GREATER SAGE-GROUSE INVENTORY AT DINOSAUR NATIONAL MONUMENT

December 2010

ROCKY MOUNTAIN BIRD OBSERVATORY

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***Mission**: To conserve birds and their habitats*

***Vision**: Native bird populations are sustained in healthy ecosystems*

***Core Values**: (Our goals for achieving our mission)*

1. ***Science** provides the foundation for effective bird conservation.*
2. ***Education** is critical to the success of bird conservation.*
3. ***Stewardship** of birds and their habitats is a shared responsibility.*

RMBO accomplishes its mission by:

***Monitoring** long-term bird population trends to provide a scientific foundation for conservation action.*

***Researching** bird ecology and population response to anthropogenic and natural processes to evaluate and adjust management and conservation strategies using the best available science.*

***Educating** people of all ages through active, experiential programs that create an awareness and appreciation for birds.*

***Fostering** good stewardship on private and public lands through voluntary, cooperative partnerships that create win-win situations for wildlife and people.*

***Partnering** with state and federal natural resource agencies, private citizens, schools, universities, and other non-governmental organizations to build synergy and consensus for bird conservation.*

***Sharing** the latest information on bird populations, land management and conservation practices to create informed publics.*

***Delivering** bird conservation at biologically relevant scales by working across political and jurisdictional boundaries in western North America.*

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Male Greater Sage-Grouse by Bill Schmoker. Used with permission.

Contact Information:

Jason Beason jason.beason@rmbo.org
Rocky Mountain Bird Observatory
39405 Lund Road
Paonia, CO 81428
970.310.5117

EXECUTIVE SUMMARY

Rocky Mountain Bird Observatory conducted surveys for Greater Sage-Grouse and their sign 18 May through 9 August, 2010. The survey was accomplished by conducting area searches in 63 randomly chosen grids (46 primary and 17 secondary) of sagebrush habitat in Dinosaur National Monument of northwest Colorado and northeast Utah. Greater Sage-Grouse were detected twice during our surveys in chosen survey grids. Incidental detections of Greater Sage-Grouse were recorded at seven locations outside of chosen survey grids. Greater Sage-Grouse sign (fecal pellets or klockers) was located in Dinosaur National Monument at 115 locations in or near the chosen survey sites. A secondary goal of this project was to identify areas in Dinosaur National Monument occupied by other sage obligate bird species. We recorded Sage Thrasher in two survey grids, Brewer's Sparrow in 26 survey grids, and Sage Sparrow in four survey grids.

ACKNOWLEDGEMENTS

The National Park Service funded this project through a cooperative agreement with the Rocky Mountain Bird Observatory. This report fulfills requirements in RMBO's contracts with the National Park Service (SC-GRSG-NPS-10).

I would like to thank Cindy Heyd, of the National Park Service, for assistance before and during the project. Rob Sparks, Geographic Information Specialist for the Rocky Mountain Bird Observatory, assisted with study design and created maps of the survey grids. I am extremely grateful to Brian Long and Rebecca Rosenbaum for conducting surveys sometimes in difficult conditions. Much of the success of this project is due to their hard work. I would also like to thank RMBO staff for careful review of this report.

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INTRODUCTION

Greater Sage-Grouse (GRSG) populations are declining throughout their range in the western United States. A recent decision by the U.S. Department of Interior defined the current status of the GRSG as warranted for listing under the Endangered Species Act, but precluded because of limited resources and other listing priorities. In the Colorado Wildlife Action Plan, GRSG is listed as a Species of Greatest Conservation Need and also was chosen by the science forum as a species of most concern for the state (Colorado's Comprehensive Wildlife Conservation Strategy 2006). GRSG currently occupy only 56% of their historical range in the western United States (Schroeder *et al.* 2004). Gunnison Sage-Grouse have lost more than 90% of their historical habitat (Schroeder *et al.* 2004) and in 2006 the species was listed by the Audubon Society as one of the ten most endangered birds in North America. Conserving GRSG, and the sagebrush ecosystem they depend upon, will require cooperation between land management agencies and private landowners throughout their range.

Dinosaur National Monument (DNM) encompasses 210,278 acres in northwest Colorado and northeast Utah. The landscape in DNM is composed of many habitats, with big sagebrush (Artemesia tridentata) a dominant habitat type. The National Park Service (NPS) has conducted habitat improvement projects to enhance the sagebrush habitat in DNM; however, a limited number of wildlife surveys have occurred to determine the impacts of these projects on wildlife such as GRSG. The goal of this project was to determine which areas in DNM are being utilized by GRSG by mapping location of detections and sign. A secondary goal of this project was to map areas occupied by Sage Thrasher, Sage Sparrow, and Brewer's Sparrow to determine which sagebrush stands are occupied by these sage obligate species. These three species were chosen because they are dependent on sagebrush habitat. DNM biologists will be able to use this information to investigate the effects of past habitat projects and decide the best way to proceed with future projects.

METHODS

Site Selection and Protocol

A 1km^2 grid was placed over DNM to define the sampling unit. To select survey sites, RMBO used a NPS Geographic Information System (GIS) landcover layer to identify priority sagebrush stands. From these, we created primary and secondary strata. The primary stratum was defined as having 60 percent or greater of the grid comprised of sagebrush, while the secondary stratum was comprised of 40 to 59 percent sagebrush. We selected 51primary stratum samples and 40 secondary stratum samples using a spatially balanced sampling algorithm in program R (R Development Core Team 2010). The 1km^2 grid was then divided into four 500 meter grids to allow for a robust occupancy design. The primary grids were prioritized because Greater Sage-Grouse are more likely to be located in areas with higher percentages of sagebrush cover. In each of the samples, four area searches were conducted, one per 500 meter grid (Figure 1). The area searches were conducted for 30 minutes in each 500 meter grid. If observers felt that a selected grid was not quality habitat for Sage Grouse after the first visit, the grid was dropped from the survey. In several instances grids were dropped because of access difficulties. To navigate to each grid observers used hand held GPS units, maintaining a distance of at least 250 meters from the center while traversing the grid. We attempted to survey each grid three times during the course of the season. The second visit to each grid did not take place until each grid was completed in order to maximize time between visits. Each grid was then surveyed twice before third visits were initiated.

