



**Department of Defense  
Legacy Resource Management Program**

PROJECT 14-764

**Migratory connectivity of At-Risk grassland  
birds**

Rosalind Renfrew and Jason Hill

Vermont Center for Ecostudies

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# Migratory connectivity of At-Risk grassland birds Fort McCoy 2015 Research Report

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## Executive Summary

In 2015 the Vermont Center for Ecostudies initiated an innovative grassland bird research project at Fort McCoy and five other military installations. Supported by the DoD Legacy Program, Project 14-764, contract no. W81EWF-4119-9496, this research is designed to elucidate the migratory pathways and wintering grounds of three At-Risk grassland bird species: Grasshopper Sparrows (*Ammodramus savannarum*), Eastern Meadowlarks (*Sturnella magna*), and Upland Sandpipers (*Bartramia longicauda*). Understanding the entire annual cycle of migratory birds offers avenues for sharing the burden of protecting declining populations. Data collected from across the breeding range will provide insight into regional population connectivity, applicable to other installations that support grassland birds. In 2015 we exclusively focused our research efforts on Grasshopper Sparrows, but we will expand our efforts to Eastern Meadowlarks and Upland Sandpipers in 2016.

We banded and fit light-level geolocators onto male Grasshopper Sparrows from 3 June through 19 June, 2015. We searched many of the grasslands on Fort McCoy for grassland birds, but we focused our banding and monitoring efforts south of Highway 21 in the Badger Drop Zone: an extensive grassland unit (~200 ha). In total, we banded 64 male Grasshopper Sparrows, found one Grasshopper Sparrow nest, and deployed 30 geolocators on male Grasshopper Sparrows on Fort McCoy. We detected 14 bird species during 28 point counts conducted at 14 locations systematically placed across the Badger Drop Zone.

While Fort McCoy currently provides substantial grassland bird habitat, several changes to the current management practices would likely tremendously benefit the grassland bird population at Fort McCoy. Periodic burning every 3-4 years would help to cease the woody vegetation expansion currently underway in the natural area, and B18 and B19 contain many savanna-like areas with too much woody vegetation to support grassland bird populations.

## Project Background

The quantity and quality of grassland bird habitat has declined in North America during the last half century, and concurrently, grassland bird population declines have been among the steepest of all North American landbirds. More than 70% of grassland bird species declined significantly between 1966 and 2012, while only 7% have increased. Upland Sandpiper (*Bartramia longicauda*), Grasshopper Sparrow (*Ammodramus savannarum*), and Eastern Meadowlark (*Sturnella magna*) are three At-Risk migratory grassland bird species that commonly occur on military installations supporting substantial grasslands. Populations of Grasshopper Sparrow, a DoD PIF priority bird species, have dropped by 78% in the last 4 decades. Many states, particularly in the Northeast, have listed Grasshopper Sparrows as Threatened or Endangered. Upland Sandpiper populations have decreased substantially in some regions, including parts of the Midwest (IL, WI, MN, and MI), and in NY and other eastern states. It is Endangered, Threatened, or of Special Concern in five of eight Midwestern states and in most eastern states. The U.S. Fish and Wildlife Service considers Upland Sandpiper to be of national conservation concern due to population declines during the last century, and the U.S. Shorebird Conservation Plan lists Upland Sandpiper as a Species of High Concern. Eastern Meadowlark populations have experienced some of the most dramatic declines of grassland bird species. Their long-term population decline has resulted in a loss of 80% of the population since 1966, and this sharp decline has continued unabated even in recent years.

Until now, the understanding of migration and wintering ecology of most migratory songbirds has been extremely difficult, if not intractable. Managers have necessarily managed breeding populations with sparse, if any, knowledge of the limitations imposed on those populations during the rest of the year. Stable isotopes can provide us with clues for some species, but entail many uncertainties. New, powerful tools have emerged that allow researchers to document the daily movements of birds throughout an entire year. For a bird as small as a Grasshopper Sparrow, light-level geolocators can now provide latitude and longitude estimates for each day of its life through an entire year, and larger birds like Eastern Meadowlark can carry GPS geolocators that provide precise (within 500 m) location fixes for up to 30 programmable dates, downloaded via satellite onto a computer. For a species as large as Upland Sandpiper, we now have the capability of accurately tracking (with 500 m resolution) their every move each day, all year, using battery- and solar-powered GPS technology. With this revolutionary advancement, researchers can accurately track a bird during migration and winter, and they can record fine-scale movements in and around breeding areas. By using the latest state-of-the-art technology available, we will not need to recapture Eastern Meadowlarks or Upland Sandpipers to retrieve data.

These technologies will allow us to record wintering areas and to track the timing and routes of an individual bird's migration. We will be able to determine whether these characteristics differ among breeding populations, with implications for where and how a species may be threatened. The data will provide managers with dramatic new insight into the potential limitations and

threats faced by migratory birds throughout their annual cycle, allowing them to forge new partnerships to address these issues.

### **Military Mission Benefits**

Conservation of natural resources on DoD lands is ultimately necessary to sustain the military training mission by ensuring the long-term availability of training lands (i.e., appropriate habitat conditions). In addition to serving its own mission, conservation fulfills the DoD's obligation, as required by the Migratory Bird Treaty Act, the Readiness Rule, Executive Order 13186, and the Sikes Act, to protect and conserve migratory birds on installations through research, habitat management, partnerships, and education. For all of these reasons, management personnel largely focus on conserving birds and their habitat on installations. Managers can use these resources more efficiently and effectively if there is an understanding of the events that affect migratory birds during their entire life cycle, rather than only during the 3-4 month-long breeding season.

Upland Sandpiper, Grasshopper Sparrow, and Eastern Meadowlark are top DoD priority species in part because they are rare and of high responsibility for DoD. Furthermore, these species are the most likely of grassland bird species to affect or to be in conflict with training activities-- further underscoring the need to understand their year-round ecology. We know little about the ecology of these species outside of the breeding season, and therefore the weight of responsibility has fallen entirely on land managers on the breeding grounds, such as DoD, for maintaining populations. Knowledge of the non-breeding ecology of these species will help spread the weight of responsibility to partners, present and future, at migration stopovers and wintering grounds. Addressing threats to these species off the breeding grounds will help the DoD maximize efficacy of breeding season management on installations. Additionally, it will provide opportunities to develop partnerships and enhance cross-cultural outreach with organizations responsible for these same species on migratory and wintering grounds.

