



# Iowa's Motus Wildlife Tracking Network

**2023 Annual Report**

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## Abstract

The Iowa DNR, with support from U.S. Fish and Wildlife Service grant funding, initiated a network of automated radio telemetry receiver stations as part of the Motus Wildlife Tracking System ([motus.org](https://motus.org)) in summer 2021. Between August 2021 and September 2022, eight Motus stations were installed at DNR buildings across the state. Three additional stations were funded by partners and placed on County Conservation Board properties in fall 2022. In 2023, Iowa DNR and partners installed nine more stations, resulting in 19 Motus stations across Iowa by the end of the year. These stations are part of a hemisphere-wide coordinated wildlife telemetry system focused on understanding long-distance movements of small migratory wildlife species like birds, bats, and insects. Any wildlife tagged on the Motus system have the potential to be detected by the Iowa DNR's receiver stations if they come within range. In 2023, Iowa Motus stations recorded 248 detections of 151 individuals from 21 bird species. Since the beginning of the project in 2021, Iowa Motus stations have recorded a total of 315 detections of 198 individuals from 26 bird species. All of these individuals were captured and tagged by licensed researchers outside of Iowa, and were detected as they migrated through the state.

## Introduction

### What is Motus?

The Motus Wildlife Tracking System is a collaborative global network of automated radio telemetry receivers and tagging projects. Motus was initiated in Ontario by Birds Canada in 2012 and has expanded globally since (Figure 1). Motus uses radio telemetry, which has three main components; transmitters, antennas, and receivers. The transmitters send out radio signals every few seconds and are placed on wildlife. Antennas are used to listen for the radio signals of nearby wildlife tagged with transmitters. Receivers interpret the radio signals heard by the antennas. Traditional wildlife telemetry requires every tagged individual to transmit a unique radio frequency, and for the receiver to be re-tuned to the frequency of each tagged individual a researcher is trying to find. The Motus system uses the same general components of radio telemetry, but the transmitters are digitally coded tags that allow for unique identification of thousands of individuals on a single radio frequency and the receivers are automated and set to listen only for Motus radio frequencies (Taylor et al. 2017).



Figure 1 Motus Wildlife Telemetry System receivers (yellow dots) across the globe as of December 2023.

In the Western Hemisphere, Motus tags and receiver stations (Figure 2) operate on two frequencies, 166.38 and 434 MHz. Scientists register tags and stations in a centralized database operated by Birds Canada, allowing researchers across the globe to collaboratively learn about the movements of small wildlife like never before. A tagged animal can

be detected by any Motus receiver station in the Hemisphere, allowing researchers to build point-by-point maps of large migrations for animals like birds, bats, and insects. Although GPS tracking technologies exist and are capable of recording highly-accurate locations of wildlife in real time, these technologies are too heavy to be carried by small wildlife like birds, bats, and insects. The Motus system, which uses tags as small as 0.2 grams, is particularly suited for learning about long-distance movements of small wildlife by leveraging the power of global collaboration.



**Figure 2** Examples of Motus receiver stations

### **Full Annual Cycle Conservation**

Over 400 species of birds can be seen in Iowa, the majority of which are considered migratory, meaning their range shifts during different parts of the year. Of those, a large proportion are long-distance migrants, traveling thousands of miles each year between breeding and nonbreeding areas. For example, the Baltimore Oriole, a common forest bird in Iowa during the summer, may travel as far as northern South America for winter (Figure 3). Using a full annual cycle conservation approach recognizes that these migratory species face different population pressures, habitat needs, and threats in different parts of their range throughout the year, and aims to support them at all stages of their annual cycle.



**Figure 3** The annual range of the Baltimore Oriole. (inset photo credit: Doug Harr).  
Map credit: Cornell Lab of Ornithology, [Allaboutbirds.org](http://Allaboutbirds.org).

Scientists have documented a loss of 2.9 billion North American birds since 1970, with migratory birds declining by 28% over that time (Rosenberg et al. 2019). Habitat loss, outdoor domestic cats, collisions with windows, and other threats are largely driving these declines. However, each species has its own unique population trend which coincides with the species specific range, habitat and resource needs, and the unique threats each species faces. The migration period, while birds are highly mobile at a hemispheric scale, is the most difficult part of the annual cycle for biologists to understand. There are many questions surrounding the threats birds face during migration, their habitat needs,

migratory connectivity, and what conservation actions can most help bird populations. Motus is one important tool that can help conservationists answer some of these important questions about migration and implement full annual cycle conservation to help stop and reverse the decline of North American bird populations.

### Why Motus in Iowa?

Iowa is an important migratory corridor for North American birds. Its location in the heart of the Mississippi Flyway and between two major rivers contributes to its high use by birds during migration. In fact, Iowa sees some of the highest volumes of migratory birds of any state during fall migration (Figure 4). An estimated 868 million birds crossed through Iowa during the fall of 2021 (BirdCast- Cornell Lab of Ornithology).



