

M.L. 2015 Project Abstract

For the Period Ending June 30, 2018

PROJECT TITLE: Creating a Statewide Wetland Bird Survey

PROJECT MANAGER: Kristin Hall

AFFILIATION: Audubon Minnesota

MAILING ADDRESS: 1 Water Street West, Suite 200

CITY/STATE/ZIP: Saint Paul, MN 55107

PHONE: (651)739-9332, ext 116

E-MAIL: khall@audubon.org

WEBSITE: mn.audubon.org

FUNDING SOURCE: Environment and Natural Resources Trust Fund

LEGAL CITATION: M.L. 2015, Chp. 76, Sec. 2, Subd. 03f

APPROPRIATION AMOUNT: \$ 146,000

AMOUNT SPENT: \$ 145,100

AMOUNT REMAINING: \$ 900

Overall Project Outcome and Results

We have successfully developed and implemented the Minnesota Statewide Marshbird survey over the course of this grant. We set out to achieve a coordinated and sustainable approach to marshbird monitoring using both paid and volunteer surveyors. The first two years of data collection were fully executed as presented in the proposed work plan. We also conducted a third “bonus” field season in 2018 using minimal management oversight and limited staff involvement to see how long-term management and implementation could work going forward. The overall goals of this project were met and in most cases exceeded. Some highlights include:

- Engaging and retaining approximately 35 volunteers throughout the duration of this effort.
- Surveying a total of 73 routes (over 776 survey points) throughout MN in 2016-2017.
- Successfully collecting statistically rigorous data (defined as $n > 25$ observations) on 9 of our 20 focal species-
 - 4 primary species: American Bittern, Pied-billed Grebe, Sora and Virginia Rail.
 - 5 secondary species: Marsh Wren, Sandhill Crane, Swamp Sparrow, Wilson’s Snipe and Yellow-headed Blackbird.
- Evaluating species-specific wetland habitat associations at multiple spatial scales.
- Assessing the sensitivity of marshbird occupancy (nine species) and abundance (three species) to anthropogenic disturbance variables (developed land, agriculture).
- Determining the strength of association between marshbird occupancy (nine species) and abundance (three species) with ecoregion (Aspen Parklands, Boreal Hardwood, Prairie Parkland and Boreal Harwood Transition).
- Currently working on the publication of this project and analysis for a peer reviewed, scientific journal.

Audubon continues to participate in the Great Lakes regional partnership focused on marshbirds and their habitat, with this project leading the way in analysis and adding to the overall dataset. This report highlights some of the results and recommendations of the statewide marshbird survey effort.

Project Results Use and Dissemination

The results of this analysis are currently being drafted for submission to a scientific, peer reviewed journal. We will distribute the final accepted paper to the ENRTF for their records upon completion (anticipated in fall 2018) and highlight the write up on the Audubon MN website.



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2015 Work Plan

Date of Report: 15 August 2018
Date of Next Status Update Report: NA
Date of Work Plan Approval: 11 June, 2015
Project Completion Date: 30 June 2018
Does this submission include an amendment request? no

PROJECT TITLE: Creating a Statewide Wetland Bird Monitoring Program

Project Manager: Kristin Hall
Organization: Audubon Minnesota
Mailing Address: 1 Water Street West, Suite 200

City/State/Zip Code: Saint Paul, MN 55107
Telephone Number: (651)739-9332, ext 116
Email Address: khall@audubon.org
Web Address: mn.audubon.org

Location: Statewide

Total ENRTF Project Budget:	ENRTF Appropriation:	\$146,000
	Amount Spent:	\$145,100
	Balance:	\$900

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 03f

Appropriation Language:

\$146,000 the first year is from the trust fund to the commissioner of natural resources for an agreement with Audubon Minnesota to develop a statewide wetland bird monitoring program in order to enable long-term monitoring of the status of wetland birds and the health of their wetland habitats. This appropriation is available until June 30, 2018, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Creating a Statewide Wetland Bird Monitoring Program

II. PROJECT STATEMENT: We will develop a statewide wetland bird monitoring program, which will include rails, bitterns, and waterbirds, utilizing a combination of volunteer citizen scientists and paid surveyors. Our objective is to establish a long-term statewide wetland bird monitoring system to provide state agencies and others with a method to monitor the status of these birds and the health of their wetland habitats now and into the future. Many wetland birds are difficult to survey, in large part because of their inconspicuous nature and the difficulty of accessing their habitats. Thus, effective conservation planning and habitat management for wetland birds is challenging and information regarding abundance, distribution, population trends, habitat relationships, and management needs for these species is limited. Systematic and coordinated wetland bird monitoring has been recognized as a high priority in state, regional and national conservation plans. Because of this, more effort is being put into wetland bird monitoring across the Midwest using standardized protocols and data collection.

Minnesota is fortunate to have some baseline data on this group of birds from the County Biological Survey and the recently completed Breeding Bird Atlas; this project is neither a repeat nor an extension of either of these surveys. However, it does build on these efforts, using what we have learned to date to monitor these species into the future. Because these birds are dependent on wetlands they can serve as valuable indicators of habitat quality and are useful monitoring tools for wetland quality as well as restoration efforts.

Methodologies to monitor wetland birds are constantly being improved and refined. We will begin the project by reviewing and referencing already established standardized protocols used to conduct the monitoring and will consult with researchers in Minnesota and other states to incorporate any modifications developed prior to the start of our field work to ensure we are using the most up to date and effective methods available. This will include a recently established secretive marsh bird survey protocol that has been developed to address research questions while providing a regional measure of population status and trends. Working with biologists to incorporate current efforts will allow our statewide survey to be compatible with larger-scale regional monitoring. Survey sites will be chosen based on a sub-sample of wetlands currently being monitored by the MN DNR located within the Audubon Minnesota Important Bird Area network. Using a combination of volunteers and paid staff proved extremely effective in completing the Breeding Bird Atlas and we propose to follow that model in this project. Such a combination allows for volunteer involvement and its reduced costs while ensuring that hard to access sites are also covered. We will use a website for data entry allowing for easy and immediate data collection and review if necessary.

III. OVERALL PROJECT STATUS UPDATES:

Amendment Request 11/17/2015

Approved by LCCMR 11-24-2015

Due to staff changes and to better align project reporting with Audubon Minnesota's fiscal calendar we are submitting the following changes in a request for an amendment to this work plan:

- 1) Shift the project Status reports one month later to align with our internal fiscal calendar
- 2) Remove Mark Martell from the project – no longer with Audubon MN
- 3) Change Kristin Hall's role from GIS Specialist and field Supervisor to Project Manager – replacing Mark
- 4) Add a part – time Volunteer Coordinator position to assist in administering the survey – conducting some previous field supervisor job duties.
- 5) Shift \$3,330 from Activities 1 and \$3,330 from Activity 3 into Activity 2 expenditures to cover the Volunteer Coordination portion of the project.

Approved by LCCMR 11-24-2015

Project Status as of: 31 January 2016

The initial phase of this project is focused on information gathering, research and coordination. To date we have coordinated and hosted 3 meetings with project partners, initiated the GIS analysis for survey site selection (scheduled for completion March 2016) and assembled resources for Audubon MN project webpage (scheduled for publication Feb 2016).

Amendment Request 08/04/2016

Due to the auditory rather than visual nature of the survey protocol, we would like to make a line item, non-monetary amendment of the Equipment/Tools/Supplies section of our original budget.

