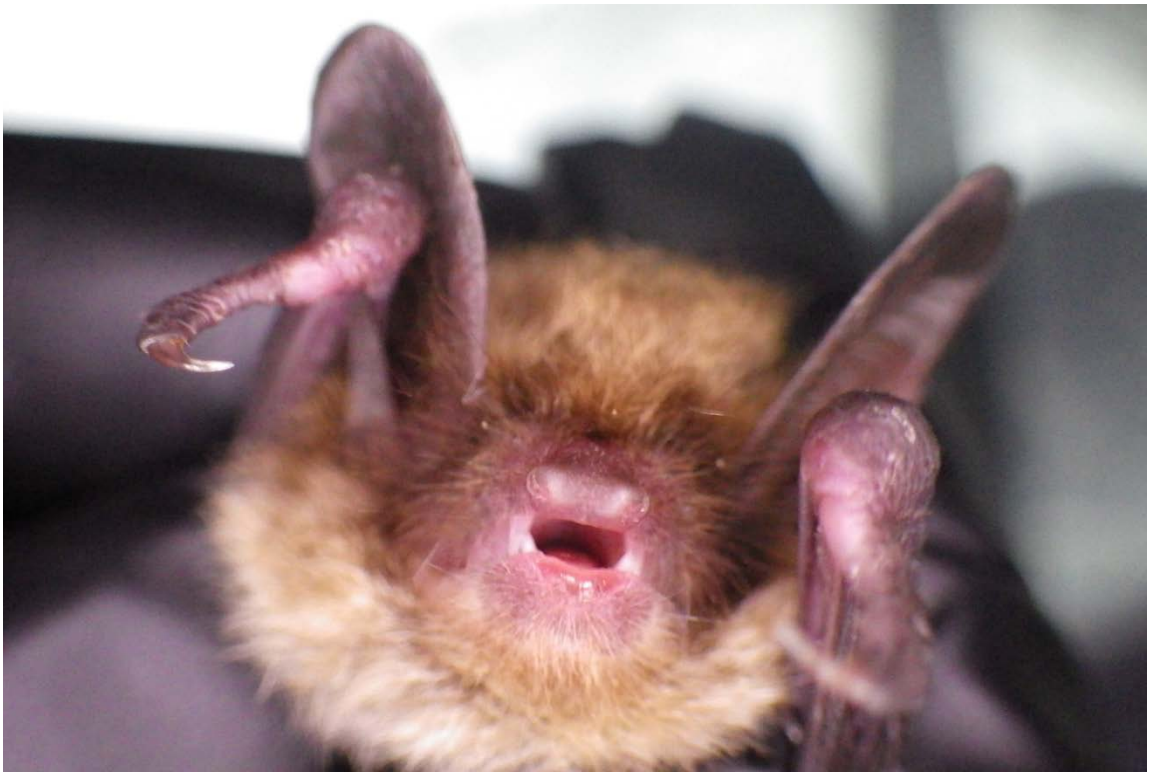
Summary of Bat Research in Whitewater State Park and WMA, MN 2016



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December 2016

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NRRI Technical Report No. NRRI/TR-2016-42L Release 1.0

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Summary

Crews from the Minnesota Department of Natural Resources captured 51 bats in Whitewater State Park and WMA from June 15th–18th, 2016. Bats of 2 species were captured during mist-netting surveys. We captured five individuals of our target species, the northern long-eared bat, and attached transmitters to four pregnant females. These four bats were tracked to 11 unique roost trees of 7 species. During emergence counts we counted from 1 to 28 bats emerging from these roost trees. Roost trees varied in both DBH and height, as well as decay stage. The roosting patterns we observed at Whitewater State Park and WMA were similar to roosting patterns we have observed in other areas of Minnesota, where bats appear to be using a variety of available trees. This report details work done in Whitewater State Park and WMA as part of a statewide study of northern long-eared bats. A report summarizing results of the statewide project will be available in early 2017.

Introduction

Bats are a critical component of Minnesota's ecosystems. A single bat may eat 1000 insects per hour, and the state's bats likely provide many millions of dollars in pest control each year (Boyles et al. 2011). Seven species of bats are known residents of Minnesota: little brown bats (*Myotis lucifugus*, MYLU), northern long-eared bats (*Myotis septentrionalis*, MYSE), big brown bats (*Eptesicus fuscus*, EPFU), tricolored bats (*Perimyotis subflavus*, PESU), silver-haired bats (*Lasionycteris noctivagans*, LANO), eastern red bats (*Lasiurus borealis*, LABO), and hoary bats (*Lasiurus cinereus*, LACI).