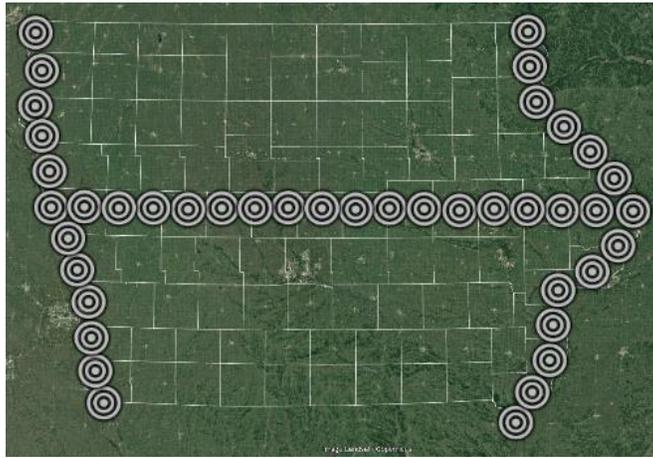
**Figure 4 Cumulative estimates of the number of migratory birds passing through each state during fall migration 2021 based on radar data. The states with the highest volume of migratory birds are shown in dark green with Iowa seeing the 4<sup>th</sup> highest volume of birds. Credit: Allaboutbird.org, BirdCast.**

By strategically placing Motus receiver stations across Iowa, we have the potential to contribute valuable migratory data for a large variety of species, including over 100 migratory bird and 6 bat species of greatest conservation concern. The data gathered by these Motus stations can help researchers understand aspects of the routes, timing, speed, and habitat use of migratory species which can be used to inform conservation action.

### Motus Station Placement in Iowa

#### Strategic Station Placement

The vision for Motus station placement in Iowa is to create an east-west fence through the center of the state and to border the Mississippi and Missouri Rivers with stations (Figure 5). This would maximize our detection of north-south migrating wildlife and our understanding of wildlife use of the corridors of habitat along the major rivers. This scenario would require 42 stations, however, implementation will need to be flexible to account for elevation, property ownership, and other practical constraints of placement. This vision will be used by the Iowa DNR as a starting point for prioritizing station placement across the state in order to contribute data at a regional scale. That being said, Motus stations placed anywhere in the state are valuable, and there is no reason to discourage placement of stations wherever funding and technical logistics allow. Iowa's station placement vision also aligns with the broader vision for Midwestern States as created by the Midwest Migration Network.

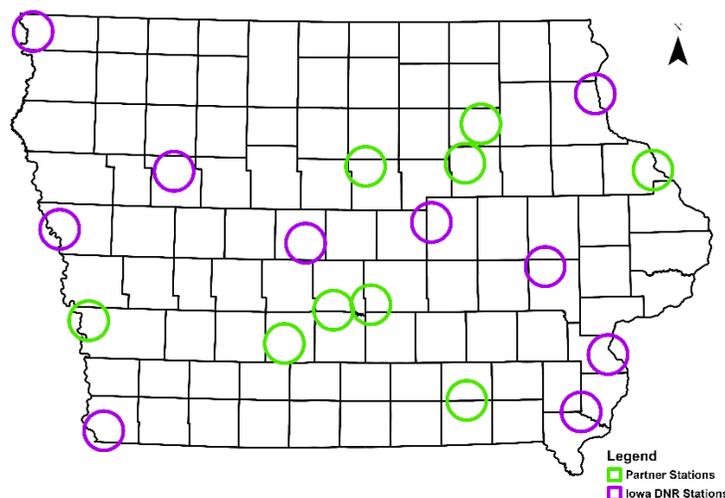


**Figure 5 The vision for Motus station placement in Iowa.**

**Station Placement Progress**

The initiation of the Motus network in Iowa was made possible by a U.S. Fish and Wildlife Service (USFWS) Competitive State Wildlife Grant (Missouri Division of Conservation 2020) which funded 59 stations in eight Midwestern states (IA, IN, IL, OH, MI, MN, MO, WI) and three countries (Mexico, Costa Rica, and Colombia). This grant funded the equipment for seven of the Iowa DNR’s stations and partially funded an eighth station. The first five of these DNR stations were placed between August and December of 2021, with two additional stations placed in spring of 2022, and one station placed in fall of 2022 (Figure 6).

Partner organizations started funding and placing stations in the fall of 2022 and have continued since. Partner stations were made possible through funding and support from Pottawattamie County Conservation, Bremer County Conservation, Hardin County Conservation, the Prairie Rapids Audubon Society, the Gilchrist Foundation, Des Moines Audubon, Iowa Audubon, Iowa Ornithologists’ Union, Dubuque County Conservation, Friends of Mines of Spain, Dubuque County Conservation Society, Dubuque Audubon, Lyon County Conservation, Wapello County Conservation, Madison County Conservation, Black Hawk County Conservation, The Friends of Hartman Reserve, Neal Smith National Wildlife Refuge, USFWS Migratory Birds -Midwest Region, Blank Park Zoo, the Loess Hills Preservation Society, Winterset Kiwanis Club, and a number of donations from individuals, including in memory of John Utter. In July of 2023, the Iowa DNR received two generous donations from Musco Sports Lighting and Diane Crookham-Johnson, which will allow us to install an additional 20 stations across the state over the next five years.