By building on grassland bird research previously funded by Legacy, this project provides a rare opportunity to conserve At-Risk species using a "full life cycle" approach. We will complement Legacy-funded work that has assessed the breeding distribution, abundance, productivity, and overall demography of the same grassland bird species on some of the same military airfields (Legacy projects #10-381 and #11-408). Models developed from these breeding season studies have provided an essential means for determining best management practices to benefit birds on installations, but they have not been able to incorporate factors outside of the breeding season that contribute to population viability. Our results will discern where and when, outside of the breeding season, other factors may affect grassland bird populations on installations. Combined with information from Legacy-funded projects on breeding parameters, the data we collect will take the initial, essential steps in ultimately determining the extent to which populations are limited on and outside of military installations. For example, we can begin to address whether

populations that are more productive differ in their migration phenology, routes, or wintering grounds compared to less productive populations.

This project will also benefit from research outside of DOD, further extending the limits of our knowledge, and if DOD desires, maximizing the use of data collected. The Principal Investigator for this Legacy proposal is involved with a project at the University of Wisconsin to develop full life cycle models under different climate change scenarios for other grassland bird species; researchers could use these models as a basis for these three grassland bird species in the future. These novel exercises in full life cycle science and stewardship will serve as templates for other migratory bird species on installations and elsewhere.

The proposed research will directly benefit the six installations included in the study: Joint Base Cape Cod (MA), Patuxent River NAS (MD), Fort Riley (KS), Fort McCoy (WI), Camp Grafton Training Site (ND), and Camp Ripley (MN). In addition, our results will be applicable to other installations across the country. Because our study spans much of the breeding range of the focal species, any installations that support breeding populations of these species may infer the connectivity of migration and wintering grounds with populations breeding on their lands, based on patterns we find. For example, we will discern whether populations breeding in the East migrate and winter in different locations compared to populations in the Midwest. Assuming species behave on this scale, installations in the East can infer where “their” populations are most likely to winter. The list of installations to benefit from our results therefore includes all that support breeding populations of the three focal species. This includes but is not limited to: Hanscom AFB (MA), Fort Devens Army Base (MA), Massachusetts Military Reservation (MA), Warren AFB (WY), Fort Drum (NY), Fort Campbell (KY/TN), McConnell AFB (KS), Grand Forks AFB (ND), Minot AFB (ND), Fort Leavenworth (KS), and Fort Indiantown Gap (PA). These are only the installations that we investigated during our site selection process, a mere subsample of those that will benefit from our study.

Installations that serve as migratory stopovers or wintering areas for these grassland birds will also greatly benefit from knowledge of connectivity between breeding, migratory, and wintering populations. By making connections on a coarse scale between the migration routes and wintering areas of birds with their breeding origin, our study will allow managers to coordinate efforts that will support bird populations during different parts of the life cycle. For example, several Navy installations in Texas host wintering populations of Grasshopper Sparrow and meadowlark spp. Knowledge about where these populations hail from will allow managers to understand where management on the breeding grounds would have the greatest impact on “their” birds. Armed with this insight, installations on the breeding and wintering grounds can work in unison to identify and address the needs unique to the populations they share.

Knowledge of breeding origin and connectivity with wintering grounds will also assist managers at installations supporting migrating bird populations (e.g., Patuxent NAS hosts migrating Upland Sandpipers). By revealing migratory paths, the consistency of migratory stopover use,

the length of time spent at stopovers, and the duration and distance of flights before and after a stopover, we will shed light on how and when different stopover regions are used by migrating birds of different breeding origins. Is a particular installation in the path a commonly used migratory route for all breeding populations or only certain ones? Do the birds stop there prior to or just after a long leg of their migratory flight, suggesting that the food resources may be critical to a successful migration? With the technology we will employ, we will be able to address such questions for the first time.

In this second year (2016) of the project, we will be able to analyze location data from any geolocators that we retrieve from recaptured Grasshopper Sparrows. In 2016 we will also deploy four solar-powered GPS tags on Upland Sandpipers, and almost two dozen battery-powered GPS tags on Upland Sandpipers (22 tags) and Eastern Meadowlarks (20 tags). The battery-powered tags have sufficient battery to store location data for 30 pre-programmed dates, while the solar-powered tags have the ability to last up to 3 years. Based on our observations of grassland birds during the 2015 field season we plan to deploy these tags on Upland Sandpipers and Eastern Meadowlarks at Fort Riley, Fort McCoy, and Joint Base Cape Cod. The other three DoD installations (Camp Grafton, Camp Ripley, and Patuxent River NAS) either lack populations or have very low densities of Upland Sandpipers and Eastern Meadowlarks.

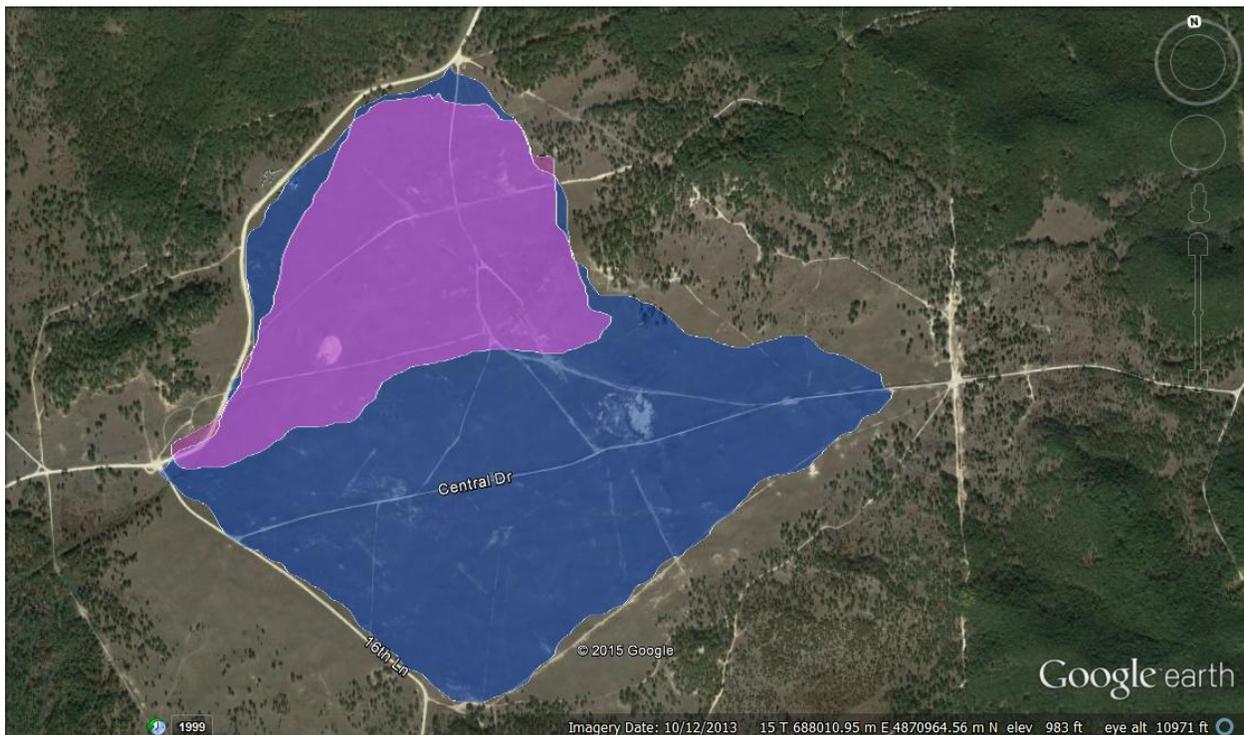
In 2018, we will issue recommendations directly relating to this proposal after we retrieve all data. These recommendations will differ from the typical land use management practices; they will identify where these installation-specific populations may be limited during migration and winter, and thus where land managers may share responsibility. Our recommendations will include a strategy for how and where the DOD, through its alliance with Partners in Flight (PIF), may forge and enhance partnerships on a broad scale in order to maximize positive management impact on grassland bird populations that breed on installations. Installations involved in the project will be advised as to 1) what entities, both military and non-military, they may coordinate with to manage grassland bird populations throughout their life cycle; 2) follow-up research questions or issues that may be helpful for managers; 3) any changes in field protocols that would be advisable or useful for future work using the new technology of geolocators.

