Iowa's Motus Wildlife Tracking Network

2022 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) 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. 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. Since 2021, Iowa Motus stations have recorded 66 detections of 57 individuals from 17 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 (motus.org) 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.

Figure 1 Motus Wildlife Telemetry System receivers (yellow dots) across the globe as of December 2022.

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 insets. Although GPS tracking technologies exists 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 wintering and breeding 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.

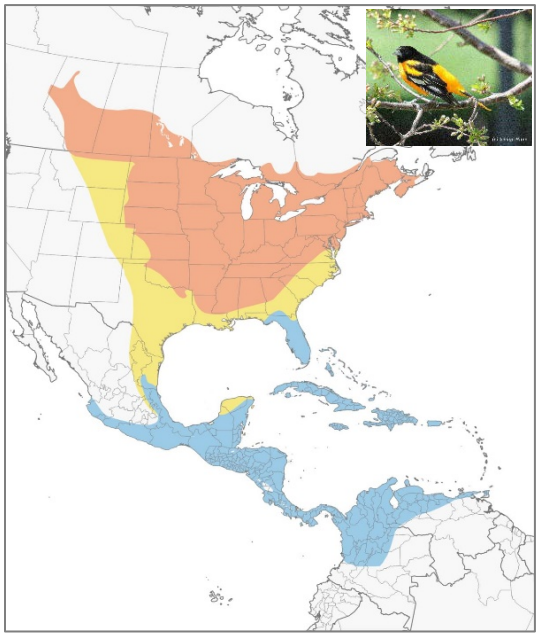

Figure 3 The annual range of the Baltimore Oriole. (inset photo credit: Doug Harr).
Map credit: Cornell Lab of Ornithology, Allaboutbirds.org.

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 or Ornithology).

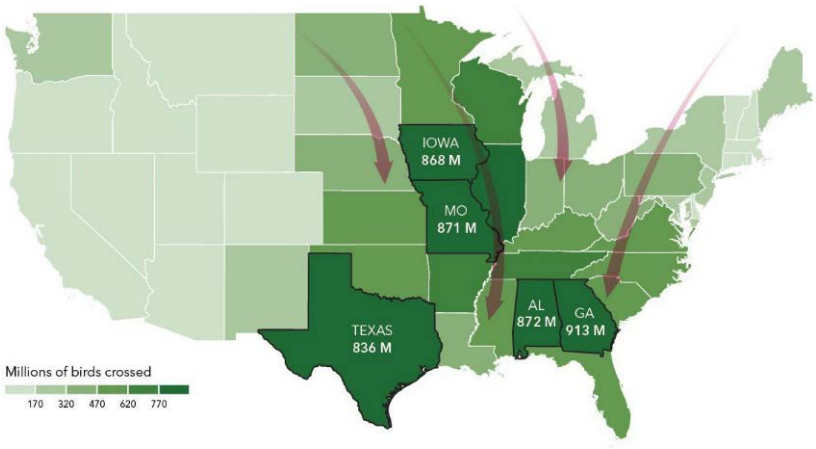

Figure 4 Cumulative estimates of the number of migratory birds passing through each state during fall migration 2021 based on radar data. The states with the highest volume of migratory birds are shown in dark green with Iowa seeing the 4rd highest volume of birds. Credit: Allaboutbird.org, BirdCast.

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 6).

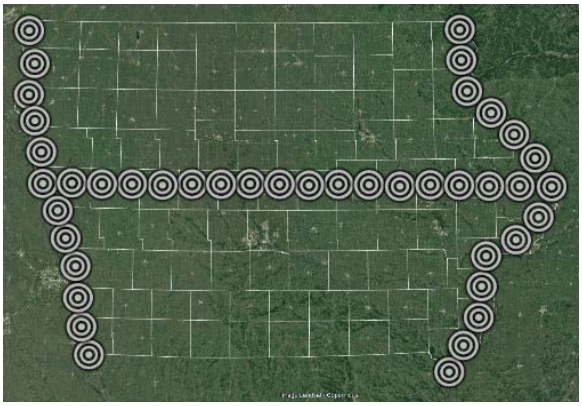

Figure 5 The vision for Motus station placement in Iowa.

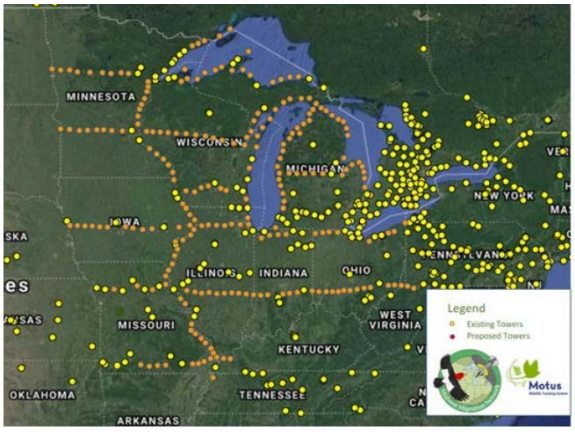

Figure 6 The Midwest Migration Network's Strategic Motus Receiver Plan. Yellow dots represent existing stations and orange dots represent proposed station locations as of November 2021.

