, there was a significant difference between fallow and planted fields for pooled values of averages for all three years (T -6.97; SD 0.817, $P < 0.0001$).

Since in 2009 an extended, 10-minute protocol was used and increased overall observation averages by 1 bird, a second analysis was run based on removal of 1 for each value in 2009 for the fallow fields (average counts in planted fields did not significantly increase). This exercise only slightly reduced the difference between the two types of fields (T -5.86 ; SD 0.697, $P < 0.0001$).

The density values increase, however, when using just the area (acreage) actually surveyed around the 15.5 points. The area actually surveyed would be the area within 100m around each point, or 7.763 acres. With 15.5 points, the total acres surveyed is 120.32 acres. Of that, 77.63 acres are in fallow fields, while 42.7 acres are in planted fields (half the acreage removed from point 104). Table 2 below shows the density and acres per bird for grasshopper sparrows, all points in all fields combined, and Table 3, compares density and acres per bird in planted versus fallow fields. Fallow fields are uniformly higher with respect to density and acres per bird in all three years. Even when corrected for the estimated increase in count by 1 bird due to increased observation time (adoption of 10-minute protocol) did not significantly reduce the nearly double lead that fallow has over planted fields.

Table 2: Total GRSP density and acres per bird per year (based on area actually surveyed)

	2007	**2008**	**2009**
Density (sum of averages/total acres surveyed)	0.22	0.24	0.35
Acres per bird	4.62	4.37	2.93

Table 3: GRSP density and acres per bird per year, planted vs. fallow fields (based on area actually surveyed) 2007-2009

Year	Planted (42.69 ac)		Fallow (77.63 ac)	
	Density	Acres/bird	Density	Acres/bird
2007	0.14	7.12	0.26	3.79
2008	0.11	9.49	0.30	3.38
2009	0.18	5.69	0.43	2.35
2009 - 1	0.18	5.69	0.30	3.38

Comparison of density per field

The sum of averages for each of Wilna's 8 grassland fields provides the basis for density per field over the three years, as shown in Table 4. Here, density is based on total acreage of the field, not acreage actually surveyed.

Table 4: Grasshopper sparrow density per field per year 2007 – 2009 (based on field acreage)

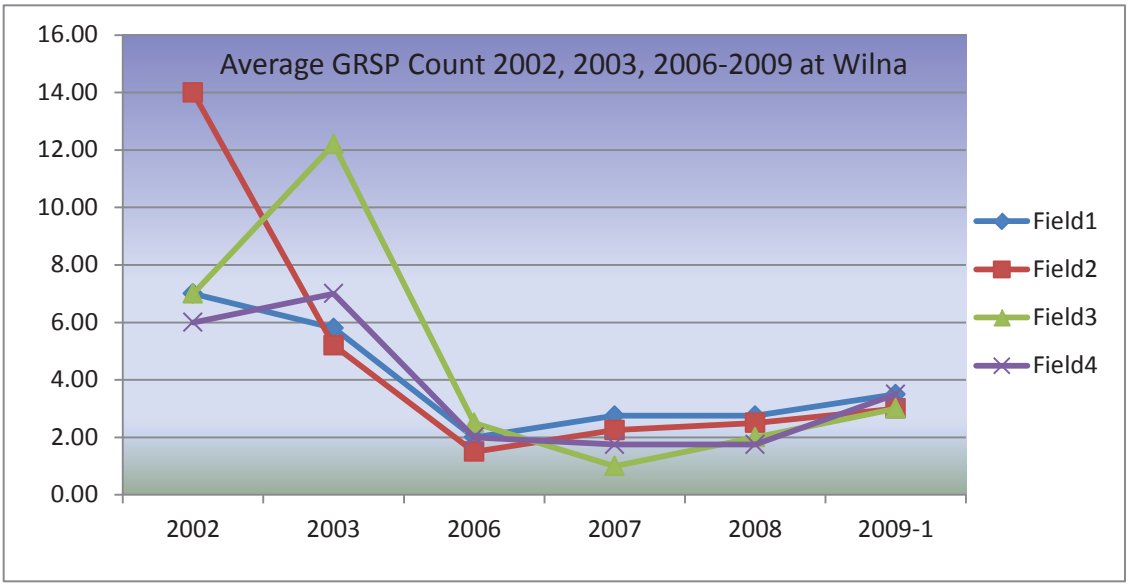
Field ID	Acreage	Cover type	2007	2008	2009
1	33.4	**Fallow**	0.08	0.08	0.10
2	31.9	**Fallow**	0.07	0.08	0.09
3	32.5	**Fallow**	0.03	0.06	0.09
4	28.8	**Fallow**	0.06	0.06	0.12
12a	37.4	**Fallow**	0.07	0.07	0.09
8	24	**Planted wsg**	0.06	0.03	0.01
14	33.9	**Planted wsg**	0.03	0.02	0.07
15	22.8	**Planted wsg**	0.04	0.07	0.11