The budget changes are as follows:

- 1) Remove line 18 – 2 spotting scopes (\$1000/ea) from the budget
- 2) Replace spotting scopes with portable speakers (40 sets @ \$50 each)
- 3) Reduce line 19 from 3 call playback machines- @\$500 each (\$1500) to 3 mp3 players @ \$50 each = \$150
- 4) Add equipment line item of 4 range finders @\$150 each = \$600
- 5) Add 1 sound meter to calibrate speakers to survey protocol specifications = \$150
- 6) Add expense line for training, supplies, printing and mailing survey materials = \$600

This amendment request does not impact the narrative or timeline of the project, therefore no further changes have been made to this document. All relevant information on budgetary changes can be found in the accompanying attachment: 2016-08-05RevisedBudget.exl

Amendment Approved: 08/08/2016

Project Status as of: 31 October 2016

We implemented the first field season of the Minnesota Statewide Marshbird Survey. We identified 65 Primary Sampling Units (PSU) with between 6-9 Secondary Sampling Units (SSU also referred to as survey routes) within each PSU. Of the 65 survey routes, 56 were fully surveyed. The survey effort required a combination of paid surveyors and volunteers. We recruited and trained 35 volunteers who contributed a cumulative effort of at least 800 hours to the survey by scouting routes, practicing the protocol, conducting the survey and entering their data. Our first season was a full scale effort and we have learned a lot. We will make some changes to survey locations and slight modifications of survey protocol in preparation for the second season, but overall this initial attempt was a success.

Project Status as of: 30 April 2017

We compiled and distributed a preliminary report on our first season's findings to partners and participating volunteers in December of 2016. This report provided guidance for adjustments or changes that needed to be made prior to our second survey season such as survey point locations, creating additional routes and fine tuning our habitat monitoring protocol.

Regarding survey locations, we lost 9 sites last season and knew we needed to supplement sites to maintain and increase survey coverage. Over this past winter we identified 15 new survey routes, bringing the total route tally to 71 for the 2017 season. We have completed our hiring and volunteer recruitment for season 2 as well. We have 2 returning staff from the 2016 season, one paid surveyor and our volunteer coordinator. Their continued participation has been a great benefit to project continuity. Likewise, we have an 81% volunteer retention rate between seasons and have recruited an additional 11 new surveyors for the second season beginning in May 2017.

Amendment Request 06/28/2017

This monitoring effort is statewide and our travel needs are on pace to slightly exceed the amount budgeted. With the changes in our equipment needs at the onset of the project (amendment 8/4/16), we are fortunate to have some excess funding in this category. We would like to make a line item, non-monetary amendment of the Equipment/Tools/Supplies section and Travel section of our original budget. The changes are as follows:

- Remove \$1,500 from the Equipment/Tools/Supplies – budget line 17, activity 2.
- Add \$1,500 to the Travel expenses- budget line 24, activity 2.

Amendment Approved by LCCMR 7/12/2017

Project Status as of: 30 October 2017

We completed our second season of data collection with the assistance of 37 volunteers, 3 hired survey staff and our volunteer coordinator. In total, we had 46 volunteers participate, with about 80% contributing data in both years and the remaining 20% participating in only one of the 2 seasons. Volunteer retention was high for this survey effort where we received mostly positive feedback. The main reason for not continuing with the project was limited time availability, many volunteers are already inquiring about next season.

Volunteers not only participated in training sessions for both years, the majority of participants also managed and entered their own data into the on-line database hosted by the Midwest Avian Data Center node of the Avian Knowledge Network. We were able to keep survey staff on beyond the survey season for data proofing and habitat data collection as well. This extra effort from volunteers and the ability to have field staff transition to data organization and proofing, has set us up well for the third activity of this project which is analysis, write up and recommendations.

In the second season, we successfully surveyed 57 routes of the initial 71 areas identified at the beginning of the season. We had to adjust locations due to limited access or inadequate habitat issues in both seasons. Although we surveyed 56 routes in season one, and 57 routes in season two, forty-six of those routes (~322 individual locations) were surveyed in both seasons. The 57 routes (400 individual locations) surveyed in the 2017 season will remain the official survey routes/locations for the survey effort going forward.

In preliminary analysis of our six focal species for the survey, we have found that the Sora Rail is most abundant/responsive to the survey methodology, followed by Virginia Rail and American Bittern (figure 4). Initial findings also show a very limited abundance/survey response by Yellow Rail, a Minnesota species of special concern, and Least Bittern, a state Species of Greatest Conservation Need (SGCN). During the analysis phase of this study, we will look to determine if species like the Yellow Rail are significantly low in number or if the Secretive Marshbird Survey Protocol (Conway et.al. 2011) is potentially limited for this species, which might have more nocturnal behavior than other focal species. The survey protocol allows us to analyze the data for species detectability and response to call back, which are important factors to be aware of as we are ultimately using these data to determine population level information like species abundance and distribution state wide.

The bulk of the analysis phase for this project is scheduled for the winter of 2017-2018. Results from this analysis will be included in our next reporting cycle.

Amendment Request 10/30/2017

We would like to make a line item, non-monetary amendment to the Personnel section of our budget. We have mostly completed the field portion of this project and are now moving into activity 3: data analysis and reporting. Because we were fortunate enough to have returning surveyors and a returning volunteer coordinator for both field seasons, we were able to save a considerable amount of funding. We have approximately \$11,000 remaining in field staff funds. While the data collection phase has almost ended (we may have some additional habitat data collection needs in the spring of 2018), we recognize a need for data management, organization and research. We would like to request that \$11,000 in field staff funding go towards data management/research work to be conducted by existing Audubon staff (no new positions or contracted entities are needed). This person will assist the Project Manager by ensuring all the species and habitat data is proofed/corrected/formatted prior to analysis. Likewise, the data assistant will research additional habitat and species information that can be used in our overall analysis from existing resources such as the recently completed Breeding Bird Atlas, the MN DNR Shallow Lakes Program and the MN PCA water quality research.

Amendment Approved by LCCMR 11/2/2017

Project Status as of: 30 April 2018

We have initiated the analysis portion of the project using the 2 years of survey data collected. I presented our statewide marshbird survey work at two professional level conferences: the Minnesota Ornithological Union Paper Session and the Midwest Fish and Wildlife conference in December of 2017 and January of 2018 respectively. The preliminary summary statistics indicate that we have four primary species with enough detections to model abundance/population estimations (AMBI, PBGR, SORA, VIRI). Likewise, we can model five of our secondary species for abundance and population level estimates. We are now looking into modeling results at differing spatial scales ranging from the survey location, to route and ecological region in order to determine any potential habitat associations in our results. Comprehensive results will be presented in our final report. Audubon continues to serve on the regional Midwest secretive marshbird working group and provides advice and recommendations on analysis and protocol considerations.

Amendment Request 4/16/2018

We would like to make a timeline and monetary amendment request. The first request pertains to the date of the final report. The project will be completed including all expenditures on June 30th 2018, but our financial records for the fourth quarter of the fiscal year do not get finalized until the month after the quarters end. If we could push the final reporting due date back to 1 August 2018, that would align better with our financial reporting schedule.

The monetary amendment request is within Section 3 of our work plan and budget; we would like to add a contracted services line. We propose removing \$2,000 from the Staff portion of Activity 3 and creating a contracted services line with those funds. The staff budget would then result in a \$21,500 allocation. Due to time and staffing constraints, we have decided it would be best to have some of the GIS analysis contracted out to a University of Minnesota graduate student who is conducting her master's thesis work on secretive marshbirds. We intend this to be a sole source contract with Nina Hill as she has recently gone through the data analysis process for her thesis research, and has consulted with Audubon Minnesota during development of the Minnesota Marshbird Survey Program. Nina is familiar with many details about the survey design and dataset. She will use GIS analysis tools that she developed during her thesis research project and apply them to the statewide spatial data set. The contract will not exceed \$2,000.

Amendment Approved by LCCMR 4/24/2018

Overall Project Outcomes and Results: 15 August 2018

We have successfully developed and implemented the Minnesota Statewide Marshbird survey over the course of this grant. We set out to achieve a coordinated and sustainable approach to marshbird monitoring using both paid and volunteer surveyors. The first two years of data collection were fully executed as presented in the proposed work plan. We also conducted a third "bonus" field season in 2018 using minimal management oversight and limited staff involvement to see how long-term management and implementation could work going forward. The overall goals of this project were met and in most cases exceeded. Some highlights include:

- Engaging and retaining approximately 35 volunteers throughout the duration of this effort.
- Surveying a total of 73 routes (over 776 survey points) throughout MN in 2016-2017
- Successfully collecting statistically rigorous data (defined as n>25 observations) on 9 of our 20 focal species-
 - 4 primary species: American Bittern, Pied-billed Grebe, Sora and Virginia Rail
 - 5 secondary species: Marsh Wren, Sandhill Crane, Swamp Sparrow, Wilson's Snipe and Yellow-headed Blackbird.
- Evaluating species-specific wetland habitat associations at multiple spatial scales
- Assessing the sensitivity of marshbird occupancy (nine species) and abundance (three species) to anthropogenic disturbance variables (developed land, agriculture).

