



Department of Defense Legacy Resource Management Program

PROJECT 14-764

Migratory connectivity of At-Risk grassland birds

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

Executive Summary

In 2015, the Vermont Center for Ecostudies initiated an innovative grassland bird research project at Fort Riley 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 4 June to 24 June, 2015. We also assessed the avifauna at Fort Riley via repeated point count surveys. We focused our efforts working in section Echo-44, primarily, but we also banded and sampled birds for blood and feathers in sections Alpha, Bravo, Charlie, and Delta. We also spent time conducting point count surveys, and recording species seen and nests found. We focused our efforts working Fort Riley in sections E, C, D, and A. In total, we banded 99 male Grasshopper Sparrows and one female Grasshopper Sparrow, found 18 nests of 4 different species, and deployed 30 geolocators on male Grasshopper Sparrows on Fort Riley. We conducted point counts and geocator deployment in a 93-ha area in Echo-44. Overall, we detected 28 species of birds during point counts, and we detected another 34 species that we observed during our daily activities at Fort Riley. We contributed all of our birding data to an online ornithological database, eBird. Currently, Fort Riley is very-well managed for a suite of grassland bird species. These management activities largely consist of a two- to three-year rotational prescribed fire regime that prevents woody vegetation establishment and ensures a mosaic of recently burned grasslands.

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 impact or be in conflict with training activities, further underscoring the need to fully 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 impact 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 versus off of military installations. For example, we can begin to address whether

more productive populations 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. But most importantly, 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

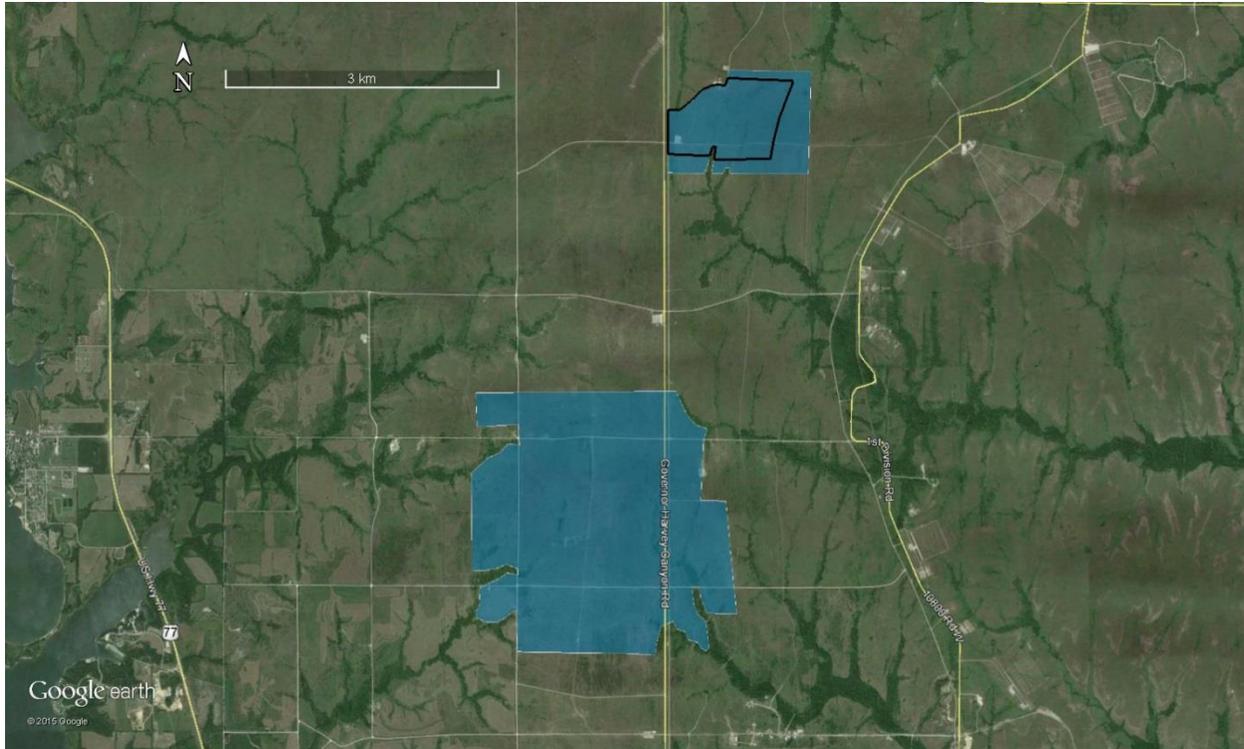
Male Grasshopper Sparrows are more vocal, visible, and easier to capture, and have lower inter-annual dispersal rates than female Grasshopper Sparrows. Therefore, we exclusively targeted male Grasshopper Sparrows for light-level geolocator deployment. We familiarized ourselves with Fort Riley during a one week visit at the end of April, 2015. We spent the month of May at Camp Grafton, ND, and then returned to Fort Riley for the month of June. Our visit in April was largely for training purposes. During the first week of June we systematically walked transects across sections Delta and Echo, and we identified areas of extensive grassland habitat. Fort Riley contains extensive grassland habitat, while some fields are dominated by non-grass and non-woody plants. Within this mosaic, patches of grass habitat suitable for Grasshopper Sparrows are dispersed across the landscape. 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 re-find and recapture males wearing geolocators, because male Grasshopper Sparrows often shift their territories between years.

We used three criteria to identify our primary place of research on Fort Riley. The area should:

1. have extensive grassland habitat and at least 30 male Grasshopper Sparrows,
2. not be scheduled for prescribed fire before summer 2016, and
3. not to be adjacent to one of the two permanent “Off Limits” ranges.

Section Delta-52 initially looked like an excellent fit for our research purposes, but it is scheduled for prescribed fire before next summer; we were concerned that territorial Grasshopper Sparrows may abandon Delta-52 for up to a year after the fire disturbance. Our next best option was Echo-44 which has an extensive population of Grasshopper Sparrows, but it is adjacent to Hotel-62 which is frequently closed to civilian entrance. Ultimately, we decided to focus on Echo-44, despite the proximity to Hotel-62 (which may complicate efforts in 2016 to relocate male Grasshopper Sparrows wearing geolocators).

Figure 1. *Main search area (blue polygon) at Fort Riley. We spent the first week of June, 2015, extensively searching the area outlined in blue for concentrations of Grasshopper Sparrows. The highest density of Grasshopper Sparrows occurred within the 93-ha black polygon, and we concentrated our capture and banding efforts within this smaller area.*



Male Grasshopper Sparrow activity greatly substantially increased between the last week of April and our return in June, and we began capture efforts on 04 June 2015. Once we located a singing male sparrow we then set up a 6-m 30mm-mesh nylon mist net on 2-m tall poles (Figure 2). We then placed a small speaker, attached to a smartphone, 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. Male sparrows generally 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. Occasionally male sparrows would fly into the net without encouragement from us. We limited the use of recordings to <5 min with any given male sparrow, and we generally targeted males between 0600 and 1030. This 4.5-hr period corresponds with the timing of copulation in this species, and males became noticeably less aggressive to our recorded intruder song after 1000.