Station Placement Progress

The initiation of the Motus network in Iowa was made possible by a U.S. Fish and Wildlife Service 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 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 7). Partner organizations started placing stations in the fall of 2022. Partner stations were made possible through funding from Pottawattamie County Conservation, Bremer County Conservation, Hardin County Conservation, the Prairie Rapids Audubon Society, the Gilchrist Foundation, and a number of small donations from individuals.

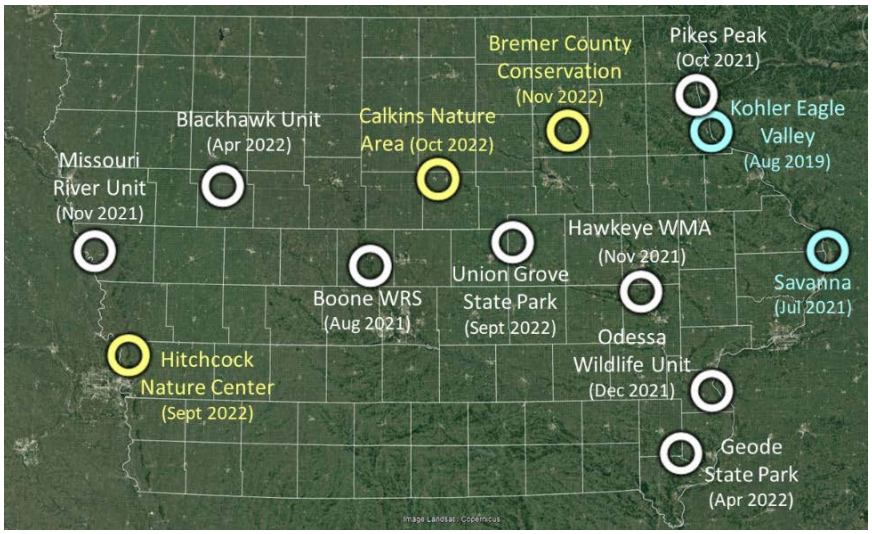

Figure 7 Motus stations in Iowa as of December 2022. Each station's name and time of installation are listed. DNR stations are in white, partner stations are in yellow, and stations in bordering states that overlap Iowa are in blue.

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. Stations in Iowa are dual-listening, meaning they operate on both the 166 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 8). Each of the 166 MHz antennas has a maximum detection range of 15 km (9.3 miles) and each 434 MHz antenna has a maximum detection distance of 10 km (6.2 miles).

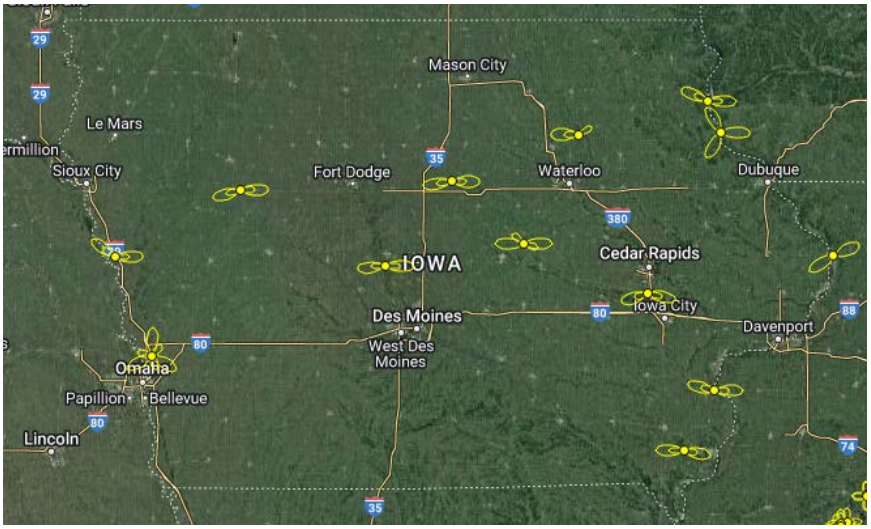

Figure 8 The approximate listening range of the antennas at each Motus station in, or bordering, Iowa are shown in yellow.