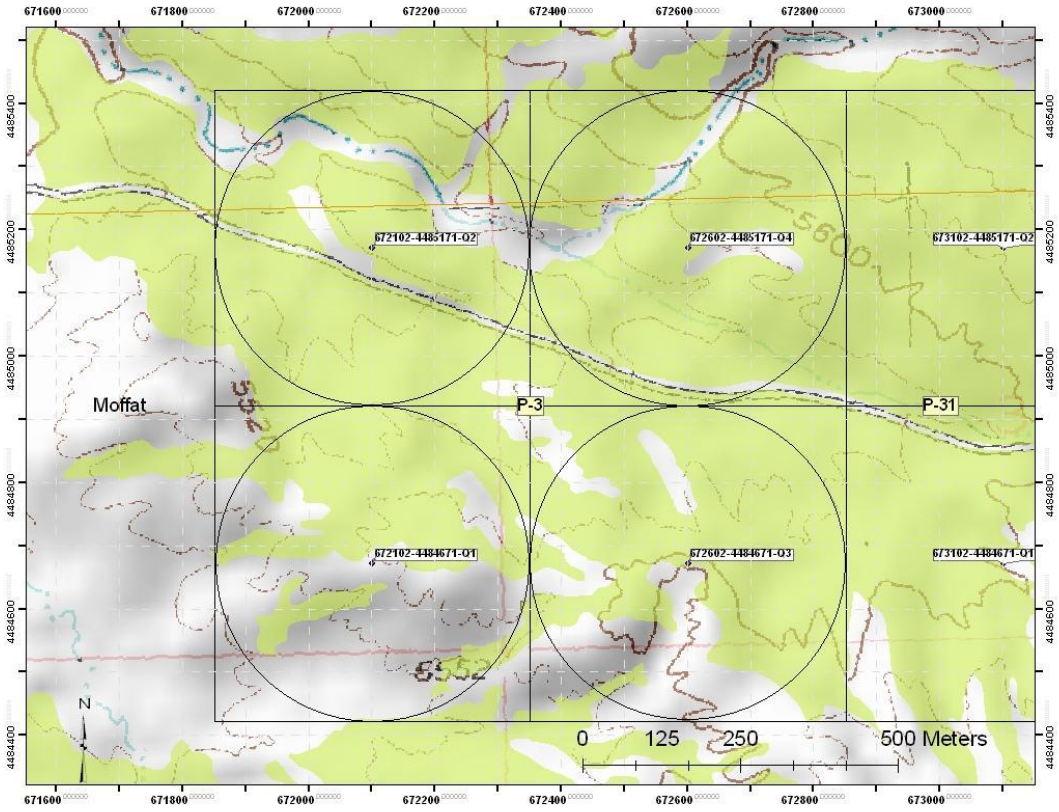

Figure 1. Example of 1 Km^2 grid design for Greater Sage-Grouse survey in Dinosaur National Monument.

The fraction of sampling units in a landscape where a target species is present (occupancy) is an extensively used concept in ecology. Yet in many applications the species will not always be detected in a sampling unit even when present, resulting in biased estimates of occupancy. Given that sampling units are surveyed repeatedly within a relatively short time frame, a number of similar methods have now been developed to provide unbiased occupancy estimates (Mackenzie and Royle 2005). Mackenzie's standard occupancy model uses likelihood methods to estimate proportion of sites occupied by a species of interest and probabilities of occupancy in a patch or grid can be modeled as a function of patch characteristics such as habitat. Replication of site visits is used to estimate a species' detection probability, the probability that a species will be detected given that the species inhabits the area of interest (Mackenzie et al. 2006). We anticipated that the number of GRSG detections would be low and decided that a total of three visits to each grid would be required.

As observers surveyed selected grids the ultimate goal was to detect GRGS; however, locations of all GRSG sign (droppings, cecal casts, and klockers) were recorded when encountered. Differentiating GRSG droppings from Dusky Grouse droppings was done by crushing fecal pellets to determine if they consisted of sage. If a sage odor was not detected the dropping was assumed to belong to Dusky Grouse. The same applied to klockers; they were broken apart and if no sage odor was detected it was assumed to be a Dusky Grouse klocker.

To determine which areas were occupied by other sagebrush obligate bird species, RMBO recorded their presence during each half-hour area search. The species were recorded as present or absent if seen or heard in each 1km^2 grid.

Surveys were conducted by two RMBO seasonal staff dedicated specifically to this project. Both field workers had previous experience conducing bird surveys when they were hired for this project. A training session was held 17 and 18 May to ensure that surveyors were able to identify GRSG sign, GRSG vocalizations, and to ensure that field surveyors had a complete understanding of the survey protocol. Surveyors were also made familiar with vocalizations of Sage Thrasher, Brewer's Sparrow, and Sage Sparrow at the training session.

RESULTS

RMBO surveyed 63 grids in DNM between 18 May and 9 August, 2010 (Figure 2; Appendix A). A total of 46 primary survey grids (Figure 3) and 17 secondary survey grids (Figure 4) were surveyed.

