



MONITORING THE MIGRATORS: TRACKING THE ANIMALS PASSING THROUGH OUR PARKS

Thomas J. Rodhouse^{1*} and Sonya Daw²

¹Upper Columbia Basin Network Inventory and Monitoring Program, National Park Service, Oregon State University-Cascades, Bend, OR, United States

²Klamath Inventory and Monitoring Network, National Park Service, Ashland, OR, United States

YOUNG REVIEWERS:



EDNA
AGE: 8



YANA
AGE: 15

Migrating animals are good at making long trips between seasons. These trips can be dangerous, and scientists monitor migrators in United States National Parks to help detect dangers and find solutions. However, migrators are challenging to monitor. Sometimes they only stay in a park for a few days. This might require a scramble to find them during the proper season, using specialized techniques. It is worth the effort! Birds are some of the best-known migrators, and birdwatchers come to parks every spring to help count them. Migrating butterflies and bats are less well-known and require more effort to monitor. Monarch butterflies are tagged with special numbered stickers, and bat calls are recorded at night with special computers. These monitoring activities reveal where, when, and how many migrators occur in parks. If we discover through monitoring that they are in decline, we can sound the alarm and get help for these special animals.

UNITED STATES NATIONAL PARKS

The National Park Service in the United States consists of over 300 parks, monuments and historic sites such as war memorials and battlefields. The National Park Service began with the creation of Yellowstone National Park and was formally established by the US Congress in 1916 with the passage of the 1916 Organic Act.

PARKS ARE IMPORTANT HOMES FOR MIGRATORS!

Migration is a remarkable behavior performed by many kinds of animals. Just like people who head to warmer climates before the cold winter months, many animals use long-distance migration to escape harsh weather. Sometimes migrators are escaping difficult seasons when food is scarce. Did you know that some birds, such as the common nighthawk and arctic tern, travel thousands of miles every spring and fall, between North and South America? Hummingbirds, no heavier than a handful of paper clips, fly across the Gulf of Mexico in a single trip. Other famous long-distance travelers include the hoary bat and the monarch butterfly.

In North America, migrators rely heavily on **United States National Parks** and other protected habitats that offer abundant food and shelter. In fact, depending on the location, migrators use parks for every stage of migration: wintering grounds, spring and fall migration stopovers, and summer breeding grounds. Migrators are important members of animal communities inside these national parks.

MIGRATORS LIVE TOUGH LIVES BUT WE CAN HELP!

Migration takes an extraordinary amount of energy, and traveling such long distances is dangerous. Many migrators do not survive the trip! This is one reason that migrating species are often considered rare and at risk of decline. Many need our attention. Furthermore, sometimes our visiting migrators spend time during the off-season in habitats unseen by us that are no longer healthy for them. These degraded habitats may contribute to population declines that we can observe as migrators move through United States National Parks—we need to count the migrators passing through parks each year to be sure that the same number are returning. This helps us detect worrisome declines and sound the alarm.

For example, in the early 1990s, concern grew among the scientists and community members that count migrating hawks in the spring and fall each year, in places like Golden Gate National Recreation Area in California, Grand Canyon National Park in Arizona, and Acadia National Park in Maine. They noticed that one species, the Swainson's hawk, was in big trouble. Swainson's hawks travel thousands of miles each year between their wintering grounds in Argentina, South America, and their summer nesting areas in the grasslands of western North America! It turned out that thousands of Swainson's hawks were dying during winter in Argentina from eating grasshoppers full of toxic farm chemicals called pesticides [1]. This discovery allowed for safer pesticides to be used to grow food in Argentina and around the world.

ORNITHOLOGIST

A scientist that specializes in the study of birds.

NEOTROPICAL MIGRANTS

Species of birds, butterflies, bats and other migratory organisms that spend part of their year in tropical America (e.g., countries in Central America such as Panama).

Figure 1

Young minds at work! Youth assistants participate in a hawk watch event during migration season in Golden Gate National Recreation Area (California, United States; photo credit: Alison Taggart-Barone, Parks Conservancy).

WE COUNT MIGRATING BIRDS IN NATIONAL PARKS!

Birds are one beloved group of animals that we count in national parks. Every year, bird watchers assist professional **ornithologists**, the scientists that study birds, to track birds in these parks (Figure 1). In spring, we count the brightly colored warblers, tanagers, hummingbirds, and orioles that winter in Central and South America and pass through parks on their way to raise babies during the summer in North America. We call these birds **neotropical migrants**. Because so many neotropical migrants eat insects or flowering plant parts (like nectar, fruit, and seeds), they are forced to follow their food supply south when winter arrives. Flying up to a mile above the ground, often at night, some neotropical migrants end up traveling several thousand miles to their destinations. To power their long journeys, they fatten up just before traveling.



