



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2014 Work Plan

Date of Report: 5 May 2014
Date of Next Status Update Report: 31 December 2015
Date of Work Plan Approval:
Project Completion Date: 30 June 2017
Does this submission include an amendment request? No

PROJECT TITLE: Sandhill Crane Populations and Management in Minnesota

Project Manager: David E. Andersen
Organization: U.S. Geological Survey, MN Cooperative Fish and Wildlife Research Unit, University of Minnesota.
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Location: Becker, Beltrami, Cass, Clearwater, Crow Wing, Hubbard, Morrison, Todd, Wadena

Total ENRTF Project Budget:	ENRTF Appropriation:	\$250,000
	Amount Spent:	\$0
	Balance:	\$250,000

Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 05h

Appropriation Language:

\$250,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to delineate population boundaries, habitat use relative to crop depredation, and migration patterns and survival of Minnesota's two populations of sandhill cranes, Mid-continent and Eastern. This appropriation is available until June 30, 2017, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Sandhill Crane Populations and Management in Minnesota

II. PROJECT STATEMENT

Sandhill cranes (*Grus canadensis*) are considered to be an important part of Minnesota's natural heritage, and although they have expanded their breeding range in Minnesota, they remain a species of management concern. Minnesota supports 2 populations of sandhill cranes– the Mid-continent Population that breeds and migrates through northwestern Minnesota, and the Eastern Population that breeds and migrates throughout much of the remainder of the state. Minnesota initiated a sandhill crane hunting season on Mid-continent Population cranes in 2010, and Eastern Population cranes are currently hunted in Kentucky and Tennessee. Several other eastern states are currently considering initiating sandhill crane hunting seasons on Eastern Population cranes, and Mid-continent Population cranes are currently hunted in much of the central U.S. and Canada. Current information on population distribution and migration patterns of sandhill cranes that breed in Minnesota is insufficient for projecting the impact of current and future hunting seasons, and for making informed management decisions in Minnesota. In addition, sandhill crane crop depredation complaints have increased exponentially over the last 10 years in some locations in Minnesota and complaints will continue to grow with increasing crane populations. Wildlife managers in the state require a better understanding of crane movements and what cranes (e.g., breeders or non-breeders) are responsible for the damage to address this growing problem.

A 2012 survey estimated there were 7,200 Mid-continent Population sandhill cranes in northwestern Minnesota during the breeding season. How many Eastern Population sandhill cranes breed in Minnesota is not known; recent surveys have tallied > 75,000 Eastern Population cranes on fall staging areas. The size of the Eastern Population of sandhill cranes has increased significantly in the past 15-20 years, and Eastern Population sandhill cranes have expanded their breeding range during that period in Minnesota. As crane numbers increase, conflicts between cranes and agriculture will also increase, and there will be additional interest in hunting cranes more broadly across Minnesota and the eastern U.S. However, management options in Minnesota are currently limited because the boundary between Mid-continent Population and Eastern Population cranes is not clearly delineated. Furthermore, additional information concerning how and where cranes depredate crops and how cranes use habitat at local and landscape scales is required to effectively manage sandhill cranes in Minnesota. By using cutting-edge GPS-cell transmitters (or satellite PTTs in the event that GPS-cell transmitter technology is insufficient), we aim to help fill in these important information gaps. Specifically, we propose to address the following goals and objectives:

1. Delineate the boundary between Mid-continent and Eastern Population sandhill cranes in Minnesota, allowing these populations to be more effectively managed as separate units.
2. Determine spatial patterns in the use of agricultural crops, grazed and ungrazed grasslands, and wetland habitats by cranes, thereby improving our ability to determine appropriate management actions, including steps necessary to address depredation issues.
3. Evaluate year-round movement patterns (e.g., migration) and survival of Minnesota sandhill cranes.