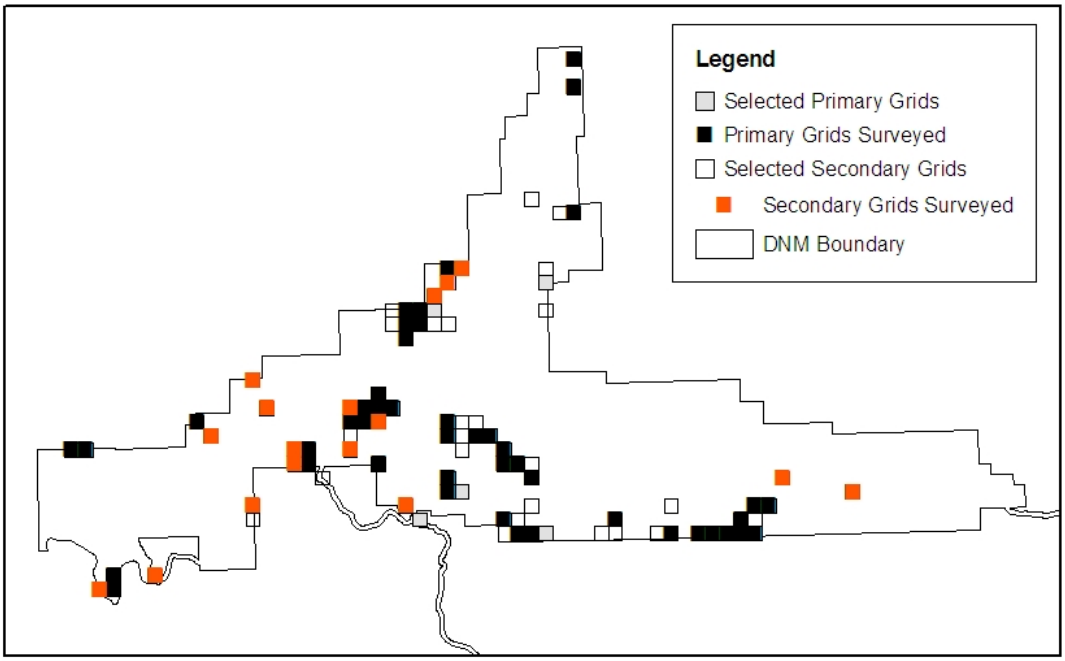

Figure 2. Primary and secondary grids where surveys were conducted.

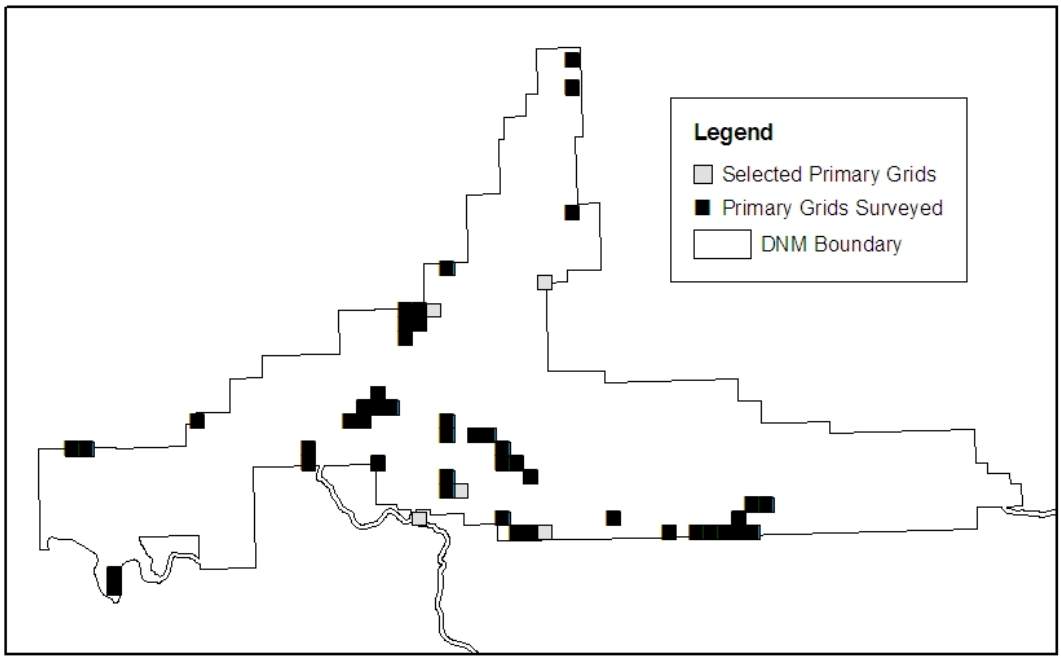

Figure 3. Locations of selected and surveyed primary grids in DNM.

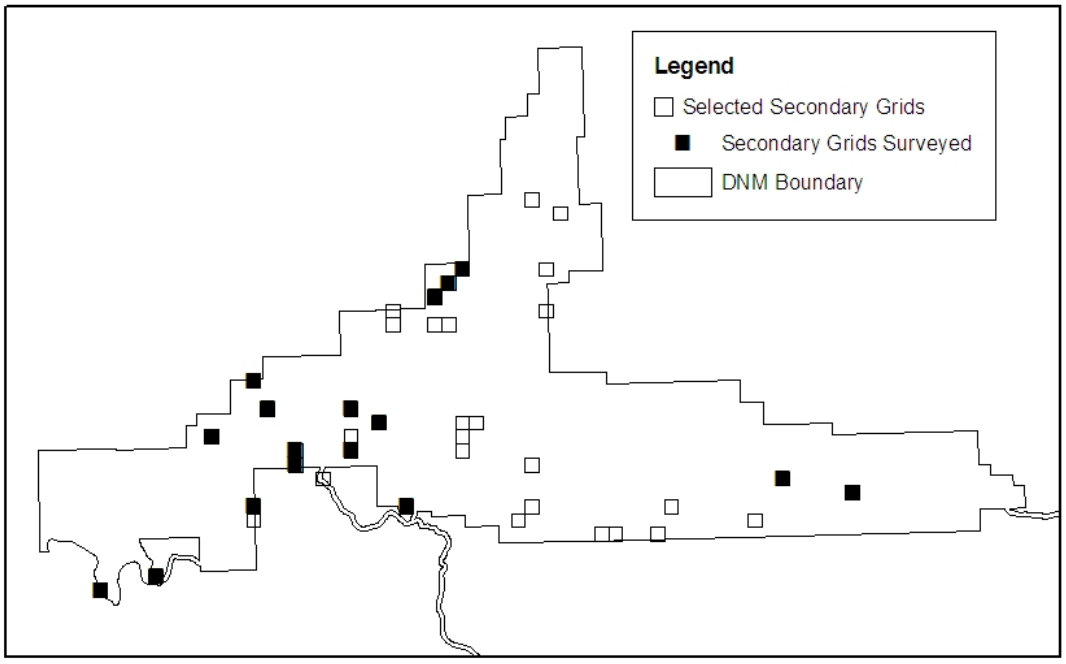

Figure 4. Locations of selected and surveyed secondary grids in DNM.

