

EXPLORING THE ROLE OF CONSERVATION EASEMENTS IN CONSERVING BIODIVERSITY: A CASE STUDY USING HOARY BATS (*LASIURUS CINEREUS*)



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INTRODUCTION

Traditional methods of conservation are falling short of protecting species due to habitat loss from anthropogenic activities [1,2]. Conservation strategies need to be more innovative to drastically reduce the decline of biodiversity. Using conservation easements to restrict development is a popular form of conservation in North America as it attempts to conserve privately owned lands, but its impacts on biodiversity need more research.

This project:

- Examined relationships between species occurrence of Hoary bats (*Lasiurus cinereus*), conservation easements, and habitat.
- Modeled hoary bat habitat suitability in the northeastern U.S.
- Examined patterns of conserved land within and around suitable hoary bat habitats.

METHODS

Hoary bat occurrence data was collected via AudioMoth acoustic recording units, simple and inexpensive devices ideal for independent monitoring (Fig. 1 & 2). Devices were placed at Rushton Woods Preserve, PA from August 15–September 19 (Fig. 3).

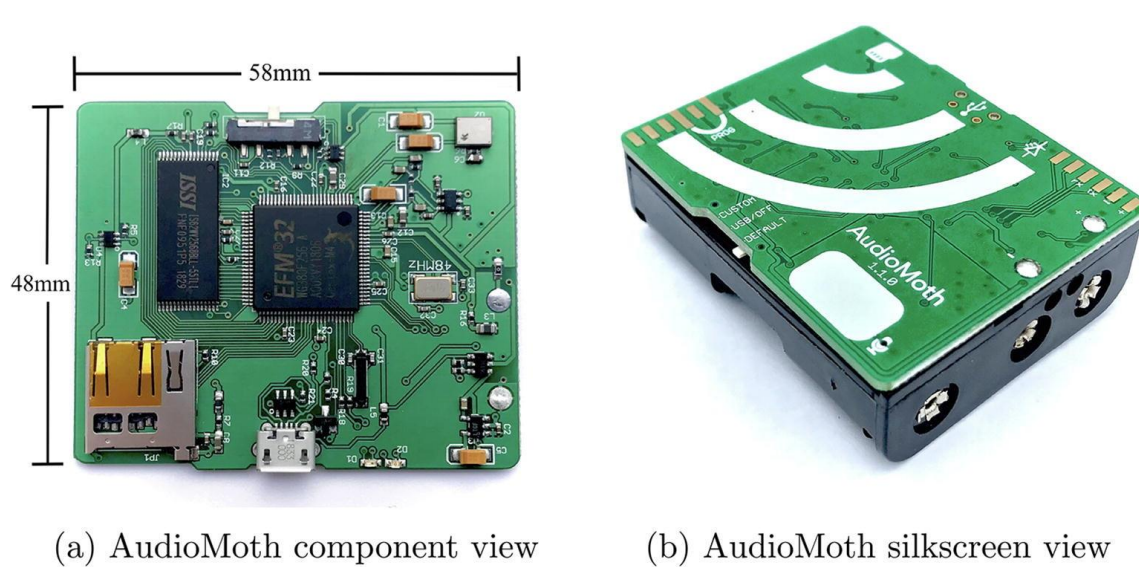


Figure 1. Showing AudioMoth interior (a) and exterior (b) [3].

Secondary data was obtained from the following sources: hoary bat presence records were collected from the online databases BatAMP and the Global Biodiversity Information Facility (Fig. 3), conservation easement locations were collected from the National Conservation Easement Database (NCED), and environmental variables for habitat modeling were acquired from a variety of sources including the National Land Cover Database (NCLD) and WorldClim.

Using this data, a habitat suitability model was generated using the Presence-only Prediction (MaxEnt) tool in ArcGIS Pro 3.0.