Grasshopper Sparrow Abundance Trend 2002 - 2009

Grasshopper sparrow abundance in 2002 and 2003 is signficantly higher (P and SD values) than that collected since 2006. In 2002-2003, the years of the Region 5 Grassland Breeding Bird (GBB), we used a double-observer protocol in which observations made by each observer at the end of each count are reconciled to obtain the true number of birds detected. The double-observer method increases the detection probability (fewer birds missed). Also during that study each field had more survey points (2 at 100m and 4 at 50m) to achieve greater coverage. At the termination of the study, surveys reverted to the old design (random, irrespective of habitat type, single observer) and which provided only 3 points in the grasslands. In 2006, following the restoration of Fields 8, and 13-15, 9 additional survey points were added to all grassland fields in order to pilot the habitat-based survey design, which was fully implemented in 2007. This addition increased the coverage of Fields 1-4 to approximately 2/3 that of GBB study.

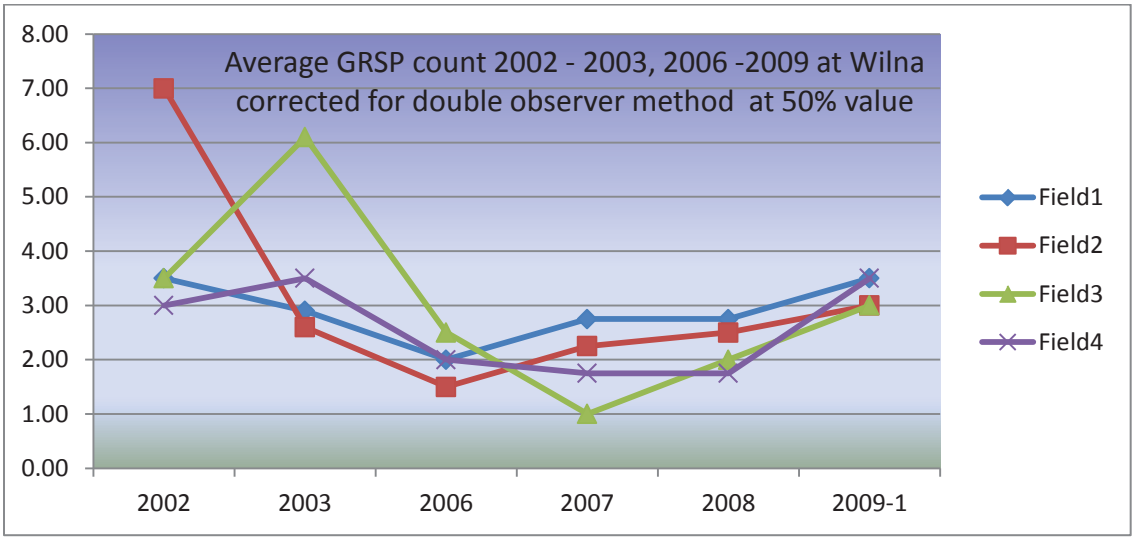
Figure 13 below shows the survey results for 2002-2003 and 2006-2009 for Fields 1-4 only (the only fields at Wilna enrolled in grassland management at that time--Fields 6-8 and 12-15 were still in crop production).

Figure 13: Average GRSP counts Wilna Fields 1-4 2002-2003, 2006-2009



To determine if bird counts are truly higher in 2002-2003 or are an artifice of having an extra pair of eyes making observations, the 2002 – 2003 data is presented at ½ the original value (Figure 14 below). Even with this correction, the difference between 2002-2003 average counts and 2006-2009 average counts is significantly higher ($t = 5.07$, $SD = 1.34$, $P = 0.0001$). This is a preliminary result pending future analsyis with a rerun of the 2002-2003 data with removal of one observer.