**Figure 6 Motus stations in Iowa as of December 2023. DNR stations are in purple, partner stations are in green. Circles represent a 15-km radius around each station, the approximate detection range of the antennas.**

Station placement thus far has generally followed the vision of an east-west fence through the center of the state and north-south fences along the rivers, but additional stations have been added based on local support. Stations in Iowa are dual-listening, meaning they operate on both the 166.38 and 434 MHz Motus frequencies, allowing them to detect any wildlife tagged on the Motus system in the Western Hemisphere. Antennas at each station are directional and generally oriented east and west in order to maximize detection of north-south moving wildlife (Figure 7). The 166 MHz antennas have a maximum detection range of 15 km (9.3 miles) and the 434 MHz antennas have a maximum detection distance of 10 km (6.2 miles).

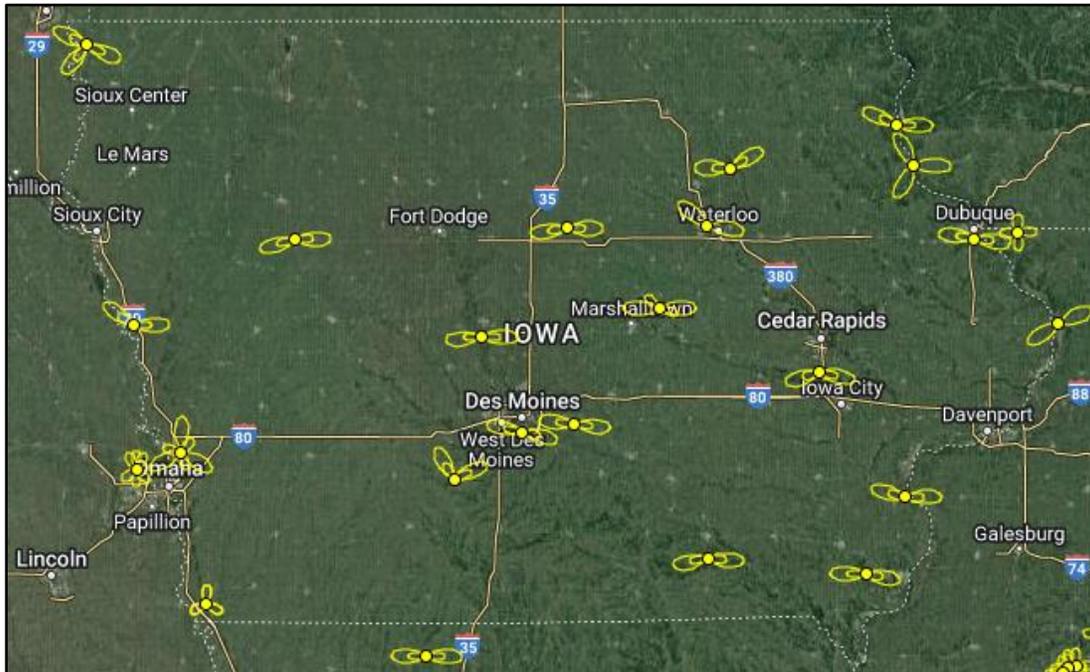


Figure 7 The approximate antenna range at each Motus station in or bordering Iowa is shown in yellow (December 2023).

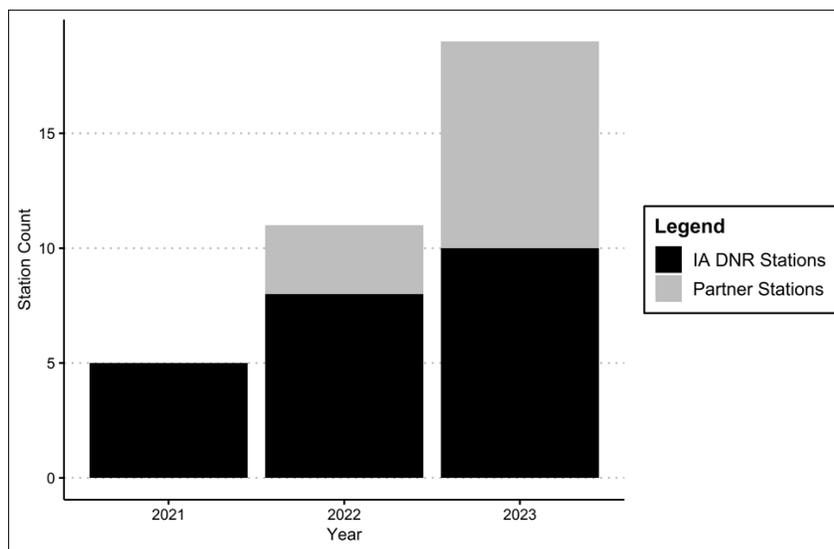


Figure 8 The number of Motus stations operational in Iowa each year. Black represents DNR stations, and gray represents partner stations.