Our project will take miniaturized technology to new limits: it will be the first to use light-level geolocators, Argos GPS technology, and PTTs on these grassland bird focal species. We will be able to ask questions that we have never before been able to address, and we will gain insights never before possible. This groundbreaking research will serve as a template for implementing tracking technology for other bird species on military lands throughout the United States. Most importantly, however, the DoD will be involved in a project that will help to transform our way of thinking about how migratory bird species management and partnerships can sustain the military training mission.

## Survey & Capture Methods

Male Grasshopper Sparrows are more vocal, visible, and easier to capture, and have lower inter-annual dispersal rates than female Grasshopper Sparrows. Therefore, we exclusively targeted male Grasshopper Sparrows for light-level geolocator deployment. At Fort McCoy, we focused on the grassland areas south of Wisconsin Highway 21, but we also considered several other grassland areas initially. The grassland area north of Highway 21 was used heavily by troops, and the biggest grassland area we found was in the impact area: a closed-off area in which research cannot be conducted. South of Highway 21, there are small grassland openings, with only two main large grasslands: B23 (the State Natural Area) and B19 (Badger Drop Zone). Grasshopper Sparrows prefer areas of extensive grass cover >50 m from woodland edges with little woody vegetation and small areas of exposed ground. A quick survey of the grassland areas in the south section of Fort McCoy revealed male Grasshopper Sparrows in every area, but in the highest density on the Badger Drop Zone: a large open grassland of ~200 ha intersected by sandy roads (Figure 1). We decided to limit our geolocator deployment to the Badger Drop Zone, despite the presence of Grasshopper Sparrows in the other areas. Marking males in one small area, as opposed to several scattered areas, will reduce the amount of land that we need to search in 2016 to relocate and recapture males wearing geolocators, because male Grasshopper Sparrows often shift their territories between years.

Figure 1. *Main search area (blue polygon, 200 ha) at Fort McCoy, WI. We spent the first three days of June, 2015, extensively searching the area outlined in blue for concentrations of Grasshopper Sparrows. The highest density of Grasshopper Sparrows occurred within the purple polygon, and we concentrated our capture and banding efforts within this smaller area.*



Male Grasshopper Sparrow activity remained fairly consistent throughout June, so we began capturing as soon as we recognized that the Badger Drop Zone contained the highest numbers of Grasshopper Sparrows. To locate male Grasshopper Sparrows we systematically walked transects across the grounds attempting to flush or encounter singing birds. Grasshopper Sparrows prefer areas of extensive grass cover >50 m from woodland edges with little woody vegetation and small areas of exposed ground. Our goal was to identify areas with high concentrations of Grasshopper Sparrows, so that we could deploy geolocators on males in a relatively small area. Marking males in one small area, as opposed to several scattered areas, will reduce the amount of land that we need to search in 2016 to relocate and recapture males wearing geolocators, because male Grasshopper Sparrows often shift their territories between years. Our capture efforts were temporarily retarded in the middle of the month due to military exercises at the Badger Drop Zone. During this time, we also explored B17, B18, and B23, but we did not deploy any geolocators in those sections. Once we located a singing male sparrow, we then set up a 6-m 30mm-mesh nylon mist net on 2-m tall poles. We then placed a small speaker, attached to an MP3 player located 1 m away from the center of the net and broadcasted a recording of a male Grasshopper Sparrow song. Male Grasshopper Sparrows are territorial and they perceive the recorded song as an intruding male sparrow. Generally, male sparrows would fly into the net without encouragement from us. However, male sparrows occasionally flew up to the net and landed on the ground near the speaker. We then quickly approached the bird and encouraged the male to fly into the net (Figure 2). We limited the use of recordings to 5 min with any given male sparrow, and we generally targeted males between 0530 and 0930. Males would continue to sing past this hour and continued to be responsive, but the morning hours were most productive. This morning period corresponds with the timing of copulation in this species.

Figure 2. *Typical mist net set up used to capture male Grasshopper Sparrows at Fort McCoy, Wisconsin. Field technicians Dana Timms and Inez Hein approach the mist-net to flush the male Grasshopper Sparrow into the net.*



### **Banding, and Feather and Blood Sampling**

We began banding on 3 June and concluded our efforts on 19 June, 2015. For all captured birds we recorded their age, sex, weight, and basic morphological measurements. Handling time was generally less than 10 minutes per bird. During June, we successfully captured and banded 64 Grasshopper Sparrows on Fort McCoy (Figure 3). Of those 64 birds, 63 were male (98%) and one (1%) was classified as sex unknown because the bird escaped before it could be sexed (Appendix A). In collaboration with other researchers we also sampled a single primary (i.e., wing) feather and a small amount of blood (<100  $\mu$ l) from birds that did not receive a geolocator (Figure 4). The feather samples will be used by colleagues in a stable isotope analysis to determine the diet of wintering Grasshopper Sparrows, and the blood samples will provide our colleagues with insight into internal parasite loads. We obtained feather and blood samples from 25 birds, and incidentally recaptured two individuals that had been initially banded earlier in the season.