GRSG were detected in two survey grids and incidental detections were recorded at six locations in Dinosaur National Monument (Figure 5; Appendix B). The survey grids where GRSG were detected were the grids labeled P14 and P22 in the south-central section of DNM. Four of the incidental detections occurred along the Harpers Corner Road in DNM. One incidental detection consisted of an adult hen GRSG with brood found dead along US Highway 40 west of Dinosaur, Colorado in Utah on 19 July. Another hen with brood was detected on 1 August along the Harpers Corner Road.

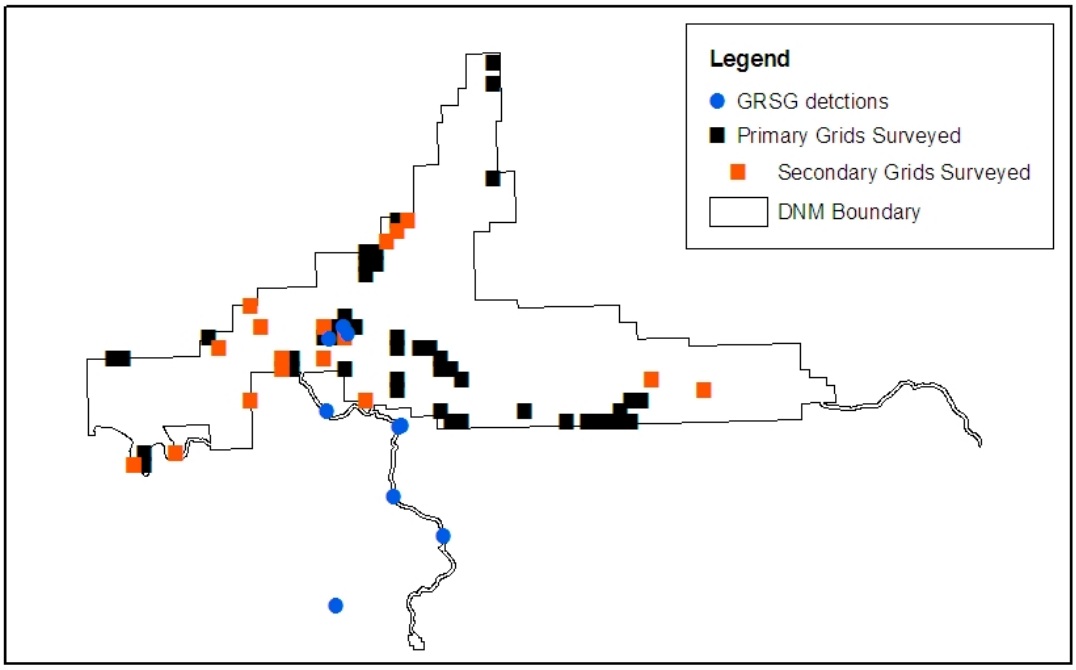

Figure 5. Locations of GRSG detections in and near DNM, 2010.

GRSG droppings were found and collected at 104 locations in 22 of the chosen survey grids (Figure 6; Appendix C). All of these droppings were found in primary grids except 14 were discovered in three secondary survey grids and five droppings were discovered outside of survey grids and included in this report. GRSG klockers were found at six locations in three primary survey grids (Figure 7; Appendix C). Klockers are considered physiological evidence of breeding because they are deposited by incubating or brooding females only. They are the result of female grouse storing fecal matter while spending long periods of time on the nest.

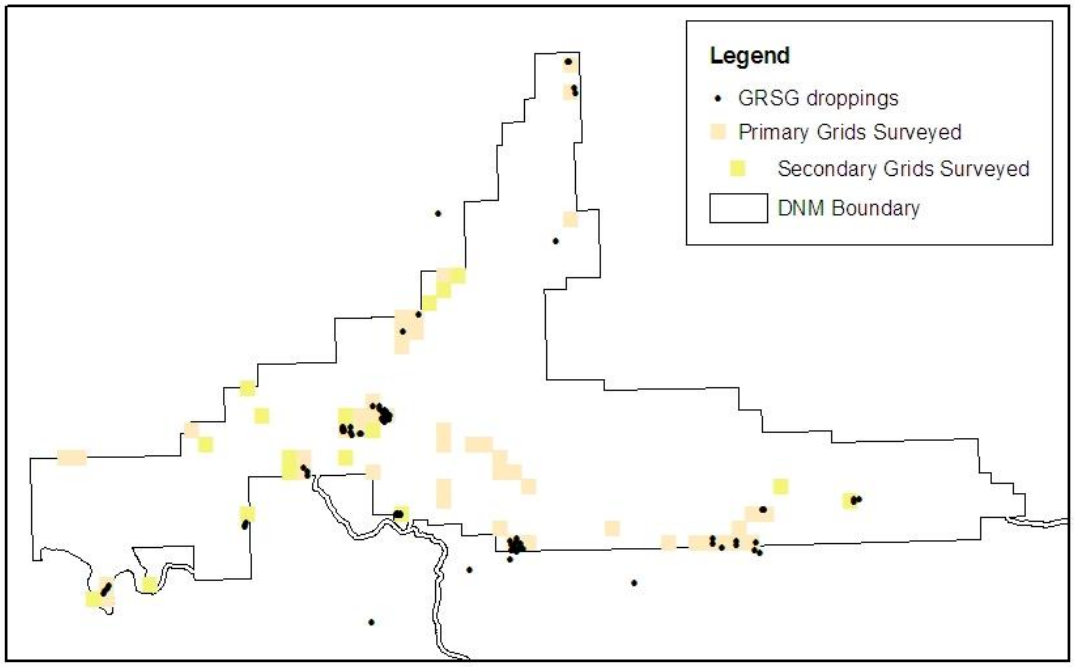

Figure 6. Locations of GRSG droppings in and near DNM, 2010.