- Determining the strength of association between marshbird occupancy (nine species) and abundance (three species) with ecoregion (Aspen Parklands, Boreal Hardwood, Prairie Parkland and Boreal Harwood Transition)
- Currently working on the publication of this project and analysis for a peer reviewed, scientific journal

Audubon continues to participate in the Great Lakes regional partnership focused on marshbirds and their habitat, with this project leading the way in analysis and adding to the overall dataset. This report highlights some of the results and recommendations of the statewide marshbird survey effort.

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Finalize Study Protocol and Monitoring Sites

Description: During the first 3 months of the project we will review and evaluate waterbird monitoring protocols used or tested in Minnesota and surrounding states, update them with the most current knowledge and incorporate them into a draft statewide protocol. This protocol will be submitted for review by biologists at the University of Minnesota and other academic institutions, the MN DNR and the U.S. Fish and Wildlife Service to ensure consistency and applicability of our protocols with other ongoing studies and current state of the art practices. Before the beginning of the first field season (by March 2016) we will work with the MN DNR to determine a subset of wetlands to be monitored within the Audubon Minnesota Important Bird Area network. These wetlands will be representative of wetland types across the state and be part of ongoing DNR wetland monitoring programs allowing for comparison between wetland bird numbers and wetland quality. Before the beginning of the first field season we will develop a website for data collection and display.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 12,500
Amount Spent: \$ 12,500.00
Balance: \$ 0.00

Outcome	Completion Date
1. Review current efforts from Minnesota and surrounding states	October 2015
2. Revise and finalize protocols	December 2015
3. Designate and map survey areas	March 2016
4. Create a data entry website	March 2016

Project Status as of: 31 January 2016

Reviewed and familiarized ourselves with the Conway (2011) marshbird monitoring protocol and site selection process (Johnson et. al. 2009). Coordinated 3 meetings and participated in subsequent discussions with USFWS, Midwest Avian Monitoring Partnership, University of Minnesota, Wisconsin DNR, Minnesota DNR, and other partners in the marshbird monitoring working group to develop potential protocol adaptations. Consistent recommendations of slight alterations to survey protocol have been incorporated into our methodology. Established criteria for site selection to include sites on public lands and wetlands accessible by public roadways. We also aim to incorporate supplemental water quality datasets such as the MN DNR wetland monitoring and the Great Lakes wetland monitoring programs. The survey site selection analysis has been initiated with the assistance of the USFWS and Joint Ventures. This process is on-going scheduled for completion in March 2016. We posted a position for a project volunteer coordinator in December 2015 and plan to have it filled by mid-February to facilitate volunteer engagement and management for the first field season.

Project Status as of: 31 October 2016

February 2016 - Audubon attended 3 additional meetings with partners about protocol and process and is now a contributing member of the Midwest Avian Monitoring Partnership Secretive Marshbird Working Group which covers 7 states and is ultimately working on compiling the trend data from various state and regional efforts.

GIS analysis and point selection: Worked with Mark Seamans (USFWS - Division of Migratory Bird Management) and Kirsten Luke (American Bird Conservancy GIS Specialist - Atlantic Coast Joint Venture) to conduct initial randomization of survey sites for consideration using the sampling design framework for monitoring secretive marshbirds (Johnson et.al. 2011). Survey site criteria was defined by using the National Wetlands Inventory Database, various public lands layers and a distance setting of 100 feet from accessible roadways. Approximately 75 Primary Sampling Units and over 450 Secondary Sampling Units were selected for ground truthing. Through field validation, we dropped 10 PSUs due to access issues or insufficient habitat.

Web-based Data Entry: We are a contributing member of the Midwest Avian Data Center and were able to create a web-based data project within their framework for our surveyors to enter their data. This data entry portal is specifically tailored to our project needs but because we are using a formalized protocol that is compatible with regional and nationwide surveys, our data will contribute to the larger monitoring network for secretive marshbirds.

Project Status as of: 30 April 2017

The “off” season was spent adjusting the 2016 survey routes and determining additional areas to add to replace the 9 routes we lost over the course of our first season. Through GIS analysis and ground truthing we have added 15 new routes for a total of 71 routes for our second season. Emphasis was placed on improving our coverage in portions of the state that either lack appropriate habitat or are a challenge to access.

We continue to coordinate our statewide efforts with the ongoing regional survey, working to establish a broad scale, long-term monitoring program throughout the Midwest. The first season of our data is housed in the Midwest Avian Data Center and accessible (with permission) to others within the secretive marshbird working group. The second season data will also be housed and managed within the same on-line database. Audubon MN has played a pivotal role in the planning and development of the long term strategies for this survey effort on a regional scale and will continue to participate in regional stakeholder meetings and planning workshops.

Project Status as of: 30 October 2017

In the second season, we successfully surveyed 57 routes of the initial 71 areas identified at the beginning of the season. We had to adjust locations due to limited access or inadequate habitat issues in both seasons. Although we surveyed 56 routes in season one; and 57 routes in season two, forty-six of those routes (~322 individual locations) were surveyed in both seasons. The 57 routes (400 individual locations) surveyed in the 2017 season will remain the official survey routes/locations for the survey effort going forward (see Map 3, end of report).

Project Status as of: 30 April 2018

N/A. Activity 1 of work plan is complete.

Overall Project Outcomes and Results: 15 August 2018

We used a slightly modified application of the Conway (2011) protocol to implement this survey. The modifications were made (and documented) in response to recommendations made by other states who have conducted this protocol. The protocol is rigorous and requires a dedicated volunteer network to ensure success. In total, 73 routes encompassing 776 individual locations were included the 2016-2017 surveys and analysis. Routes were proportionately randomized within the four ecoregions in Minnesota (Tallgrass Aspen Parklands, Prairie Pothole, Boreal Hardwood Transition, and Prairie Hardwood Transition; Map 3). A total of 65 routes now constitute the finalized dataset going forward.

Activity 2: Statewide Wetland Bird Location Data Collection

Description: During the first 4 months of 2016 we will recruit volunteers and hire two surveyors for Season 1. All surveyors, both volunteers and hired, will be trained in our data collection and recording protocols. Season 1 data collection will occur from April – July 2016 at the sites chosen in Activity 1. Following the initial field season we will analyze data and modify our protocols as needed. We will produce an interim report with the initial data findings of Season 1 and outlining any modifications of protocols for Season 2. Hiring of surveyors for Season 2

will occur in the first 4 months of 2017 and we will bring back as many surveyors from Season 1 as possible. Again all surveys will be trained in our modified protocols and Season 2 data will be collected from April – July 2017.

Summary Budget Information for Activity 2:

ENRTF Budget: \$110,000
Amount Spent: \$109,100
Balance: \$900

Outcome	Completion Date
1. Recruit and train volunteers and hire temp staff for Season 1	April 2016
2. Conduct Season 1 field work statewide at sites determined in Activity 1	August 2016
3. Submit interim report with results of Season 1	October 2016
4. Analyze Season 1 field work and modify protocols as needed	December 2016
5. Recruit and train volunteers and hire temp staff for Season 2	April 2017
6. Conduct Season 2 field work at sites determined in Activity 1 and modified by results from Season 1.	August 2017
7. Analyze Season 2 field work and produce final survey protocols.	September 2017

Project Status as of: 31 January 2016
 No Action – Activity 2 begins in April of 2016

Project Status as of: 31 October 2016

February 2016 – Hired a part-time seasonal Marshbird Survey Volunteer Coordinator.

March 2016 – Hired field crew surveyor positions.

April 2016 – Field Staff conducted survey site ground truthing. Sixty-five of the 75 Primary Sampling Units (PSU) identified through remote sensing analysis, with 6-9 Secondary Survey Units (SSU) each, were deemed suitable for surveying. Our Volunteer Coordinator successfully recruited 35 citizen scientists for the survey.