There are four Minnesota bat species (northern long-eared bat, tricolored bat, little brown bat, and big brown bat) that hibernate in caves during the winter, and then disperse widely across the state in spring, summer, and fall. Very little is known about the summer habitat use of these species. These four cave-hibernating bats are all Species of Special Concern in Minnesota.

The U.S. Fish and Wildlife Service listed the northern long-eared bat as Threatened under the federal Endangered Species Act in April 2015, largely due to the impact of white-nose syndrome on bat populations (U.S. Fish and Wildlife Service 2016). White-Nose Syndrome (WNS) is caused by the fungus *Pseudogymnoascus destructans* which leads to increased winter activity and extremely high mortality rates of cave-hibernating bats (Frick et al. 2010). WNS has been moving through bat populations in the eastern states and provinces, with range expansions of WNS occurring every year (Turner et al. 2011). *P. destructans* was detected in Minnesota in 2013, and bat mortalities from WNS were first recorded during January 2016 at Lake Vermilion - Soudan Underground Mine State Park, near Soudan, MN (Minnesota Department of Natural Resources 2013, 2016a).

Maintaining reproductive success will be critical to the viability of Minnesota's bat populations as WNS spreads in Minnesota. Obtaining knowledge about maternity roosts before a population decline occurs will be critical for future efforts to reduce negative impacts of forest management and provide high quality habitat to support recovery of bat populations. Even if mortality rates can be reduced, there is still likely to be a drastic reduction in bat populations. Implementing management strategies that minimize mortality will be important as WNS continues to affect Minnesota bats.

In 2015, the Minnesota legislature approved $1.25 million in Environment and Natural Resources Trust Fund (ENRTF) funding for the project *Endangered Bats, White-Nose Syndrome, and Forest Habitat*, the goal of which is to collect data on the distribution and habitat use of the northern long-eared bat in Minnesota. This project is being conducted by the Minnesota Department of Natural Resources (MNDNR), the University of Minnesota Duluth – Natural Resources Research Institute (NRRI), and the USDA-Forest Service (USFS). Data for this project are being collected from across the state during 2015-2017. Data from year 1 of this project were summarized in a report released in the fall of 2015 (Swingen et al. 2015). Whitewater State Park and WMA served as one of 15 study sites for this project during 2016, with personnel from the MNDNR mist-netting bats and conducting radio-telemetry and roost tree characterization.