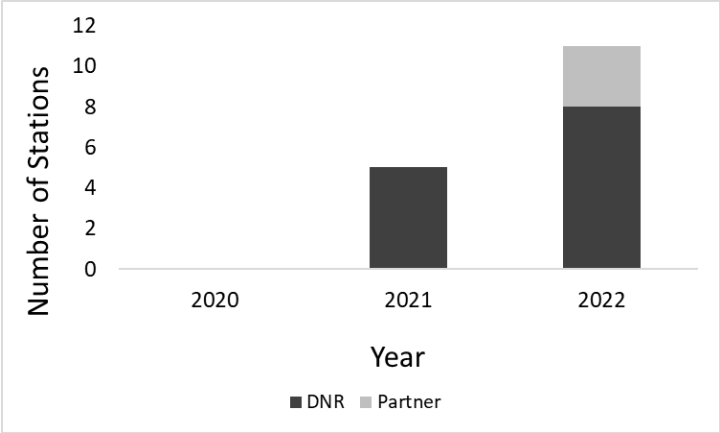

Figure 9 The number of Motus stations operational in Iowa each year. Dark gray represents DNR stations, and light gray represents partner stations.

Iowa Motus Detections

Motus Detection Summary

Motus stations in Iowa have been operational for as little as 2 and as many as 16 months. All but the newest stations, which were installed after the peak of fall migration in 2022, have detected birds (Figure 10). Between August 2021 and December 2022, Iowa stations have a total of 66 detections of 57 individuals from 17 bird species, with some individuals being detected at more than one station and during both spring and fall migration. Iowa DNR's Motus stations have recorded 62 detections of 53 individuals from 17 bird species and partner stations placed in fall 2022 have detected 4 individuals from 4 bird species. Species detected include: Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), Semipalmated Plover (*Charadrius semipalmatus*), Stilt Sandpiper (*Calidris himantopus*), Dunlin (*Calidris alpina*), Least Sandpiper (*Calidris minutilla*), Short-billed Dowitcher (*Limnodromus griseus*), Lesser Yellowlegs (*Tringa flavipes*), Black Tern (*Chlidonias niger*), Common Nighthawk (*Chordeiles minor*), Eastern Whip-poor-will (*Antrostomus vociferus*), American Kestrel (*Falco sparverius*), Swainson's Thrush (*Catharus ustulatus*), Golden-winged Warbler (*Vermivora chrysoptera*), American Redstart (*Setophaga ruticilla*), White-throated Sparrow (*Zonotrichia albicollis*), and Rusty Blackbird (*Euphagus carolinus*; Table 1).

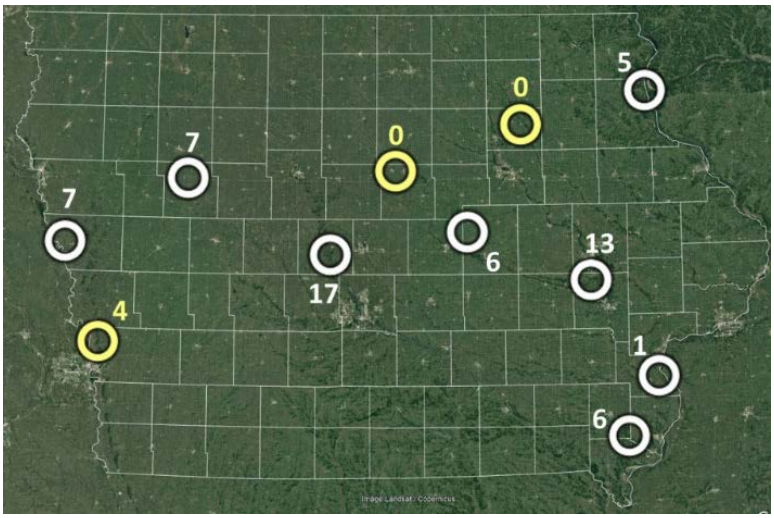

Figure 10 The total number of individuals detected per Iowa Motus station between Aug 2021 and Dec 2022. DNR stations are shown in white and partner station in yellow.

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 11).