Audubon hosted 3 full day training sessions for volunteers and staff to be trained in survey protocol and data collection. The trainings consisted of classroom and field exercises, distribution of survey manual and additional on-line resources, as well as the calibration and allocation of necessary survey equipment (speakers, GPS units and maps).

May 2016 – Kicked off the first season of the statewide waterbird survey. The survey window is from 1 May – 30 June and the aim was to survey each site 3 times throughout the season with each visit falling at least 10 days apart from one another. Of the original 65 PSU locations selected through site visits and ground truthing, 10 were deleted because of poor habitat or lack of access and 2 were dropped due to non-participatory volunteers. We were able to add 3 survey routes to supplement some of the areas we lost while the survey was in progress. In total, 56 PSUs (~370 SSUs) were successfully surveyed (Figure 4). We plan on designating 12 additional PSU sites for next season.

July 2016 – Completed first field season. Of the 35 volunteers trained, only 2 dropped out. We hosted a volunteer appreciation event on July 20th where about 20 volunteers were able to come together, discuss and give important feedback about the season, including suggested changes. In addition, we conducted an end of the year survey and estimate that about 90% of the volunteers who participated in the survey this year will be back next year. Of the 33 volunteers who participated in the survey, 28 of them also registered to the online database hosted by the Midwest Avian Data Center and entered their own data. Field staff entered the remaining data. To date approximately 75% of the survey data have been proofed for accuracy.

Preliminary Findings

We identified 6 focal species (American Bittern, Least Bittern, Pied-billed Grebe, Sora, Virginia Rail, and Yellow Rail) and 10 secondary species for our survey protocol. Focal species observations represented 20% of all observations including surveys conducted with no data (30%). The Sora and Virginia Rail appear to be the most

represented focal species on the survey with the Yellow Rail showing the lowest level of observations (Figure 1). Of the secondary species monitored, the yellow-headed black bird was observed in the highest numbers and relatively early in the season which may indicate we were picking up on some migratory flocks (Figure 2). In the coming months we will conduct a more robust analysis of where the focal species were observed in order to begin to parse out some habitat suitability questions.

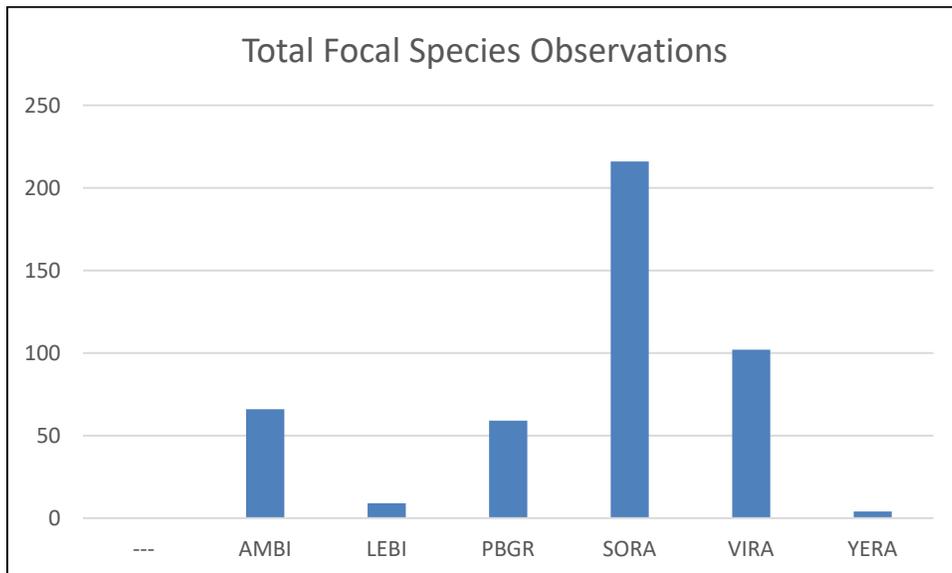


Figure 1. Summary of focal species observed in 2016 season of MN Marshbird Survey

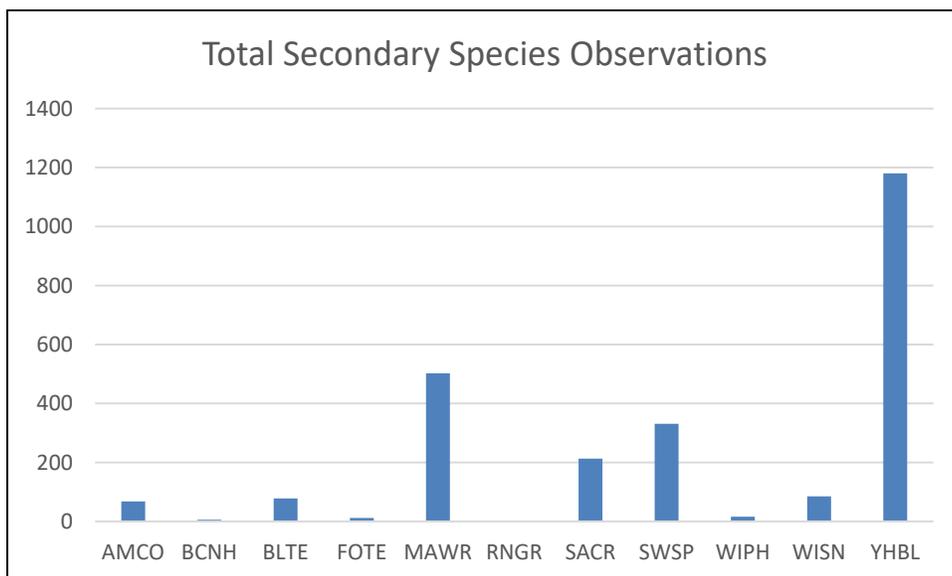


Figure 2. Summary of secondary species observed in 2016 season of MN Marshbird Survey

Project Status as of: 30 April 2017

February 2017 Staff– Hired a part-time seasonal Marshbird Survey Volunteer Coordinator. This position was filled by our returning Volunteer Coordinator from the 2016 season. Returning staff has been instrumental in getting the call out to volunteers early and getting the prep work done for our volunteer training in spring.
 March 2017 Staff– Hired field crew surveyor positions. Again, we are fortunate to have one of our surveyors from the 2016 season return for 2017. With returning staff we are able to build on the continuity and knowledge of our efforts last season and offer high level, first hand training to new staff and volunteers.

2017 Volunteer Recruitment – Sent out a call for volunteers interested in returning to the survey in February and worked to recruit new volunteers throughout March. As of April 1st we have 30 surveyors/ survey teams returning for season 2. Overall volunteer retention from the 2016 season was high (~81%) which is an advantage going into the 2017 training and survey season. We were also able to recruit 11 new participants to increase coverage in our newly established routes.

Project Status as of: 30 October 2017

We completed our second season of data collection with the assistance of 37 volunteers, 3 hired survey staff and our volunteer coordinator. In total, we had 46 volunteers participate, with about 80% contributing data in both years and the remaining 20% participating in only one of the 2 seasons. Volunteer retention was high for this survey effort where we received mostly positive feedback. The main reason for not continuing with the project was limited time availability, many volunteers are already inquiring about next season.

Volunteers not only participated in training sessions for both years, the majority of participants also managed and entered their own data into the on-line database hosted by the Midwest Avian Data Center node of the Avian Knowledge Network. We were able to keep survey staff on beyond the survey season for data proofing and habitat data collection as well. This extra effort from volunteers and the ability to have field staff transition to data organization and proofing, has set us up well for the third activity of this project which is analysis, write up and recommendations.

In preliminary analysis, we successfully conducted over 3,100 individual surveys during both years of the survey (each survey location, 3 times/season, for 2 seasons). Of all observations, our selected focal species (6) were observed 27% of the time, the secondary species (14) were observed 50% of the time and 23% of surveys had no data (figure 3).