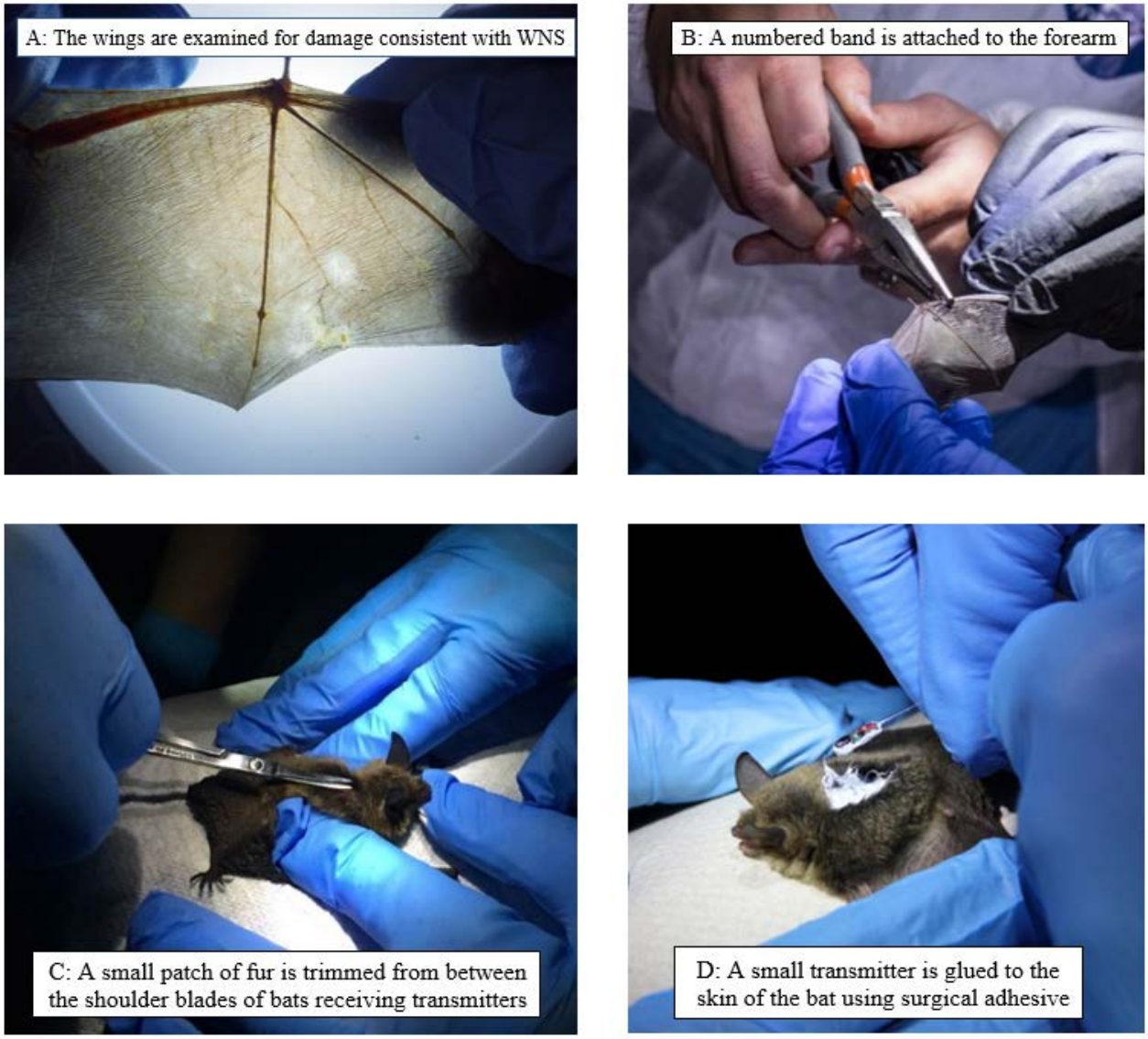
Methods

Bat Capture/Processing

Fine mesh mist-nets (Avinet Inc., Dryden, NY, USA) were set up along forested roads that could act as travel corridors for bats. Each night, 2–4 mist-nets were set up within 200 m of a central processing location. Mist-nets were opened after sunset, and checked every 15 minutes for 2–5 hours, depending on capture rates and weather conditions. Captured bats were placed in cloth bags until processing

Figure 1. Photos showing the techniques for capturing and processing bats. Photo Credits: A – Superior National Forest; B, D – Brian Houck, NRRI; C – Peter Kienzler, NRRI.

Figure 2. Photos showing techniques for processing bats and attaching bands and transmitters. Photo Credits: A – Christi Spak, MN DNR; B – Ryan Pennesi, USFS; C – Sarah Baker, NRRI; D – Morgan Swingen, NRRI.



We identified each captured bat to species by morphology, and determined sex, age, and reproductive condition by physical examination. Each captured bat was weighed and measured, and the wings were inspected for damage potentially caused by WNS (Fig. 1, Fig. 2). Each bat was then fitted with an individually-numbered lipped aluminum wing band (Porzana Ltd., Icklesham, United Kingdom).

Radio-transmitters (A2414 Advanced Telemetry Systems Inc., Isanti, MN, USA; or LB-2X, Holohil Systems Ltd., Carp, ON, Canada) were attached to most reproductive adult female MYSE. We trimmed a small section of hair in the center of the back, and attached the transmitter to the skin using surgical adhesive (Perma-Type, Permatype Company Inc., Plainville, CT, USA, Fig. 2). Bats were released at the capture site after processing.

Tracking/Roost Tree Characterization

Bats with radio-transmitters were tracked to their roosts each day until the transmitter failed or the transmitter fell off. Data recorded at each roost included roost type, tree species, and decay stage. At dusk, crews returned to the roost trees to conduct emergence surveys. During an emergence survey, personnel watched the roost tree from 30 minutes before sunset to 1 hour after sunset. During the emergence survey we recorded the number of bats emerging in each 10-minute interval, the location of the exit point, and whether or not the bat with the transmitter left the tree.