Figure 2. *Typical mist net set up used to capture Grasshopper Sparrows at Fort Riley, KS.*



Banding, Feather & Blood Sampling

We began banding on 04 June, 2015 and concluded our efforts on 24 June, 2015. For all captured birds we recorded their age, sex, weight, and basic morphological measurements (Figures 3-4). Handling time was generally less than 10 minutes per bird, and all birds were released unharmed at their capture location. We successfully captured and banded 100 Grasshopper Sparrows on Fort Riley (Figure 5; Appendix A). Of those 100 banded Grasshopper Sparrows, 99 were male (99%) and 1 was female (1%). In collaboration with other researchers we also sampled a single primary (i.e., wing) feather and a small amount of blood (<100 μ l) from birds that did not receive a geolocator. 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 samples from 55 birds, and obtained blood samples from 38 birds. We recaptured one previously banded individual, who was initially banded one week prior.



Figure 3. *Jason Hill obtains a blood sample of a male Grasshopper Sparrow at Fort Riley using a small needle and a capillary tube.*

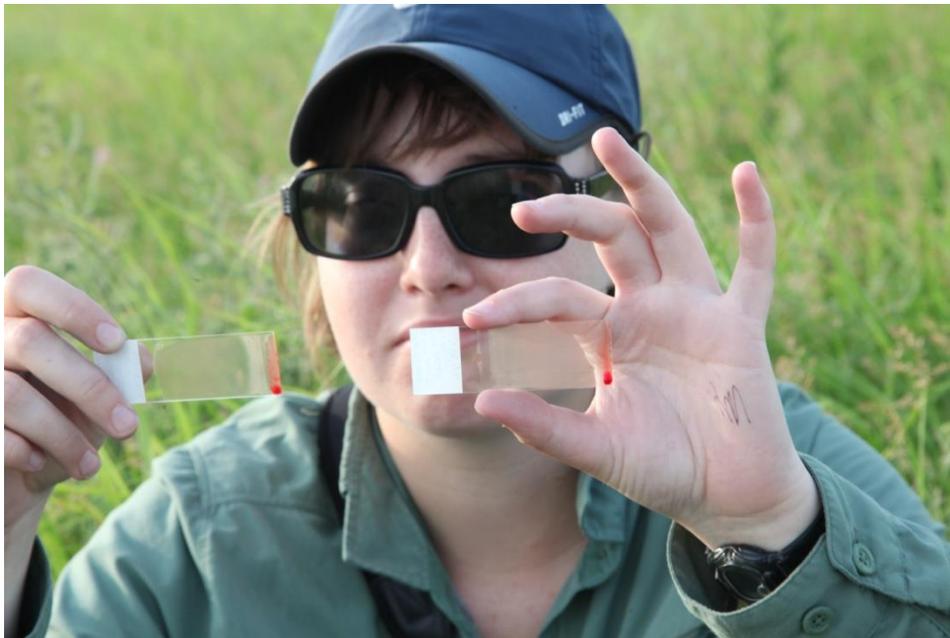
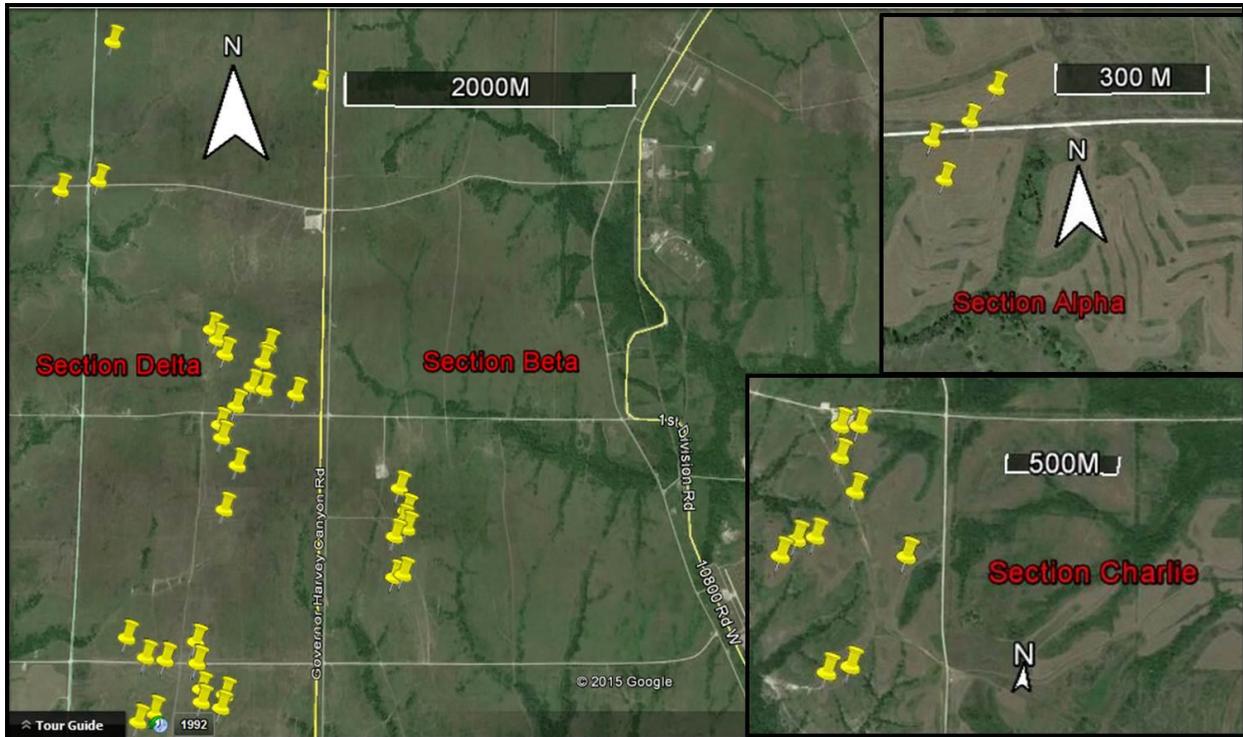


Figure 4. *Biological Technician Leah Rensel examines two blood slides prepared in the field at Fort Riley.*

Figure 5. *Banding locations of all Grasshopper Sparrows captured at Fort Riley, April and June 2015, including sections Delta-52,54, and 55, Bravo-38, and Alpha-49 (left panel), Charlie-25 (lower right panel), and Alpha-48 (upper right panel).*



Geolocator Deployment & Color-banding

Birds wearing geolocators must be recaptured in 2016 to gain access to 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. 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 an 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 ≥ 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 (Figure 6). 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 used a small piece of plastic to smooth the body

feathers underneath the harness. Before releasing the bird, we made sure that the harness fit securely, and that the wings and legs were free to move unimpeded.

Figure 6. *Grasshopper Sparrow wearing a light-level geolocator at Fort Riley, June 2015. The light stalk of the geolocator is visible at the tip of the index finger, whereas the actual geolocator sits beneath the feathers.*



At Fort Riley we color-banded 33 adult male Grasshopper Sparrows (Figure 7) and we deployed 30 geolocators (Appendix A). 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 8).