Figure 3. *Banding location of every captured Grasshopper Sparrow at Fort McCoy, WI in June 2015.*

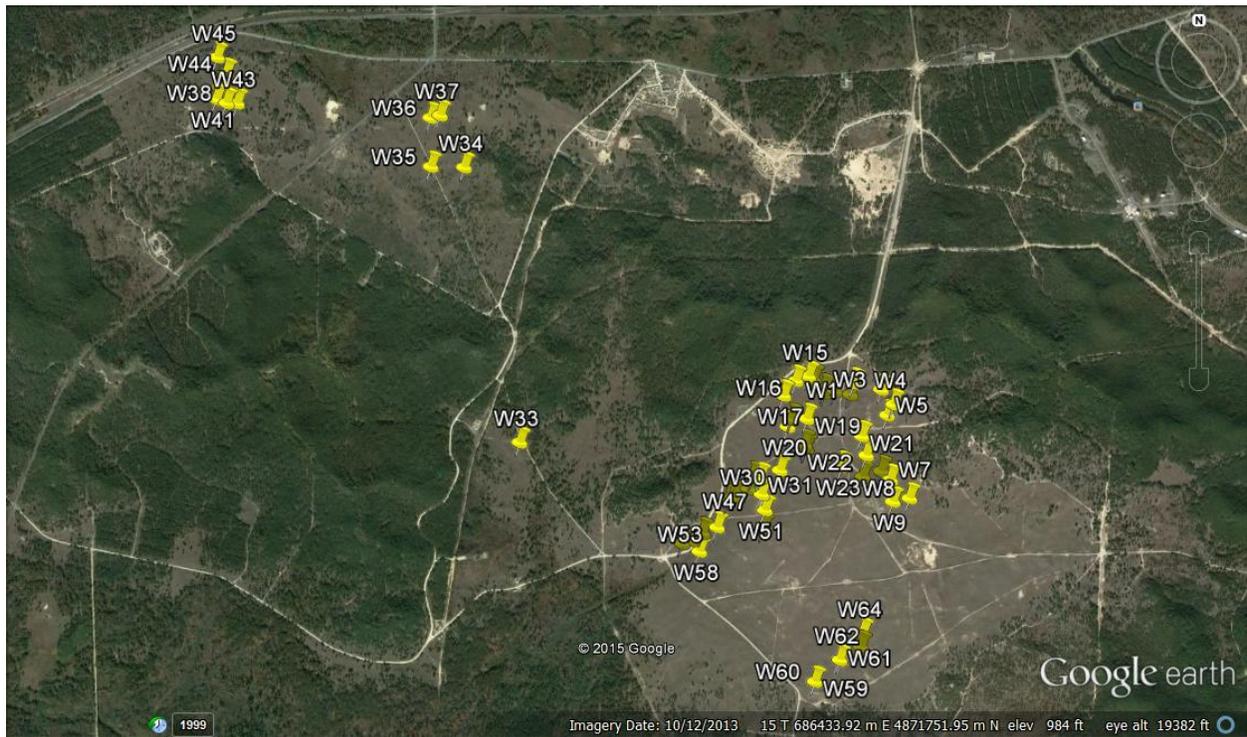


Figure 4. Crew Leader Alison Nevins collects blood from a banded Grasshopper Sparrow with a capillary tube at Fort McCoy, WI.



### **Geolocator Deployment and Color-banding**

Birds wearing geolocators must be recaptured in 2016 to gain access to the geolocator data. To facilitate our future recovery efforts we attached a unique combination of color bands to the legs of a Grasshopper Sparrows fitted with a geolocator (Figure 5). The geolocator units are small (~0.5 g, including the harness) and are difficult to see on a moving bird. Color bands, however, are more visible and in 2016 these color band combos will allow us to quickly key in on birds wearing a geolocator. We made a simple loop harness for the geolocators using a 78.0-80.5 mm piece of Stretch Magic bead and jewelry cord (0.7 mm). We passed the material through the geolocator loops, and melted the ends of the cord together using a soldering iron. The resulting fused harnesses are strong, but also flexible so as to accommodate sparrows of varying body sizes.

We only deployed geolocators on birds that weighed  $\geq 17.0$  g, so that the geolocator + harness weight did not exceed 3% of body mass. The geolocator harness slipped on over a bird's legs and fit snugly over their hips. Once the geolocator was on the bird we checked the harness fit by measuring the amount of vertical play between the bird's back and the bottom of the geolocator when slight upwards force was applied to the geolocator. We deemed that the harness fit adequately if the play was 1-2 mm. We found that it is helpful to have a small crochet hook to pull the harness over the legs. The hook was also helpful to pull the feathers under the

geolocator. We found that when the geolocator was first put on, it would sit right above the tail and the birds legs would splay out, making it seem as if the geolocator didn't fit. We would move the geolocator up to the correct placement in the center of the back, and the birds would begin to use their legs normally. Before releasing the bird we made sure that the harness fit securely, and that the wings and legs were free to move unimpeded.

Figure 5. *Male Grasshopper Sparrow wearing a light-level geolocator at Fort McCoy, Wisconsin, June 2015. The light stalk of the geolocator is visible on the back of the bird.*



We color-banded 32 adult male Grasshopper Sparrows at Fort McCoy (Figure 6), and we deployed 30 geolocators (Appendix A). Two individuals were color-banded but escaped before we could put on the geolocator. The color band combinations consist of an aluminum band (A) with three color bands of the following colors: red (R), white (W), blue (L), orange (O), green (G), black (K), violet (V), yellow (Y), and hot pink (H). The color band combinations are read in the following order: right leg top, right leg bottom, left leg top, left leg bottom (Figure 7).

Figure 6. Location and color band combination of all Grasshopper Sparrows captured at Fort McCoy, WI (all fitted with geolocators except GALH and HARW, marked with an asterisk).