III. PROJECT STATUS UPDATES:

Project Status as of 31 December 2014:

Project Status as of 31 March 2015:

Project Status as of 31 December 2015:

Project Status as of 31 March 2016:

Status as of 31 December 2016:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Mark 45 sandhill cranes with GPS-cell transmitters in Minnesota

Description: We propose to mark 60 (15 in 2014 and 30 in 2015 plus 15 additional cranes to be marked with cooperator funds prior to receiving Environmental and Natural Resources Trust Fund funding) sandhill cranes along the presumed boundary between MCP and EP cranes in Minnesota with GPS-cell transmitters (or satellite PTTs in the event that GPS-cell transmitter technology is insufficient).

We will capture adult sandhill cranes that are paired during May-August using bait and rocket nets, nest traps, net guns, and/or night-lighting. We will measure morphological characteristics and collect a blood sample for each crane captured and equipped with a transmitter. We will use established procedures to determine sex of captured cranes based on analysis of DNA in blood samples. We will mark all birds captured with a U.S. Geological Survey, Bird Banding Laboratory (BBL) size 8, 1-800, aluminum, butt-end band. We will affix a Cellular Tracking Technologies™ solar-powered GPS transmitter (or satellite PTTs in the event that GPS-cell transmitter technology is insufficient) to the upper tarsus of the smaller individual of the pair, which is the presumed female.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 167,029
Amount Spent: \$ 0
Balance: \$ 167,029

Activity Completion Date: August 2015

Outcome	Completion Date	Budget
1. Mark 15 (plus 15 with cooperator funds for a total of 30) sandhill cranes along presumed boundary in 2014	August 2014	\$ 51,163
2. Mark 30 sandhill cranes along boundary in 2015	August 2015	\$ 115,866

Activity Status as of 31 December 2014:

Activity Status as of 31 March 2015:

Activity Status as of 31 December 2015:

Activity Status as of 15 March 2016:

Status as of 31 December 2016:

Final Report Summary:

ACTIVITY 2: Acquire movement and habitat data for radio-marked cranes

Description: Beginning with transmitter deployment in 2014, we propose to acquire high-resolution location data for sandhill cranes breeding in Minnesota, and evaluate local and regional movements and habitat use.

The GPS transmitters will record and save GPS locations several times each day and can be programmed to record locations at different intervals throughout the day and at different times of the year. The data are uploaded using cellular phone technology (or satellite PTTs in the event that GPS-cell transmitter technology is insufficient) when the bird is within range of a cellular phone tower. Data can be saved for several weeks if the bird is outside the range of a cell tower. The transmitters will be programmed to last for a minimum of 2 seasons.

We will fit statistical models to the location data to describe seasonal movement and habitat use patterns. In particular, we will compare use and availability of different habitat types (agricultural crops, grazed and

ungrazed grasslands, wetlands) as an index of habitat selection or preference. We will map migration pathways and fit movement models or movement-based home range estimators (e.g., Brownian Bridges) to summarize local movement patterns.

We will assess land-cover abundance and distribution based on a combination of existing land-cover data (e.g., data available through the MN Department of Natural Resources Data Deli [<http://deli.dnr.state.mn.us/>], U.S. Department of Agriculture National Agriculture Imagery Program) and local surveys in areas used by radio-marked sandhill cranes. We will use these data, along with high-resolution movement data derived from marked cranes, to identify patterns in use of agricultural crops by Minnesota sandhill cranes.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 82,971
Amount Spent: \$ 0
Balance: \$ 82,971

Activity Completion Date: December 2016

Outcome	Completion Date	Budget
1. Acquire high-resolution GPS data for marked cranes	August 2016	\$ 50,443
2. Acquire data regarding local habitat (including distribution of agricultural crops)	October 2016	\$ 16,265
3. Assess habitat use and patterns of crop depredation	December 2016	\$ 16,263

Activity Status as of 31 December 2014:

Activity Status as of 31 March 2015:

Activity Status as of 31 December 2015:

Activity Status as of 15 March 2016:

Status as of 31 December 2016:

Final Report Summary:

V. DISSEMINATION:

Description: Results will be summarized in a Master of Science thesis and peer-reviewed publications. One or more presentations will be given at appropriate professional conferences (e.g., The Wildlife Society’s Annual Meeting, Minnesota Chapter of The Wildlife Society Annual Meeting). We also propose to make crane location data available via a website accessible to the general public once location data begin to be collected as part of this project

Status as of 31 December 2014:

Status as of 31 March 2015:

Status as of 31 December 2015:

Status as of 15 March 2016:

Status as of 31 December 2016:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Explanation
Personnel:	\$ 98,102	Co-PI salary, M.S. student, technicians
Professional/Technical/Service Contracts:	\$ 29,008	Telemetry data retrieval
Equipment/Tools/Supplies:	\$ 119,500	Telemetry devices, capture supplies
Travel Expenses in MN:	\$ 3,390	Vehicle mileage
TOTAL ENRTF BUDGET:	\$ 250,000	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: N/A

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 1.167

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: N/A

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
MN CFWRU	\$ 30,000	\$ 0	Technician salary, transmitters, supplies
U.S. Geological Survey	\$ 33,222	\$ 0	Technician salary, travel, transmitters, supplies, overhead
U.S. Fish and Wildlife Service	\$ 51,170	\$ 0	Technician salary, travel, transmitters, supplies, data fees, overhead
State			
MN DNR	\$ 25,000	\$ 0	Travel, transmitters
TOTAL OTHER FUNDS:	\$ 139,392	\$ 0	

VII. PROJECT STRATEGY:

A. Project Partners:

This project will be conducted cooperatively through the MN Cooperative Fish and Wildlife Research Unit at the University of MN. Project partners include University of MN principal investigators, MN Department of Natural Resources scientists, and U.S. Fish and Wildlife Service biologists. Funds received from this Environmental and Natural Resources Trust Fund request will be received by the University of MN in an agreement with Drs. Andersen and Fieberg as co-Principal Investigators. Funds contributed from other sources will be used to initiate the project prior to Environmental and Natural Resources Trust Fund funds becoming available in 2014.

David Andersen is Leader of the U.S. Geological Survey, Minnesota Cooperative Fish and Wildlife Research Unit and Adjunct Professor in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. Dr. Andersen has considerable experience conducting field studies of birds, including a current project with EP sandhill cranes. John Fieberg is an Assistant Professor in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. Dr. Fieberg is a quantitative ecologist with experience developing analytical approaches for interpretation of animal movement data. Tom Cooper is the Eastern Webless Migratory Game Bird Biologist for the U.S. Fish and Wildlife Service and an Adjunct Assistant Professor

in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. Dr. Cooper has considerable expertise involving sandhill crane management and biology. Jeff Lawrence is Group Leader of the Wetlands Wildlife and Populations Research Group of the Minnesota Department of Natural Resources, and adjunct Assistant Professor in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. Dr. Lawrence has considerable experience with management of migratory birds, and currently coordinates breeding surveys of MCP sandhill cranes in Minnesota. David Fronczak is a Wildlife Biologist with U.S. Fish and Wildlife Service, Migratory Bird Management. He is also currently a graduate student at the Minnesota Cooperative Fish and Wildlife Research Unit, working on migration ecology of EP sandhill cranes. Mr. Fronczak has considerable experience trapping and attaching satellite transmitters to sandhill cranes.