Figure 7. Locations of all color-banded adult male Grasshopper Sparrows at Fort Riley, June, 2105. All of these birds except three (YA—, WARR, and VARY) were fitted with a geolocator, and all but three of them were color-banded in Echo-44. The Echo-44 urban cluster is visible just to the right of the scale bar.

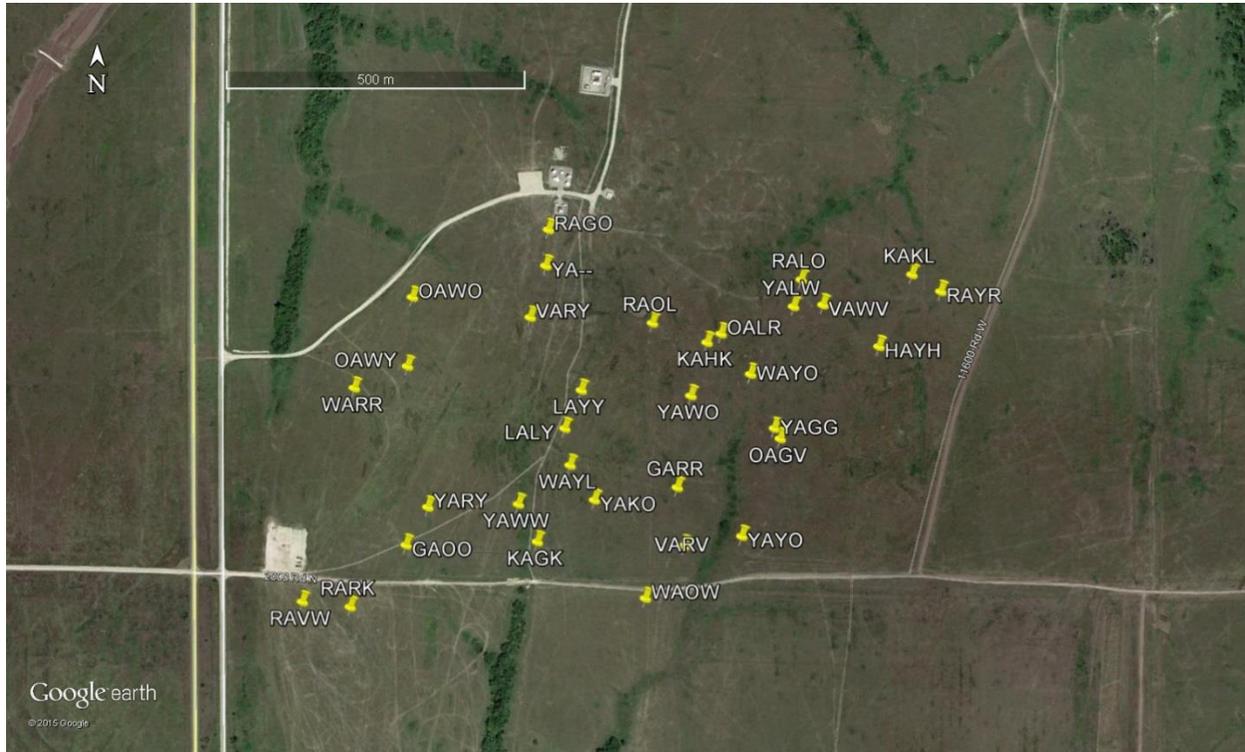


Figure 8. Adult male Grasshopper Sparrow wearing a geolocator at Fort Riley, June, 2105. This bird's color band combination is RAYR (red over aluminum on the bird's right leg, and yellow over red on the bird's left leg).



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. Males wearing geolocators must be recaptured in subsequent years to acquire their data. Males can become weary of mist nets if they are captured frequently. One male Grasshopper Sparrow (color combination of RAVW) was resighted and photographed on 16 June 2015 at the same location where he was captured on 15 June 2015. Another individual with color combination WAOW was initially banded on 6 June and accidentally recaptured while we were attempting to capture a non-banded male Grasshopper Sparrow on 8 June 2015. The geolocator still fit well on WAOW, but the bird (or its normal foraging and flying movements) caused the body feathers to become untucked from underneath the harness. In our experience with geolocators and radio-transmitters it is very normal for feathers to become untucked from the harness, and these untucked feathers should not affect the operation of the geolocator in any way, or affect our project objectives.

Nesting Birds

Nest searching was not one of our main foci at Fort Riley, but we did occasionally discover bird nests (Appendix B). We recorded the location of these nests, but we did not monitor them. We found 18 nests of four species (Figure 9): Mourning Dove (*Zenaida macroura*), Grasshopper Sparrow, Dickcissel (*Spiza americana*), and Eastern Meadowlark (Figure 10).

Figure 9. Locations of all nests 18 discovered on Fort Riley, June, 2015, including Grasshopper Sparrow (green), Eastern Meadowlark (yellow), Dickcissel (orange), and Mourning Dove (red).

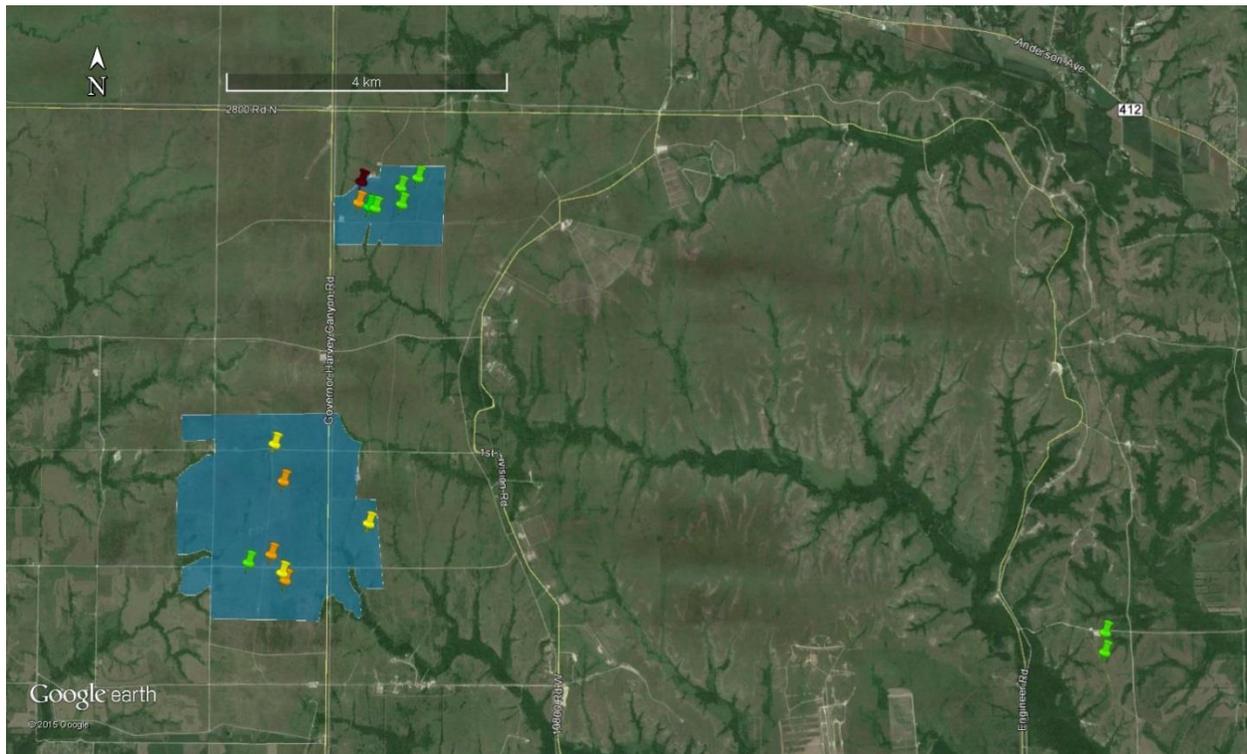


Figure 10. Eastern Meadowlark nest discovered in section Delta-52 on Fort Riley.