Figure 14: Average GRSP counts Fields 1-4 with 2002-2003 data at 50% original value

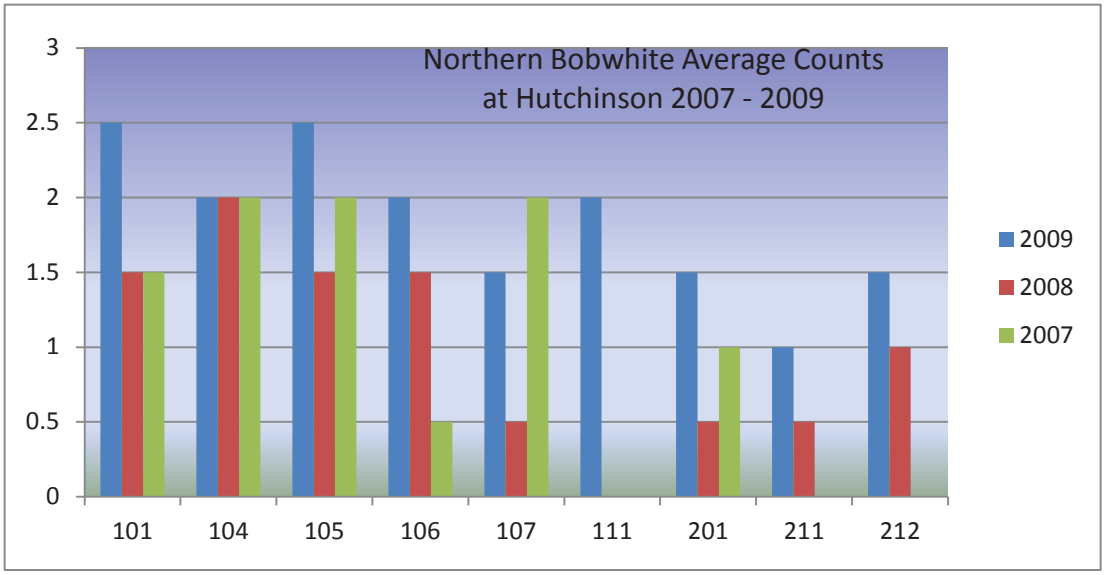


Northern Bobwhite Quail at Hutchinson 2007 - 2009

Northern Bobwhite by Sandy Spencer

Although the Hutchinson grasslands are not suitable habitat for attracting breeding grasshopper sparrows, it typcially produces higher observations of northern bobwhite quail (a grassland generalist) than Wilna. Figure 15 below shows the average count for two visits to each survey point at the Hutchinson grasslands 2007 – 2009. Point 111 was added in 2009 increase the sample size of grassland observations. Observations are generally made by auditory detections. Sightings are infrequent and predominately enroute to point. The highest count at any one observation was four, observed at point 107 in 2007.

Figure 15: Average bobwhite count for two visits each point 2007-2009



Not quantified here are the casual sightings by staff and visitors of quail using the grassy roadsides between fields, or forest edge. A more intensified survey for bobwhite quail was conducted in 2010. Results from those surveys follow in the next section.

Grasshopper Sparrow Territory Mapping Results , Wilna 2010

The twenty-eight territory mapping points provide the basis for determining grasshopper sparrow use of the fields at Wilna. The highest count per point over the three visits yielded 78 individual grasshopper sparrows among the 28 territory mapping points. The sum of averages for all points was 54.8 sparrows. Observations were also summarized by field for high counts and sum of averages (observations per point/three visits).

Table 5: High counts of grasshopper sparrows per territory mapping point and sum of averages within fields at Wilna tract 2010 (HC = high count)