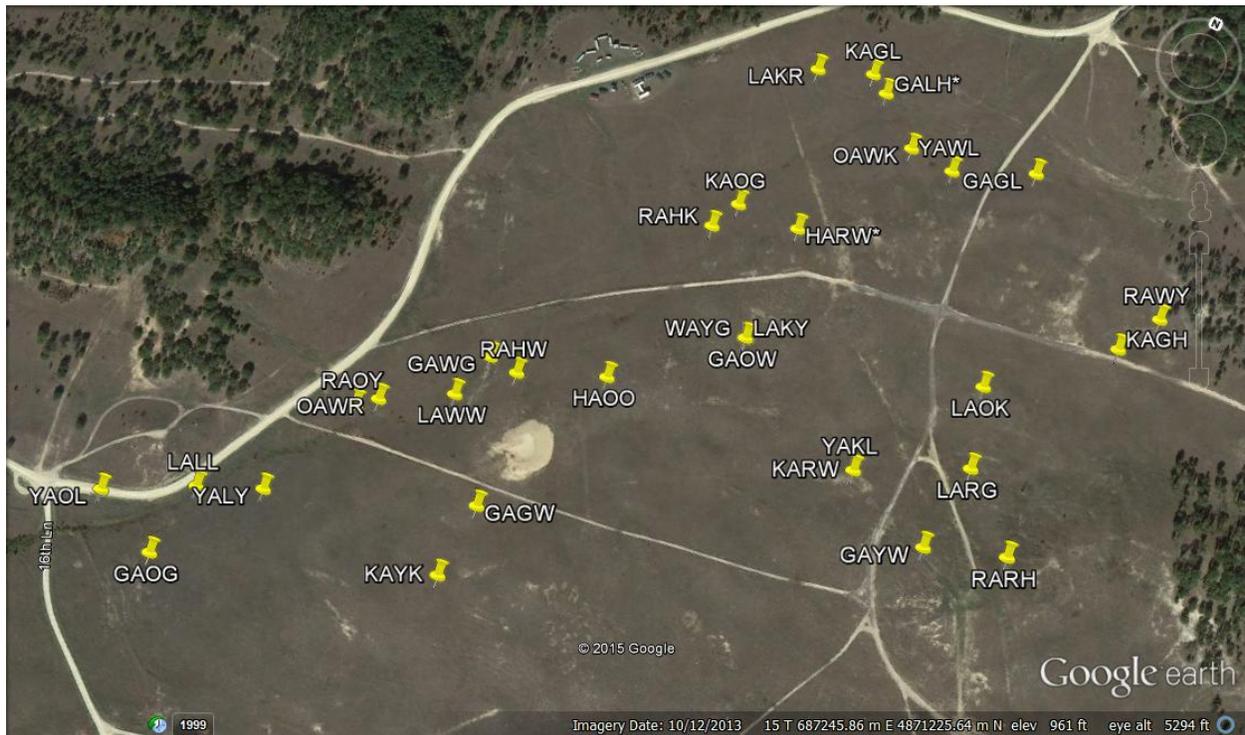


Figure 7. Adult male Grasshopper Sparrow just after banding at Fort McCoy, Wisconsin with color band combination KAGL (black over aluminum on the bird's right leg, and green over blue on the bird's left leg).



## Post-deployment Observations

In general, we tried to avoid areas where we had previously banded male Grasshopper Sparrows to avoid accidentally recapturing birds wearing geolocators. Male Grasshopper Sparrows wearing geolocators must be recaptured in subsequent years to acquire their data. Males may become weary of mist nets if they are captured frequently, which could hinder our recapture efforts in 2016. We only resighted one color-banded bird, but the geocator was not visible. The bird, however, was singing and behaving naturally.

## Nesting Birds

Nest searching was not one of our main foci at Fort McCoy, but we did opportunistically discover a Grasshopper Sparrow nest on B23 when a female flushed from the nest. On Badger Drop Zone, we did not find nests but we saw many indications of nesting such as two birds perched together, food-carrying, and the presence of juvenile birds. We recorded the location of these nests (Appendix B), but we did not monitor them.

## eBird Summary

All of our daily observations of birds were entered into eBird ([www.ebird.org](http://www.ebird.org)) [Table 1; Appendix C], which is an online database managed by Cornell University that has become an important resource about bird distribution and abundance for scientists, researchers, and amateur birders. eBird is entirely free and available to anyone with an internet connection, and has dramatically changed the way that the professional and amateur birding communities record and assess information about birds throughout the world. Essentially, an observer enters a checklist of the number of individuals seen of each species that they encounter while birding into eBird (Figure 8). The user plots their location on a map, records information about their effort (e.g., number of hours birded, and distance traveled, if any), and can provide comments about their observations or even upload photos. An expert local reviewer examines each observation to ensure a high level of integrity in the database. In May 2015, for example, users around the world submitted >9.5 million bird observations.

Table 1. Summary of our eBird avian observation data from Fort McCoy, June 1 through June 31, 2015 which includes the number of checklists submitted and the number of species and individuals detected.

	June 1-5	June 6-10	June 11-15	June 16-20	June 21-25
No. of species	7	12	9	13	11
No. of individuals	92	38	35	155	27
No. of checklists	4	2	2	4	1

Figure 8. A partial example of a typical eBird checklist that we submitted for Fort McCoy, June, 2015.

**Location** Edit Location

**Badger Drop Zone, Monroe County, Wisconsin, US** [\(Map\)](#)

**Date and Effort** Edit Date and Effort

**Sat Jun 20, 2015 5:15 AM**

Protocol: Traveling  
 Party Size: 1  
 Duration: 2 hour(s)  
 Distance: 2.15 mile(s)  
 Observers: **Alison Nevins**  
 Comments: Vermont Center for Ecostudies Grassland Bird Research

**Species** Edit Species List

**13 species total**

**8 Upland Sandpiper**
Delete

**1 Mourning Dove**
Delete

**1 Red-headed Woodpecker**
Delete

**1 Great Crested Flycatcher**
Delete

## Point Count Summary

We conducted point count surveys at 14 locations (Figure 9) in the general vicinity where we deployed geolocators on male Grasshopper Sparrows. Each point was surveyed twice, by different observers on 20 June and 25 June, 2015. Point count locations were a minimum of 0.25 km apart. Over the course of five minutes a lone observer counted all individual birds that were detected by either sight or sound within an unlimited distance from the point. In practice, however, most individual birds were detected within 100 m of the observer. No audio records or decoys of any kind were used to increase the detection of individuals. We made every effort to avoid double-counting individual birds (e.g., a soaring hawk) across multiple point count locations. Each count started immediately as the observer arrived at the point count location, and all points were surveyed between 0515 and 0730. In total we detected 14 species including a few species just outside of the grassland area (Appendix D). The two most frequently detected grassland bird species were Eastern Meadowlark (*Sturnella magna*) (detected on 78% of our point counts) and Grasshopper Sparrow which were detected during every point count (100%).

Figure 9. Point count locations (green markers) were systematically located within the area of Badger Drop Zone on Fort McCoy where we deployed geolocators.