eBird Summary

All of our daily observations of birds were entered into eBird (www.ebird.org), 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 birding community (professional and amateur) records and assesses 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. 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. Each observation is examined by an expert local reviewer 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.

In general, we strived to create a checklist of the bird species that we observed each day on Fort Riley (Table 1), but we also recorded the breeding statuses and interesting behaviors of individuals that we observed (Figure 11).

Table 1. *Summary of our eBird avian observation data from Fort Riley, 3 June 2105 through 24 June 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	June 26-30
No. of species	40	27	11	54	26	0
No. of individuals	544	130	73	815	129	0
No. of checklists	12	3	1	7	3	0

Checklist S24047258

Location Fort Riley (Restricted Access), Riley County, Kansas, US

Date and Effort Fri Jun 19, 2015 6:38 AM
 Protocol: Traveling
 Party Size: 1
 Duration: 40 minute(s)
 Distance: 1.5 kilometer(s)
 Observers: Jason Hill, Leah Rensel [List](#)
 Comments: Vermont Center for Ecostudies Grassland Bird Research Project 2015 Point Counts

Species 18 species (+1 other taxa) total

- 5 Northern Bobwhite *Colinus virginianus*
- 4 Ring-necked Pheasant *Phasianus colchicus*
- 1 Killdeer *Charadrius vociferus*
- 4 Upland Sandpiper *Bartramia longicauda*
At least two pairs, very agitated behavior when I neared certain locations. Nest have been found in area previously.
 Breeding Code A Probable-Agitated Behavior
- 2 Mourning Dove *Zenaidura macroura*

Figure 11. *A partial example of a typical eBird checklist that we submitted for Fort Riley, June 2015.*

The number of individuals and species presented in Table 1 is a substantial underestimate of the amount of effort that we exerted. Often we simply reported the presence of a species (i.e., “X”) without a count of individuals when we were engaged in banding efforts, because it was too difficult to accurately count individuals while also

trying to capture birds. Nonetheless, we contributed an abundance of data to eBird.org (Appendix C), and detected 63 species on Fort Riley—some of which had not been previously reported as occurring on Fort Riley. All of our data and bird sighting information is publicly available on eBird.org and DoD personnel can view these data at any time to aid them in making management decisions on Fort Riley.

Point Count Summary

We conducted point count surveys at 15 locations in the general vicinity where we deployed geolocators on male Grasshopper Sparrows (Figure 12). Fort Riley contains >25,000 ha of grasslands and adequately surveying such a large area would likely take a dedicated crew working for the entire summer. Rather than sample the entire grassland complex at Fort Riley we chose to sample grassland birds in the 93-ha area (black polygon, Figure 1) where we performed the majority of our research. By focusing on this smaller area we were able to much more effectively sample the avian population, and our point count results are likely informative of the species diversity and relative abundance of grassland bird species across the remainder of Fort Riley.

Each point count location was surveyed twice, by different observers, on different days: 16 and 19 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 0530 and 1000. In total, 28 bird species were detected during the point counts (Appendix D). Eastern Meadowlark, Grasshopper Sparrow, and Dickcissel (*Spiza americana*) were the most frequently detected species, and were all detected on >95% of our point counts. Grasshopper Sparrows were most abundant at point count stations KS6, KS7, and KS13 (Figure 13), while all grassland birds (including Grasshopper Sparrow, Eastern Meadowlark, Dickcissel, Eastern Kingbird [*Tyrannus tyrannus*], Killdeer [*Charadrius vociferus*], Northern Bobwhite [*Colinus virginianus*], Ring-necked Pheasant [*Phasianus colchicus*], Upland Sandpiper, and Greater Prairie-Chicken [*Tympanuchus cupido*]) were more abundant at point count stations KS3 and KS10 (Figure 14).

Figure 12. Point count locations (yellow markers) were systematically located within the area of Fort Riley where we deployed geolocators (black polygon).

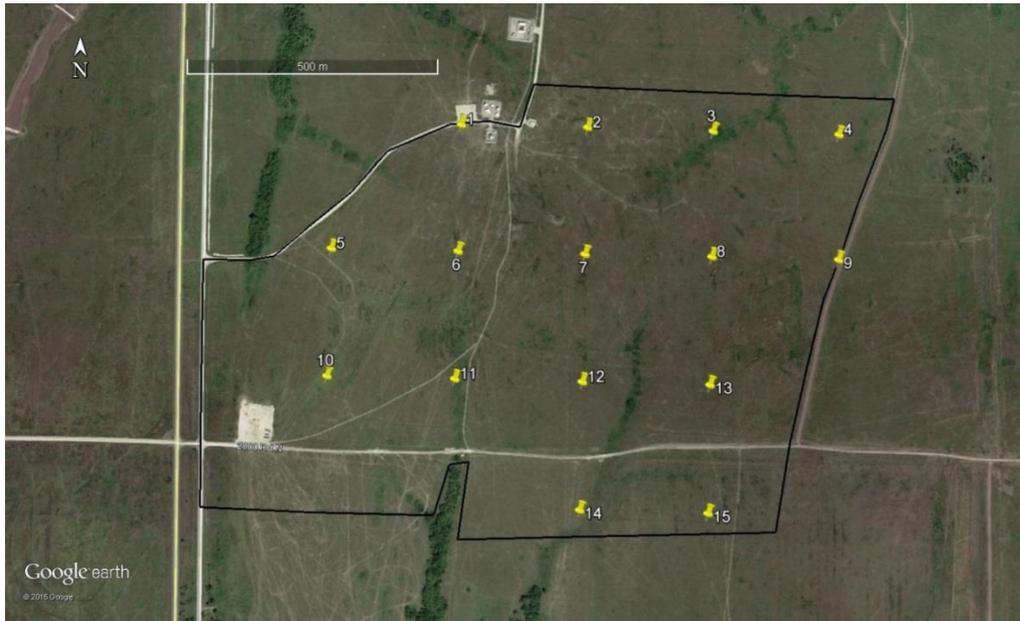


Figure 13. The mean number of Grasshopper Sparrows detected on a point count in the 100-m area surrounding each point count location (e.g., KS1) on Fort Riley.