## Iowa Motus Detections

### Motus Detection Summary 2021-2023

Motus stations in Iowa have been operational for as little as 1 and as many as 28 months. All but the newest stations, which were installed after the peak of fall migration in 2023, have detected birds. From 2021-2023, Iowa Motus stations had a total of 315 detections of 198 individuals from 26 bird species.

**Table 1 Total number of individuals detected and detection rate (individuals detected per month) for IA DNR stations since station start.**

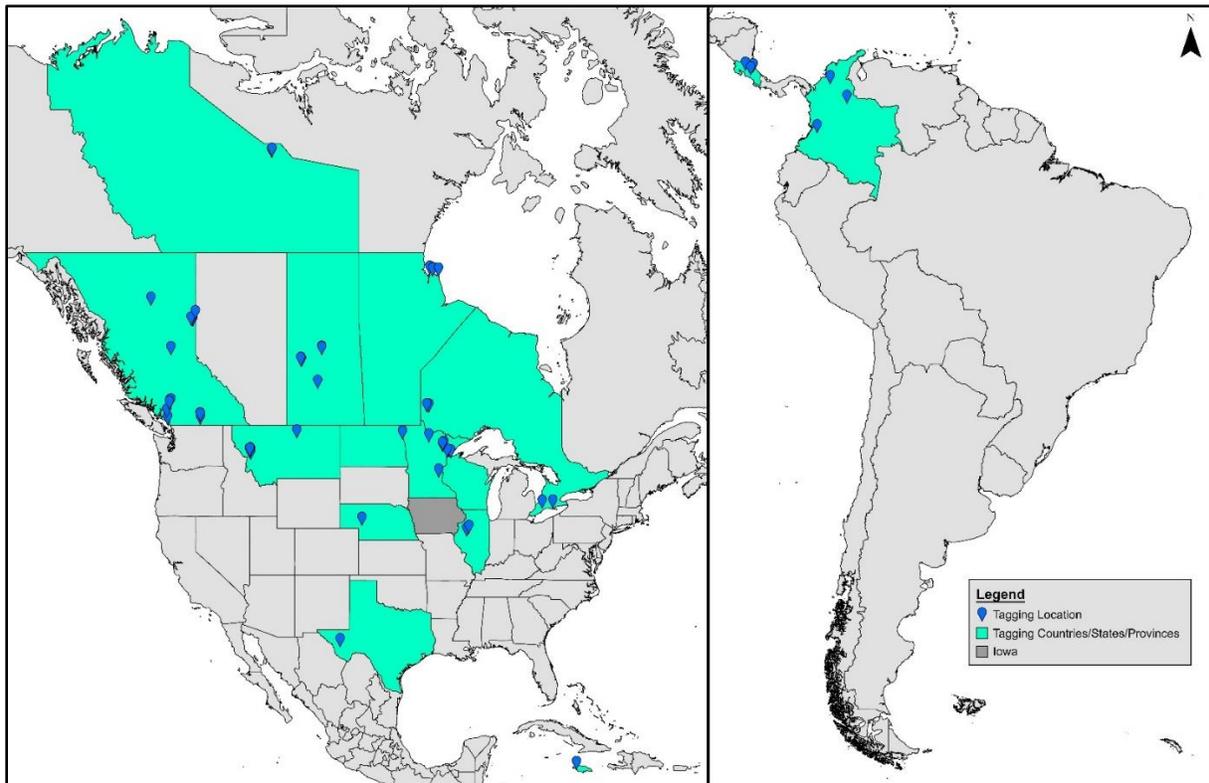
Station Name	Start Date	Total Detections	Detection Rate
Union Grove State Park	09-2022	23	1.53
Waubonsie State Park	08-2023	3	0.75
MO River Unit	09-2021	14	0.52
Blackhawk Unit	04-2022	15	0.71
Boone WRS	09-2021	37	1.32
Hawkeye WMA	10-2021	44	1.63
Lake Pahoja - IA Ornithologists' Union/IA Audubon	10-2023	2	0.67
Odessa Wildlife Unit	10-2021	18	0.67
Geode State Park	04-2022	18	0.9
Pikes Peak	10-2021	10	0.38

**Table 2 Total number of individuals detected and detection rate (individuals detected per month) for partner stations since station start.**

