



# POINT REYES LIGHT

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## NEWS

### New towers reveal bird migration patterns

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Three tall antenna towers perched on the edges of Tomales Bay and Bolinas Lagoon have joined a global effort to monitor the world's migrating birds and other small wildlife in hopes of better understanding the timing and route of their travels.

The antennae, part of a fast-growing network named Motus after the Latin word meaning “movement,” listen for pings emitted by tiny VHF radio transmitters attached to animals flying over West Marin. The information is transmitted to an online portal that people all over the world can log into and follow their favorite creature.

“How far do they migrate? How long do they stay at different sites? Motus helps us better understand how some of the smaller animals move around the world,” said Dr. Nils Warnock, director of conservation science of Audubon Canyon Ranch, the environmental nonprofit based in Stinson Beach that erected the towers.

The system, managed by Birds Canada, relays location information about individual

animals that is much more precise than most previous tracking technologies.

Its tags are so small—weighing less than one-tenth of an ounce—that they can be carried by hummingbirds, bats and butterflies. The tag simply hitches a ride. Researchers need not retrieve the tags because their data is sent electronically.

As climate change and habitat destruction roil the planet, Motus could provide information needed to guide on-the-ground conservation measures. More than 56,240 animals have been tagged, representing 452 species, including monarch butterflies, green darner dragonflies and silver-haired bats.

The data is already yielding insights. For example, Dr. Warnock's team is monitoring the six-month sojourn of dunlins, 1.8-ounce species of shorebird, from their West Marin winter grounds to nesting territories in the snowmelt of the subarctic tundra. Although still abundant, dunlin populations are declining precipitously.

One bird, netted and tagged on a cold December night on a rising tide in Walker Creek, was monitored online as it flew east to the Central Valley, then north. On April 3, the dunlin was detected near Portland, Ore. Then it flew to Washington's Willapa Bay, where it lingered for a week. On May 7, it reached the mouth of Copper River, in the Gulf of Alaska. Now flying to the far north, it is beyond the range of modern technologies.

"It's fascinating," said Keith Hansen, a bird illustrator who lives in Bolinas. "As humans, we've always made educated assumptions about birds' stopover spots and how they migrate. But now that all this information is coming out, it's opening up a huge world about exactly where they go."

The data can show how extreme weather events, especially drought, influence migration, Dr. Warnock said.

It also reveals the value of protecting specific habitats. Motus researchers studying Swainson's thrushes have found that birds that gained the most fat at a stopover site in Colombia flew faster and arrived more quickly in North America.

The data can also help influence public policy. For instance, information gathered through the Motus system showed that mudflats imperiled by the expansion of the Port of Vancouver provide critical habitat for western sandpipers.

“The conservation of migratory species can be challenging because it requires considering threats to species that occur at different stages of their lifecycle that span multiple jurisdictions, habitats and landscapes and that are often thousands of kilometers apart,” said Amie MacDonald, the Motus manager for Birds Canada.

The science of wildlife tracking has come a long way since the first major bird-banding programs were established in the early 1930s, Ms. MacDonald said.

While banding birds is inexpensive, the recapture rate can be quite low, and traditional methods don’t offer real-time tracking. GPS devices, which rely on satellites, provide precise location information. But they’re too heavy for small animals. And these devices are expensive, costing \$2,000 to \$3,000 each. By comparison, a Motus tag costs just \$200.

Another tool, called light-level geolocation, is small and inexpensive, employing a light sensor, clock, memory chip and battery to estimate an animal’s location. But it doesn’t transmit data, so animals must be recaptured so that researchers can download the data.

Motus offers substantial advantages, but it also poses unique challenges. Animals must be caught and then equipped with a tag, which is secured with glue or a small harness. Signals are most easily detected if animals fly close—generally within a mile of a tower. Towers must be located at a high vantage point to ensure a clear sightline, and they can’t be surrounded by trees.

Each tower, made of a thin, metal frame outfitted with its own solar-recharging battery, costs \$5,000 to \$10,000, with an annual fee of around \$1,500 to be part of the network. And its installation requires technical skills.

“It’s not a plug-and-play kind of system. There’s a learning curve,” Dr. Warnock said. “You’re ordering parts from all over and you put it together, then lug it out.”

The rich data also needs a way to be transmitted to Canada. On a windswept ridge of Audubon Canyon Ranch's Cypress Grove campus in Marshall, the tower sends data through a wireless server. At the remote Tom's Point site north of Walker Creek, tower data is downloaded to a cellular network, as is data collected by the tower at A.C.R.'s Martin Griffin Preserve on Bolinas Lagoon.

There's also a high failure rate. Last year, due to a manufacturing glitch, most of Dr. Warnock's tags went silent.

"We live and die by the technology," he said. "It's remarkable when it works. But there's a lot of stuff that can go wrong. And I've pretty much seen it all."

West Marin's three towers are among 2,163 Motus stations in 34 countries. Initially focused on the East Coast and Canada, Motus is now expanding on the West Coast. In the Bay Area, there are towers on Burnside Road in Sebastopol, on Mount Barnabe above Lagunitas, at the Richardson Bay Audubon Center in Tiburon, on Wolfback Ridge above Sausalito and at the Napa Sonoma Marsh. Other towers have been erected in El Cerrito, Milpitas and San Jose, at Stanford University and near Half Moon Bay.

"Motus is a powerful technology that can provide invaluable information about habitat connectivity," said Maddy Schwarz, science director of the Milpitas-based San Francisco Bay Bird Observatory, which is tagging threatened western snowy plovers this summer to better understand the birds' movement in the region. "Given the number of Motus towers in the Point Reyes area, we are excited to see whether they record any of our plovers."

The precision of the information gathered by the towers depends on the number of tags that are detected—the more, the better. "To enact effective conservation measures," Ms. MacDonald said, "first we have to figure out where the bottlenecks are occurring, where populations are limited and then prioritize actions that will have the greatest impact."