Project Partners Not Receiving Funds:

- David E. Andersen, U.S. Geological Survey, MN Cooperative Fish and Wildlife Research Unit, University of Minnesota. Dr. Andersen will serve as Project Manager, co-advisor for an M.S. student who will work on the project, and assist in conducting the project. LCCMR funds granted for this project will be administered by the University of Minnesota.
- Jeff S. Lawrence, Minnesota Department of Natural Resources. Dr. Lawrence will assist in conducting the project and serve as liaison with Minnesota Department of Natural Resources staff who will assist with identifying potential study areas.
- Tom Cooper, U.S. Fish and Wildlife Service, Webless Migratory Bird Coordinator. Dr. Cooper will assist in conducting the project and serve as liaison with the U.S. Fish and Wildlife Service, which has management responsibility for migratory birds.
- Dave Fronczak, U.S. Fish and Wildlife Service. Mr. Fronczak has considerable experience capturing and marking sandhill cranes, and will aid in capture and marking cranes in this project.

Project Partners Receiving Funds:

- John Fieberg, University of MN, Department of Fisheries, Wildlife, and Conservation Biology: 1 month summer salary per year x 2 years, 19.83% fringe benefits - \$21,435. Dr. Fieberg will serve as co-advisor for an M.S. student who will work on the project and be involved in project design and execution.

B. Project Impact and Long-term Strategy: Mid-continent Population sandhill cranes are hunted in much of the Central Flyway, and recent data on distribution and abundance of MCP cranes is being used to revise existing harvest management strategies. There is considerable management interest in MCP cranes that breed and migrate through northwest Minnesota, but relatively little is known about their movement patterns and survival. Recently, the Minnesota Department of Natural Resources implemented aerial, spring surveys to provide better information about MCP cranes breeding in Minnesota (J. Lawrence, Minnesota Department of Natural Resources, unpublished report), and tissue samples from MCP cranes harvested in northwest Minnesota and adjacent southern Manitoba are being analyzed to derive breeding origins of harvested cranes (G. Knutson, U.S. Fish and Wildlife Service, personal communication). Information derived from the study we are undertaking will help inform harvest management strategies for MCP cranes by elucidating the extent and movement patterns of MCP cranes that breed in Minnesota.

Eastern Population cranes are currently hunted in the Mississippi Flyway in Tennessee and Kentucky, under a flyway harvest management plan. Other states in the EP range, including states where EP cranes breed (e.g., Michigan, Wisconsin, and Minnesota) may also allow hunting of EP cranes in the future. An ongoing study of migration movements of EP sandhill cranes (D. Fronczak, U.S. Fish and Wildlife Service, personal communication) is elucidating how these cranes move to and from staging and wintering areas, but high-resolution information about habitat use during the breeding season is not a part of that study. The study we are undertaking will provide high-resolution data on habitat use throughout the year for a portion of the EP that breeds in Minnesota, and also provide additional data on movement patterns of EP cranes throughout the year. We also

anticipate adding to the relative paucity of data regarding survival of adult EP sandhill cranes, which can be incorporated into population models that inform management.

Moreover, Minnesota is one of only a few states with >1 population of sandhill cranes breeding within its borders, and both populations of cranes that breed in Minnesota are hunted. Information about how these 2 populations are distributed across the landscape in Minnesota will help inform crane management in the state. Finally, as the EP sandhill crane population has increased, conflicts with agriculture have increased and there are currently approximately 2,000 take permits issued to help manage crop depredation by cranes. Our study has the potential to provide additional information about how, where, and when EP sandhill cranes engage in crop depredation, which in turn could help inform future mitigation policy.

In summary, we are aware of 3 projects that have obvious and direct connections to the work we are undertaking. First, the Minnesota Department of Natural Resources (J. Lawrence, personal communication) has been conducting spring breeding surveys of EP sandhill cranes in northwest Minnesota, with the objective of monitoring the breeding population in the state and quantifying abundance and distribution. Our project will compliment that effort by providing more detailed information about EP cranes that breeding in Minnesota, with special emphasis on the eastern boundary of that population.

Second, an ongoing satellite telemetry study of EP sandhill crane migration behavior (D. Fronczak, U.S. Fish and Wildlife Service, personal communication) is near completion, and will provide information about movement patterns of EP cranes between breeding areas and staging and wintering areas. Our project will add to the results of that study by providing migration data on additional EP cranes, and will also provide high resolution data regarding habitat use during the breeding season in Minnesota.