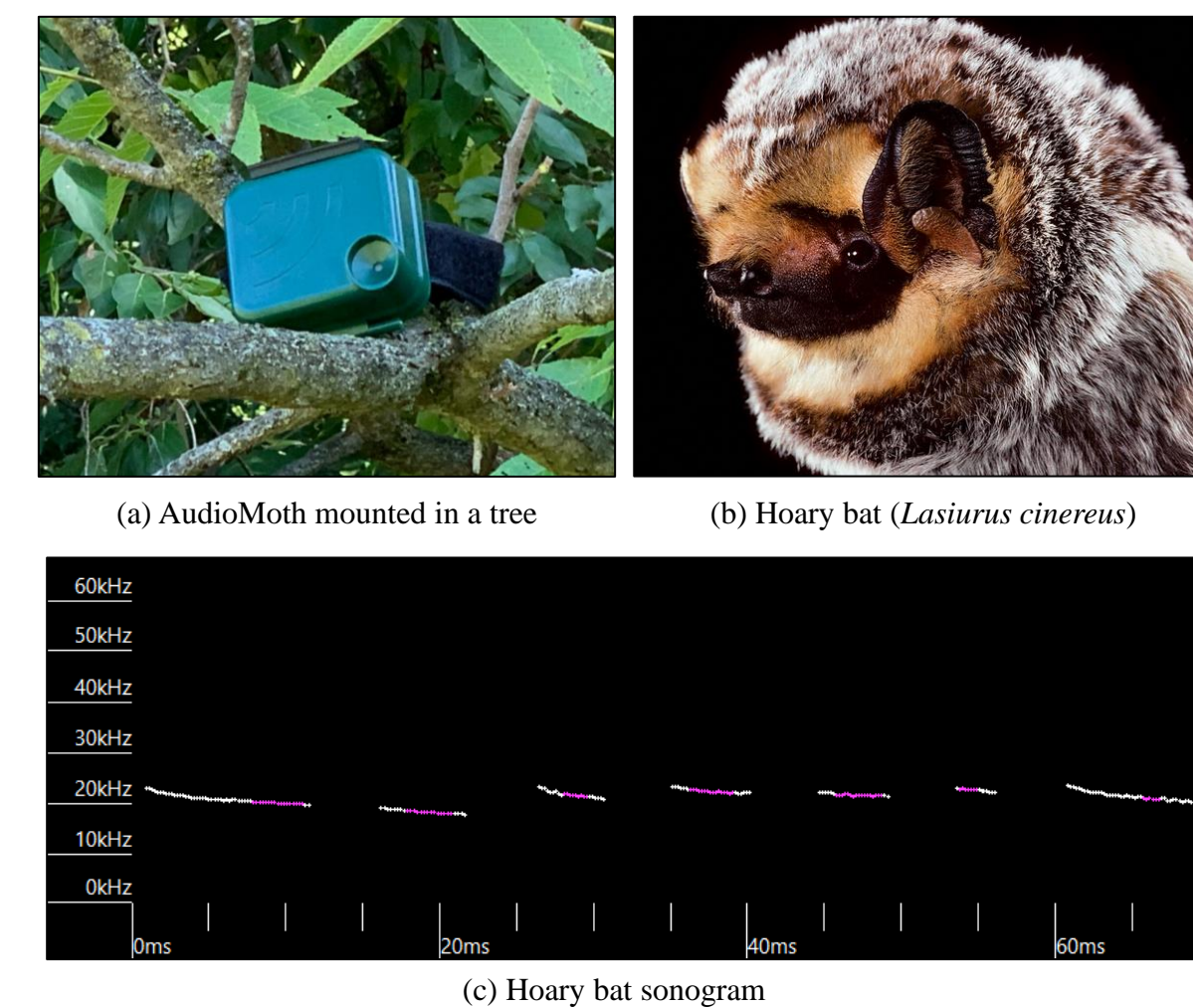


Figure 2. Showing an AudioMoth unit in the field (a), a hoary bat (b), and a hoary bat sonogram from the Rushton data (c). Hoary bat photo: MerlinTuttle.org.