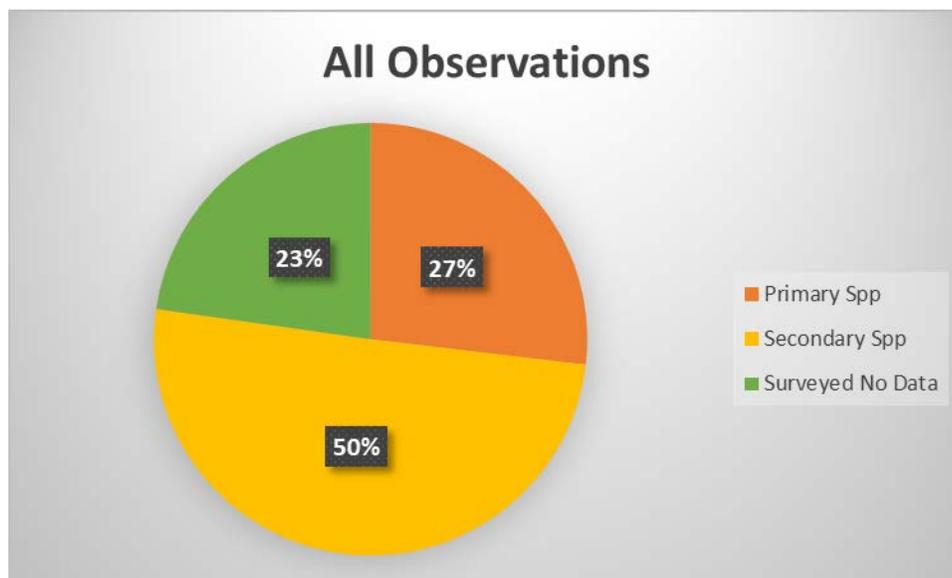


Figure 3. Percent observations within primary and secondary focal species MN Marshbird Survey 2016-17

Of the six focal species for the survey, we have found that the Sora Rail is most abundant/responsive to the survey methodology, followed by Virginia Rail and American Bittern (figure 4).

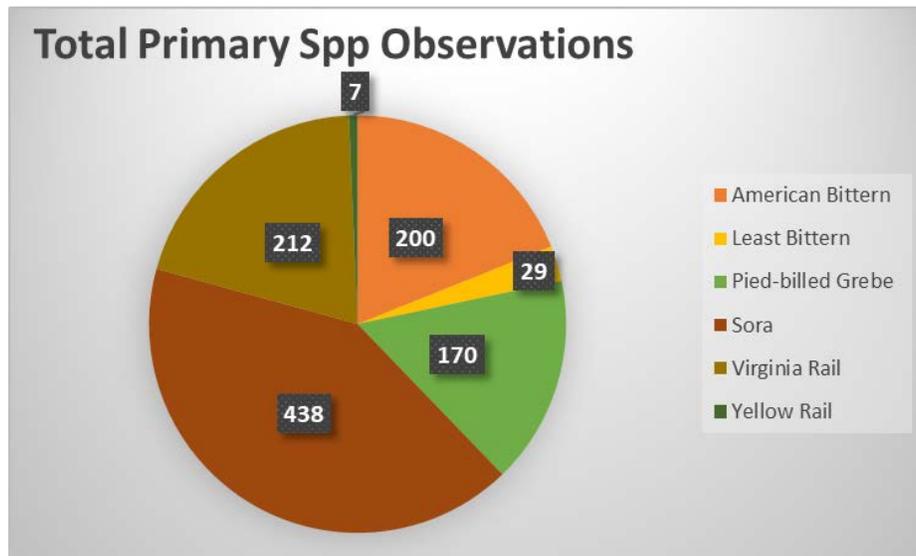


Figure 4. Primary Species Observations MN Marshbird Survey 2016-17

Initial findings also show a very limited abundance/survey response by Yellow Rail, a Minnesota species of special concern, and Least Bittern, a state Species of Greatest Conservation Need (SGCN). During the analysis phase of this study, we will look to determine if species like the Yellow Rail are significantly low in number or if the Secretive Marshbird Survey Protocol (Conway et.al. 2011) is potentially limited for this species, which is nocturnal in behavior than other focal species. The survey protocol allows us to analyze the data for species detectability and response to call back, which are important factors to be aware of as we are ultimately using these data to determine population level information like species abundance and distribution state wide. The analysis phase for this project is scheduled for the winter of 2017-2018. Results from this analysis will be included in our next reporting cycle.

Project Status as of: 30 April 2018

We conducted minimal outreach with our current volunteer surveyors in March of 2018 and asked if they would be interested in conducting the survey again for a “bonus” third season. We received 17 responses back from interested volunteers who are willing and able to survey again. This is a reduced effort, without the aid of multiple field staff and a volunteer coordinator. This bonus season will take place in May and June of 2018 and will help us determine the longevity of this survey going forward. All data is being entered into the Midwest Avian Data Center on-line database. These data are available for analysis on a broader scale (throughout the region) within the Secretive Marshbird Working Group. No expenses will go toward this grant after the June 30th deadline.

Overall Project Outcomes and Results: 15 August 2018

Volunteers were trained at the beginning of both full years of the survey (2016 and 2017) and we provided one-on-one training or updates as needed for the minimal management 2018 “bonus season”. The 2018 season consisted of 35 routes being covered by 17 volunteers and one staff member. As with the two previous seasons, Virginia Rail and Sora were the most common focal species observed; Sandhill Cranes and Swamp Sparrows were the most common secondary species observed. We took an opportunistic approach to the minimal management season, just to see what level of involvement and effort would be required. We did not ensure a proportionate coverage throughout the state but rather let volunteer interest depict site selection. The 2018 extra season emphasized that the minimal management approach can be a cost effective way to ensure the longevity of the statewide marshbird survey effort. Recommendations if a minimal management approach is adopted to continue this effort include:

- Surveying at least 20% of the locations every year
 - Ensure that a strategic approach such as rotating between eco regions or selecting representative coverage within each eco region is achieved every year.

- Or surveying as many of the original locations as possible every 3 to 5 years
- Continue to cultivate volunteer engagement through communications and updates even during off years of the survey
- Continued involvement with the marshbird working group for larger scale analysis is key to conducting a reduced effort.

In general, project oversight by a paid coordinator is required in order to implement this survey and provide support to the volunteer network. A staffed coordinator is also needed to manage and maintain the equipment necessary to conduct the survey. That said, volunteer retention was good and interest in continuing with this monitoring effort remains high. Marshbird survey efforts in Canada have taken a different approach to conducting long-term monitoring by emphasizing the longevity of the effort and letting volunteers select the survey sites (in appropriate habitat). There is potential to blend the stratified random site selection process and the volunteer lead site selection approaches that could result in more long-term trend data collected over time. The stratified random site selection approach was necessary for the first iteration of this effort in order to ensure that a standardized method was used within the Marshbird working group. We recommend that the staffed coordinator also take on the role of data management and maintenance. All data is housed in the Midwest Avian Data Center, a node of the Avian Knowledge Network, which is an on-line database that can be accessed by volunteer surveyors to enter their own data. The coordinator needs to make sure the data is proofed and formatted accurately for analysis. These data are also accessible to regional partners with the intention to be included in a broader scale analysis (beyond ecoregion or state level).

ACTIVITY 3: Final Analysis and Statewide Monitoring Design for Wetland Birds in MN

Description: The final analysis of methodology and data from both seasons of field work will be conducted and reviewed. We will develop a final protocol that will be used in future monitoring and develop a structure for continuing statewide wetland bird monitoring that will track populations of wetland birds.

Summary Budget Information for Activity 3:

ENRTF Budget: \$23,500
Amount Spent: \$23,500
Balance: \$0

Outcome	Completion Date
1. Submit interim report with results of Season 2	October 2017
2. Do final data analysis of entire survey effort	April 2018
3. Develop plan for ongoing state wetland bird monitoring	June 2018

Project Status as of: 31 January 2016
 No Action – Activity 2 begins in October 2017

Project Status as of: 31 October 2016
 No Action – Activity 2 begins in October 2017

Project Status as of: 30 April 2017
 No Action – Activity 2 begins in October 2017

Project Status as of: 30 October 2017
 The statewide design of the study has been adapted and finalized during the 2 seasons of data collection and have been reported on previously. Preliminary summary statistics are included in this report under activity 2. We are just beginning the bulk of the analysis phase and results from our analysis will be included in our next reporting cycle.