Figure 1

We also count the birds that spend their winters in national parks. Every December, parks across the United States host the annual Christmas Bird Count. For example, in California's Yosemite National Park, this annual count started in 1932! We use the many years of data to understand how bird populations have changed over time. Sometimes we find surprises—hummingbirds or other neotropical migrants that never left for winter, or arctic birds like the snowy owl that are pushed southward into parks outside the Arctic during strong storms.

WE TAG BUTTERFLIES IN NATIONAL PARKS!

Monarch butterflies migrate from parks such as Great Smoky Mountains National Park to the mountains of Central Mexico and back again. This is a very unusual way for a butterfly to survive harsh winters. In fact, the monarch is the only butterfly species known for round-trip migration. Other species of butterflies survive the winter in cold places just by staying put, as eggs, or as babies in a protective shell, called **pupae**. Monarchs depend on one type of plant, the milkweed, to feed their young (which are caterpillars). Conserving milkweed along

PUPAE

Pupae is a significant life cycle stage of insects.

roadsides and farmlands is one of the most important ways to help monarch butterflies.

ENTOMOLOGIST

A scientist that specializes in learning about insects, therefore also butterflies.

Every year, professional **entomologists** (scientists that study butterflies and other insects), assisted by community volunteers, work together to gently catch, tag, and release thousands of monarch butterflies. Can you believe that such delicate little animals can actually be tagged? While GPS tracking devices can be fitted on some larger animals, the monarch tag is a lightweight, numbered sticker placed on the butterfly's delicate wing (Figure 2). It does not transmit information like a GPS tracker. Instead, any entomologist lucky enough to catch the monarch again during a survey can learn where it came from by reading the tag. This is how we learn the monarch butterfly migration routes [2]. Armed with this information about migration routes, we can then protect milkweed plants along the route.

Figure 2

A monarch butterfly with a wing tag, Great Smoky Mountains National Park (North Carolina and Tennessee, United States; photo credit: Great Smoky Mountains Institute at Tremont).



Figure 2

HIBERNATE

Some mammals, including bats, hibernate to survive during winter by lowering body temperature, reducing bodily functions, and using stored fat reserves.

ECHOLOCATION

The process used by bats and other mammals, including dolphins, to make noises using their voice boxes and then listen to their own echoes to navigate and chase down prey.

WE EVEN RECORD THE CALLS OF BATS IN PARKS!

Over 50 species of bats occur in U.S. national parks! During the winter, some bats **hibernate** in caves, but other bats migrate south to avoid the cold winters. Some of our most widespread migrating bat species include the hoary bat, the red bat, and the silver-haired bat. These three insect-eating species raise their babies, called pups, during summer in parks all across the northern U.S. and southern parts of Canada. They then head south into the southern U.S. and Mexico during winter, to have a steady supply of mosquitoes, flies, and moths to eat.

How do scientists monitor bats? The answer begins by understanding bat **echolocation**. Did you know that most bats find their way in the dark and chase down insect prey by shouting? It is true! Well, most do not shout—they whisper—but they are all making noises with their voice box, just like humans and other mammals do. We do not hear bats making these calls because they call at such high pitches, or frequencies. We describe bat calls as echolocation because they make high-frequency calls and listen for the echoes of their own calls. They use those echoes to avoid objects in their path, such as rocks, trees,

and even other bats. They also use echoes to chase down and catch flying insects, like mosquitoes and moths. With special weatherproof computers and microphones tuned to high-frequency bat calls, we can hear and record those calls (Figure 3).

Figure 3

Scientists set up a bat “detector” to record echolocation calls in Smith Rocks State Park (Oregon, United States) as part of the North American Bat Monitoring Program. Note the microphone at the top of the tall pole (photo credit: Oregon State University-Cascades).



Figure 3

Scientists have joined together all across North America to form a team called the North American Bat Monitoring Program. This team records bats both inside and outside of parks during summer [3]. Recorded bat calls can tell us where and when bats occur. Over time, we can discover if a species like the hoary bat is occurring in fewer places because of habitat loss and disease or occurring in new places because of a changing climate [4]. Bats are very sensitive to changes in their environments. Climate changes that result in more long dry spells, shortened winters, and earlier springs can force bats to shift their ranges northward. These kinds of changes can also prevent bats from finding enough food to store as fat reserves to survive hibernation and raise pups.