Station Name	Start Date	Total Detections	Detection Rate
Pioneer Ridge - Wapello County Conservation	09-2023	8	2.67
Blank Park Zoo - Des Moines Audubon	07-2023	14	2.8
Bremer County Conservation	11-2022	29	2.07
Hitchcock Nature Center	09-2022	25	1.56
Hartman Reserve - Black Hawk County Conservation	07-2023	7	1.17
Calkins Nature Area - Hardin County Conservation	10-2022	10	0.67
Mines of Spain - Dubuque County Conservation	06-2023	10	1.43
Neal Smith NWR	11-2023	0	0
Pammel State Park - Madison County Conservation	12-2023	0	0

### 2023 Motus Detection Summary

In 2023, Iowa stations had 248 detections of 151 individuals from 21 bird species, with some individuals detected at more than one station and/or during both spring and fall migration. 57 individuals were detected in spring and 107 individuals were detected in fall, with several detected during both periods. Species detected in 2023 include: Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), Short-billed Dowitcher (*Limnodromus griseus*), Stilt Sandpiper (*Calidris himantopus*), Franklin's Gull (*Leucophaeus pipixcan*), Black Tern (*Chlidonias niger*), Common Nighthawk (*Chordeiles minor*), Eastern Whip-poor-will (*Antrastomus vociferus*), Veery (*Catharus fuscescens*), Sprague's Pipit (*Anthus spragueii*), Ovenbird (*Seiurus aurocapilla*), Swainson's Thrush (*Catharus ustulatus*), American Kestrel (*Falco sparverius*), Golden-winged Warbler (*Vermivora chrysoptera*), American Redstart (*Setophaga ruticilla*), White-throated Sparrow (*Zonotrichia albicollis*), Mourning Warbler (*Geothlypis Philadelphia*), Chestnut-collared Longspur (*Calcarius ornatus*), Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), and Tree Swallow (*Tachycineta bicolor*); Table 3. Iowa Stations detected tagged birds from 14 different projects. Detected birds were tagged in the United States (IL, MN, MT, WI), Canada (BC, MB, NT, ON, SK), Colombia, Costa Rica, and Jamaica (Figure 9).



**Figure 9** The origin of birds detected at Iowa Motus stations. The states (U.S.), provinces (Canada), and Countries (Caribbean and Central and South America) where birds detected in Iowa were tagged are highlighted in green. Exact tagging locations are shown as blue pins. Iowa is highlighted in dark gray.

**Table 3** Summary of species detected by Iowa Motus stations in 2023.

 <p>USFWS Mountain-Prairie</p>	 <p>USFWS Midwest Region</p>	 <p>USFWS Midwest Region</p>	 <p>USFWS</p>
<b>Virginia Rail</b> Individuals Detected: Spring - 15 Fall - 12 Total - 21	<b>Sora</b> Individuals Detected: Spring - 13 Fall - 8 Total - 18	<b>Short-billed Dowitcher</b> Individuals Detected: Spring - NA Fall - 2 Total - 2	<b>Stilt Sandpiper</b> Individuals Detected: Spring - NA Fall - 2 Total - 2
 <p>USFWS Mountain-Prairie</p>	 <p>USFWS Mountain-Prairie</p>	 <p>USFWS Mountain-Prairie</p>	 <p>CC BY-NC 2.0 Tom Murray</p>
<b>Franklin's Gull</b> Individuals Detected: Spring - NA Fall - 16 Total - 16	<b>Black Tern</b> Individuals Detected: Spring - NA Fall - 4 Total - 4	<b>Common Nighthawk</b> Individuals Detected: Spring - NA Fall - 4 Total - 4	<b>Eastern Whip-poor-will</b> Individuals Detected: Spring - 4 Fall - 3 Total - 7

			
<b>Veery</b>	<b>Sprague's Pipit</b>	<b>Ovenbird</b>	<b>Swainson's Thrush</b>
Individuals Detected: Spring - NA Fall - 3 Total - 3	Individuals Detected: Spring - NA Fall - 1 Total - 1	Individuals Detected: Spring - NA Fall - 4 Total - 4	Individuals Detected: Spring - 1 Fall - 37 Total - 38
			
<b>American Kestrel</b>	<b>Golden-winged Warbler</b>	<b>American Redstart</b>	<b>White-throated Sparrow</b>
Individuals Detected: Spring - 7 Fall - 6 Total - 9	Individuals Detected: Spring - 6 Fall - NA Total - 6	Individuals Detected: Spring - 4 Fall - NA Total - 4	Individuals Detected: Spring - 4 Fall - 1 Total - 5
			
<b>Mourning Warbler</b>	<b>Chestnut-collared Longspur</b>	<b>Bank Swallow</b>	<b>Barn Swallow</b>
Individuals Detected: Spring - NA Fall - 1 Total - 1	Individuals Detected: Spring - 1 Fall - NA Total - 1	Individuals Detected: Spring - NA Fall - 2 Total - 2	Individuals Detected: Spring - 2 Fall - NA Total - 2
	TOTAL		
<b>Tree Swallow</b>	<b>21 species</b>		
Individuals Detected: Spring - NA Fall - 1 Total - 1	Individuals Detected: Spring - 57 Fall - 107 Total - 151		