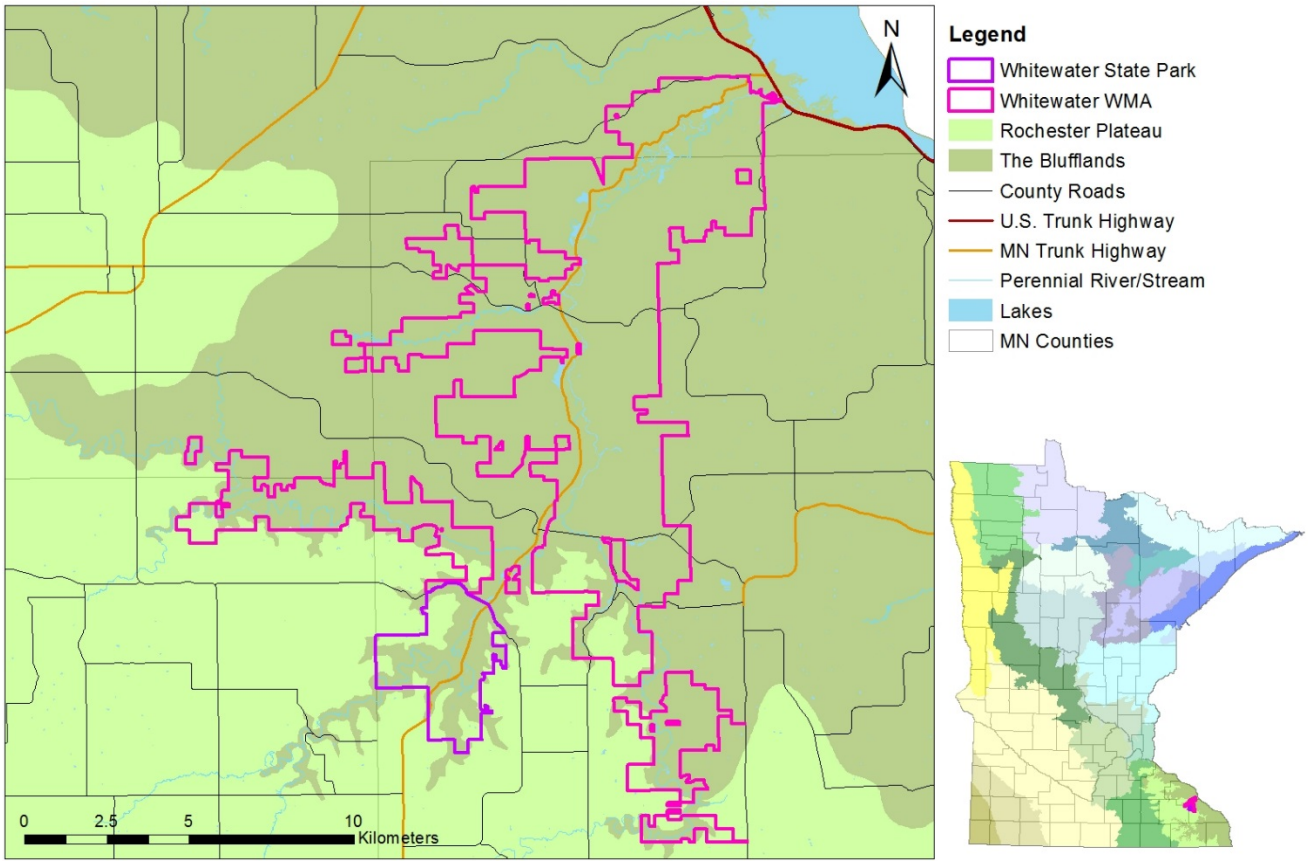
Crews returned to each roost tree to conduct a more detailed tree characterization after bats left. This included measuring roost diameter at breast height (dbh), tree height, decay stage, canopy closure, slope, aspect, and recording details about the vegetation surrounding the roost tree. All trees were marked with a numbered aluminum tree tag with the text “NLEB” (for Northern Long-Eared Bat) stamped on the tag (Fig. 3).

Figure 3. Photo of the type of aluminum tree tags used to permanently mark northern long-eared bat roost trees in Whitewater State Park and WMA, June 2016.

Study Area

Bats were captured for the large-scale study were collected at 15 locations around the state of Minnesota in 2016, including Whitewater State Park and Wildlife Management Area (WMA). The State Park and WMA served as one joint location for this study. Whitewater State Park is owned by the State of Minnesota and managed by the Minnesota Department of Natural Resources (MNDNR) – Division of Parks and Trails. Whitewater WMA is also owned by the State of Minnesota and is managed by the MNDNR – Division of Fish and Wildlife. Whitewater State Park and WMA collectively cover over 30,700 acres of forest, savanna, bluff prairie, and wetland, including stands of white pine (Fig. 4).

Figure 4. Map showing the Ecological Subsections overlapped by Whitewater State Park and WMA in Winona, Wabasha, and Olmsted Counties in Minnesota.