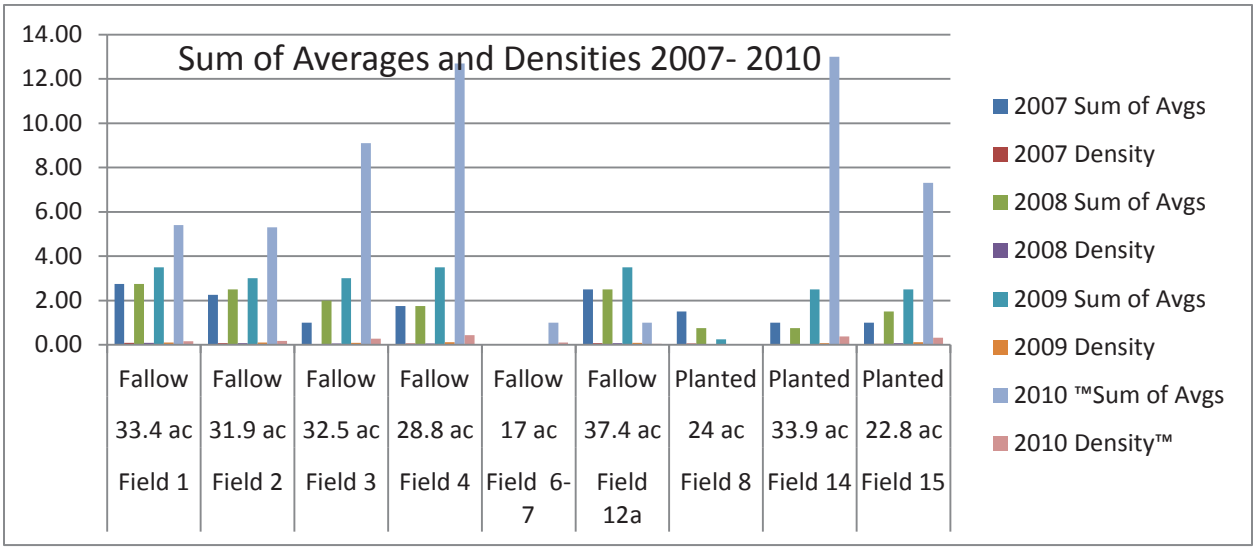
Grasshopper Sparrow Territory Mapping Results			
Field/Point	**HC**	**HC/field**	**Sum of averages/field**
1-1	2		
1-2	3		
1-3	2	7	5.4
2-4	2		
2-5	4		
2-6	3	9	5.3
3-7	4		
3-8	3		
3-9	4	11	9.1
4-10	7		
4-11	6		
4-12	7	20	12.7
6/7-28	1	1	1
8-13	1		
8-14	2		
8-15	0	3	1
12-23	0		
12-24	0		
12-25	0		
12-26	0		
12-27	0	0	0
14-19	5		
14-20	3		
14-21	6		
14-22	3	17	13
15-16	3		
15-17	3		
15-18	4	10	7.3
Total High Count		78	54.8

The sum of averages above provides the basis for density estimates in the nine grassland fields. The following table, Table 6, show the density results for 2010 using the territory mapping method of counting grasshopper sparrows. The densities for 2007-2009 are also presented for comparison between years.

Table 6: Densities per field per year 2007-2010. (TM = territory mapping)

Field ID	Acreage	Cover Type	2007 Density	2008 Density	2009 Density	2010 Density™
Field 1	33.4	Fallow	0.08	0.08	0.10	0.16
Field 2	31.9	Fallow	0.07	0.08	0.09	0.17
Field 3	32.5	Fallow	0.03	0.06	0.09	0.28
Field 4	28.8	Fallow	0.06	0.06	0.12	0.44
Field 6-7	10	Fallow	0.00	0.00	0.00	0.1
Field 12a	37.4	Fallow	0.07	0.07	0.09	0.04
Field 8	24	Planted	0.06	0.03	0.01	0
Field 14	33.9	Planted	0.03	0.02	0.07	0.38
Field 15	22.8	Planted	0.04	0.07	0.11	0.32

Figure 15 provides a graphic representation of all years' sum of averages and densities. (TM = territory mapping method)