Grasshopper Sparrows were most abundant at point counts in the northern and central portion of the survey area in the Badger Drop Zone (Figure 10), while all grassland birds combined

(including Grasshopper Sparrow, Eastern Meadowlark, Horned Lark [*Eremophila alpestris*], Vesper Sparrow [*Pooecetes gramineus*], and Upland Sandpiper) were more abundant at point count stations 1, 10-11, and 14 (Figure 11).

Figure 10. The mean number of Grasshopper Sparrows detected on a point count in the 100-m area surrounding each point count location on Fort McCoy.

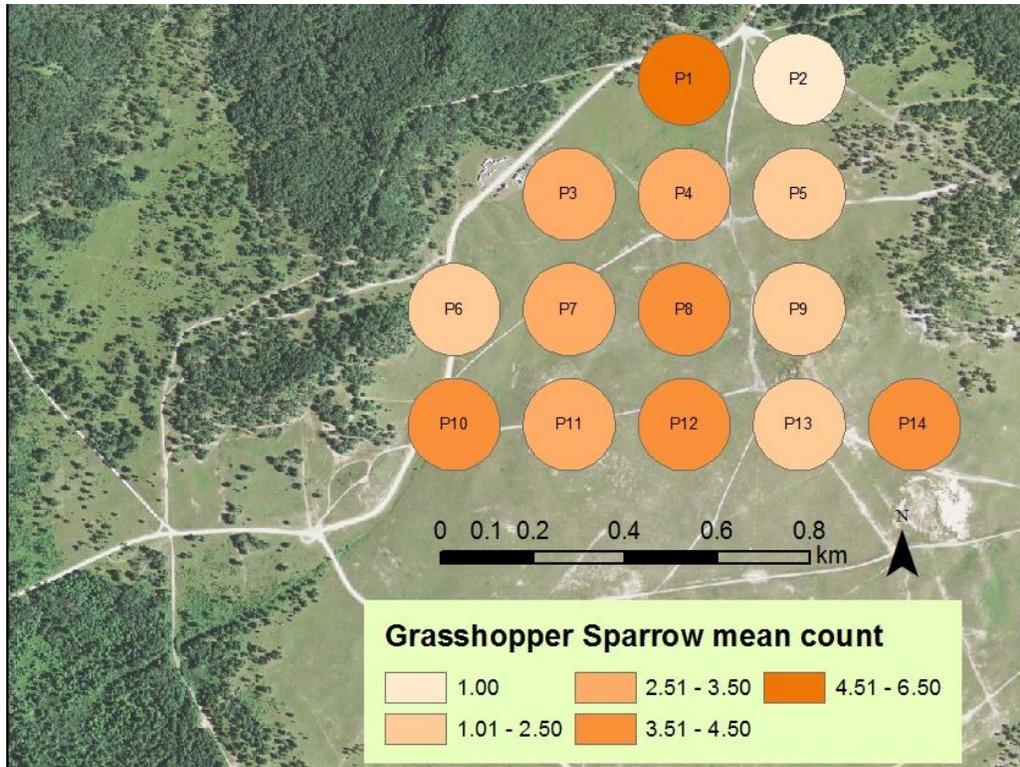
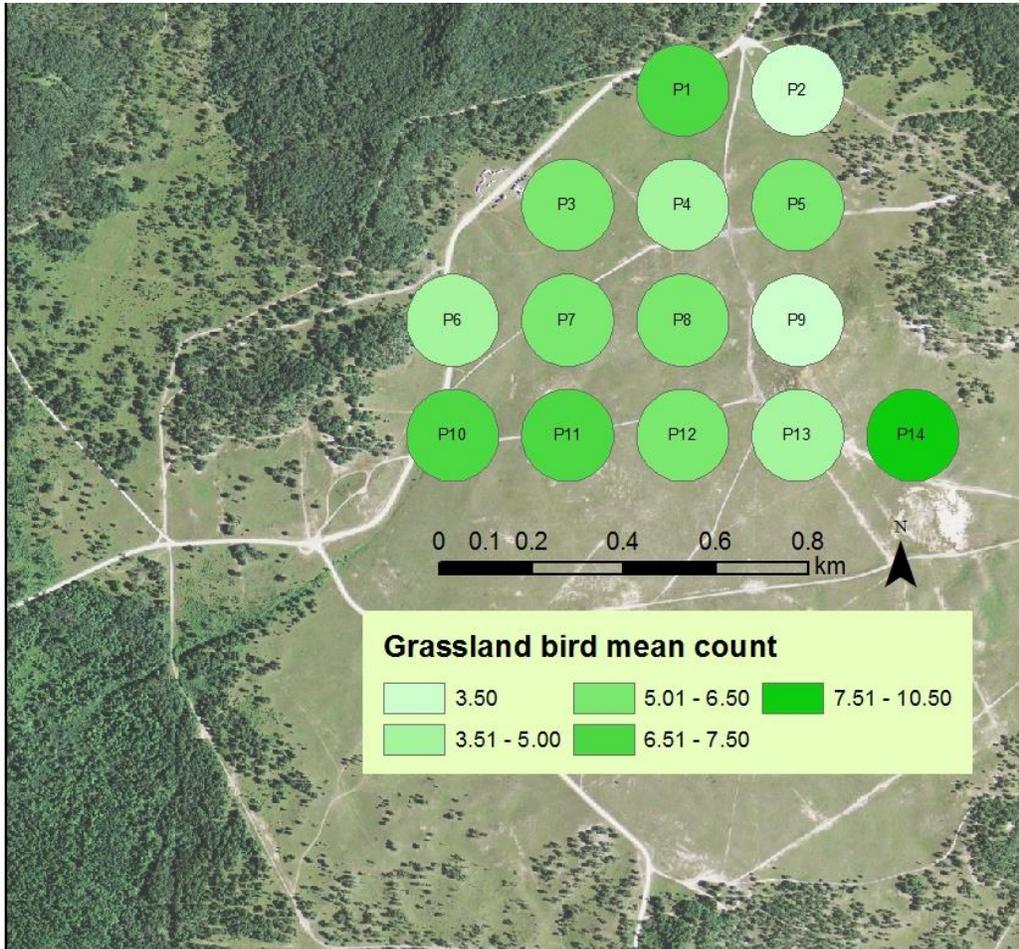


Figure 11. *The mean number of individual grassland birds (including Grasshopper Sparrow, Eastern Meadowlark, Horned Lark [Eremophila alpestris], Vesper Sparrow [Pooecetes gramineus], and Upland Sandpiper) detected on a point count in the 100-m area surrounding each point count location at Fort McCoy.*



### Habitat Management Recommendations

The Badger Drop Zone was the only large grassland area that we visited at Fort McCoy, and it was the focus of our research efforts. We met with Sue Vos (Range and Training Lands Assessment Coordinator, Center of Environmental Management on Military Lands) on many occasions and Sue provided us with an overview of the current grassland management at Fort McCoy, and gave us bird survey data and maps of bird abundance. The Installation already has an extensive team of management crews that actively control invasive species, conduct prescribed fires, and monitors the native flora.