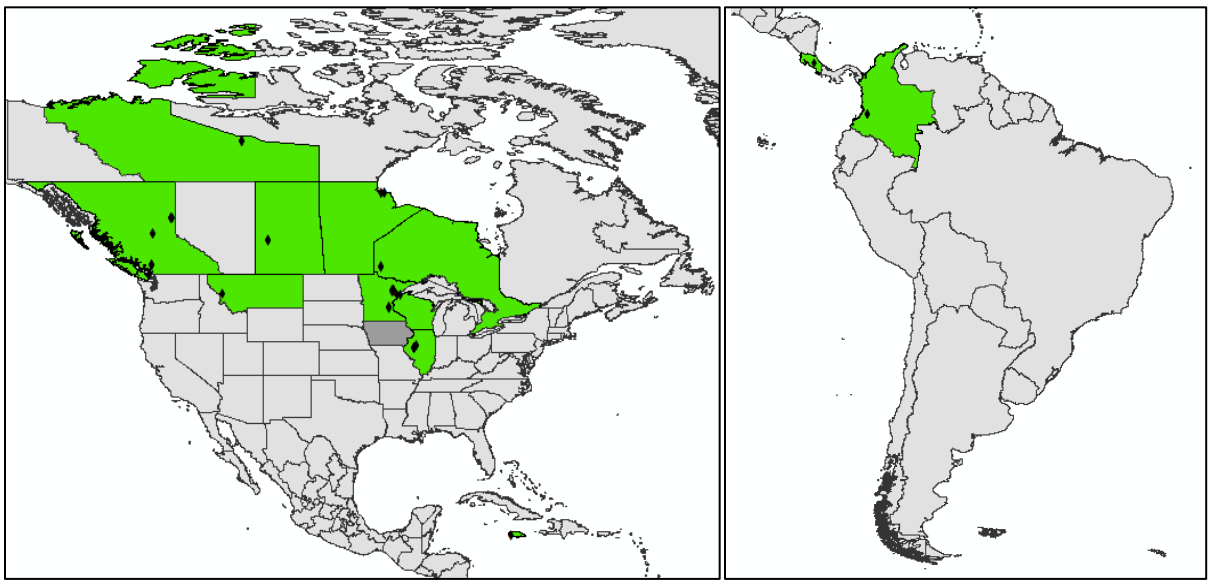

Figure 11 The origin of birds detected at Iowa Motus stations from 2021-2022. The states (U.S.), provinces (Canada), and Countries (Caribbean and Central and South America) where birds detected in Iowa were tagged are highlighted in green. Exact tagging locations are shown as black diamonds. Iowa is highlighted in dark gray.

Table 1 Summary of species detected by Iowa Motus stations from August 2021 to December 2022.

			
Virginia Rail	Sora	Semipalmated Plover	Stilt Sandpiper
Individuals Detected: Spring - 6 Fall - 1 Total - 7	Individuals Detected: Spring - 3 Fall – 3 Total - 5	Individuals Detected: Spring - 0 Fall - 3 Total - 3	Individuals Detected: Spring - 1 Fall - 1 Total - 1
			
Dunlin	Least Sandpiper	Short-billed Dowitcher	Lesser Yellowlegs
Individuals Detected: Spring - 1 Fall - 1 Total - 1	Individuals Detected: Spring - 1 Fall - 1 Total - 1	Individuals Detected: Spring - 0 Fall - 1 Total - 1	Individuals Detected: Spring - 3 Fall - 6 Total - 6
			
Black Tern	Common Nighthawk	Eastern Whip-poor-will	Swainson’s Thrush
Individuals Detected: Spring - 0 Fall - 2 Total - 2	Individuals Detected: Spring - 1 Fall - 0 Total - 1	Individuals Detected: Spring - 0 Fall - 3 Total - 3	Individuals Detected: Spring - 0 Fall - 5 Total - 5
			
American Kestrel	Golden-winged Warbler	American Redstart	White-throated Sparrow
Individuals Detected: Spring - 2 Fall - 10 Total - 11	Individuals Detected: Spring - 1 Fall - 0 Total - 1	Individuals Detected: Spring - 1 Fall - 0 Total - 1	Individuals Detected: Spring - 0 Fall - 7 Total - 7

	TOTAL		
Rusty Blackbird	17 species		
Individuals Detected: Spring - 0 Fall - 1 Total - 1	Individuals Detected: Spring - 17 Fall - 45 Total - 57		

Detections by Station - DNR Stations

Station: Black Hawk Unit
Owner: Iowa DNR

Start Date: April 2022

Avg. detection rate:
0.77 detections/month

Species	Date Detected	Date Tagged	Location Tagged
Lesser Yellowlegs	5/7/2022	4/19/2022	La Esparanza, Colombia
Golden-winged Warbler	5/11/2022	3/5/2022	Birrisito, Costa Rica
American Kestrel	8/4/2022	6/17/2022	Sax-Zim Bog, MN
American Kestrel	9/22/2022	7/8/2022	Twin Cities, MN
Swainson's Thrush	9/22/2022	8/24/2022	Whistler, British Columbia, Canada
American Kestrel	10/6/2022	6/2/2021	Sax-Zim Bog, MN
White-throated Sparrow	10/13/2022	5/31/2022	Arras, British Columbia, Canada

Station: Boone WRS
Owner: Iowa DNR

Start Date: August 2021

Avg. detection rate:
1.06 detections/month

Species	Date Detected	Date Tagged	Location Tagged
American Kestrel	9/11/2021	8/2/2021	Arden Hills Armory, Twin Cities, MN
American Kestrel	10/5/2021	6/2/2021	Sax-Zim Bog, MN
American Kestrel	4/12/2022	5/28/2021	Arden Hills Armory, Twin Cities, MN
Virginia Rail	5/13/2022	5/2/2022	Emiquon National Wildlife Refuge, IL
Common Nighthawk	6/5/2022	7/19/2021	Carlton, MT
Semipalmated Plover	8/14/2022	7/2/2022	Northwest Territories, Canada
Lesser Yellowlegs	8/16/2022	4/19/2022	La Esparanza, Colombia
Semipalmated Plover	8/30/2022	6/13/2022	Northwest Territories, Canada
Sora	9/21/2022	5/22/2022	Emiquon National Wildlife Refuge, IL
Sora	9/21/2022	5/10/2022	Emiquon National Wildlife Refuge, IL
Eastern Whip-poor-will	9/25/2022	7/11/2022	Kenora, Ontario, Canada
Swainson's Thrush	9/26/2022	8/24/2022	Whistler, British Columbia, Canada
White-throated Sparrow	9/26/2022	5/25/2022	Arras, British Columbia, Canada
American Kestrel	9/27/2022	6/24/2022	Sax-Zim Bog, MN
Swainson's Thrush	10/2/2022	8/24/2022	Whistler, British Columbia, Canada
White-throated Sparrow	10/19/2022	6/1/2022	Prince George, British Columbia, Canada
White-throated Sparrow	10/19/2022	5/26/2022	Prince George, British Columbia, Canada