Project Status as of: 30 April 2018

Final analysis on the first two comprehensive seasons worth of data is ongoing and will be included in the final report. Preliminary findings show that rarer species such as the Yellow Rail were detected at such low levels that the sample size is too small for statistical analysis. However, having seven confirmed observations of Yellow Rail throughout the state (along with new information from the MN Breeding Bird Atlas) will help guide future survey and conservation efforts for this species. We are able to model the detectability and abundance of four of the primary species identified in our survey efforts and five of the secondary species. The results of this analysis will set baseline population data for these birds in Minnesota, which was previously unknown.

Throughout the survey effort, we have been working with the regional secretive marshbird monitoring working group led by the USFWS Upper Mississippi River and Great Lakes Joint Ventures. This working group has been essential in assisting us with conducting the statewide survey and has allowed us to document our process and plans for on-going statewide monitoring efforts into the future. We will present these recommendations in the final report. Details on protocol adaptations and methodology can be found on our website at:

<http://mn.audubon.org/get-involved/marshbird-survey-volunteers>

We are in the process of rolling out a reduced survey effort this May and June based largely on volunteer surveyor effort. We believe that this work can continue into the future as long as a monitoring coordinator is able to spearhead the effort. The results of this reduced effort- third season will help determine the need, costs and feasibility of running this survey on an annual or semi-annual basis going forward.

Overall Project Outcomes and Results: 15 August 2018

The analysis for this study was conducted in 2 phases: Phase 1 was spatial analysis and phase two was statistical modeling using the spatial covariates as inputs. We ran analysis on 3 major categories: ecoregion, wetland classification, and available land cover- highlighting two variables pertaining to human impacts on the landscape: (1) developed space and (2) cropland cover. We examined wetland and anthropogenic disturbance variables at three spatial scales to capture the potential habitat associations of marshbird species with differing home range sizes: a local scale (200 m radii buffer), an intermediate scale (400 m radii buffer) and a landscape scale (4000 ha), which was the hexagon-shaped area surrounding points. We chose these three spatial scales because they are (1) biologically relevant, i.e. the 200 m radius corresponds to the distance at which most marshbirds can be detected; (2) ecologically important, given that they span a range of spatial scales at which our suite of marshbird species may be responding to habitat features; and (3) spatially relevant, given that the buffer distances increase in area by a factor of four, and the landscape-scale designation is that of the primary sampling unit.

The results of this analysis are currently being drafted for submission to a scientific, peer reviewed journal. In light of the publication in progress we can briefly report on the result here and will distribute the final, accepted paper to the ENRTF for their records upon completion. Result highlights:

- Five of the nine target marshbird species occupied $\geq 30\%$ of the sites surveyed across Minnesota during the two-year study period; all of these species had strong, positive relationships with proportion of emergent vegetation surrounding survey points (at multiple spatial scales). Our results demonstrate that maintenance of quality emergent marsh breeding bird habitat is important for attaining higher rates of marshbird occupancy in the state.
- The influence of agriculture is generally considered a threat to wetland-dependent birds. Our results somewhat corroborate this hypothesis, given that half of the species with significant cropland associations exhibited negative relationships with this land cover type. However, our results also indicate somewhat positive relationships (i.e. higher occupancy at intermediate amounts of surrounding cropland) between Yellow-headed Blackbird, Sandhill Crane, and Marsh Wren occupancy and agriculture. Our measure of cropland cover also included grasses and hay; thus, positive correlations

with agriculture may also represent species-specific habitat use of cultivated pastures for foraging, as has been shown previously for Yellow-headed Blackbird and Sandhill Crane.

- With the exception of Marsh Wren, all species whose occupancy was influenced by development had negative associations with the cover type across all three spatial scales of interest. It is not surprising that developed land typically represents unsuitable marshbird habitat, as most species avoid nesting or foraging near human-populated centers.
- The four Minnesota ecoregions were important predictors of marshbird occupancy across all species, with the highest mean expected occupancy estimated in the Prairie ecoregion. The prairie region is one of Minnesota's most threatened landscapes; hence, continuing restoration and preservation efforts targeted at wetlands in this section of the state is most likely to boost breeding marshbird populations, and use available conservation funding effectively.

V. DISSEMINATION:

Description: Over the course of the project we will work closely with our partners in the MN DNR and USFWS and update them regularly with iterative reporting and copies of survey protocol document(s). We will develop an online data collection mechanism which may be a means for partners to access information. We will create a webpage featuring project overview and results hosted on the Audubon Minnesota website (mn.audubon.org).

Project Status as of: 31 January 2016

Content for the Audubon MN webpage related to the wetland bird monitoring project including: project description, survey protocol resources, volunteer participation sign up and background resources is being assembled and will be posted in February 2016 when the call for volunteer recruitment is scheduled to take place. Audubon MN is currently undergoing an organizational website change but we do not foresee this causing a delay in posting information on this program.

Project Status as of: 31 October 2016

In February 2016 we completed the project webpage <http://mn.audubon.org/get-involved/minnesota-marshbird-survey> which includes information about the project and a volunteer resources page. Our spring 2016 quarterly newsletter featured the marshbird survey effort in a 2 page spread and our April e-newsletter contained an additional call for volunteers with links to the webpage.

Project Status as of: 30 April 2017

Compiled a first season report for USFWS Joint Venture partners in December of 2016. From that preliminary report we developed a season recap that was distributed to our volunteers via individual e mails. The summary write up on our first season is also available on the Marshbird Survey portion of our webpage.

Project Status as of: 30 October 2017

In July 2017, we presented the preliminary results, methodologies and implications of the MN Marshbird Survey at the National Audubon Convention in Park City Utah. The conference is an opportunity to share strategies, challenges and successes with colleagues. The MN Marshbird survey work was held up as an example for other states to emulate. This broad scale monitoring approach, incorporating the existing Audubon membership as surveyors, is a key model for conducting long term monitoring which will guide our future conservation efforts on the ground.

Project Status as of: 30 April 2018

Presented methodology and preliminary results at 2 separate professional conferences the first was the Minnesota Ornithological Paper session on December 2nd 2017, Presentation title: *Minnesota Statewide Marshbird Survey: Using Monitoring to Guide Conservation Action*. The second was at the Midwest Fish and Wildlife Conference in Milwaukee, WI. in January of 2018. Presentation title: *Minnesota Statewide Marshbird*

Survey: a framework to help prioritize wetlands for conservation actions. Both presentations were well attended, reaching over 200 people combined, and acknowledged the Environmental and Natural Resources Trust Fund for support.

Overall Project Outcomes and Results: 15 August 2018

The results of this analysis are currently being drafted for submission to a scientific, peer reviewed journal. We will distribute the final accepted paper to the ENRTF for their records upon completion (anticipated in fall 2018) and highlight the write up on the Audubon MN website.

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$121,300	3 Audubon MN Staff- Kristin Hall, Project Manager: \$60,000 (.28 FTE for each year for 3 years) Volunteer Coordinator (to be hired/contracted): \$20,000 (.08 FTE each for 20 weeks for 2 years) Susan Swanson, Administrative support: \$7,500 (.06 FTE each year for 3 years) 2 Field Surveyors (to be hired)- \$35,800 (2 people for 10 weeks for 2 years) .19 FTE
Contracted Services	\$2,000	Spatial Analysis of habitat using GIS
Equipment/Tools/Supplies:	\$2,200	2 pair of waders, 3 Mp3 players, 4 range finders, multiple portable speakers, etc.
Travel Expenses in MN:	\$20,500	Travel and lodging for surveyors and staff
TOTAL ENRTF BUDGET:	\$146,000	

Explanation of Use of Classified Staff: N/A

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

Number of Full-time Equivalent (FTE) Directly Funded with this ENRTF Appropriation: 2.11

Number of Full-time Equivalent (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			
Audubon MN	\$31,500	\$31,500	Personnel
USFWS (in-kind)	\$2,500	<u>\$2,500</u>	Federal employee time in kind
State			
MN DNR (in-kind)	\$2,500	<u>\$2,500</u>	State wildlife non-game employee time
TOTAL OTHER FUNDS:	\$36,500	\$ 36,500	

VII. PROJECT STRATEGY:

A. Project Partners Receiving Funds:

Kristin Hall, Audubon Minnesota – Project lead

Project Partners Not Receiving Funds

Katherine Koch, U.S. Fish and Wildlife Service - Connecting Project with other efforts throughout the Midwest, facilitating data management and sharing with our Midwest Avian Data Center’s marshbird database
Carrol Henderson, MN DNR Nongame Program – Facilitating statewide effort within the DNR and other partners.