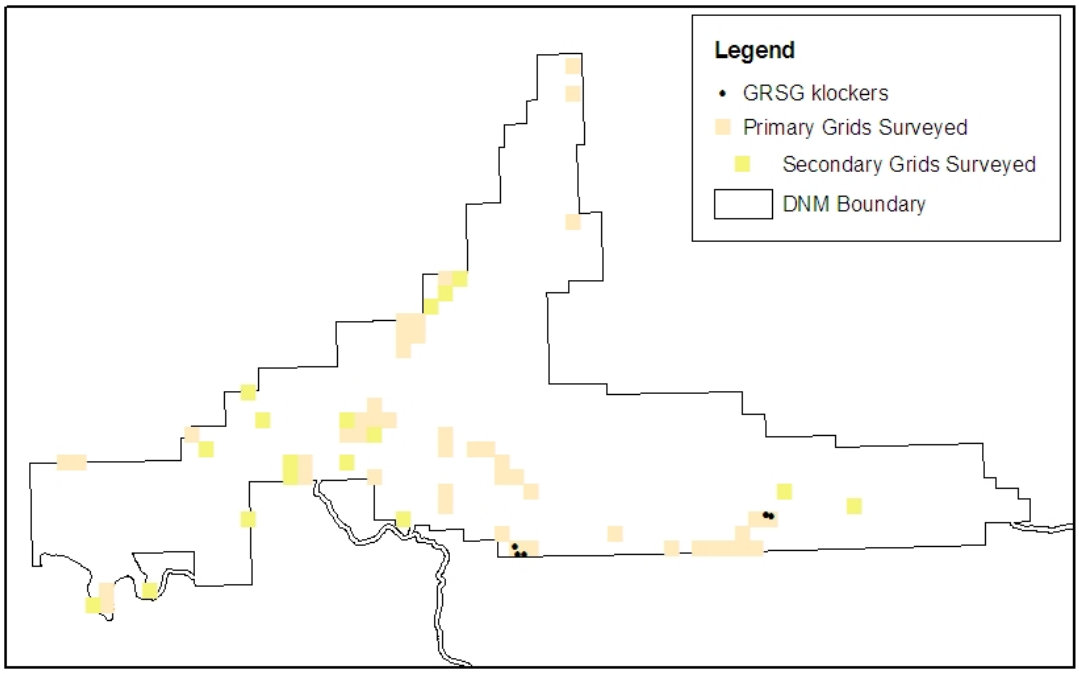

Figure 7. Locations of GRSG klockers in DNM, 2010.

Other targeted sage obligate bird species (Sage Thrasher, Brewer's Sparrow, and Sage Sparrow) were discovered in 27 primary survey grids and one secondary survey grid

(Appendix D). Sage Thrashers were detected in four primary survey grids (Figure 8) and Sage Sparrows were found in four primary survey grids (Figure 9). Sage Thrashers or Sage Sparrows were not located in secondary grids. We found Brewer's Sparrows in 25 primary survey grids and one secondary survey grid (Figure 10).

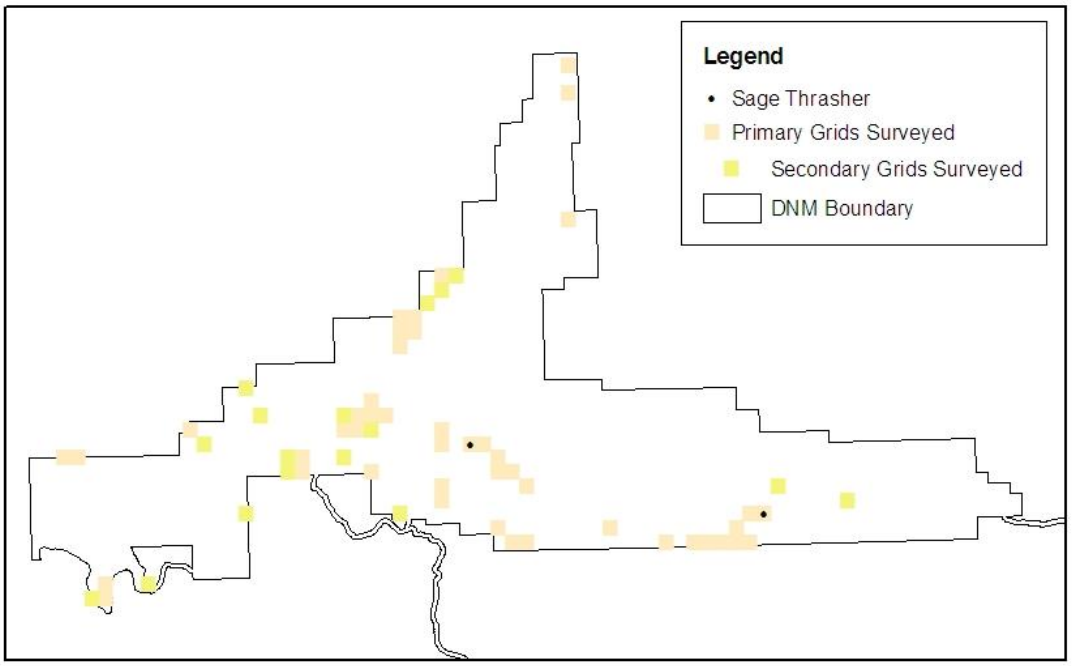

Figure 8. Survey grids with detections of Sage Thrasher in DNM, 2010.