The continuation of existing management activities is critical to maintaining healthy populations of grassland birds at Fort McCoy. The Badger Drop Zone is primarily maintained as grassland

for military exercises, but it also provides substantial grassland habitat for several DoD priority bird species (Eberly and Fischer 2011; Appendix D) including Upland Sandpiper, Grasshopper Sparrow, and Eastern Meadowlark. Currently the edges of the Natural Area (B23) are being encroached upon by woody shrubs, which is reducing available habitat for grassland bird species. In general, grassland birds prefer areas of extensive grass and avoid nesting within 50 m of woody edges. A combination of physical removal (e.g., with chainsaws or brush cutters), prescribed fire, and woody vegetation-specific herbicide (e.g., Escort or Garlan 3A) will be necessary to prevent further spread of woody vegetation into the grasslands. These shrubby areas support a population of Clay-colored Sparrows (*Spizella pallida*), and Fort McCoy may engage in some management actions directed at this species. Clay-colored Sparrows, however, are also found on other areas of Fort McCoy, and we recommend curtailing woody vegetation expansion in the BDZ. For grassland management activities many installations (e.g., Fort Riley, KS) employ the “25-33% per year” rule, where management activities for grassland birds (e.g., prescribed fire) are performed on one-quarter to one-third of the lands each year, and we recommend this approach.

We also observed many vehicle tracks across the grasslands that did not appear to be a part of training exercises. We strongly recommend that nonessential vehicle travel across grasslands be discouraged and avoided when possible. Vehicles may cause direct nest failure and abandonment due to disturbance. Care should be taken to avoid or at least minimize negatively affecting nesting birds from May 15 through August 1.

## Lessons Learned

Unforeseen events will affect any research project of this size and scope, but for the most part, we were very fortunate and prepared at Fort McCoy in 2015. Compared to some of our other partner installations (e.g., Camp Grafton, ND), we had access to very thorough bird data from eBird and Sue Vos for the Fort McCoy area. Access to this information had a large and positive effect on the success of our research at Fort McCoy. Without access to this information, we would have needed a greater amount of time at Fort McCoy to scout for areas with high densities of grassland birds.

We slept in military quarters at Fort McCoy during June, and all three VCE employees had their own separate rooms. This living situation was a good balance of allowing each employee to have privacy while still allowing everyone to easily socialize after work. We have learned that good relationships between team personnel are essential during our very long workdays. In retrospect, if we had made our reservations for military quarters earlier, we could have ensured that the three rooms were side-by-side.

## Acknowledgments

Funding and support by the DoD Legacy Program (Project 14-764, contract no. W81EWF-4119-9496), and the assistance of Sue Vos (Range and Training Lands Assessment Coordinator, Center of Environmental Management on Military Lands), Alison Nevins (Field Crew Leader, VCE), Inez Heins (Field Technician, VCE), and Dana Timms (Field Technician, VCE) were instrumental to our success at Fort McCoy. Sue Vos, in particular, provided us with the best locations to find Grasshopper Sparrows, gave us a tour of those locations, introduced us to all of our other contacts on base, gave us maps of her previous bird surveys, and made us feel welcomed. Thank you everyone.

Figure 12. A rare triple simultaneous capture of three male Grasshopper Sparrows at Fort McCoy, Wisconsin. From left to right: Inez Heins, Dana Timms, and Alison Nevins. Photo by Sue Vos.



## References

Eberly, C., and R. Fischer. 2011. DoD PIF Priority Species. Fact Sheet #11. Department of Defense. Partners in Flight. Available at <file:///C:/Users/jmh656/Downloads/DOD%20priority%20species%202011.pdf>

Appendix A: Summary of Grasshopper Sparrow banding efforts at Fort McCoy, WI (June, 2015)

Date	UTMS Easting (zone 16)	UTMS Northing (zone 16)	Disposition	Band number	Color band combo	Fitted with a geolocator?	Blood taken?	Feather collected?	Age	Sex
6/3/2015	687600	4871657	New	222152837	GAGL	Yes			Adult	Male
6/3/2015	687584	4871598	New	222152838					Adult	Male
6/3/2015	687743	4871628	New	222152839			Yes	Yes	Adult	Male
6/3/2015	687809	4871552	New	222152841	RAWY	Yes			Adult	Male
6/3/2015	687778	4871496	New	222152842	KAGH	Yes			Adult	Male
6/3/2015	687753	4871205	New	222152843	RARH	Yes			Adult	Male
6/3/2015	687802	4871161	New	222152844			Yes	Yes	Adult	Male
6/3/2015	687910	4871068	New	222152845				Yes	Adult	Male
6/3/2015	687822	4871047	New	222152846				Yes	Adult	Male
6/4/2015	687452	4871604	New	222152848					Adult	Male
6/4/2015	687505	4871614	New	222152849	YAWL	Yes			Adult	Male
6/4/2015	687388	4871671	New	222152850	GALH				Adult	Male
6/4/2015	687388	4871571	New	222152851			Yes	Yes	Adult	Male
6/4/2015	687447	4871619	New	222152852	OAWK	Yes			Adult	Male
6/4/2015	687363	4871686	New	222152853	KAGL	Yes			Adult	Male
6/4/2015	687297	4871660	New	222152854	LAKG	Yes			Adult	Male
6/4/2015	687236	4871581	New	222152855			Yes	Yes	Adult	Male
6/4/2015	687282	4871460	New	222152856	KAOG	Yes			Adult	Male
6/4/2015	687362	4871463	New	222152857	HARW				Adult	Male
6/4/2015	687263	4871420	New	222152858	RAHK	Yes			Adult	Male
6/5/2015	687650	4871382	New	222152859	LAOK	Yes			Adult	Male
6/5/2015	687676	4871284	New	222152860	LARG	Yes			Adult	Male
6/5/2015	687550	4871221	New	222152861	KARW	Yes			Adult	Male
6/5/2015	687550	4871221	New	222152862	YAKL	Yes			Adult	Male
6/5/2015	687662	4871172	New	222152863	GAYW	Yes			Adult	Male
6/9/2015	0687353	4871328	New	222152864			Yes	Yes	Adult	Male
6/9/2015	0687363	4871309	New	222152865	WAYG	Yes			Adult	Male
6/9/2015	0687363	4871309	New	222152866	LAKY	Yes			Adult	Male
6/9/2015	0687363	4871309	New	222152867	GAOW	Yes			Adult	Male
6/9/2015	0687230	4871191	New	222152868	HAOO	Yes			Adult	Male
6/9/2015	0687127	4871147	New	222152869	RAHW	Yes			Adult	Male
6/9/2015	0687088	4871151	New	222152870	GAWG	Yes			Adult	Male
6/10/2015	0685864	4871295	New	222152871			Yes	Yes	Adult	Male
6/11/2015	0685529	4872720	New	222152872			Yes	Yes	Adult	Male
6/11/2015	0685355	4872720	New	222152873				Yes	Adult	Unknown
6/11/2015	0685344	4872972	New	222152874			Yes	Yes	Adult	Male
6/11/2015	0685394	4872991	New	222152875			Yes	Yes	Adult	Male
6/14/2015	0684271	4873021	New	222152876			Yes	Yes	Adult	Male
6/14/2015	0684226	4873103	New	222152877			Yes	Yes	Adult	Male
6/14/2015	0684226	4873103	New	222152878			Yes		Adult	Male
6/14/2015	0684218	4873039	Recapture	222152876					Adult	Male