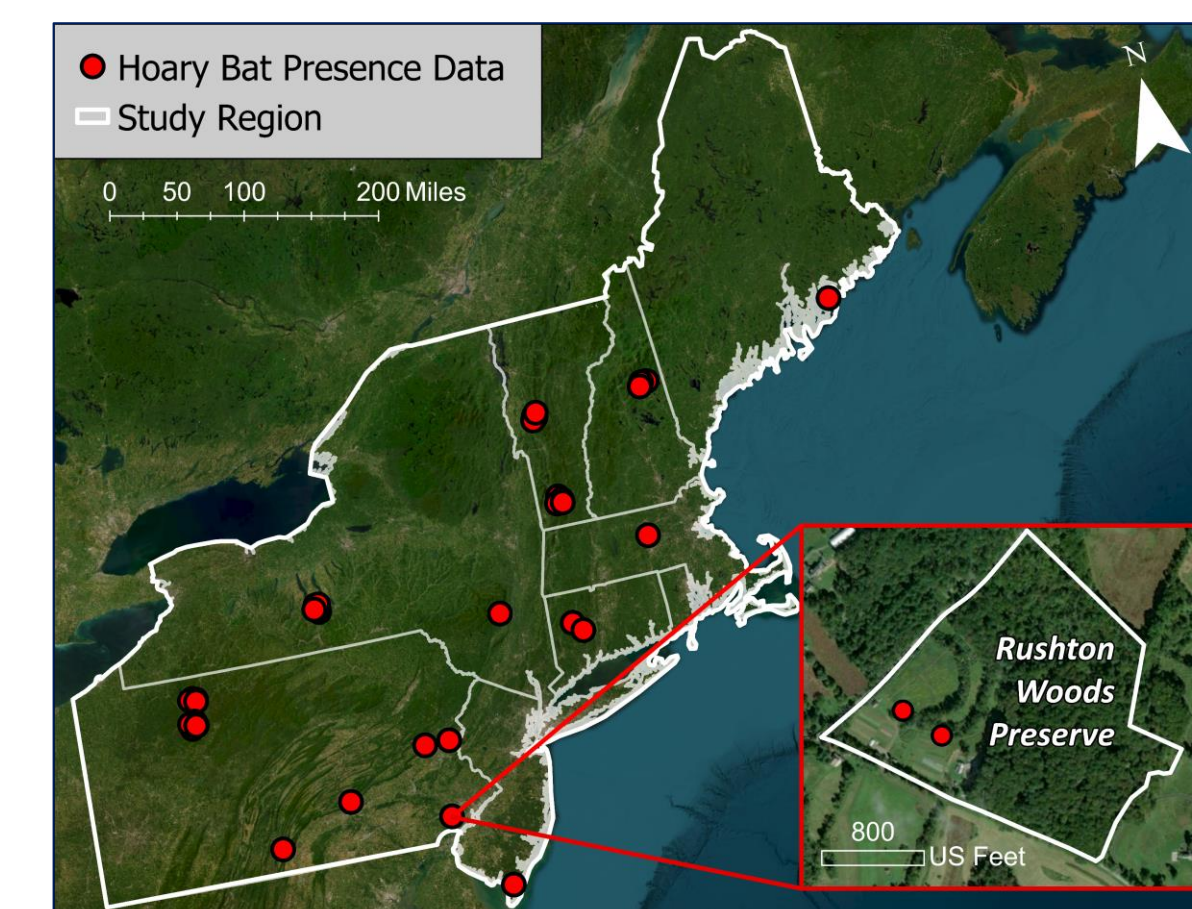


Figure 3. Showing the study region and the locations of the hoary bat presence records used for modeling.