Station: Geode State Park
Owner: Iowa DNR

Start Date: April 2022

Avg. detection rate:
0.67 detections/month

Species	Date Detected	Date Tagged	Location Tagged
Virginia Rail	5/17/2022	4/30/2022	Emiquon National Wildlife Refuge, IL
Virginia Rail	5/24/2022	4/8/2022	Emiquon National Wildlife Refuge, IL
Stilt Sandpiper	7/21/2022	6/24/2022	Churchill, Manitoba, Canada
Lesser Yellowlegs	7/24/2022	4/19/2022	La Esparanza, Colombia
Semipalmated Plover	8/10/2022	7/2/2022	Northwest Territories, Canada
Semipalmated Plover	8/30/2022	6/13/2022	Northwest Territories, Canada

Station: Hawkeye WMA
Owner: Iowa DNR

Start Date: November 2021

Avg. detection rate:
0.93 detections/month

Species	Date Detected	Date Tagged	Location Tagged
Sora	5/16/2022	5/6/2022	Emiquon National Wildlife Refuge, IL
Virginia Rail	5/18/2022	5/1/2022	Banner Marsh State Fish & Wildlife Area, IL
Virginia Rail	5/24/2022	4/30/2022	Emiquon National Wildlife Refuge, IL
Virginia Rail	5/29/2022	5/11/2022	Emiquon National Wildlife Refuge, IL
Sora	6/5/2022	5/22/2022	Emiquon National Wildlife Refuge, IL
Lesser Yellowlegs	7/20/2022	4/19/2022	La Esparanza, Colombia
Least Sandpiper	7/20/2022	6/21/2022	Northeastern Northwest Territories, Canada
Short-billed Dowitcher	7/28/2022	6/12/2022	Churchill, Manitoba, Canada
Lesser Yellowlegs	8/4/2022	4/19/2022	La Esparanza, Colombia
American Kestrel	8/10/2022	6/26/2022	Wentworth, WI
American Kestrel	9/25/2022	6/24/2022	Sax-Zim Bog, MN
White-throated Sparrow	10/16/2022	5/31/2022	Arras, British Columbia, Canada
White-throated Sparrow	10/26/2022	5/26/2022	Prince George, British Columbia, Canada

Station: MO River Unit
Owner: Iowa DNR

Start Date: November 2021

Avg. detection rate:
0.50 detections/month

Species	Date Detected	Date Tagged	Location Tagged
Lesser Yellowlegs	5/7/2022	4/19/2022	La Esparanza, Colombia
Lesser Yellowlegs	5/7/2022	4/19/2022	La Esparanza, Colombia
Lesser Yellowlegs	5/10/2022 & 7/27/2022	4/19/2022	La Esparanza, Colombia
Black tern	7/20/2022	6/27/2022	Jackfish Lake, Saskatchewan, Canada
Black tern	8/11/2022	6/26/2022	Jackfish Lake, Saskatchewan, Canada
Sora	9/19/2022	4/26/2022	Emiquon National Wildlife Refuge, IL
Swainson's Thrush	9/21/2022	8/24/2022	Whistler, British Columbia, Canada

Station: Odessa Wildlife Unit
Owner: Iowa DNR

Start Date: December 2021

Avg. detection rate:
0.08 detections/month

Species	Date Detected	Date Tagged	Location Tagged
Lesser Yellowlegs	7/20/2022	4/19/2022	La Esparanza, Colombia

Station: Pikes Peak
Owner: Iowa DNR

Start Date: October 2021

Avg. detection rate:
0.33 detections/month

Species	Date Detected	Date Tagged	Location Tagged
Rusty Blackbird	10/31/2021	10/16/2021	Perch Lake Park, MN
Sora	5/12/2022	5/4/2022	Emiquon National Wildlife Refuge, IL
American Redstart	6/2/2022	4/1/2022	Fonthill Nature Reserve, Jamaica
Lesser Yellowlegs	7/20/2022	6/29/2022	Churchill, Manitoba, Canada
Dunlin	11/26/2022	11/24/2022	Vancouver, British Columbia, Canada