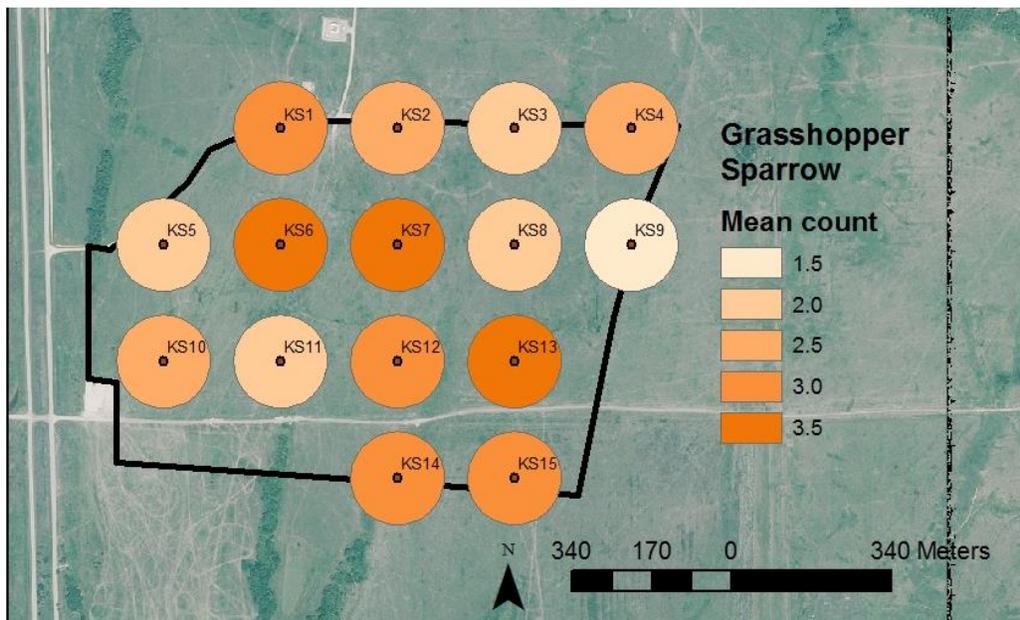
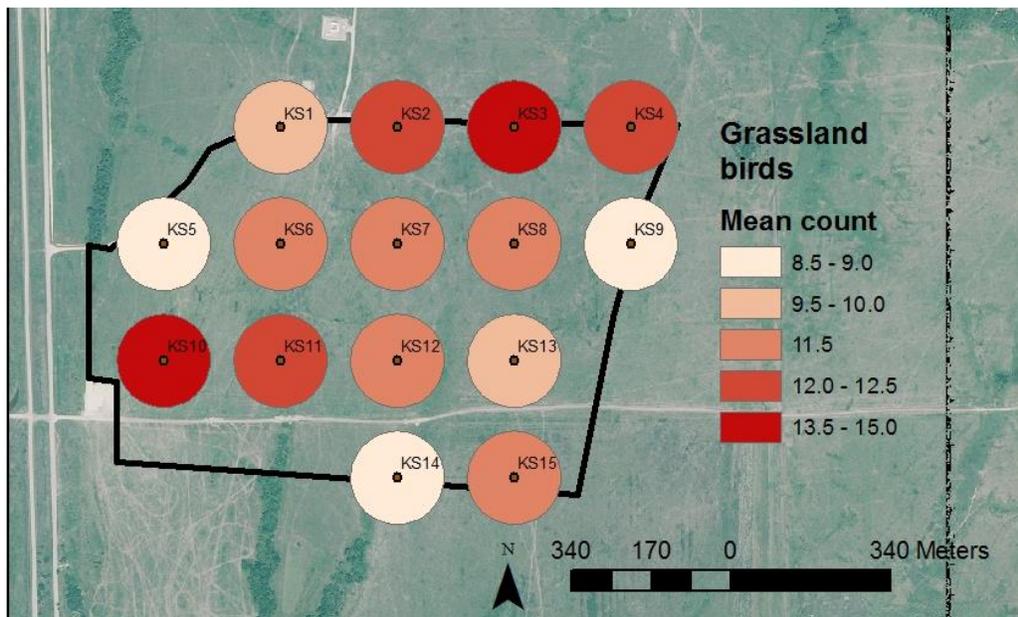


Figure 14. *The mean number of individual grassland birds (including Grasshopper Sparrow, Eastern Meadowlark, Dickcissel, Eastern Kingbird [Tyrannus tyrannus], Killdeer [Charadrius vociferus], Northern Bobwhite [Colinus virginianus], Ring-necked Pheasant [Phasianus colchicus], Upland Sandpiper, and Greater Prairie-Chicken [Tympanuchus cupido]) detected on a point count in the 100-m area surrounding each point count location (e.g., KS1) at Fort Riley.*



Habitat Management Recommendations

Fort Riley is a vast complex of diverse habitats including wetlands, woodlots, shrublands, and of course grasslands. Much of the training lands are open to public access, including hunting, via the iSportsman system (<https://fortriley.isportsman.net/>). Fort Riley is currently very well managed for grassland bird populations. As explained to us in our multiple meetings with Shawn Stratton (Supervisory F&W Biologist, DPW Environmental, Conservation) and Mike Houck (Threaten & Endangered Species Biologist, DPW Environmental Division) this management includes a two- to three-year rotational burning plan that creates a mosaic of newly-burned grassland while also hindering woody vegetation establishment. Stratton and Houck and our crew explored multiple grassland areas on Fort Riley, and we discussed invasive species management and the fire regime and how current management actions provide exemplary habitat for grassland bird species at Fort Riley. Grassland birds, in general, favor grass-dominated areas with little woody vegetation and we encountered few Grasshopper Sparrows or Eastern Meadowlarks in the few shrub- and forb-dominated areas that we found. We encountered a few areas at Fort Riley (e.g., Echo-44) that had extensive disturbance due to tank travel, which is perceived by the management staff as a benefit to grassland birds (Shawn Stratton personal communication). Indeed, we found that many birds actually used these tank tracks for foraging and as travel corridors (Figure 15). Our data may later help managers further refine their

management activities, but currently the installation staff is not in need of additional management suggestions. Fort Riley has great potential for attracting birders to the installation, as currently there are very few birders who visit the grasslands on Fort Riley. The large numbers of Greater Prairie-Chickens, Upland Sandpipers, Eastern Meadowlarks and Grasshopper Sparrows at Fort Riley should make this area one of the premier grassland birding destinations in the area.

Figure 15. *An Upland Sandpiper forages near along a tank track at Fort Riley, KS, June 2015.*



Lessons Learned

Any research project of this size and scope will be affected by unforeseen events, but we were very fortunate at Fort Riley in 2015. We greatly benefited from existing eBird data to estimate the arrival dates of Grasshopper Sparrows, and we benefited from Shawn Stratton and Mike Houck’s local bird knowledge to direct us to areas of high densities of grassland birds. Without these resources we would have needed to visit Fort Riley in 2014 to discover this information for ourselves. We rented a car for field work, because a pickup truck would have been comparably very expensive with the amount of driving that we did. The lack of a truck prohibited us from reaching some sections of Fort Riley. More complete knowledge of the road construction

schedule and road surface material (i.e., gravel, dirt, or paved) would have saved us much frustration.