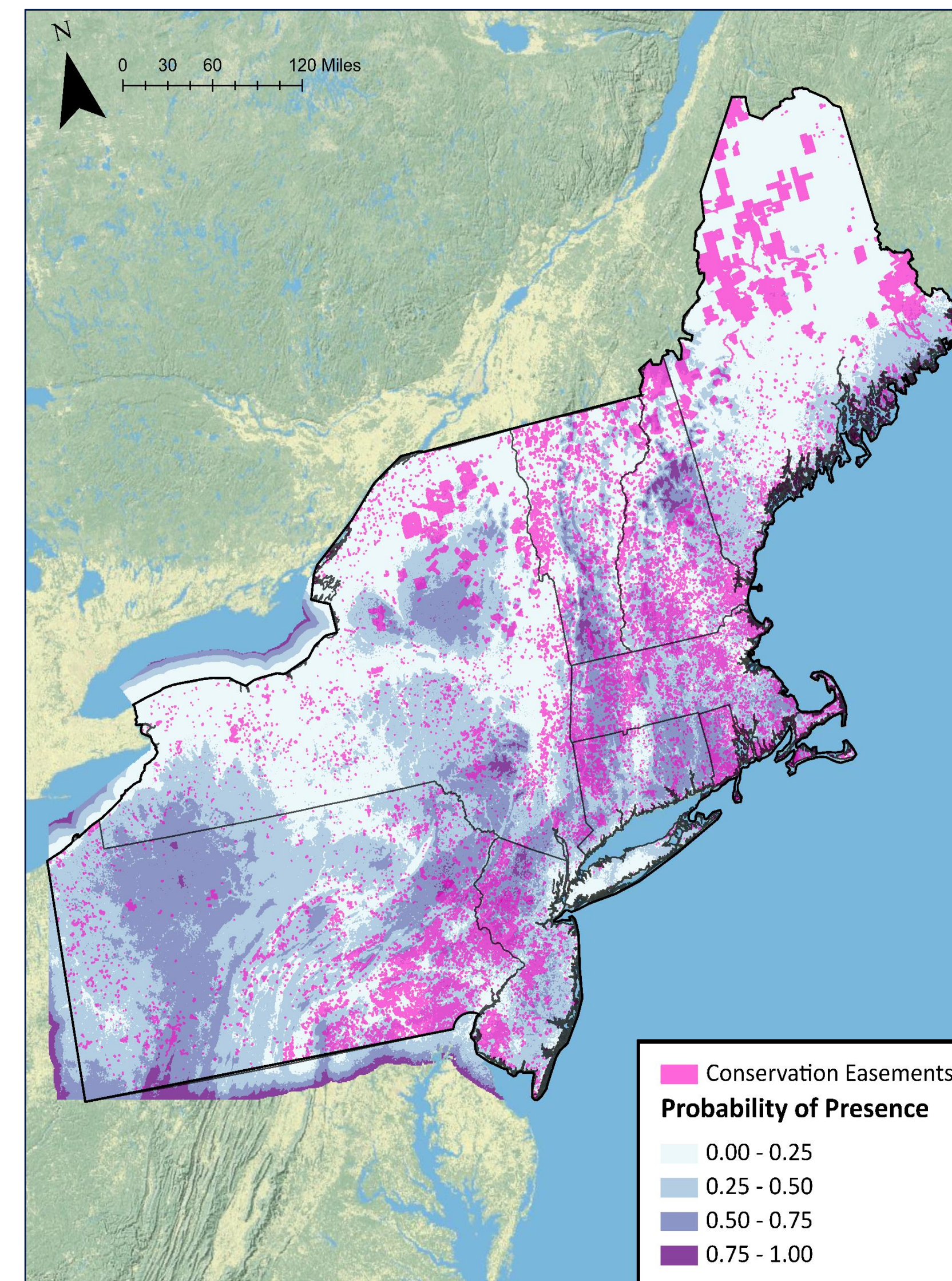


Figure 4. The habitat suitability model output showing the probability of hoary bat presence overlaid with conservation easement properties.

RESULTS

The model revealed areas of suitable hoary bat habitat along the mountain ranges of the northeastern U.S. as well as in northwestern Pennsylvania and the coastal regions of Connecticut, Rhode Island, and Maine (Fig. 4). Easements overlapped areas of more suitable habitat (>0.50 probability of presence) in southwestern New Hampshire, Massachusetts, Rhode Island, western Connecticut, upstate New York, and northern New Jersey. Areas of greatest suitability (>0.75 probability of presence) appear unprotected or less protected by easements overall.

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DISCUSSION

Easements did not protect the most suitable hoary bat habitats but were clustered around them, contributing to publicly conserved land networks or buffering unprotected natural areas. The ability for easements to complement public land protections and enhance ecological representation [4] may make them most suited to protecting buffer habitats.

Hoary bats and other bat species benefit from land matrices that protect both roosting and foraging habitats [5], support mosaic landscapes [6,7], preserve corridors in fragmented landscapes [8], and support less-intensive agriculture [9]. Easements in the study region, by nature and through deliberate siting, have preserved these types of lands for bats.

This study highlighted the need for greater biodiversity monitoring efforts on eased private land, a finding echoed by similar studies [10,11]. Solutions vary, but a common obstacle has been a lack of funding [11,12]. The use of AudioMoth recorders here presents a simple and cost-effective approach appropriate for citizen science, easement monitoring, and institutional research. ≥75% of endangered species use private lands for habitat [12], making monitoring efforts essential. Leveraging new, easy-to-use technologies like AudioMoths can further ally preserving land with protecting biodiversity.

CONCLUSION

Innovations in conservation are needed if we are to slow the global rate of biodiversity loss. Simple and inexpensive devices like AudioMoth recorders are a relatively new technology that can greatly expand monitoring capabilities on eased private lands. Conservation easements have become a popular land preservation tool and can be leveraged to better protect biodiversity as well. By siting easements with habitat requirements in mind and applying new technologies to biodiversity monitoring, these private lands could better inform and bolster conservation actions nationwide.