Station: Union Grove State Park
Owner: Iowa DNR

Start Date: September 2022

Avg. detection rate:
1.5 detections/month

Species	Date Detected	Date Tagged	Location Tagged
American Kestrel	10/6/2022	6/2/2021	Sax-Zim Bog, MN
American Kestrel	9/25/2022	6/24/2022	Sax-Zim Bog, MN
American Kestrel	9/27/2022	6/24/2022	Sax-Zim Bog, MN
American Kestrel	9/27/2022	6/14/2022	Sax-Zim Bog, MN
American Kestrel	9/27/2022	6/14/2022	Sax-Zim Bog, MN
Eastern Whip-poor-will	10/6/2022	6/17/2022	Minaki, Ontario, Canada

Detections by Station - Partner Stations

Station: Bremer County Conservation
Owner: Bremer County Conservation

Start Date: November 2022

Avg. detection rate:
0 detections/month

Species	Date Detected	Date Tagged	Location Tagged
No Detections			

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

Start Date: October 2022

Avg. detection rate:
0 detections/month

Species	Date Detected	Date Tagged	Location Tagged
No Detections			

Station: Hitchcock Nature Center
Owner: Pottawattamie County Conservation

Start Date: September 2022

Avg. detection rate:
1.0 detections/month

Species	Date Detected	Date Tagged	Location Tagged
Eastern Whip-poor-will	9/25/2022	7/13/2022	Reddit, Ontario, Canada
Virginia Rail	10/6/2022	4/25/2022	Emiquon National Wildlife Refuge, IL
Swainson’s Thrush	10/11/2022	8/24/2022	Whistler, British Columbia, Canada
White-throated Sparrow	10/17/2022	5/26/2022	Arras, British Columbia, Canada

Detection Highlights

The first 18 months of the Motus Network in Iowa were very eventful, 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 or can be accessed through the links in the Appendix below. Although every Iowa detection is fascinating and biologically important, there were a few birds detected in Iowa that really stood out.

The Full Annual Cycle of a Lesser Yellowlegs

Lesser Yellowlegs 38364 was a perfect example of the power of Motus to shed light on the full annual cycle of a bird (Figure 12). This bird was tagged on the wintering grounds in Valle del Cauca, Colombia on April 19th, 2022. Eighteen days later on May 7th it was detected at the MO River Unit station for 10 minutes (an apparent short stopover). The bird was not detected during the breeding period, but presumably spent the summer in the arctic. On July 19th, the bird was detected during its southern migration at a station in Southwestern Manitoba and then 2.5 hours later at a station in central North Dakota for 41 minutes (another stopover). It was traveling ~87 miles/hour. It took 6 hours and 55 minutes to get from North Dakota to the station at Hawkeye WMA (traveling ~82 miles/hour), and was detected there for 16 minutes. From there, it flew another 30 minutes at ~101 miles/hour to the Odessa Wildlife Unit station where it was detected for 10 minutes. The fact that we detected this same individual Lesser Yellowlegs during both spring and fall migration and at 3 different stations in Iowa is just amazing, and highlights the importance of Iowa to this bird's full annual cycle!

Figure 12 The full annual cycle of Lesser Yellowlegs 38364 in 2022. The bird was tagged in Colombia in April and detected at 3 Iowa Motus stations during spring and fall migration.

But the story doesn't end there...Nine hours and 40 minutes later the bird was detected at a station in far northeastern Tennessee, where it stopped for 20 minutes and then 6 hours and 10 minutes later it was detected for 33 minutes at Bald Head Island off the southern coast of North Carolina. In a 48 hour period from Jul 19th-20th this Lesser Yellowlegs traveled over 1,700 miles! It was detected back on its wintering grounds in Colombia on September 2nd 2022.

Migration is Complex

Although we typically think of Western Hemisphere birds flying north in spring and south in fall, it's more complex than that. There is often an east-west component to their travel as well. Wind and weather patterns, the earth's magnetic fields, instincts, and learned behaviors are all thought to play into the phenomenon of bird migration. For White-throated Sparrows and Swainson's Thrushes that breed in British Columbia in Western Canada, fall migration is more of an east then south movement than a direct south route (Figure 13).

Figure 13 The fall migration of White-throated Sparrow 39535 and Swainson's Thrush 41988 in 2022. The birds were tagged in British Columbia in May and August, respectively, and detected at the Boone WRS Motus station in Iowa in October 2022.

Swainson's Thrush 41988 was tagged near Vancouver on August 24th, 2022. It initiated its migration by September 24th 2022 and started making its way east and south through the U.S. It was detected in Nebraska on September 27th, at the Boone WRS in Iowa on October 1st, in Missouri on Oct 6th, and made it to Mississippi on October 13th. White-throated Sparrow 39535 was tagged near Prince George, British Columbia on May 26th 2022 and was on fall migration by October 4th when it was detected in Alberta. It made it to Saskatchewan on October 6th and was in Southwestern Manitoba by October 11th. It reached the Boone WRS on October 18th, and was detected in northern Missouri on October 25th.