On some days, military training activities prevented us from visiting some sections of Fort Riley. It is important to plan ahead for these closures, and to have a suite of potential sites to visit on any given day in the event that some sites are unexpectedly closed to non-military personnel.

Acknowledgments

Funding and support by the DoD Legacy Program (Project 14-764, contract no. W81EWF-4119-9496), and the assistance of Shawn Stratton (Supervisory F&W Biologist, DPW Environmental, Conservation), Mike Houck (Threaten & Endangered Species Biologist, DPW Environmental Division), Leah Rensel (Field Technician, VCE), and Alexandra Lehner (Field Technician, VCE) were instrumental to our success at Fort Riley. Thank you everyone.

Appendix A: Grasshopper Sparrow banding data from Fort Riley, Kansas

Date	UTMS Easting (Zone 14N)	UTMS Northing (Zone 14N)	Disposition	Band number	Color band combo	Geolocator?	Blood sampled?	Feather collected?	Age	Sex
4/28/2015	687373	4344975	New	160123301	None		Yes		Adult	UNK
4/28/2015	687853	4345439	New	160123302	None		Yes		Adult	Male
4/29/2015	688083	4342776	New	160123303	None		Yes	Yes	Adult	Male
4/30/2015	685478	4339890	New	160123305	None			Yes	Adult	Male
4/30/2015	687645	4349891	New	160123304	None		Yes	Yes	Adult	Male
5/1/2015	685733	4339960	New	160123306	None				Adult	Male
5/1/2015	685773	4340932	New	160123307	None				Adult	Male
6/4/2015	687618	4341765	New	160123369	GAOO	Yes			Adult	Male
6/4/2015	687527	4341660	New	160123368	RARK	Yes			Adult	Male
6/4/2015	687446	4341667	New	160123367	RAVW	Yes			Adult	Male
6/4/2015	687618	4341765	New	160123370	YAWW	Yes			Adult	Male
6/6/2015	686923	4338747	New	160123375	None			Yes	Adult	Male
6/6/2015	686565	4338958	New	160123379	None				Adult	Male
6/6/2015	686666	4338795	New	160123376	None			Yes	Adult	Male
6/6/2015	686955	4338857	New	160123374	None			Yes	Adult	Male
6/6/2015	686941	4338564	New	160123372	None			Yes	Adult	Male
6/6/2015	686758	4338448	New	160123380	None				Adult	Male
6/6/2015	686859	4338583	New	160123371	None			Yes	Adult	Male
6/6/2015	686610	4338890	New	160123378	None				Adult	Male
6/6/2015	686666	4338795	New	160123377	None			Yes	Adult	Male
6/6/2015	687154	4338536	New	160123373	None			Yes	Adult	Male
6/7/2015	687804	4341837	New	160123381	None			Yes	Adult	Male
6/7/2015	687804	4341837	New	160123382	None			Yes	Adult	Male
6/7/2015	687859	4341834	Recapture	160123381	None				Adult	Male
6/7/2015	687836	4341775	New	160123383	KAGK	Yes			Adult	Male
6/7/2015	687618	4342178	New	160123387	OAWO	Yes			Adult	Male
6/7/2015	687613	4342062	New	160123386	OAWY	Yes			Adult	Male
6/7/2015	687525	4342024	New	160123385	WARR				Adult	Male
6/7/2015	687859	4341829	New	160123384	YARY	Yes			Adult	Male
6/8/2015	688048	4341657	New	160123392	None				Adult	Male
6/8/2015	687987	4341615	New	160123391	None				Adult	Male
6/8/2015	687906	4341638	New	160123389	None			Yes	Adult	Male
6/8/2015	687878	4341965	New	160123397	None				Adult	Male
6/8/2015	687882	4341679	New	160123390	None			Yes	Adult	Male
6/8/2015	687910	4341579	New	160123388	None			Yes	Adult	Male
6/8/2015	687904	4342029	New	160123398	LAYY	Yes			Adult	Male
6/8/2015	687878	4341965	New	160123396	LALY	Yes			Adult	Male
6/8/2015	688019	4341686	New	160123393	WAOW	Yes			Adult	Male
6/8/2015	687888	4341904	New	160123395	WAYL	Yes			Adult	Male
6/8/2015	687930	4341847	New	160123394	YAKO	Yes			Adult	Male
6/9/2015	688126	4341826	New	160123400	None			Yes	Adult	Male

Appendix A: Grasshopper Sparrow banding data from Fort Riley, Kansas

Date	UTMS Easting (Zone 14N)	UTMS Northing (Zone 14N)	Disposition	Band number	Color band combo	Geolocator?	Blood sampled?	Feather collected?	Age	Sex
6/9/2015	688068	4341872	New	222152702	GARR	Yes			Adult	Male
6/9/2015	688112	4342114	New	222152707	KAHK	Yes			Adult	Male
6/9/2015	688112	4342114	New	222152706	OALR	Yes			Adult	Male
6/9/2015	688020	4342144	New	222152708	RAOL	Yes			Adult	Male
6/9/2015	688082	4341774	New	160123399	VARV	Yes			Adult	Male
6/9/2015	688186	4342062	New	222152704	WAYO	Yes			Adult	Male
6/9/2015	688087	4342025	New	222152703	YAWO	Yes			Adult	Male
6/9/2015	688229	4341973	New	222152705	YAGG	Yes			Adult	Male
6/9/2015	688179	4341792	New	222152701	YAYO	Yes			Adult	Male
6/10/2015	687822	4342150	New	222152710	VARY				Adult	Male
6/10/2015	688239	4341956	New	222152709	OAGV	Yes			Adult	Male
6/10/2015	688033	4341676	Recapture	160123393	WAOW	Yes			Adult	Male
6/11/2015	688189	4342143	New	222152713	None			Yes	Adult	Male
6/11/2015	688399	4342114	New	222152715	HAYH	Yes			Adult	Male
6/11/2015	688453	4342234	New	222152717	KAKL	Yes			Adult	Male
6/11/2015	687843	4342294	New	222152711	RAGO	Yes			Adult	Male
6/11/2015	688268	4342221	New	222152718	RALO	Yes			Adult	Male
6/11/2015	688501	4342208	New	222152716	RAYR	Yes			Adult	Male
6/11/2015	688305	4342180	New	222152719	VAWV	Yes			Adult	Male
6/11/2015	688255	4342176	New	222152714	YALW	Yes			Adult	Male
6/11/2015	687840	4342235	New	222152712	YA--				Adult	Male
6/15/2015	686374	4336780	New	222152724	None		Yes	Yes	Adult	Male
6/15/2015	686571	4336902	New	222152721	None		Yes	Yes	Adult	Male
6/15/2015	686587	4336765	New	222152723	None		Yes	Yes	Adult	Male
6/15/2015	686114	4336918	New	222152727	None		Yes	Yes	Adult	Male
6/15/2015	686246	4336793	New	222152725	None		Yes	Yes	Adult	Male
6/15/2015	686571	4336902	New	222152720	None		Yes	Yes	Adult	Male
6/15/2015	686587	4336765	New	222152722	None		Yes		Adult	Male
6/15/2015	686246	4336793	New	222152726	None				Adult	Male
6/16/2015	698225	4336113	New	222152729	None		Yes	Yes	Adult	Male
6/16/2015	698140	4336109	New	222152728	None		Yes	Yes	Adult	Male
6/16/2015	698236	4335794	New	222152731	None		Yes	Yes	Adult	Male
6/16/2015	698153	4335959	New	222152730	None		Yes	Yes	Adult	Male
6/17/2015	697937	4335485	New	222152733	None		Yes	Yes	Adult	Male
6/17/2015	698487	4335500	New	222152737	None		Yes	Yes	Adult	Male
6/17/2015	698190	4334973	New	222152735	None		Yes	Yes	Adult	Male
6/17/2015	698287	4335003	New	222152736	None		Yes	Yes	Adult	Male
6/17/2015	698081	4335576	New	222152734	None		Yes	Yes	Adult	Male
6/17/2015	698000	4335563	New	222152732	None		Yes	Yes	Adult	Male
6/19/2015	684744	4335135	New	222152740	None			Yes	Adult	Male
6/19/2015	684773	4335057	New	222152742	None			Yes	Adult	Male