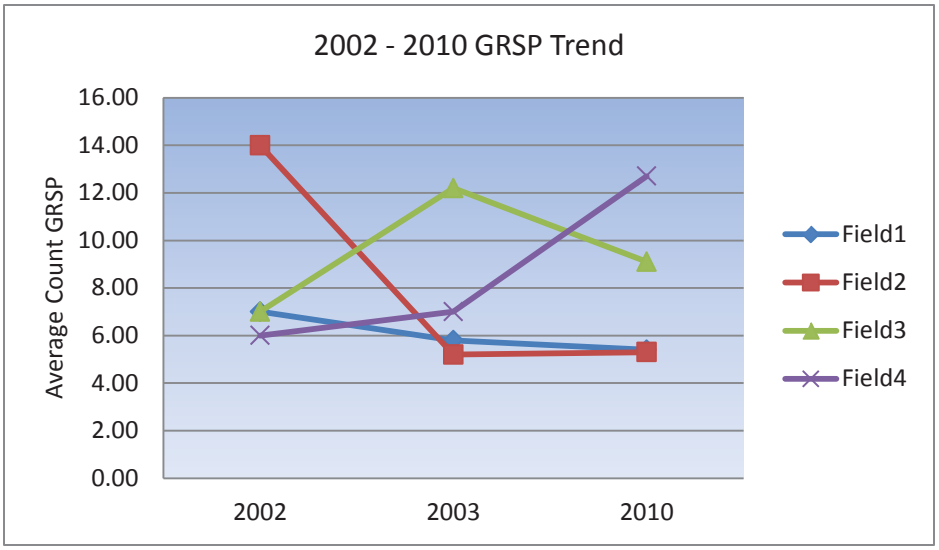
Densities in 2010 are well above the BCR 30 recommendation in two fallow fields and in two planted fields. There is no significant difference between fallow and planted fields based on these data derived from the territory mapping method (t-= 0.304, SD. = 0.163; P = 0.77).

Results from the territory mapping method also change the conclusion on the grasshopper sparrow abundance trend since 2002. While there appeared to be a uniform and dramatic decline before, now the trend is varied depending on the field. Table 7 below shows the average count for 2002, 2003 and 2010 surveys in Fields 1-4, the only fields enrolled in grasslands throughout the whole period. Abundances for 2002-2003 are at 100% of the original value, not modified to compensate for the double-observer method. Figure 16 below presents the trendlines of these data. No significant change in Fields 1 and 2 since 2003. Fields 3 and 4 both show inclines, but Field 3 is a net increase. These results are like a factor of changing field conditions and increased survey area.

Table 7: Average abundances in Fields 1-4 2002, 2003, and 2010

	2002	2003	2010
Field1	7.00	5.80	5.40
Field2	14.00	5.20	5.30
Field3	7.00	12.20	9.10
Field4	6.00	7.00	12.70

Figure 16: Average GRSP counts Wilna Fields 1-4 2002-2010



Mapping the distribution of grasshopper sparrows within fields with an overlay of the vegetation characterization (percent woody, forb or grass) in 2010 is pending.

Northern Bobwhite Call Count Survey Results for Hutchinson, 2010

127 bobwhite call count observations were made on the fourteen survey points in Hutchinson fields 1-6 over a period of five days of surveys. The average abundance of quail for this period is 25.4. Table 6 below shows the observations per point and survey dates. The total acreage of the grassland fields at this time is 178.8. Density of quail based on average observations (25.4) is 0.14 quail/acre. Density based on highest count observation (59) is 0.33. The BCR30Plan 2008 recommendation is 1.01 breeding individuals per acre.

Table 6: Northern Bobwhite callcount survey data at Hutchinson tract 2010

Northern Bobwhite Quail Call Count Survey Results					
Point Id	**6/23/2010**	**6/28/2010**	**7-7-10 7-8-10**	**7-13 7-14-10**	**7/15/2010**
1	5	2	4	0	0
2	7	1	2	0	0
3	5	5	1	0	0
4	8	1	1	2	0
5	7	0	1	1	0
6	6	3	1	0	2
7	7	1	0	0	2
8	3	3	6	0	
9	2	1	1	2	
10	1	0	0	0	
11	7	2	4	1	
12	1	0	4	1	
13	0	0	3	3	
14	0	2	5	0	
Total Obs	**59**	**21**	**33**	**10**	**4**

IV. Discussion (this section needs to be revised based on newly added data from 2010)

For grasshopper sparrows, the uniformly downward trend in abundance from 2002 - 2009 (Fig. 13 above) is likely explained by the shift from double-observer to single-observer method in the surveys, particularly since a different trend result when 2010 is included. Also, there were fewer points in the fields from 2007-2009 compared to the 2002-2003 surveys. This is a preliminary conclusion until analyzed again with removal of one observer. The territory mapping conducted in 2010 showed a higher abundance of grasshopper sparrows and not a uniform downward trend. The varied trajectories of the trend lines in the 2002 – 2010 comparison suggest that field conditions may be a better indicator of what is happening here since survey coverage is similar between years.