## Iowa DNR Station Summaries

### **Station: Blackhawk Unit**

Sac County

Start Date: April 2022

2023 detection rate: 0.67 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=8513>

<b>2023 Blackhawk Unit Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
American kestrel	4	5
Franklins gull	1	2
Swainson's thrush	1	1
Virginia rail	1	1
White-throated sparrow	1	1

### **Station: Boone WRS**

Boone County

Start Date: August 2021

2023 detection rate: 1.67 detections/month

Links to station: <https://motus.org/data/receiverDeploymentDetections?id=8295>  
<https://motus.org/data/receiverDeploymentDetections?id=8131>

<b>2023 Boone WRS Species Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
American kestrel	2	2
Bank swallow	1	1
Barn swallow	1	1
Black tern	1	1
Eastern Whip-poor-will	2	2
Franklins gull	4	4
Sora	1	1
Swainson's thrush	3	3
Veery	1	1
Virginia rail	4	4

**Station: Geode State Park**

Henry County  
Start Date: April 2022  
2023 detection rate: 1 detection/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=8585>

<b>2023 Geode State Park Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
Barn swallow	1	1
Eastern Whip-poor-will	1	1
Franklins gull	1	1
Golden-winged warbler	2	2
Mourning warbler	1	1
Sora	3	3
Swainson’s thrush	3	3

**Station: Hawkeye WMA**

Johnson County  
Start Date: November 2021  
2023 detection rate: 2.58 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=8309>

<b>2023 Hawkeye WMA Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
American kestrel	1	1
American redstart	1	1
Common nighthawk	2	2
Eastern Whip-poor-will	2	2
Golden-winged warbler	2	2
Short-billed dowitcher	1	1
Sora	5	5
Swainson’s thrush	10	10
Virginia rail	7	7

**Station: Lake Pahoja -IA Ornithologists’ Union/IA Audubon**

Lyon County  
Start Date: November 2021  
2023 detection rate: 0.17 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=10258>

**2023 Lake Pahoja - IA Ornithologists’ Union/IA Audubon Species Detections**

<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
Franklins gull	2	2

**Station: MO River Unit**

Monona County

Start Date: November 2021

2023 detection rate: 0.58 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=8336>

2023 MO River Unit Detections		
Species	Individuals Detected	Total Detections
Black tern	1	1
Eastern Whip-poor-will	1	1
Franklins gull	3	3
Sora	1	1
Sprague's pipit	1	1

**Station: Odessa Wildlife Unit**

Louisa County

Start Date: December 2021

2023 detection rate: 1.42 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=8336>

2023 Odessa Wildlife Unit Detections		
Species	Individuals Detected	Total Detections
American redstart	2	2
Bank swallow	1	1
Golden-winged warbler	1	1
Short-billed dowitcher	1	1
Sora	3	4
Stilt sandpiper	1	1
Virginia rail	8	8

**Station: Pikes Peak**

Clayton County

Start Date: October 2021

2023 detection rate: 0.42 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=8266>

2023 Pikes Peak Detections		
Species	Individuals Detected	Total Detections
Sora	1	1
Virginia rail	4	4

**Station: Union Grove State Park**

Marshall County

Start Date: September 2022

2023 detection rate: 1.42 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=9059>

2023 Union Grove State Park Detections		
Species	Individuals Detected	Total Detections
American kestrel	3	4
Common nighthawk	1	1
Franklins gull	2	2
Sora	5	5
Stilt sandpiper	1	1
Swainson's thrush	3	3
Virginia rail	1	1
White-throated sparrow	1	1

**Station: Waubonsie State Park**

Fremont County

Start Date: August 2023

2023 detection rate: 0.75 detections/month

Link to Station: <https://motus.org/data/receiverDeploymentDetections?id=10125>

2023 Waubonsie State Park Detections		
Species	Individuals Detected	Total Detections
Sora	1	1
Swainson's thrush	1	1
Tree swallow	1	19

**Partner Station Summaries****Station: Blank Park Zoo – Des Moines Audubon**

Polk County

Start Date: July 2023

2023 detection rate: 1.17 detections/month

Link to Station: <https://motus.org/data/receiverDeploymentDetections?id=10144>

2023 Blank Park Zoo - Des Moines Audubon Detections		
Species	Individuals Detected	Total Detections
American kestrel	2	2
Common nighthawk	1	1
Franklins gull	1	1
Ovenbird	1	1
Sora	1	1

Species	Individuals Detected	Total Detections
Swainson's thrush	2	2
Veery	2	2
Virginia rail	4	4

**Station: Bremer County Conservation**

Bremer County

Start Date: November 2022

2023 detection rate: 2.07 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=9466>