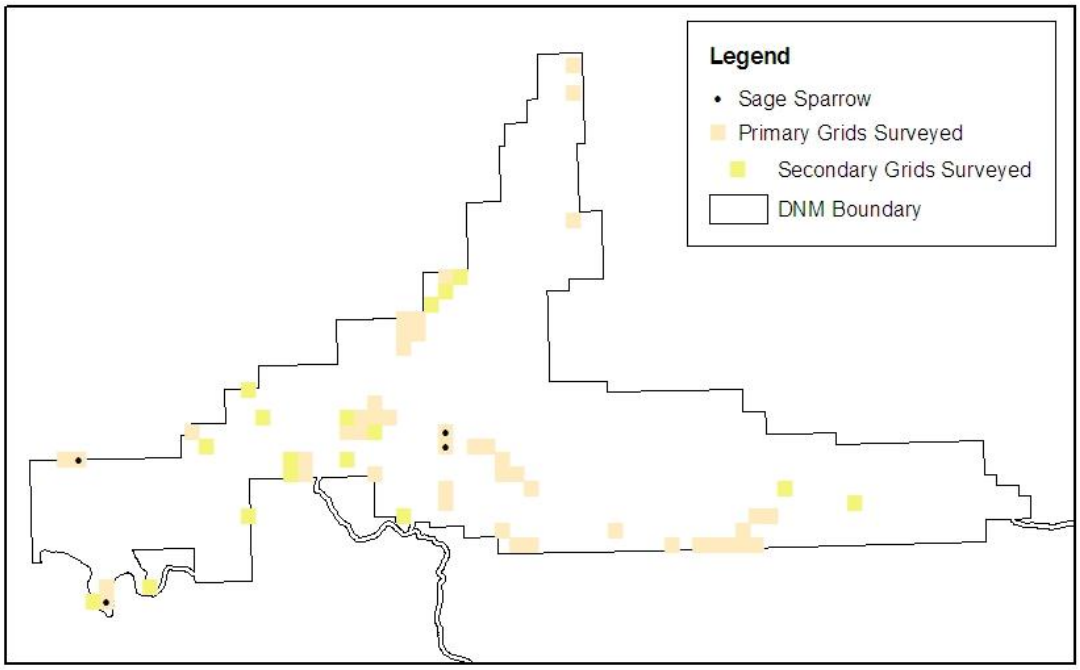

Figure 9. Survey grids with detections of Sage Sparrow in DNM, 2010.

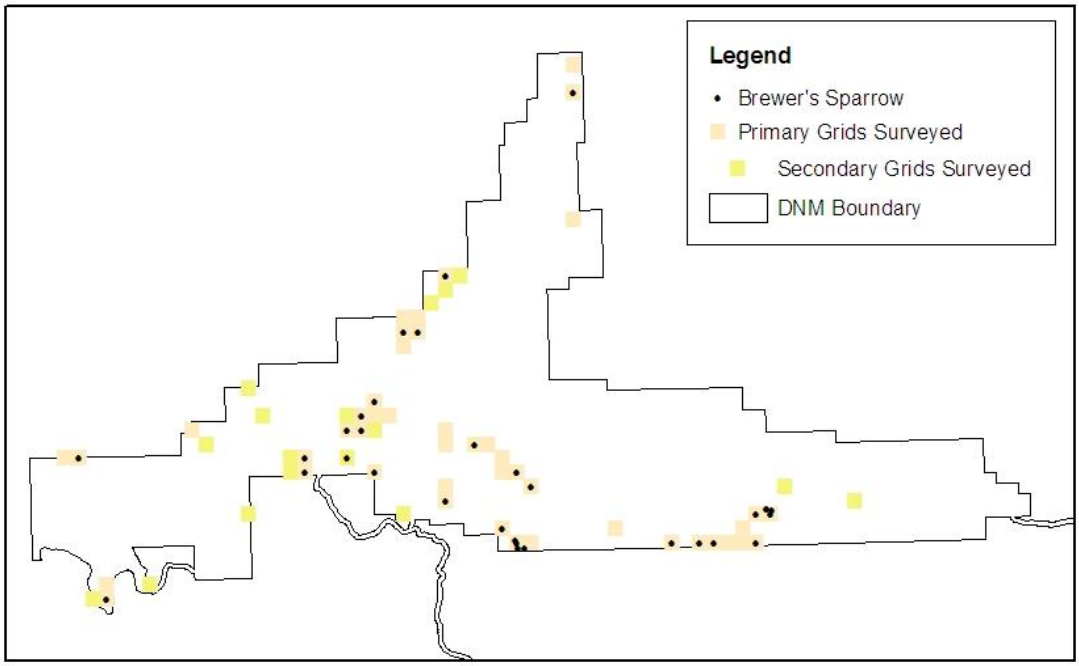

Figure 10. Survey grids with detections of Brewer's Sparrow in DNM, 2010.

DISCUSSION AND RECOMMENDATIONS

The NPS has expressed interest in continuing surveys for GRSG in DNM. If surveys continue we recommend sampling sage stands in the monument not surveyed in 2010. We recommend beginning surveys earlier in the year, possibly as early as late-March when lekking behavior could begin. Locating and protecting lek sites in DNM is very important for GRSG conservation in DNM. We attempted to visit each survey grid three times in order to determine a population size for GRSG in DNM. We originally believed that we would be able to detect sufficient numbers of GRSG to accomplish this. However, surveying each grid three times resulted in not being able to visit every sagebrush stand that exists in DNM. We believe that future survey efforts should involve just one visit to selected survey grids in order to survey more area. Most likely, detecting sufficient numbers of GRSG to estimate a population size will not be possible unless surveys take place during the lekking period. Also, more data could be gathered for other sage obligate species if more area is covered in one season. We would also like to recommend that a point-count survey take place before each area search to provide better information for other bird species occupying sagebrush habitat in DNM.

We recommend that the Colorado Division of Wildlife be contacted to explore the possibility of a GRSG telemetry study. Even though it is an expensive endeavor, tracking GRSG using telemetry methods would provide detailed location information and provide insight into which areas are occupied during specific times of the year.

Some populations of GRSG migrate between summer and winter ranges and it is possible that many of the GRSG that occupy DNM do not remain in the monument year-round (Schroeder et al. 1999). In order to conserve GRSG in DNM the NPS will need to manage GRSG cooperatively with the Bureau of Land Management and the adjacent private landowners. RMBO Stewardship Division staff and Natural Resource Conservation Service biologists are available to conduct site visits to assist landowners who would like to learn about conservation programs available for GRSG on private property.

