**Showcasing the DNR: Motus wildlife tracking in Michigan**

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Where do birds go when they migrate?

If you were to ask that question in the late 17th century, you might have been told that birds migrate to the moon.

We’ve come a long way since then when it comes to understanding migration, and new technology is allowing us to have an even better understanding of the phenomena.

Knowing where, how and when birds, bats and other creatures migrate tells us about our ecosystem and its overall health. Identifying stopover habitat where migratory wildlife rest and refuel, tracking population numbers and measuring the impact climate change has on wildlife are just some of the ways that migration data can help us understand more about our environment and how we can conserve and protect it.

Because of Michigan’s geography, the Straits of Mackinac offer a unique opportunity to observe migration between two peninsulas, and it is something that we have only recently begun to study.

The data gathered there has the potential to revolutionize our understanding of migratory animals and can be used in conservation efforts throughout the Western Hemisphere, which is why researchers, educators and government agencies like the Michigan Department of Natural Resources and the U.S. Forest Service have come together to study the area.

**The origins of migration research**

Migration research is a relatively new field, with American researchers beginning to delve into it in the early 1900s through the coordination of nationwide bird banding programs.

At a cost of less than a dollar each, the metal leg bands are inexpensive, but the method has a limitation: they are tiny. While the size is safer for the bird, the bands can be difficult to read from a distance, and the recovery of banded birds is a game of chance at best.

In the ‘70s, researchers began repurposing satellite transmitters to track bird migration. While the data gathered from these devices is far more accurate and detailed than banding data, the transmitters are not cost-effective, with a tracking system for a bald eagle costing upwards of $5,000. For a well-designed study with multiple subjects, this can add up quickly and can be difficult to fund long-term.

**The new age of research**

Researchers needed a way to track wildlife that could provide the detailed analytics of satellite transmitters but still retain the cost-effectiveness of banding and be as safe as possible for wildlife.

This led to the creation of the Motus (Latin for movement or motion) Wildlife Tracking System, an international research network that uses automated radio telemetry to track wildlife.

“The Motus Wildlife Tracking System is an international collaborative research network that uses cooperative automated radio telemetry to track small flying organisms (birds, bats, and insects),” the system website reads. “When compared to other technologies, automated radio telemetry currently allows researchers to track some of the smallest animals possible, with high temporal and geographic precision, over great distances.

“The system enables a community of researchers, educators, organizations, and citizens to undertake impactful, cost-effective, research and education on the ecology and conservation of migratory animals.”

Built on existing antenna towers, new pop-up towers or rooftops, the Motus antennas are equal parts cost-effective and efficient. Each Motus tower tracks migratory wildlife by receiving signals from within an 11-mile radius of the tower.

Every time one of the tracking tags enters the tower’s range, the information is uploaded to the [Motus Wildlife Tracking System’s online database](https://motus.org/).

The tags that the antennas track are lightweight and can be used to study species as small as warblers and dragonflies. Over 250 species are currently documented in the ever-growing database, and community scientists, researchers, educators and government agencies can access the data for free to view findings from throughout the world.

Thirty-four countries are currently involved in the Motus tower research, and there are just over 2,000 stations operating worldwide.

**Motus research in Michigan**

To date, 40 Motus towers are scattered across Michigan. Because of their small size, the antennas can be built almost anywhere that allows them to receive a clear signal, with some being built on military bases and college campuses, in remote wildlife areas and even at farmer’s markets.

Most of the antennas in the Lower Peninsula of Michigan were built through the support of [Audubon Great Lakes](https://gl.audubon.org/), Kalamazoo Nature Center, the Smithsonian Institute and Detroit Zoo. They form a line from Detroit west to Kalamazoo, with an outlying cluster built near the Grayling area to specifically study the once-endangered Kirtland’s warbler.

Currently, four of the state’s antennas are on properties managed by the Michigan DNR, with three more being built at Cheboygan State Park, Wilderness State Park and the DNR’s property on Mackinac Island.

Spearheading the building effort in this area is [Mackinac Straits Raptor Watch](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.mackinacraptorwatch.org%2F&data=05%7C02%7Ckemmea%40michigan.gov%7C15d935e474464479c19b08dd04ed0e85%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C638672138382274035%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIwLjAuMDAwMCIsIlAiOiJXaW4zMiIsIkFOIjoiTWFpbCIsIldUIjoyfQ%3D%3D%7C0%7C%7C%7C&sdata=FJgyBPxanBCJaran1YwxbjXDbK9kNpnneQeMiNXGCa8%3D&reserved=0) , a nonprofit organization that has monitored the migration of raptors, songbirds and waterfowl in the Straits region since the 1980s.

 Watch partners on the project include the DNR, the U.S. Forest Service, the University of Michigan and Central Michigan University, with funding provided from grants and private donors.

Each partner is allowing Raptor Watch to build an antenna on its property, with the DNR allowing antennas at three separate locations. Once completed, the series of six towers will offer the clearest picture to date of how wildlife migrates throughout the Straits region.