The BCR30 Plan (2008) recommended density of 0.14 breeding grasshopper sparrows per acre is being surpassed in 6 out of 9 fields in 2010. Performance in some fields is better than others—Fields 1 and 2 are barely above recommended density, while Fields 3,4, 14, and 15 are double or more the recommendation. Three fields were poor performers: 6/7, 8, and 12a. Woody encroachment and tall monocultures of *Sericea lespedeza* and blackberry in 12a (fallow) likely accounts for the absence of grasshopper sparrows in that field. Likewise for Field 8, which was planted in shortgrass in 2004 but overcome with tall vegetation (pokeweed, partridge pea) in successive years. It is unclear why only one observation was made in Field 6/7, a fallow field of 17 acres abutting Fields 3 and 4, but context may be a factor. It is small, surrounded by forest on three sides and a road with hedgerow on the fourth side. For the 2007 – 2009 surveys, the recommended density was not being, but given the high abundance of grasshopper sparrows surrounding this time period, this result is likely due to insufficient distribution of survey points. Increasing the number of survey points in 2010 to achieve near full coverage of the fields has demonstrated that some individuals were being missed .

Do grasshopper sparrows prefer fallow fields to planted fields? Average densities are somewhat higher in fallow fields versus planted fields, but all densities are below the recommendation, ranging from 0.06 to 0.12 for fallow, and 0.1 to 0.11 for planted. (Results for Field 6 omitted; an outlier due to no survey points until 2010.)

Estimates of breeding territory sizes elsewhere average from 3 – 15 acres and more commonly from 7 – 8 acres (Schroeder and Sousa 1982). Perhaps the comparatively high density of grasshopper sparrows at Wilna exerts some competition pressure resulting in territory compression. The extent to which habitat suitability within fields is a contributing factor will be examined later from the 2010 vegetation data in those fields. Overall there appears to be no difference between the fallow and planted fields with respect to The fallow fields appear to be favored over the planted fields for the 2006 – 2009 data, but the 2010 suggests that grasshopper sparrows favor fallow fields over the planted fields.

The cause may lie in how the points are distributed throughout the fields (sparse coverage), or in several characteristics relating to habitat quality. The planted fields have low species diversity and thus low insect diversity. The structure is still fairly uniform in 6 years post-planting, and two of the planted fields

are compromised by an overhead powerline, creating an edge effect. Fields planted in tall grasses, whether at Hutchinson or Wilna, lack grasshopper sparrows entirely. In March of 2007, portions of the planted fields were spot-mowed to create some structural diversity and set back standing vegetation from the previous year. I noticed that these shorter patches remained popular with grasshoppers sparrows later in the growing season compared to unmowed portions (Spencer, personal observation). This strongly suggests that vegetation structure is a significant factor.

Density values between fallow and planted fields in 2010 do not significantly differ.(*P value and SD here*) As stated in the Refuge CCP, we set a minimum threshold of approximately 60-percent use of available short-structure grasslands by grasshopper sparrows on a 5-year average with a targeted density of about one pair every 4 to 8 acres. It should be noted that although every point had grasshopper sparrow observations, the 100 meter radius around each point amounted to only 120.32 acres of area actually surveyed, or about 42% of the available managed grassland, leaving 58% of the grasslands unsurveyed. This 100m buffer is an artificial construct and grasshopper sparrows were being detected beyond the conservative 100m buffer. Increasing the number of points so as to obtain complete coverage of the fields for territory mapping and to observe habitat use and other reproductive behaviors, will provide a more complete picture and a firmer basis for evaluation of goals achieved. Territory mapping was conducted in 2010. Further analysis on grasshopper sparrow habitat occupancy and distribution with respect to vegetation characterization within fields is pending.

Northern bobwhite is underestimated and underrepresented in general breeding bird point count surveys (2007 – 2009). Habitat quality and survey timing are likely factors. Detections are at best auditory observations, as visual sightings are infrequent. Flushing occurs enroute to and seldom within the 100m bounds of the points. The high detectability of the male's call may also be causing the observer(s) to record bobwhite at the point when actually it is well above 100m from the point, and most auditory detections may be from field perimeters, which are mowed one to two times per year. If still short at the onset of breeding, these open avenues between the forest and tall grass may be attracting quail. As with the grasshopper sparrow analyses above, instituting a 10-minute protocol in 2009 may have resulted in a slight increase in detections, and adding another point also increased the chances of detections.

We began a more intense survey for northern bobwhite quail at Hutchinson in 2010 during late June to mid-July, the peak calling period for quail in middle Virginia. This is much later than when breeding bird surveys are normally conducted and may partly account for lower detections in previous years.