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Appendix A. Center Point UTMs[1] for primary (P) and secondary grids (S) selected for surveys in Dinosaur National Monument, whether or not grid was surveyed, and number of visits, 2010.

Grid Label	Zone	Easting	Northing	Surveyed	Number of Visits
P1	12	643352	4483921	yes	2
P2	12	674352	4483921	yes	3
P3	12	672352	4484921	yes	3
P4	12	691352	4477921	yes	3
P5	12	660352	4483921	yes	2
P6	12	674352	4478921	yes	1
P7	12	670352	4485921	yes	3
P8	12	693352	4479921	yes	3
P9	12	646352	4473921	yes	3
P10	12	682352	4478921	yes	1
P11	12	667352	4492921	yes	1
P12	12	679352	4500921	yes	1
P13	12	670352	4480921	yes	1
P14	12	665352	4486921	yes	3
P15	12	689352	4477921	yes	2
P16	12	668352	4493921	yes	1
P17	12	652352	4485921	yes	3
P18	12	677352	4477921	no	-
P19	12	665352	4487921	yes	3
P20	12	679352	4511921	yes	3
P21	12	670352	4481921	yes	3
P22	12	664352	4485921	yes	-
P23	12	668352	4492921	yes	1
P24	12	677352	4495921	no	-
P25	12	668352	4478921	no	-
P26	12	664352	4486921	yes	3
P27	12	688352	4477921	yes	2
P28	12	669352	4493921	no	-
P29	12	644352	4483921	yes	2
P30	12	676352	4477921	yes	2
P31	12	673352	4484921	yes	3
P32	12	691352	4478921	yes	1
P33	12	671352	4480921	no	-
P34	12	663352	4485921	yes	3
P35	12	686352	4477921	yes	2
P36	12	667352	4493921	yes	1
P37	12	675352	4482921	yes	3
P38	12	666352	4486921	yes	3

Grid Label	Zone	Easting	Northing	Surveyed	Number of Visits
P39	12	690352	4477921	yes	3
P40	12	670352	4496921	yes	1
P41	12	660352	4482921	yes	2
P42	12	675352	4477921	yes	2
P43	12	670352	4484921	yes	3
P44	12	692352	4479921	yes	3
P45	12	646352	4474921	yes	3
P46	12	676352	4481921	yes	3
P47	12	667352	4491921	yes	1
P48	12	679352	4509921	yes	3
P49	12	674352	4482921	yes	3
P50	12	665352	4482921	yes	3
P51	12	692352	4477921	yes	3
P52	12	725352	4475921	no	-
S1	12	653352	4484921	yes	2
S2	12	661352	4481921	no	-
S3	12	675352	4478921	no	-
S4	12	666352	4493921	no	-
S5	12	656352	4478921	no	-
S6	12	657352	4486921	yes	1
S7	12	676352	4482921	no	-
S8	12	656352	4488921	yes	1
S9	12	663352	4484921	no	-
S10	12	685352	4477921	no	-
S11	12	671352	4483921	no	-
S12	12	671352	4496921	yes	1
S13	12	663352	4486921	yes	1
S14	12	694352	4481921	yes	1
S15	12	699352	4480921	yes	2
S16	12	677352	4493921	no	-
S17	12	656352	4479921	yes	1
S18	12	645352	4473921	yes	1
S19	12	671352	4485921	no	-
S20	12	678352	4500921	no	-
S21	12	665352	4485921	yes	2
S22	12	681352	4477921	no	-
S23	12	669352	4494921	yes	1
S24	12	670352	4492921	no	-
S25	12	649352	4474921	yes	3
S26	12	659352	4482921	yes	1

Grid Label	Zone	Easting	Northing	Surveyed	Number of Visits
S27	12	676352	4479921	no	-
S28	12	669352	4492921	no	-
S29	12	663352	4483921	yes	2
S30	12	692352	4478921	no	-
S31	12	671352	4484921	no	-
S32	12	676352	4501921	no	-
S33	12	667352	4479921	yes	2
S34	12	686352	4479921	no	-
S35	12	672352	4485921	no	-
S36	12	677352	4496921	no	-
S37	12	659352	4483921	yes	1
S38	12	682352	4477921	no	-
S39	12	666352	4492921	no	-
S40	12	670352	4495921	yes	1

[1] NAD 83 projection

Appendix B. Locations of Greater Sage Grouse detections in and near Dinosaur National Monument, 2010[1].

Date	Grid Label	Zone	Easting	Northing	Notes
5/18/2010	Incidental	12	669986	4470872	one hen
5/19/2010	P14	12	665237	4486853	one hen
6/6/2010	Incidental	12	665573	4486236	one grouse (not identified to sex)
7/15/2010	Incidental	12	670655	4477542	one grouse (not identified to sex)
7/17/2010	Incidental	12	674694	4467095	one grouse (not identified to sex)
7/19/2010	Incidental	12	664488	4460595	one hen with brood found dead
7/20/2010	P22	12	663812	4485729	one grouse (not identified to sex)
7/27/2010	Incidental	12	670370	4477492	one grouse (not identified to sex)
8/1/2010	Incidental	12	663551	4478967	one hen with three young

[1]UTMs are NAD 83 projection

Appendix C. Locations of Greater Sage Grouse fecal pellets and klockers in or near Dinosaur National Monument, 2010[1].