Appendix A: Grasshopper Sparrow banding data from Fort Riley, Kansas

Date	UTMS Easting (Zone 14N)	UTMS Northing (Zone 14N)	Disposition	Band number	Color band combo	Geolocator?	Blood sampled?	Feather collected?	Age	Sex
6/19/2015	684869	4335244	New	222152738	None			Yes	Adult	Male
6/19/2015	684819	4335176	New	222152739	None			Yes	Adult	Male
6/22/2015	687851	4337613	New	222152747	None		Yes	Yes	Adult	Male
6/22/2015	687871	4337929	New	222152743	None		Yes	Yes	Adult	Male
6/22/2015	687930	4337666	New	222152745	None		Yes	Yes	Adult	Male
6/22/2015	687859	4337347	New	222152749	None		Yes	Yes	Adult	Male
6/22/2015	687917	4337366	New	222152748	None		Yes	Yes	Adult	Male
6/22/2015	687921	4337781	New	222152746	None		Yes	Yes	Adult	Male
6/22/2015	687897	4337711	New	222152744	None		Yes	Yes	Adult	Male
6/23/2015	686759	4336483	New	222152750	None		Yes	Yes	Adult	Male
6/23/2015	686630	4336518	New	222152753	None		Yes	Yes	Adult	Male
6/23/2015	686778	4336568	New	222152751	None			Yes	Adult	Male
6/23/2015	686221	4336382	New	222152754	None		Yes	Yes	Adult	Male
6/23/2015	686622	4336600	New	222152752	None		Yes	Yes	Adult	Male
6/23/2015	686319	4336441	New	222152755	None		Yes	Yes	Adult	Male
6/24/2015	686713	4337764	New	222152760	None		Yes	Yes	Adult	Male
6/24/2015	686655	4338323	New	222152756	None		Yes	Yes	Adult	Male
6/24/2015	686674	4338238	New	222152757	None		Yes	Yes	Adult	Male
6/24/2015	686674	4338238	New	222152758	None		Yes	Yes	Adult	Female
6/24/2015	686787	4338057	New	222152759	None		Yes	Yes	Adult	Male

Appendix B: Discovered bird nests at Fort Riley, Kansas

Species	Date Discovered	Contents	UTM Easting (Zone 14N)	UTM Northing (Zone 14N)
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	6/4/2015	Eggs	688228	4341855
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	6/4/2015	Eggs	688208	4342091
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	6/7/2015	Eggs	687767	4341804
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	6/10/2015	Eggs	687858	4341791
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	6/11/2015	Eggs	688446	4342236
Upland Sandpiper (<i>Bartramia longicauda</i>)	6/15/2015	Eggs	687520	4341714
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	6/15/2015	Eggs	686256	4336784
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	6/15/2015	Eggs	698231	4335829
Dickcissel (<i>Spiza americana</i>)	6/15/2015	Eggs	686570	4336903
Eastern Meadowlark (<i>Sturnella magna</i>)	6/15/2015	Unknown	687776	4341805
Eastern Meadowlark (<i>Sturnella magna</i>)	6/15/2015	Unknown	687916	4337365
Eastern Meadowlark (<i>Sturnella magna</i>)	6/15/2015	Unknown	686732	4336655
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	6/16/2015	Eggs	698237	4336102
Dickcissel (<i>Spiza americana</i>)	6/19/2015	4 eggs	687621	4341862
Mourning Dove (<i>Zenaida macroura</i>)	6/19/2015	2 eggs	687648	4342162
Dickcissel (<i>Spiza americana</i>)	6/24/2015	Unknown	686779	4336555
Eastern Meadowlark (<i>Sturnella magna</i>)	6/24/2015	Eggs	686558	4338437
Dickcissel (<i>Spiza americana</i>)	6/25/2015	Unknown	686700	4337922

Appendix C: Summary of eBird checklist data

Species Name	Proportion of eBird checklists with inclusion of each species				
	June 1-5	June 6-10	June 11-15	June 16-20	June 21-25
Canada Goose - <i>Branta canadensis</i>	0.29	0.00	0.00	0.00	0.00
Mallard - <i>Anas platyrhynchos</i>	0.00	0.00	0.00	0.17	0.00
Northern Bobwhite - <i>Colinus virginianus</i>	0.86	1.00	1.00	0.83	1.00
Ring-necked Pheasant - <i>Phasianus colchicus</i>	0.86	0.33	1.00	1.00	0.67
Greater Prairie-Chicken - <i>Tympanuchus cupido</i>	0.43	1.00	0.00	0.17	0.33
Wild Turkey - <i>Meleagris gallopavo</i>	0.14	0.00	0.00	0.33	0.33
Great Blue Heron - <i>Ardea herodias</i>	0.29	0.33	0.00	0.00	0.00
Green Heron - <i>Butorides virescens</i>	0.14	0.00	0.00	0.00	0.00
Turkey Vulture - <i>Cathartes aura</i>	0.14	0.00	1.00	0.17	1.00
Cooper's Hawk - <i>Accipiter cooperii</i>	0.00	0.33	0.00	0.33	0.00
Bald Eagle - <i>Haliaeetus leucocephalus</i>	0.00	0.00	0.00	0.17	0.00
Red-tailed Hawk - <i>Buteo jamaicensis</i>	0.00	0.00	0.00	0.33	0.67
Killdeer - <i>Charadrius vociferus</i>	0.14	0.67	0.00	0.50	1.00
Upland Sandpiper - <i>Bartramia longicauda</i>	0.71	1.00	1.00	0.83	1.00
Rock Pigeon - <i>Columba livia</i>	0.00	0.00	0.00	0.17	0.00
Mourning Dove - <i>Zenaida macroura</i>	0.57	0.33	0.00	1.00	0.67
Yellow-billed Cuckoo - <i>Coccyzus americanus</i>	0.00	1.00	0.00	0.67	0.00
Common Nighthawk - <i>Chordeiles minor</i>	0.43	0.67	0.00	0.33	0.33
Red-headed Woodpecker - <i>Melanerpes erythrocephalus</i>	0.14	0.00	0.00	0.33	0.00
Red-bellied Woodpecker - <i>Melanerpes carolinus</i>	0.00	0.67	0.00	0.17	0.00
Downy Woodpecker - <i>Picoides pubescens</i>	0.00	0.00	0.00	0.17	0.00
Northern Flicker - <i>Colaptes auratus</i>	0.14	0.00	0.00	0.17	0.00
Pileated Woodpecker - <i>Dryocopus pileatus</i>	0.00	0.00	0.00	0.17	0.00
American Kestrel - <i>Falco sparverius</i>	0.00	0.00	0.00	0.00	0.33
Eastern Wood-Pewee - <i>Contopus virens</i>	0.00	0.00	0.00	0.33	0.00
Great Crested Flycatcher - <i>Myiarchus crinitus</i>	0.00	0.00	0.00	0.17	0.00
Eastern Kingbird - <i>Tyrannus tyrannus</i>	0.29	0.67	0.00	0.33	0.00
Scissor-tailed Flycatcher - <i>Tyrannus forficatus</i>	0.00	0.00	0.00	0.00	0.33
Bell's Vireo - <i>Vireo bellii</i>	0.14	0.00	0.00	0.33	0.00
Warbling Vireo - <i>Vireo gilvus</i>	0.00	0.00	0.00	0.17	0.00
Blue Jay - <i>Cyanocitta cristata</i>	0.00	0.67	1.00	0.33	0.00