B. Project Impact and Long-term Strategy: The intent of this project is to create an ongoing, long-term wetland bird monitoring survey in Minnesota. This will provide natural resource managers information they need to effectively manage these birds, and their wetland habitats. For example, some of these birds are game species yet the dearth of information on their population numbers makes setting bag limits difficult. By using volunteers we expect the long-term cost of this survey to be minimal. This “citizen science” model is used effectively by Audubon for our Christmas Bird Count, now in its 115th year, and by the MN DNR in its Common Loon and amphibian surveys.

C. Funding History: The ENRTF and various partners have provided funding for the Minnesota Breeding Bird Atlas which will provide critical information to the Wetland Bird Survey Project. However, this project is not a continuation or repeat of the Breeding Bird Survey but builds on the information obtained from that effort. The ENRTF part of the funding is shown below:

- M.L. 2008 – Audubon Minnesota - \$169,000; NRRI - \$101,000
- M.L. 2010 – Audubon Minnesota - \$211,000; NRRI - \$161,000
- M.L. 211-12 – Audubon Minnesota - \$250,000
- M.L. 2014 – Audubon Minnesota - \$300,000

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS:

A. Parcel List: Not Applicable

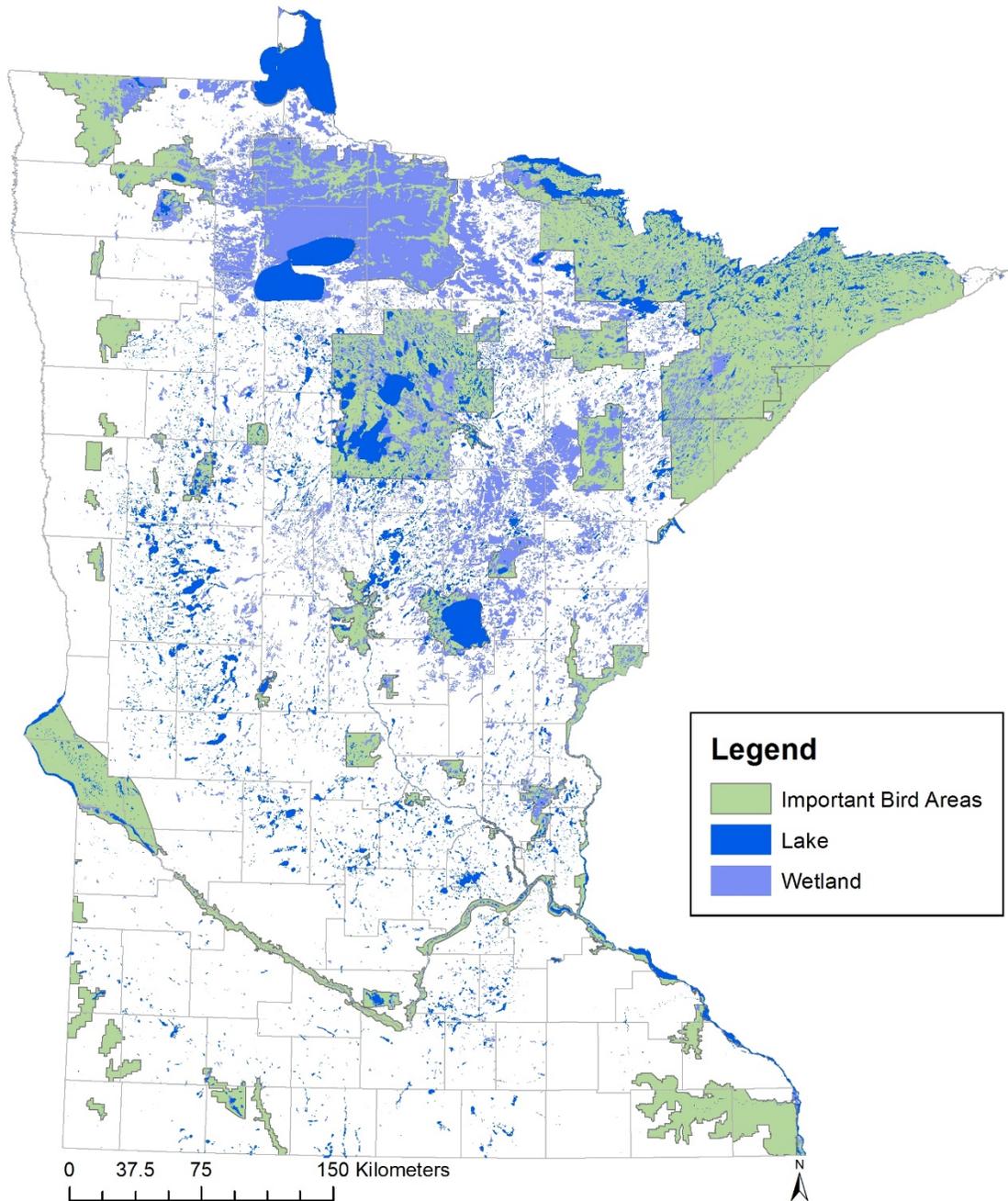
B. Acquisition/Restoration Information: Not Applicable

IX. VISUAL COMPONENT or MAP(S): See Maps 1-3

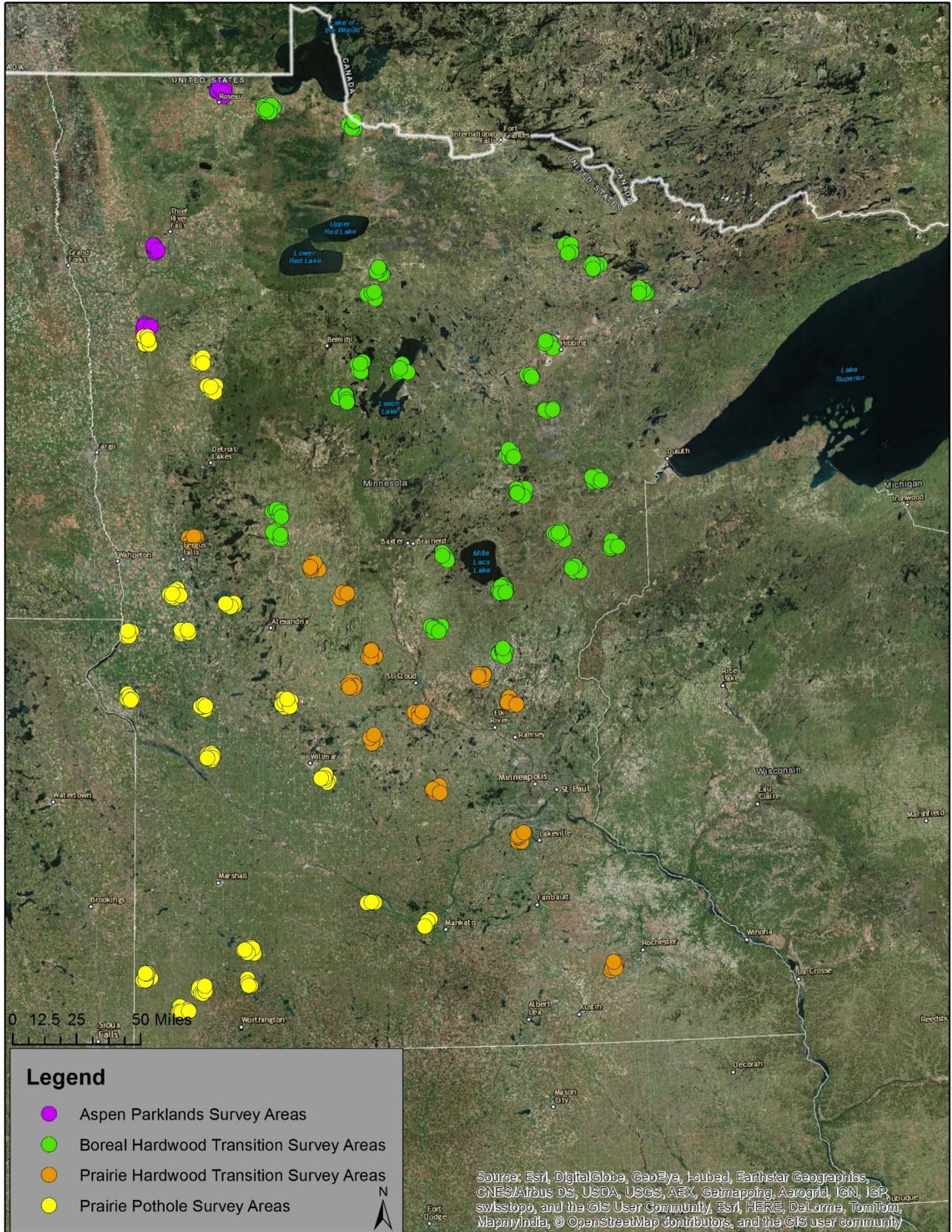
XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than [1/30/2016], [10/31/2016], [4/30/2017], [10/31/2017] and A final report and associated products will be submitted by June 30, 2018.