Grid Label	Zone	Easting	Northing	Type
P4	12	690146	4477657	Dropping
P4	12	691163	4478072	Dropping
P4	12	691199	4477850	Dropping
P4	12	692540	4477394	Dropping
P5	12	660326	4483350	Dropping
P5	12	660626	4483069	Dropping
P8	12	693033	4480351	Klocker
P8	12	693072	4480355	Dropping
P8	12	693079	4480355	Dropping
P8	12	693084	4480355	Klocker
P8	12	693163	4480362	Dropping
P8	12	693188	4480283	Dropping
P8	12	693189	4480283	Dropping
P8	12	693432	4480272	Klocker
P9	12	646086	4474319	Dropping
P11	12	667416	4493030	Dropping
P12	12	678339	4499439	Dropping
P15	12	689484	4477872	Dropping
P15	12	689551	4478291	Dropping
P19	12	665349	4487686	Dropping
P19	12	665816	4487459	Dropping
P19	12	666178	4486987	Dropping
P20	12	679233	4512162	Dropping
P20	12	679254	4512171	Dropping
P20	12	679266	4512173	Dropping
P22	12	663791	4485660	Dropping
P22	12	664424	4485715	Dropping
P22	12	664448	4485691	Dropping
P23	12	668573	4494205	Dropping
P30	12	675857	4477861	Dropping
P30	12	675877	4477598	Dropping
P30	12	675916	4477559	Klocker
P30	12	676005	4477534	Dropping
P34	12	663144	4485961	Dropping
P34	12	663154	4486053	Dropping
P34	12	663166	4486014	Dropping
P34	12	663170	4486108	Dropping
P34	12	663179	4486126	Dropping

Grid Label	Zone	Easting	Northing	Type
P34	12	663179	4486126	Dropping
P34	12	663188	4486191	Dropping
P34	12	663192	4486150	Dropping
P34	12	663205	4486022	Dropping
P34	12	663215	4485991	Dropping
P34	12	663224	4485910	Dropping
P34	12	663730	4486182	Dropping
P34	12	663749	4485823	Dropping
P38	12	665733	4487691	Dropping
P38	12	665937	4486825	Dropping
P38	12	665985	4486747	Dropping
P38	12	665991	4487288	Dropping
P38	12	666010	4486702	Dropping
P38	12	666137	4487111	Dropping
P38	12	666145	4487384	Dropping
P38	12	666159	4486556	Dropping
P38	12	666185	4486677	Dropping
P38	12	666201	4487351	Dropping
P38	12	666214	4486745	Dropping
P38	12	666242	4487279	Dropping
P38	12	666256	4487179	Dropping
P38	12	666257	4487024	Dropping
P38	12	666258	4487010	Dropping
P38	12	666258	4487008	Dropping
P38	12	666296	4487156	Dropping
P38	12	666322	4487055	Dropping
P38	12	666375	4486822	Dropping
P38	12	666380	4487030	Dropping
P38	12	666381	4486788	Dropping
P38	12	666411	4486918	Dropping
P38	12	666418	4486788	Dropping
P38	12	666419	4486778	Dropping
P38	12	666426	4486785	Dropping
P38	12	666440	4486785	Dropping
P38	12	666444	4486935	Dropping
P38	12	666445	4486841	Dropping
P38	12	666520	4487025	Dropping
P41	12	660679	4482781	Dropping
P42	12	675045	4478047	Dropping
P42	12	675143	4477857	Dropping

Grid Label	Zone	Easting	Northing	Type
P42	12	675165	4477451	Dropping
P42	12	675178	4477475	Dropping
P42	12	675269	4478130	Klocker
P42	12	675349	4477538	Dropping
P42	12	675449	4477500	Klocker
P42	12	675480	4477455	Dropping
P42	12	675483	4477901	Dropping
P42	12	675513	4478321	Dropping
P42	12	675528	4478130	Dropping
P42	12	675563	4477312	Dropping
P42	12	675654	4477507	Dropping
P45	12	646242	4474552	Dropping
P45	12	646408	4474773	Dropping
P45	12	646503	4474887	Dropping
P48	12	679624	4510355	Dropping
P48	12	679713	4509950	Dropping
P51	12	692638	4478036	Dropping
P51	12	692900	4477250	Dropping
S15	12	699603	4480902	Dropping
S15	12	699622	4481080	Dropping
S15	12	699964	4481043	Dropping
S17	12	656144	4479135	Dropping
S17	12	656167	4479193	Dropping
S17	12	656278	4479384	Dropping
S33	12	666973	4480072	Dropping
S33	12	667029	4479953	Dropping
S33	12	667053	4479949	Dropping
S33	12	667062	4480077	Dropping
S33	12	667075	4479969	Dropping
S33	12	667248	4479979	Dropping
S33	12	667277	4479973	Dropping
S33	12	667294	4480018	Dropping
Incidental	12	665232	4472320	Dropping
Incidental	12	669956	4501417	Dropping
Incidental	12	672220	4476036	Dropping
Incidental	12	675111	4476773	Dropping
Incidental	12	683931	4475101	Dropping

[1]UTMs in NAD 83 projection

Appendix D. Center point UTMs for survey grids with detections of Sage Thrasher, Brewer's Sparrow, and Sage Sparrow in Dinosaur National Monument, 2010[1].

Grid Label	Sage Thrasher	Brewer's Sparrow	Sage Sparrow	Zone	Easting	Northing
P3	Present	Present		12	672352	4484921
P5		Present		12	660352	4483921
P6		Present		12	674352	4478921
P7			Present	12	670352	4485921
P8	Present	Present		12	693352	4479921
P9		Present	Present	12	646352	4473921
P11		Present		12	667352	4492921
P13		Present		12	670352	4480921
P15		Present		12	689352	4477921
P19		Present		12	665352	4487921
P22		Present		12	664352	4485921
P23		Present		12	668352	4492921
P26		Present		12	664352	4486921
P27		Present		12	688352	4477921
P29		Present	Present	12	644352	4483921
P34		Present		12	663352	4485921
P35		Present		12	686352	4477921
P37		Present		12	675352	4482921
P40		Present		12	670352	4496921
P41		Present		12	660352	4482921
P42		Present		12	675352	4477921
P43			Present	12	670352	4484921
P44		Present		12	692352	4479921
P46		Present		12	676352	4481921
P48		Present		12	679352	4509921
P50		Present		12	665352	4482921
P51		Present		12	692352	4477921
S29		Present		12	663352	4483921

[1]UTMs in NAD 83 projection