Because of the region’s unique geography, birds funnel through the Mackinac Straits to avoid the need to cross wider expanses of Great Lakes water.

Raptor Watch’s ’s migration count sites have set nationwide records for the number of red-tailed hawks and the most golden eagles seen east of the Mississippi.

Birds typically not seen in Michigan, like black vultures, Swainson’s hawks and American white pelicans, have even been detected at the Straits.

“Our research has demonstrated that species like red-tailed hawks consistently use the Straits to move between their breeding grounds in Canada and overwintering sites in the lower Midwest,” said Scott Davis, Mackinac Straits Raptor Watch’s executive director. “However, it is unclear how many other species of birds or even mammals, like bats, might be using this natural migratory choke point to move through the Great Lakes region. That’s why adding additional Motus towers in the Straits is so important.”

Helping Raptor Watch build the towers is Rich Keith, who has worked on the majority of the Motus towers in the state since 2017. When he is not building the antennas across the state, Keith works at the [Kalamazoo Nature Center](https://naturecenter.org/) as part of its Kalamazoo Valley Bird Observatory program and leads the program’s bird research efforts.

“Banded migrant birds have a very low recapture rate, with one in 10,000 birds being recaptured by researchers,” Keith said. “We tagged 46 thrushes last year through the Motus system in Kalamazoo. We detected 13 of the 46 birds throughout their migration, with some of them flying as far south as Panama. That’s a significant increase, and the birds will keep telling us more as time goes on.”

**It takes a village**

After the initial installation costs and paying for the cellular data, the annual cost of operating a tower is the equivalent of running a 40-watt light bulb, which offers researchers the ability to focus funding on putting out as many tags as their budgets allow.

However, getting to that point is tricky and requires the cooperation of several organizations to fund the project and provide the land for the antenna system and the knowledge to install it properly.

“A project like this requires multiple partners working together because a huge project like this would be difficult for the DNR to do alone,” said John Darling, a DNR wildlife technician at St. Clair Flats State Wildlife Area in St. Clair County. “What’s going on in the state is a microcosm of what is happening internationally with the Motus network. We couldn’t do this research without the support of others.”

Darling helps manage the state’s first Motus tower, which was built in 2017. The tower is located at St. Clair Flats State Wildlife Area, which is an hour north of Detroit. There, with the help of additional towers hosted by Lake St. Clair Metropark, the City of New Baltimore and the DNR’s Wigwam Bay State Wildlife Area, researchers from [Environment and Climate Change Canada](https://www.canada.ca/en/environment-climate-change.html) and Audubon Great Lakes have been able to monitor the nesting success and migratory routes of black terns.

“Black terns face an uncertain future in Michigan,” said Kylie McElrath, Michigan conservation manager for Audubon Great Lakes. “We were able to deploy tags on pre-fledged black tern chicks, which allowed us to understand how many birds were fledging each year and where they traveled during migration. Thanks to this work, now we know where to target efforts to help recover this species more effectively.”

A Michigan threatened species, the black tern has experienced a drastic population decline over the past 54 years, with numbers of the marsh birds dropping by up to 99% in Michigan, according to Breeding Bird Survey data.

“We’ve had a lot of community support for the project,” Darling said. “People didn’t understand what was happening with the black terns, so their nesting habitat was being damaged. But by putting the tower up and educating the local community about the birds, it took a situation that was a challenge for us and turned it into a positive thing for the community.”

**Recent results**

The Water Plant tower in the City of New Baltimore has detected federally threatened rufa red knots, state-threatened eastern whip-poor wills, black terns and a common nighthawk, among other migratory bird species, for a total of 13 detections from six research projects, according to the Audubon Great Lakes blog.

A black tern fledgling photographed at its nesting location at St. Clair Flats in June 2021 was redetected at the City of New Baltimore on July 30, 2021, and in South Carolina on Aug. 18.

The Lake St. Clair Metroparks tower in Harrison Township also detected rufa red knots, three Kirtland’s warblers, a common nighthawk and eastern whip-poor-will, among many other migratory land birds, between 2021 and 2023, for a total of 47 detections from 14 research projects, according to the Audubon blog.

**What happens next**

What might the new towers pick up next year?

We have some ideas, thanks to initial research from groups like [Mackinac Straits Raptor Watch](https://www.mackinacraptorwatch.org/research-data/), [Kalamazoo Nature Center](https://naturecenter.org/kvbo/) and [Audubon Great Lakes](https://gl.audubon.org/news/audubon-great-lakes%E2%80%99-radio-towers-detect-migratory-bird-species-conservation-need), which have spearheaded Motus research in Michigan.

Each year new migration research projects begin and new Motus tags are deployed, giving us new, exciting data. All we know for sure is that the DNR won’t be alone in looking at the findings this spring.

“The beautiful thing about this is that it is an open technology. There is no pay-to-play, and the data is free and available to everyone,” Davis said. “We all care about the conservation of these species. Because of this technology, we’re able to partner as a global community to protect them. This is the way that conservation work should be done.”

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