In comparison to the Lesser Yellowlegs which flew 1,700 miles in 48 hours, the Swainson's thrush traveled 2,200 miles in 20 days. The White-throated Sparrow took a very similar route to the Swainson's Thrush and flew 1,400 miles in 22 days. These comparisons highlight the variety in migration strategy across species, and demonstrate the need to understand the full annual cycle and migration of species in order to implement effective conservation strategies.

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Rosenberg, KV, AM Dokter, PJ Blancher, JR Sauer, AC Smith, PA Smith, JC Stanton, A Panjabi, L Helft, M Parr, and PP Marra. 2019. Decline of the North American avifauna. Science, 366(6461), 120-124.

Appendix

Chronological table of all wildlife detected on Iowa Motus Stations from Aug 2021-Dec 2022 with links to migration maps on the motus.org website.

Species Common Name	Date(s) Detected	Location(s) Detected	Date Tagged	Project Tagged By	Link to Detection on Motus Website
American Kestrel	9/11/2021	Boone WRS	8/2/2021	AMKE Research MN	https://motus.org/data/tagDeployment?id=35140
American Kestrel	10/5/2021	Boone WRS	6/2/2021	AMKE Research MN	https://motus.org/data/tagDeployment?id=33678
Rusty Blackbird	10/31/2021	Pikes Peak	10/16/2021	Lake Superior Migration	https://motus.org/data/tagDeployment?id=37272
American Kestrel	4/5/2022 & 10/6/2022	Blackhawk Unit, Union Grove State Park	6/2/2021	AMKE Research MN	https://motus.org/data/tagDeployment?id=33680
American Kestrel	4/12/2022	Boone WRS	5/28/2021	AMKE Research MN	https://motus.org/data/tagDeployment?id=33563
Lesser Yellowlegs	5/7/2022 & 7/20/2022	MO River Unit, Hawkeye WMA & Odessa Unit	4/19/2022	SELVA Colombia	https://motus.org/data/tagDeployment?id=38364
Lesser Yellowlegs	5/7/2022 & 8/4/2022	MO River Unit & Blackhawk Unit, Hawkeye WMA	4/19/2022	SELVA Colombia	https://motus.org/data/tagDeployment?id=38367
Lesser Yellowlegs	5/10/2022 & 7/27/2022	MO River Unit	4/19/2022	SELVA Colombia	https://motus.org/data/tagDeployment?id=38365
Golden-winged Warbler	5/11/2022	Blackhawk Unit	3/5/2022	SELVA- Costa Rica	https://motus.org/data/tagDeployment?id=37828
Sora	5/12/2022	Pikes Peak	5/4/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38034
Virginia Rail	5/13/2022	Boone WRS	5/2/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38030
Sora	5/16/2022	Hawkeye WMA	5/6/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38036
Virginia Rail	5/17/2022	Geode State Park	4/30/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38021
Virginia Rail	5/18/2022	Hawkeye WMA	5/1/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38027
Virginia Rail	5/24/2022	Hawkeye WMA	4/30/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38022
Virginia Rail	5/24/2022	Geode State Park	4/8/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38269
Virginia Rail	5/29/2022	Hawkeye WMA	5/11/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38040
American Redstart	6/2/2022	Pikes Peak	4/1/2022	Jamaica Long-Term Research - Font Hill Nature Preserve	https://motus.org/data/tagDeployment?id=37964
Sora	6/5/2022 & 9/21/2022	Hawkeye WMA, Boone WRS	5/22/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38044
Common Nighthawk	6/5/2022	Boone WRS	7/19/2021	Intermountain West Collaboration - Birds	https://motus.org/data/tagDeployment?id=34647
Black tern	7/20/2022	MO River Unit	6/27/2022	Black Tern Dispersal - Saskatchewan	https://motus.org/data/tagDeployment?id=40751
Least Sandpiper	7/20/2022	Hawkeye WMA	6/21/2022	Arctic Shorebirds -CWS Yellowknife	https://motus.org/data/tagDeployment?id=41388
Lesser Yellowlegs	7/20/2022	Pikes Peak	6/29/2022	SELVA Colombia	https://motus.org/data/tagDeployment?id=40004
Stilt Sandpiper	7/21/2022	Geode State Park	6/24/2022	Nol- Churchill Shorebirds	https://motus.org/data/tagDeployment?id=40042