Results

Mist-Netting

We mist-netted bats at three sites in Whitewater State Park and WMA on the nights of June 15th, 16th, and 17th, 2016 (Fig. 5). We captured and processed 51 bats over a total of 50.74 net-hours. We captured 2 species (Table 1). All bats captured were adults, and 43 of the 44 female bats captured were determined to be pregnant at the time of capture. Fourteen of the 51 bats captured showed some wing damage consistent with that caused by WNS, although none showed severe wing damage.

Figure 5. Map of bat mist-netting sites at Whitewater State Park and WMA, June 15th–18th, 2016. The pie chart at each net site indicates the proportion of species captured at that site, and the size of the pie chart represents the total number of bats captured at that site relative to other sites.

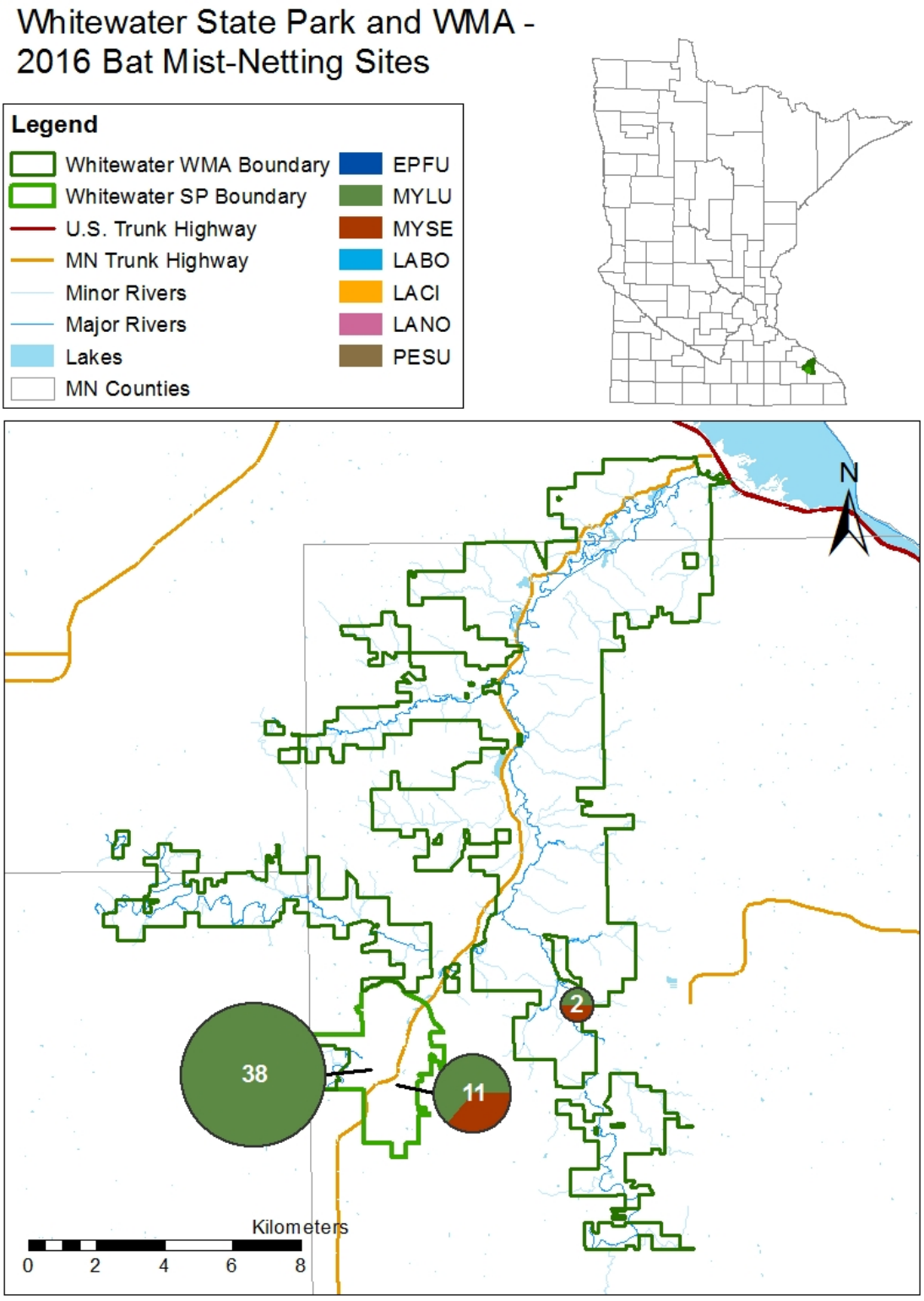


Table 1. Count of bats captured and processed at Whitewater State Park and WMA, June 15th–18th, 2016 by species and sex.