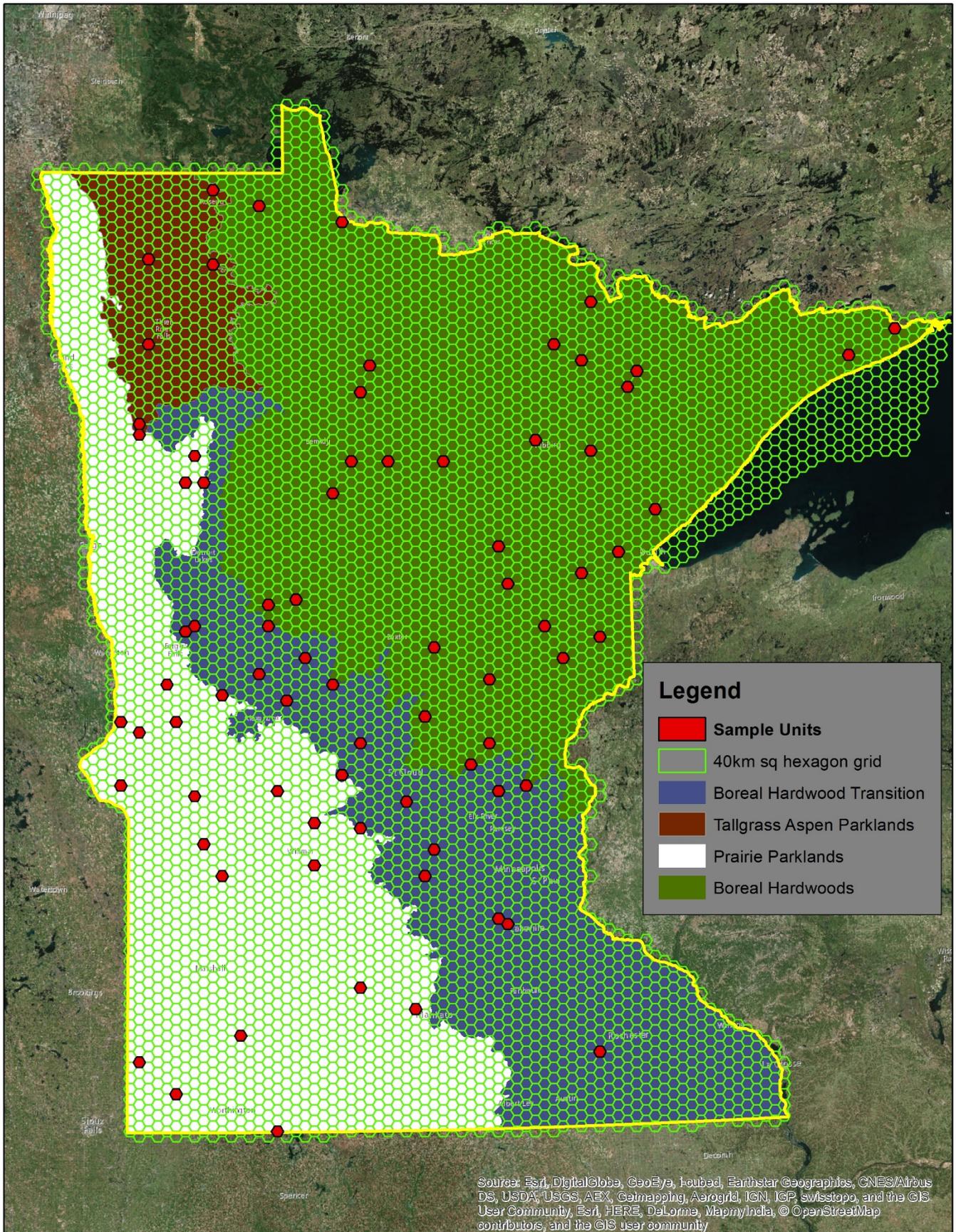
Waterbird Survey Areas of Interest



Map 1 Waterbird Survey Area of Interest



Map 2. Minnesota Marshbird Survey Locations - 2016 Season



Map 3 Finalized marshbird survey locations within MN Eco-Regions 2017 field season

Environment and Natural Resources Trust Fund
M.L. 2015 Project Budget



Project Title: Creating a Statewide Wetland Bird Monitoring Program
Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 03f
Project Manager: Kristin Hall, Nat Miller
Organization: Audubon Minnesota
M.L. 2015 ENRTF Appropriation: \$ 146,000
Project Length and Completion Date: 3 Years, June 30, 2018
Date of Report: 15 August 2018

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget 30 Oct 17	Amount Spent	Activity 2 Balance	Activity 3 Budget 16 April 2018	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	<i>Finalize Study Prorotcols</i>										
Personnel (Wages and Benefits)	\$12,500	\$12,500	\$0	\$87,300	\$86,573	\$727	\$21,500	\$21,500	\$0	\$121,300	\$727
Kristin Hall, Project Manager: \$60,000 (75% salary, 25% benefits) .28 FTE for each year for 3 years											
Volunteer Coordinator: \$20,000 (93% Salary and 7% benefits); .22 FTE each year for 2 years (20 wks/yr)											
Susan Swanson, Administrative support: \$7,500, (75% salary, 25% benefits); .06 FTE each year for 3 years											
2 Temporary Field Surveyors: \$35,800, (93% Salary and 7% benefits); .19FTE for 2 people for 2 years (10 wks/yr)											
Data assistant; \$11,000, (75% salary, 25% benefits) .23 FTE 1 yr											
Contracted Services							\$2,000	\$2,000	\$0	\$2,000	\$0
Equipment/Tools/Supplies - Overall				\$2,200	\$2,077	\$123			\$0	\$2,200	\$123
Portable speakers (\$50/ea)											
3 MP3 players (\$50/ea)											
4 range finders (\$150/ ea)											
1 sound meter (\$150)											
Training supplies, printing and mailing materials (\$600)											
2 sets of waders (\$100) each											
Travel expenses in Minnesota				\$20,500	\$20,450	\$50			\$0	\$20,500	\$50
Temp Employees mileage and lodging for travel to survey sites (2 years) - est \$13000											\$0
Audubon Staff travel to survey sites (2 years) - ext \$6000											\$0
COLUMN TOTAL	\$12,500	\$12,500	\$0	\$110,000	\$109,100	\$900	\$23,500	\$23,500	\$0	\$146,000	\$900