**2023 Bremer County Conservation Detections**

Species	Individuals Detected	Total Detections
American kestrel	3	4
American redstart	1	1
Eastern Whip-poor-will	4	4
Golden-winged warbler	1	1
Ovenbird	2	2
Short-billed dowitcher	1	1
Sora	5	5
Stilt sandpiper	1	1
Swainson's thrush	6	6
Virginia rail	5	5

**Station: Calkins Nature Area - Hardin County Conservation**

Hardin County

Start Date: October 2022

2023 detection rate: 0.67 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=9090>

**2023 Calkins Nature Area Species Detections**

Species	Individuals Detected	Total Detections
American kestrel	5	5
Franklins gull	1	1
Sora	1	1
Swainson's thrush	2	4
Virginia rail	1	1

**Station: Hartman Reserve -Black Hawk County Conservation**

Black Hawk County  
Start Date: July 2023  
2023 detection rate: 0.58 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=9971>

<b>2023 Hartman Reserve Species Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
Common nighthawk	1	1
Swainson’s thrush	6	6

**Station: Hitchcock Nature Center**

Pottawattamie County Conservation  
Start Date: September 2022  
2023 detection rate: 1.31 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=9005>

<b>2023 Hitchcock Nature Center Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
Black tern	3	3
Chestnut-collared longspur	1	1
Franklins gull	2	2
Sora	1	1
Spragues pipit	1	1
Swainson’s thrush	9	9
Tree swallow	1	1
Veery	1	1
White-throated sparrow	2	2

**Station: Mines of Spain – Dubuque County Conservation**

Dubuque County  
Start Date: June 2023  
2023 detection rate: 0.83 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=9822>

<b>2023 Mines of Spain -Dubuque county Conservation Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
Common nighthawk	1	1
Ovenbird	1	1
Swainson’s thrush	5	5
Virginia rail	2	2
White-throated sparrow	1	1

### **Station: Neal Smith NWR**

Polk County

Start Date: November 2023

2023 detection rate: 0 detections/month

Link to station: <https://motus.org/data/receiverDeployment?id=10388>

<b>2023 Neal Smith NWR Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
NA	NA	NA

### **Station: Pammel State Park -Madison County Conservation**

Madison County

Start Date: December 2023

2023 detection rate: 0 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=10469>

<b>2023 Pammel State Park - Madison County Conservation Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
NA	NA	NA

### **Station: Pioneer Ridge -Wapello County Conservation**

Wapello County

Start Date: September 2023

2023 detection rate: 0.67 detections/month

Link to station: <https://motus.org/data/receiverDeploymentDetections?id=10239>

<b>2023 Pioneer Ridge - Wapello County Conservation Detections</b>		
<b>Species</b>	<b>Individuals Detected</b>	<b>Total Detections</b>
American kestrel	1	2
Franklins gull	4	5
Sora	1	1
Virginia rail	2	2

### **Detection Highlights**

2023 was an exciting year for the Motus Network in Iowa, with a variety of bird species detected by Iowa stations during spring and fall migration periods. Some birds were detected at multiple Iowa stations on the same day, allowing us to understand how fast they were traveling. Other individuals were detected at Iowa stations during both spring and fall migration, telling us something about their migratory routes. Birds detected in Iowa were often detected by stations in other states and countries as well, helping researchers build a point-by-point picture of the migration of these individuals. Information on each of the birds detected at Iowa stations is available at [motus.org](https://motus.org) or can be accessed through the links in the station summary above. Although every Iowa detection is fascinating and biologically important, there were a few birds detected in Iowa in 2023 that really stood out.