Appendix A: Summary of Grasshopper Sparrow banding efforts at Fort McCoy, WI (June, 2015)

Date	UTMS Easting (zone 16)	UTMS Northing (zone 16)	Disposition	Band number	Color band combo	Fitted with a geolocator?	Blood taken?	Feather collected?	Age	Sex
6/14/2015	0684283	4873088	New	222152879			Yes	Yes	Adult	Male
6/14/2015	0684327	4873021	New	222152880			Yes		Adult	Male
6/14/2015	0684264	4873174	Recapture	222152878					Adult	Male
6/14/2015	0684213	4873260	New	222152881			Yes		Adult	Male
6/17/2015	687070	4871090	New	222152882	LAWW	Yes			Adult	Male
6/17/2015	687138	4871062	New	222152883			Yes	Yes	Adult	Male
6/17/2015	687007	4871049	New	222152884			Yes	Yes	Adult	Male
6/17/2015	686988	4871043	New	222152885	OAWR	Yes			Adult	Male
6/17/2015	686965	4871026	New	222152886	RAOY	Yes			Adult	Male
6/17/2015	687157	4870980	New	222152887	GAGW	Yes			Adult	Male
6/17/2015	687152	4870885	New	222152888	KAYK	Yes			Adult	Male
6/18/2015	686912	4870884	New	222152889	YALY	Yes			Adult	Male
6/18/2015	686912	4870884	New	222152890			Yes	Yes	Adult	Male
6/18/2015	686835	4870851	New	222152891	LALL	Yes			Adult	Male
6/18/2015	686812	4870801	New	222152892			Yes	Yes	Adult	Male
6/18/2015	686732	4870795	New	222152893	YAOL	Yes			Adult	Male
6/18/2015	686823	4870754	New	222152894	GAOG	Yes			Adult	Male
6/19/2015	687445	4870097	New	222152895			Yes	Yes	Adult	Male
6/19/2015	687445	4870097	New	222152896			Yes	Yes	Adult	Male
6/19/2015	687572	4870214	New	222152897			Yes	Yes	Adult	Male
6/19/2015	687572	4870214	New	222152898			Yes	Yes	Adult	Male
6/19/2015	687681	4870285	New	222152899			Yes	Yes	Adult	Male
6/19/2015	687689	4870356	New	222152900			Yes	Yes	Adult	Male

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Appendix B: Summary of discovered nests at Fort McCoy, WI (June, 2015)

Species	Date found	Nest contents	UTMs Easting zone 15	UTMs Northing zone 15
Grasshopper Sparrow ( <i>Ammodramus savannarum</i> )	6/14/2015	4 eggs	684292	4873028

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Appendix C: Species observed on Fort McCoy, WI (June, 2015) and submitted to eBird

Species	Latin name
Wild Turkey	<i>Meleagris gallopavo</i>
Upland Sandpiper	<i>Bartramia longicauda</i>
Mourning Dove	<i>Zenaida macroura</i>
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
Great Crested Flycatcher	<i>Myiarchus crinitus</i>
Eastern Kingbird	<i>Tyrannus tyrannus</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>
Blue Jay	<i>Cyanocitta cristata</i>
American Crow	<i>Corvus brachyrhynchos</i>
Horned Lark	<i>Eremophila alpestris</i>
Grey Catbird	<i>Dumetella carolinensis</i>
Brown Thrasher	<i>Toxostoma rufum</i>
Blue-winged Warbler	<i>Vermivora cyanoptera</i>
Eastern Towhee	<i>Pipilo erythrophthalmus</i>
Chipping Sparrow	<i>Spizella passerina</i>
Clay-colored Sparrow	<i>Spizella pallida</i>
Field Sparrow	<i>Spizella pusilla</i>
Vesper Sparrow	<i>Pooecetes gramineus</i>
Grasshopper Sparrow	<i>Ammodramus savannarum</i>
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
Indigo Bunting	<i>Passerina cyanea</i>
Eastern Meadowlark	<i>Sturnella magna</i>

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Appendix D: Point count summary for Fort McCoy, WI (June, 2015)

Species	Individuals detected	Detection rate (%)
Upland Sandpiper ( <i>Bartramia longicauda</i> )	13	28.57
Mourning Dove ( <i>Zenaida macroura</i> )	6	14.29
Red-headed Woodpecker ( <i>Melanerpes erythrocephalus</i> )	1	3.57
Great Crested Flycatcher ( <i>Myiarchus crinitus</i> )	1	3.57
Blue Jay ( <i>Cyanocitta cristata</i> )	2	3.57
American Crow ( <i>Corvus brachyrhynchos</i> )	16	35.71
Horned Lark ( <i>Eremophila alpestris</i> )	12	28.57
American Robin ( <i>Turdus migratorius</i> )	3	10.71
Brown Thrasher ( <i>Toxostoma rufum</i> )	1	3.57
Eastern Towhee ( <i>Pipilo erythrophthalmus</i> )	1	3.57
Field Sparrow ( <i>Spizella pusilla</i> )	8	25.00
Grasshopper Sparrow ( <i>Ammodramus savannarum</i> )	91	100.00
Vesper Sparrow ( <i>Pooecetes gramineus</i> )	8	17.86
Eastern Meadowlark ( <i>Sturnella magna</i> )	45	78.57

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