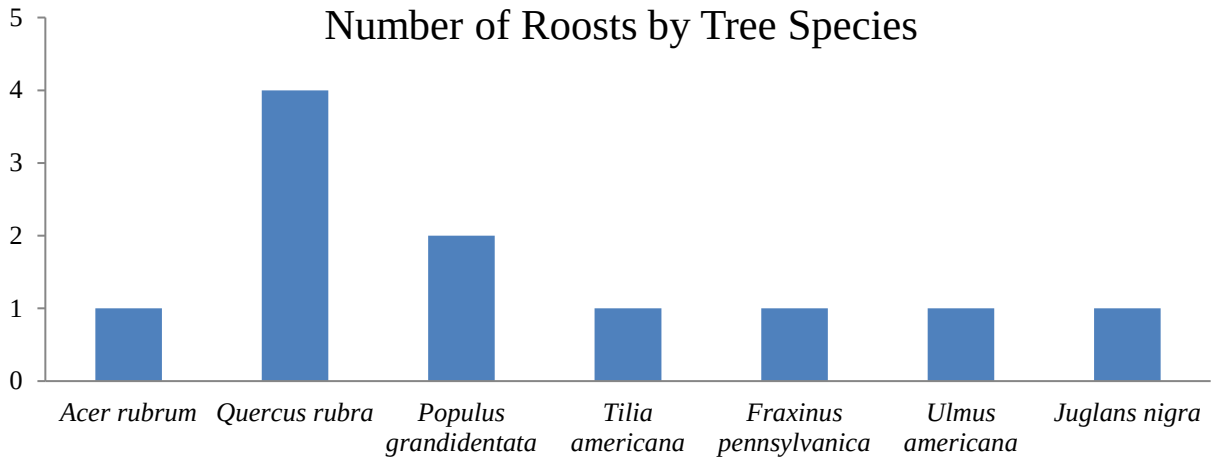
	Species Code							
Sex	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**	**PESU**	**Grand Total**
Female	0	0	0	0	40	4	0	**44**
Male	0	0	0	0	6	1	0	**7**
Grand Total	**0**	**0**	**0**	**0**	**46**	**5**	**0**	**51**

We attached radio-transmitters to the 4 female MYSE captured, all of which were pregnant. Three transmitters were placed on bats near the eastern border of the State Park on the night of 6/15 and one along the southeastern border of the WMA on the night of 6/17.

Radio-Telemetry/Tree Characterization

The four bats with radio-transmitters were tracked until the transmitters failed or fell off, which was between 4–6 days. We tracked the four bats with radio-transmitters to 11 unique roost trees of 7 species (Fig. 6, Fig. 7). A list of roost trees is in Appendix A. Detailed maps of movements between roost trees by bats with transmitters is in Appendix B.

Figure 6. Histogram showing the number of northern long-eared bat roosts by tree species at Whitewater State Park and WMA, June 2016. Eleven total roost trees were identified.



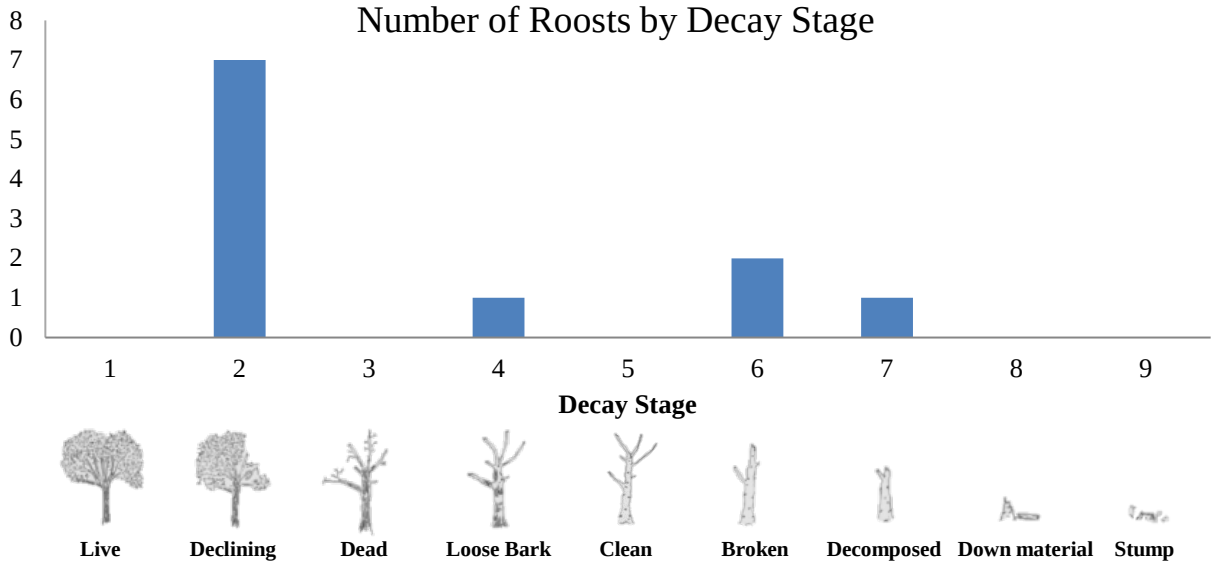
The average distance from the capture location to the first roost was 260 m (range: 157–375), and the average distance moved between consecutive roosts was 313 m (range: 7–677). An average of 3 roosts were identified per bat, and these four bats spent an average of 1.3 days in each roost (of those roosting events with known start and end dates).