## Migratory Stopover of a Tree Swallow

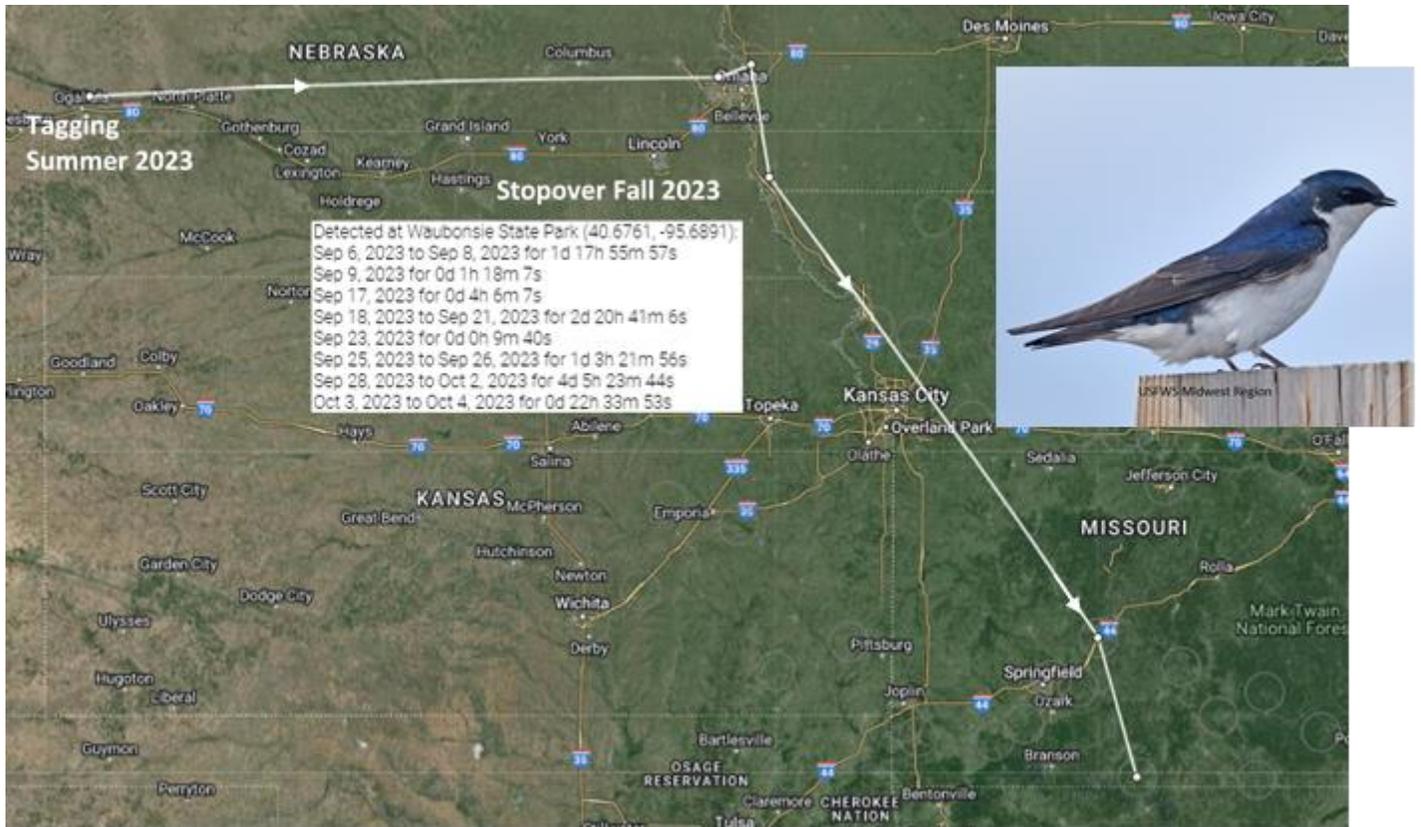


Figure 10 Detection locations and predicted flight paths of Tree Swallow 47355. Map from motus.org.

Tree Swallow 47355 was tagged on June 12, 2023 near Ogallala, NE. It was detected during a fall migratory movement in Omaha, NE and Lewis and Clark State Park in IA on September 6<sup>th</sup>, before making it's way south to Waubonsie State Park that same day. The Tree Swallow was then detected repeatedly for many hours and days in a row, making an apparent migratory stopover. It stayed near the station at Waubonsie State Park for 29 days, from Spetember 6<sup>th</sup> to October 4<sup>th</sup>. As we began speculating whether the tag had fallen off or the swallow had been predated, it continued moving south, and was detected at two stations in Southern MO on October 6<sup>th</sup> and 7<sup>th</sup>. Many migrating birds rely on stopover habitats to rest and refuel during their long journeys between their breeding and nonbreeding areas. Habitat and food resources are critical to the survival of migratory birds, and as we saw in this example, Iowa is likely supporting many birds during stopovers of varying lengths.

## American Kestrel Detected Over Multiple Years



Figure 11 Detection locations and predicted flight paths of American Kestrel 33680. Map from motus.org.

American Kestrel 33680 was tagged on June 2, 2021 at Sax Sim Bog in MN. During fall of 2021 it was detected in northeast MO and later near Branson, MO. It likely flew through IA but was not detected since there were only two active Motus stations in Iowa at that time. The following spring, it was detected at the Blackhawk Unit station in IA on 4/5/2022, which had been activated just 4 days prior. The kestrel was not detected again until September of 2022 when it was detected south of Minneapolis, MN. The Union Grove State Park station in Iowa which was set up on 9/22/2022 was able to detect the kestrel on its fall migration on 10/6/2022. Within a day, it made its way to southern MO, near Branson again. In April of 2023, it was detected just outside Kansas City, MO and on April 7 it was detected at the Calkins Nature Area – Hardin County Conservation station as it moved through IA on its spring migration. A day later, it was detected in Minneapolis again (Figure 11). Due to their large size compared to other Motus-tagged species, American Kestrels are able to be fitted with solar tags with a longer battery life, allowing us to get a better understanding of their migratory movements over several years. We were able to discern that kestrel 33680 passed through IA each year during migration. As the Motus network expands in Iowa and other surrounding states, we will be able to get increasingly better data on how tagged individuals are moving through IA during migration and the amount of time they spend in our state.

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