For 2007 – 2009, how well the Wilna tract serves as breeding habitat for dickcissel and eastern meadowlark is variable, depending on the microsite conditions of any given field. Dickcissels occupy the shrubbier portions of the fallow and planted fields. Considered an irruptive species in this part of the country, we would not expect to be able to maximize their occurrence here unless at the expense of our focal species, grasshopper sparrow. This is not a focal species but a species of interest. A small breeding population (7-8 birds) however, has shown strong site fidelity to Wilna fields 4, 8, 12, 14, 15 since about 2004.

Fallow and planted fields alike are used by breeding eastern meadowlarks but only where there are patches of short grass. As the growing season progresses and grasses become taller, the fields become less attractive. However, these fields have higher numbers of eastern meadowlarks in winter.

Management for optimum use by eastern meadowlark, which prefers very short grass structure, may also be somewhat in conflict with grasshopper sparrow habitat management, although not to the same extent as for dickcissels.

Recommendations

For grasshopper sparrows, future management implications suggested by these analyses would include: continued and aggressive control of woody encroachment; timing the setback actions for shortgrass fields so that grasses and new growth are still short (<2') at the onset of breeding for grasshopper sparrows. Edge management to remove sources of high seed-producing trees, and spot treatment of stand-replacing, monocultures of invasive herbaceous and vine species (such as sericea lespedeza, Canada and bull thistle, Japanese honeysuckle and trumpet vine) on the interior of the grasslands should also continue. The fields planted in Indiangrass and big bluestem are so dense and rank as to form near monocultures and as such are avoided by obligates during all seasons. Improving the quality of these fields is an issue that needs to be addressed in order to maximize the refuge's contribution to focal grassland birds. Light discing should be implemented to thin planted grasses at Wilna and Hutchinson that are too rank and dense. This should benefit the quail populations at both sites.

Point counts should continue in the refuge grasslands and consideration should be given to increasing the number of points. Once the vegetation characteristics that grasshopper sparrows are selecting for for breeding territory, territory dimensions, and what areas are being avoided are better understood, management actions should be implemented to provide the maximum area of those vegetation and increase occupancy. Reproductive success in the grasslands should also be assessed.

A cost-benefit analysis should be conducted to evaluate how well the management inputs contribute to meeting the goals of the BCR30 density and the refuge site occupancy goals. This information would inform as to which fields would be better managed as forest. However, given the high site tenacity that the grasshopper sparrows exhibit for fallow fields 1-4 at Wilna, and the cultural objective to keep these fields open for the historical significance of the former plantation, it is unlikely we will allow these fields to revert to forest within the 15-year planning horizon of the 2009 CCP, unless other more suitable fields are identified as we continue with our land protection program.

We also do not know the value of each type of field with respect to reproductive success. We may be able to assume greater success in the fallow fields, based on the site fidelity exhibited by the birds; however, in absence of monitoring, this is speculation.

The northern bobwhite counts appear to drop dramatically between June 23 and late June/early July. This may suggest that we may have missed part of the peak calling period for this area of Virginia and need to conduct the call count surveys a week or two earlier. This represents only one year of data however. Observers had difficulty travelling through the grasslands to reach the survey points and reaching all of the points in one morning. We may consider extending the count circle to 250 m in addition to opening up the habitat. In order to meet the BCR30 2008 Plan goal of 1.01 breeding individuals per acre, some habitat manipulations (i.e., partial discing) is needed to open up the dense grasslands. This may possibly increase quail abundance. Food abundance has not been examined but all fields have been planted in native warm season grasses and native wildflowers. Food diversity (in plants and insects) will improve with increased opportunity for other native plants favored by quail to

establish in these grasslands. Surveys should continue to monitor their response to habitat manipulations and to fine tune the calling period for this area.

A year-round understanding of the refuge's contribution to grassland bird is also desirable, particularly for migratory winter birds. A winter grassland report based on the surveys since 2003 is planned for the future, however, some preliminary results and analysis are already available in refuge files.

Male Bobolink at Wilna. Photo by Les Brooks.

Acknowledgements:

The author gratefully acknowledges the contributions made by Megan Davis and Kyran Belfield for the northern bobwhite surveys at Hutchinson; Inigo Howlett and Julie Martin for collecting vegetation data of the grasshopper territories at Wilna.

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