CONCLUSION

United States National Parks are home to a dizzying array of animal life. We monitor the populations of as many animals as we can, including the migrators that do not stay very long. Some of these migrators turn out to be very sensitive to changes in the environment, including

increases in chemicals like pesticides, loss of important food plants like milkweed, and changing climates. Monitoring migrators not only helps us to understand and protect them but also to detect big changes in the environment.

Monitoring birds, butterflies, and bats is fun and not just for professional scientists. People of all ages and backgrounds can join birdwatching and butterfly-tagging outings. With a bit of extra effort, you can even learn how to operate a bat echolocation recording computer and assist the North American Bat Monitoring Program. In some parts of the country, we have bats that make low-pitch calls that can easily be heard without a special computer. We monitor these deeper-voiced bats just by listening for them [5]. Find your nearest park and come give us a hand!

REFERENCES

1. Goldstein, M. I., Lacher, T. E., Zaccagnini, M. E., Parker, M. L., and Hooper, M. J. 1999. Monitoring and assessment of Swainson's hawks in Argentina following restrictions on Monocrotophos use, 1996-97. *Ecotoxicology* 8:215–24. doi: 10.1023/A:1026448415467
2. Inamine, H., Ellner, S. P., Springer, J. P., and Agrawal, A. A. 2016. Linking the continental migratory cycle of the monarch butterfly to understand its population decline. *Oikos* 125:1081–91. doi: 10.1111/oik.03196
3. Reichert, B. E., Bayless, M., Cheng, T. L., Coleman, J. T. H., Francis, C. M., Rodhouse, T. J., et al. 2021. NABat: a top-down, bottom-up solution to collaborative continental-scale monitoring. *Ambio* 50:901–13. doi: 10.1007/s13280-020-01411-y
4. Rodhouse, T. J., Rodriguez, R. M., Banner, K. M., Ormsbee, P. C., Barnett, J., and Irvine, K. M. 2019. Evidence of region-wide bat population decline from long-term monitoring and Bayesian occupancy models with empirically informed priors. *Ecol. Evol.* 9:11078–88. doi: 10.1002/ece3.5612
5. Rodhouse, T. J., Rose, S., Hawkins, T., and Rodriguez, R. M. 2021. Audible bats present opportunities for citizen scientists. *Conserv. Sci. Practice* 2021:e435. doi: 10.1111/csp2.435

SUBMITTED: 17 April 2021; **ACCEPTED:** 12 October 2022;

PUBLISHED ONLINE: 02 November 2022.

EDITOR: Vishal Shah, Community College of Philadelphia, United States

SCIENCE MENTORS: Nejc Stopnisek and Salza Palpurina

CITATION: Rodhouse TJ and Daw S (2022) Monitoring The Migrators: Tracking The Animals Passing Through Our Parks. *Front. Young Minds* 10:696621. doi: 10.3389/frym.2022.696621

CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

COPYRIGHT © 2022 Rodhouse and Daw. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

YOUNG REVIEWERS

EDNA, AGE: 8

Edna is a curious 8 year old girl who is interested to know more about nature. She is also keen to learn how to be a good baker. She loves to help people and is very sociable: she brings joy to whomever meets with her. She plays piano and enjoys to dance.



YANA, AGE: 15

Hi, I am Yana and I am a normal teenage girl who seeks adventures and is really passionate about the climate change. I like reading fantasy books and enjoy long walks in the forest. I am trying to live as sustainable and green as possible. My mission is to help the planet or at least not to harm it so much.



AUTHORS

THOMAS J. RODHOUSE

Tom Rodhouse is an ecologist with the National Park Service in Bend, Oregon. He specializes in monitoring plants and animals and helped build the North American Bat Monitoring Program. When not doing science work, Tom can be found with his daughters exploring the rivers and mountains of the Pacific Northwest. *tom_rodhouse@nps.gov



SONYA DAW

Sonya Daw is a science communication specialist with the National Park Service in Ashland, Oregon. She helps scientists share what they are learning about nature in parks. She does a lot of editing, but the best part of her job is weaving together words and images about park science that make learning enjoyable. You could call her a translator. In her spare time, she loves to backpack in the high mountains of the Sierra Nevada, play guitar, cook, read, and find elusive birds.