Finally, a study of stable isotopes in cranes harvested in northwest Minnesota and adjacent southern Manitoba (G. Knutson, U.S. Fish and Wildlife Service, personal communication) is near completion and is attempting to determine the origin of cranes harvested in northwest Minnesota. Our study will provide high-resolution data regarding where MCP cranes that breed in Minnesota occur during the period when they are vulnerable to harvest, which will provide a means of comparison to derivations resulting from isotope analyses.

We expect to be able to meet project objectives during the proposed project period (July 2014 – December 2016) with requested and collaborator funds, and do not anticipate making additional requests to the Environmental and Natural Resources Trust Fund to support this project. We have funds secured and pending to begin this project prior to when Environmental and Natural Resources Trust Fund funds would become available in 2014.

C. Spending History:

Funding Source	M.L. 2013 or FY14
MN Cooperative Fish and Wildlife Research Unit	\$ 20,000
U.S. Geological Survey	\$ 20,000
MN DNR	\$ 5,000
These are estimates based upon available funding and the need to hire crews, purchase transmitters, and begin capturing cranes prior to 1 July 2014	

VIII. ACQUISITION/RESTORATION LIST: N/A

IX. VISUAL ELEMENT or MAP(S): See attached map.

X. ACQUISITION/RESTORATION REQUIREMENTS WORKSHEET: N/A

XI. RESEARCH ADDENDUM: N/A

XII. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than 31 December 2014, 15 March 2015, 31 December 2015, 15 March 2016, and 31 December 2016. A final report and associated products will be submitted between June 30 and August 15, 2017 (final report scheduled for 31 December 2016)