Appendix C: Summary of eBird checklist data

Species Name	Proportion of eBird checklists with inclusion of each species				
	June 1-5	June 6-10	June 11-15	June 16-20	June 21-25
American Crow - <i>Corvus brachyrhynchos</i>	0.29	0.33	1.00	0.83	0.00
Tree Swallow - <i>Tachycineta bicolor</i>	0.00	0.00	0.00	0.17	0.00
Barn Swallow - <i>Hirundo rustica</i>	0.29	1.00	0.00	0.67	1.00
Cliff Swallow - <i>Petrochelidon pyrrhonota</i>	0.00	0.00	0.00	0.17	1.00
Black-capped Chickadee - <i>Poecile atricapillus</i>	0.00	0.00	0.00	0.33	0.00
Tufted Titmouse - <i>Baeolophus bicolor</i>	0.00	0.00	0.00	0.17	0.00
House Wren - <i>Troglodytes aedon</i>	0.00	0.00	0.00	0.00	0.00
Eastern Bluebird - <i>Sialia sialis</i>	0.00	0.33	0.00	0.33	0.33
American Robin - <i>Turdus migratorius</i>	0.29	0.00	0.00	0.00	0.00
Gray Catbird - <i>Dumetella carolinensis</i>	0.43	0.00	0.00	0.67	0.33
Brown Thrasher - <i>Toxostoma rufum</i>	0.43	1.00	0.00	0.67	0.33
Northern Mockingbird - <i>Mimus polyglottos</i>	0.00	0.00	0.00	0.17	0.00
Common Yellowthroat - <i>Geothlypis trichas</i>	0.29	0.00	0.00	0.17	0.00
Yellow Warbler - <i>Setophaga petechia</i>	0.29	0.33	0.00	0.17	0.33
Eastern Towhee - <i>Pipilo erythrophthalmus</i>	0.00	0.00	0.00	0.17	0.00
Field Sparrow - <i>Spizella pusilla</i>	0.43	0.67	0.00	0.83	0.67
Grasshopper Sparrow - <i>Ammodramus savannarum</i>	1.00	1.00	1.00	1.00	1.00
Henslow's Sparrow - <i>Ammodramus henslowii</i>	0.14	0.33	0.00	0.00	0.00
Northern Cardinal - <i>Cardinalis cardinalis</i>	0.29	1.00	0.00	0.67	0.00
Rose-breasted Grosbeak - <i>Pheucticus ludovicianus</i>	0.00	0.00	0.00	0.17	0.00
Indigo Bunting - <i>Passerina cyanea</i>	0.14	0.00	0.00	0.17	0.00
Dickcissel - <i>Spiza americana</i>	1.00	1.00	1.00	1.00	1.00
Red-winged Blackbird - <i>Agelaius phoeniceus</i>	1.00	0.33	1.00	0.50	0.33
Eastern Meadowlark - <i>Sturnella magna</i>	1.00	1.00	1.00	1.00	1.00
Brown-headed Cowbird - <i>Molothrus ater</i>	1.00	1.00	1.00	1.00	1.00
Orchard Oriole - <i>Icterus spurius</i>	0.14	0.00	0.00	0.17	0.67
Baltimore Oriole - <i>Icterus galbula</i>	0.00	0.00	0.00	0.17	0.00
blackbird sp. - <i>Icteridae</i> sp.	0.43	0.00	0.00	0.33	0.00
American Goldfinch - <i>Spinus tristis</i>	0.29	0.33	0.00	0.33	0.33

Appendix D: Fort Riley, Kansas, point count data summary

Species	Individuals Detected	Detection Rate (%)
Northern Bobwhite (<i>Colinus virginianus</i>)	25	70.0
Greater Prairie-Chicken (<i>Tympanuchus cupido</i>)	1	3.3
Cooper's Hawk (<i>Accipiter cooperii</i>)	2	6.7
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	1	3.3
Killdeer (<i>Charadrius vociferus</i>)	3	10.0
Upland Sandpiper (<i>Bartramia longicauda</i>)	42	70.0
Red-necked Phalarope (<i>Phalaropus lobatus</i>)	19	63.3
Rock Pigeon (<i>Columba livia</i>)	5	3.3
Mourning Dove (<i>Zenaida macroura</i>)	15	40.0
Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	2	6.7
Common Nighthawk (<i>Chordeiles minor</i>)	4	6.7
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	2	6.7
Eastern Kingbird (<i>Tyrannus tyrannus</i>)	2	6.7
Bell's Vireo (<i>Vireo bellii</i>)	1	3.3
American Crow (<i>Corvus brachyrhynchos</i>)	17	50.0
Barn Swallow (<i>Hirundo rustica</i>)	72	33.3
Black-capped Chickadee (<i>Poecile atricapillus</i>)	1	3.3
Eastern Bluebird (<i>Sialia sialis</i>)	1	3.3
Gray Catbird (<i>Dumetella carolinensis</i>)	6	10.0
Brown Thrasher (<i>Toxostoma rufum</i>)	3	6.7
Field Sparrow (<i>Spizella pusilla</i>)	3	10.0
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	79	100.0
Northern Cardinal (<i>Cardinalis cardinalis</i>)	4	13.3
Dickcissel (<i>Spiza americana</i>)	100	100.0
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	18	36.7
Eastern Meadowlark (<i>Sturnella magna</i>)	66	96.7
Brown-headed Cowbird (<i>Molothrus ater</i>)	56	60.0
Unidentified Blackbird (Icteridae sp.)	128	50.0
Baltimore Oriole (<i>Icterus galbula</i>)	1	3.3