Species Common Name	Date(s) Detected	Location(s) Detected	Date Tagged	Project Tagged By	Link to Detection on Motus Website
Lesser Yellowlegs	7/24/2022	Geode State Park	4/19/2022	SELVA Colombia	https://motus.org/data/tagDeployment?id=38360
Short-billed Dowitcher	7/28/2022	Hawkeye WMA	6/12/2022	Nol- Churchill Shorebirds	https://motus.org/data/tagDeployment?id=40033
American Kestrel	8/4/2022	Blackhawk Unit	6/17/2022	AMKE Research MN	https://motus.org/data/tagDeployment?id=40831
American Kestrel	8/10/2022	Hawkeye WMA	6/26/2022	AMKE Research MN	https://motus.org/data/tagDeployment?id=40833
Semipalmated Plover	8/10/2022	Geode State Park	7/2/2022	Arctic Shorebirds -CWS Yellowknife	https://motus.org/data/tagDeployment?id=41475
Black Tern	8/11/2022	MO River Unit	6/26/2022	Black Tern Dispersal - Saskatchewan	https://motus.org/data/tagDeployment?id=40731
Semipalmated Plover	8/14/2022	Boone WRS	7/2/2022	Arctic Shorebirds -CWS Yellowknife	https://motus.org/data/tagDeployment?id=41478
Lesser Yellowlegs	8/16/2022	Boone WRS	4/19/2022	SELVA Colombia	https://motus.org/data/tagDeployment?id=38359
Semipalmated Plover	8/30/2022	Boone WRS & Geode State Park	6/13/2022	Arctic Shorebirds -CWS Yellowknife	https://motus.org/data/tagDeployment?id=41377
Sora	9/19/2022	MO River Unit	4/26/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38279
Swainson's Thrush	9/21/2022	MO River Unit	8/24/2022	BC Interior Thrushes	https://motus.org/data/tagDeployment?id=41900
Sora	9/21/2022	Boone WRS	5/10/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38039
American Kestrel	9/22/2022	Blackhawk Unit	7/8/2022	AMKE Research MN	https://motus.org/data/tagDeployment?id=41161
Swainson's Thrush	9/22/2022	Blackhawk Unit	8/24/2022	BC Interior Thrushes	https://motus.org/data/tagDeployment?id=41917
Eastern Whip-poor-will	9/25/2022	Boone WRS	7/11/2022	Eastern Whip-poor-wills	https://motus.org/data/tagDeployment?id=43246
American Kestrel	9/25/2022	Union Grove State Park & Hawkeye WMA	6/24/2022	AMKE Research MN	https://motus.org/data/tagDeployment?id=40835
Eastern Whip-poor Will	9/25/2022	Hitchcock Nature Center	7/13/2022	Eastern Whip-poor-wills	https://motus.org/data/tagDeployment?id=43256
Swainson's Thrush	9/26/2022	Boone WRS	8/24/2022	BC Interior Thrushes	https://motus.org/data/tagDeployment?id=41980
White-throated Sparrow	9/26/2022	Boone WRS	5/25/2022	White-throated Sparrow Migration	https://motus.org/data/tagDeployment?id=39524
American Kestrel	9/27/2022	Union Grove State Park & Boone WRS	6/24/2022	AMKE Research MN	https://motus.org/data/tagDeployment?id=40825
American Kestrel	9/27/2022	Union Grove State Park	6/14/2022	AMKE Research MN	https://motus.org/data/tagDeployment?id=40836
American Kestrel	9/27/2022	Union Grove State Park	6/14/2022	AMKE Research MN	https://motus.org/data/tagDeployment?id=40837
Swainson's Thrush	10/2/2022	Boone WRS	8/24/2022	BC Interior Thrushes	https://motus.org/data/tagDeployment?id=41988
Eastern Whip-poor-will	10/6/2022	Union Grove State Park	6/17/2022	Eastern Whip-poor-wills	https://motus.org/data/tagDeployment?id=43232
Virginia Rail	10/6/2022	Hitchcock Nature Center	4/25/2022	Forbes Bio Station Motus Tags	https://motus.org/data/tagDeployment?id=38278
Swainson's Thrush	10/11/2022	Hitchcock Nature Center	8/24/2022	BC Interior Thrushes	https://motus.org/data/tagDeployment?id=41905
White-throated Sparrow	10/13/2022	Blackhawk Unit	5/31/2022	White-throated Sparrow Migration	https://motus.org/data/tagDeployment?id=39775

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White-throated Sparrow	10/16/2022	Hawkeye WMA	5/31/2022	White-throated Sparrow Migration	https://motus.org/data/tagDeployment?id=39236
White-throated Sparrow	10/17/2022	Hitchcock Nature Center	5/26/2022	White-throated Sparrow Migration	https://motus.org/data/tagDeployment?id=39522
White-throated Sparrow	10/19/2022	Boone WRS	6/1/2022	White-throated Sparrow Migration	https://motus.org/data/tagDeployment?id=39858
White-throated Sparrow	10/19/2022	Boone WRS	5/26/2022	White-throated Sparrow Migration	https://motus.org/data/tagDeployment?id=39535
White-throated Sparrow	10/26/2022	Hawkeye WMA	5/26/2022	White-throated Sparrow Migration	https://motus.org/data/tagDeployment?id=39532
Dunlin	11/26/2022	Pikes Peak	11/24/2022	Fraser Estuary Overwintering Shorebirds	https://motus.org/data/tagDeployment?id=44053