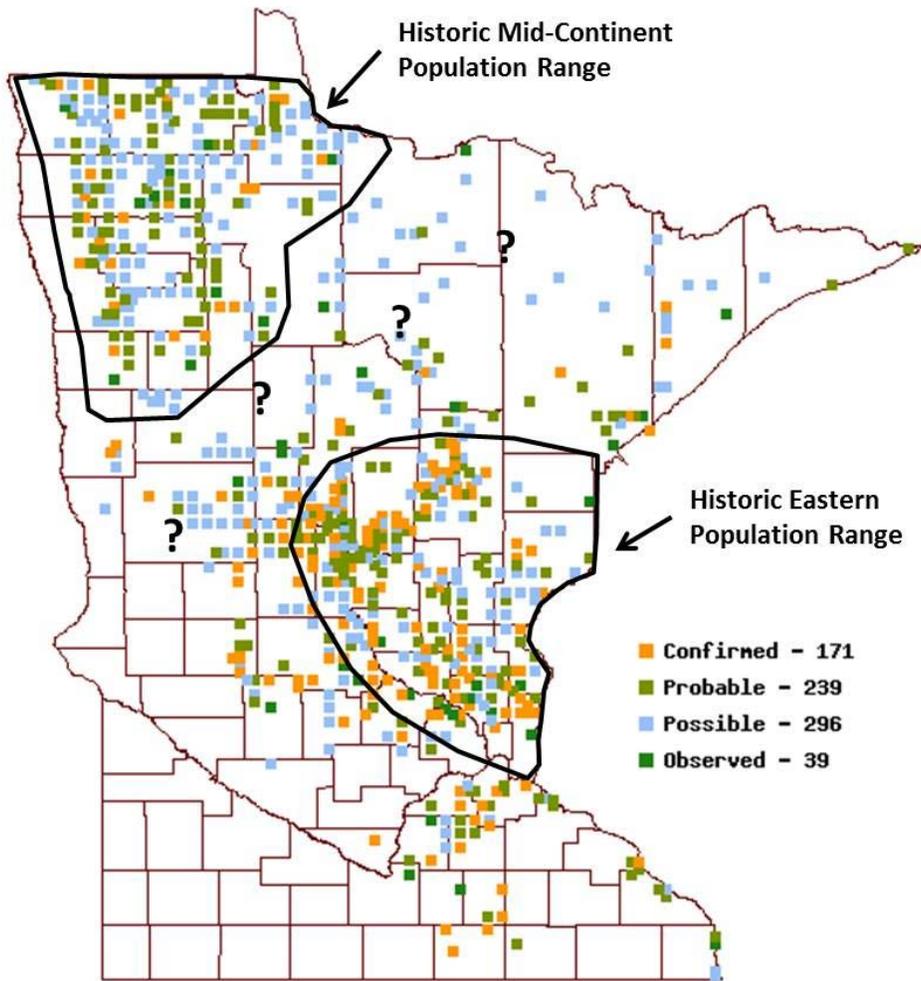


Figure 1. Sandhill crane locations in Minnesota based on preliminary data from the Minnesota Breeding Bird Atlas. The historic breeding ranges of Mid-continent and Eastern Population sandhill cranes in Minnesota are delineated by the polygons, while the cranes breeding in the area delineated by question marks are the focus of this proposal. ([http://www.mnbba.org/blockmap/cresults.php?species=Sandhill Crane](http://www.mnbba.org/blockmap/cresults.php?species=Sandhill%20Crane))



Figure 2. Sandhill crane at Crex Meadows, Wisconsin equipped with a tibiotarsus-mounted GPS satellite transmitters and alpha-numeric coded band. GPS – cell transmitters would be attached to sandhill cranes near the presumed boundary between the Mid-Continent Population and Eastern Population cranes in Minnesota as part of the proposed project.



Environment and Natural Resources Trust Fund								
M.L. 2014 Project Budget								
Project Title: Sandhill Crane Populations and Management in Minnesota								
Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 05h								
Project Manager: David E. Andersen								
Organization: University of Minnesota, U.S. Geological Survey, MN Cooperative Fish and Wildlife Research Unit								
M.L. 2014 ENRTF Appropriation: \$ 250,000								
Project Length and Completion Date: 3 Years, June 30, 2017								
Date of Report: 5 May 2014								

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	Mark 45 sandhill cranes with transmitters			Acquire movement and habitat data				
Personnel (Wages and Benefits)	\$44,139	\$0	\$44,139	\$53,963	\$0	\$53,963	\$98,102	\$98,102
<i>Co-Principal Investigator salary (1 month per year @ \$8,944 per month * 2 years, 19.83% fringe benefits rate, 100% appointment for 1 month each year, 83.45% of total in salary and 16.55% in fringe)</i>								
<i>M.S. Student (\$37,634 in Year 1 \$39,033 in Year 2 approximately 14 months in Activity 1 and 10 months in Activity 2, including tuition [\$13,510 in Year 1 and \$14,185 in Year 2] and 17.68% fringe, 50% appointment)</i>								
Professional/Technical/Service Contracts								
Contracts for data from transmitters suppliers (cell-transmitters and/or PTT GPS - approximately \$400 per 12-month period per transmitter * 30 transmitters in Year 1 and 60 transmitters in Year 2 - partially funded by other partner funding - contracted through University of Minnesota process)				\$29,008	\$0	\$29,008	\$29,008	\$29,008
Equipment/Tools/Supplies								
GPS-cell or PTT satellite transmitters (45 @ \$2,600)	\$117,000	\$0	\$117,000				\$117,000	\$117,000
Bands, capture equipment, and miscellaneous field supplies	\$2,500	\$0	\$2,500				\$2,500	\$2,500
Travel expenses in Minnesota								
4-wheel drive vehicle (1 vehicles@\$0.565/mile x 100 miles/day x 60 days/year) - additional vehicle costs provided by partner funding	\$3,390	\$0	\$3,390				\$3,390	\$3,390
COLUMN TOTAL	\$167,029	\$0	\$167,029	\$82,971	\$0	\$82,971	\$250,000	\$250,000