The roost trees varied in size from 32.0–65.5 cm in diameter at breast height (DBH), with an average DBH of 50.7 cm. Roosts were located in both live trees and dead trees of varying decay stage (Fig. 8). Roost tree height ranged from 16.6m to 30.0 m, with an average of 22.4 m.

Figure 7. Photos of three roost trees of different species at Whitewater State Park and WMA, June 2016. From left to right: live northern red oak (*Quercus rubra*), live green ash (*Fraxinus pennsylvanica*), broken big-tooth aspen snag (*Populus grandidentata*).

Field crews conducted 7 emergence counts on 5 of the identified roost trees. Bats were observed exiting the roost tree in 5 of the emergence counts. Colony size (number of bats observed in one emergence count) ranged from 1–28 in those 5 emergence counts, and averaged 7.6.

Figure 8. Histogram showing variation in decay stage among eleven northern long-eared bat roost trees identified at Whitewater State Park and WMA, June 2016.



Discussion

The four bats with transmitters at Whitewater State Park and WMA used a variety of roost trees, and moved often, which is consistent with findings both at other sites in this project and in other areas of the NLEB range. Under the Endangered Species Act, there are restrictions on tree harvest within 150 ft of known, occupied roost trees between June 1st and July 31st. For more details on these restrictions, please visit the website of the U.S. Fish and Wildlife Service (https://www.fws.gov/midwest/nleb/). We intend to use the data collected in this project to inform future management decisions regarding the northern long-eared bat as WNS continues to spread across the United States.

Crews captured 2 of the 7 species of bats resident in Minnesota at Whitewater State Park and WMA. None of the migratory tree bats (Eastern red bats, silver-haired bats, and hoary bats) were captured at Whitewater State Park and WMA, and were uncommon in the southeastern part of the state overall. Tricolored bats (*Perimyotis subflavus*) were also not captured or observed during this survey. The lack of tricolored bat captures does not accurately reflect their presence in the state. This species is a regular hibernator in caves and mines in this region (Nordquist, pers. comm.). Summer captures of tricolored bats are uncommon – out of the more than 1000 individual bats captured over the past four summers as part of this project and pilot studies only one tricolored bat was recorded, at Mystery Cave State Park.

Also during the summer of 2016, the first capture of an evening bat (*Nycticeius humeralis*) in Minnesota was recorded in Ramsey County (Minnesota Department of Natural Resources 2016b). It is yet unknown if that capture represented a lone individual or a range extension for that species, however Wisconsin also recently documented the first maternity colony of evening bats in that state (Wisconsin Department of Natural Resources 2016)

The capture of 14 bats with wing damage consistent with WNS is not unexpected. In this region of the state, Mystery Cave tested positive for the fungus that causes WNS and nearby mines in western Wisconsin have confirmed the presence of WNS. Of the 646 bats captured during summer 2016 across Minnesota as part of the overall project, 43% showed some wing damage consistent with WNS.

This is one of 13 site-level reports from the 2016 field season, and is intended for use by the manager(s) and staff of Whitewater State Park and Whitewater WMA. A report summarizing and discussing the results from all 2016 locations will be made publicly available in early 2017 (Swingen et al. 2016).

Acknowledgements

We would like to thank the staff of Whitewater State Park and WMA for accommodating our research at the park. This fieldwork was conducted with the assistance of volunteers, field technicians and other staff, including: M. Boman, A. Herberg, A Maleski, G. Nordquist, and C. Spak.

Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund (ENRTF) as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR). The Trust Fund is a permanent fund constitutionally established by the citizens of Minnesota to assist in the protection, conservation, preservation, and enhancement of the state's air, water, land, fish, wildlife, and other natural resources. Currently 40% of net Minnesota State Lottery proceeds are dedicated to growing the Trust Fund and ensuring future benefits for Minnesota's environment and natural resources.

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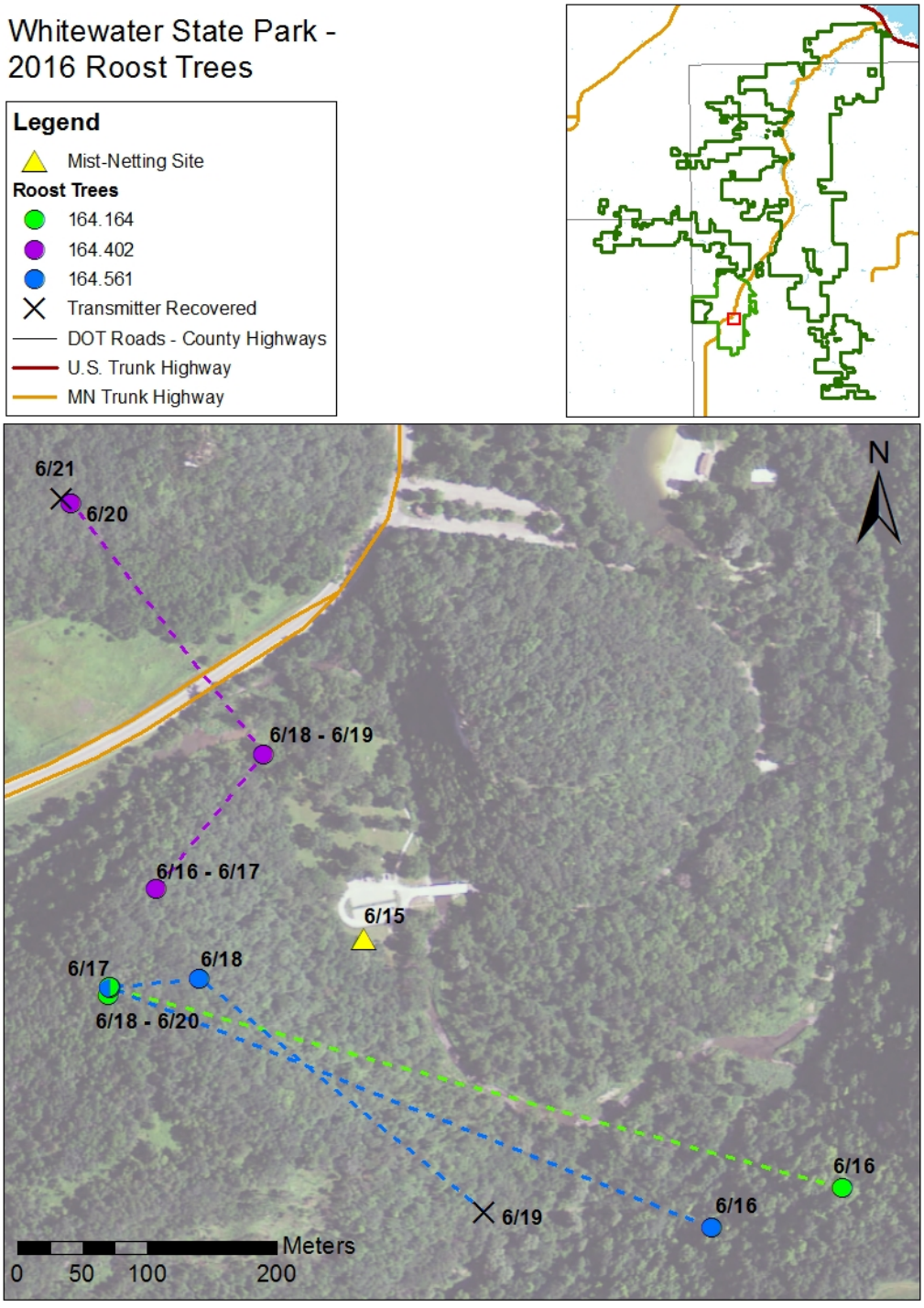
Appendix A. Table of NLEB Roost Tree Specifications

Roost Tree ID (Tag #)	Common Name	Species	DBH (cm)	Height (ft)	Status	Decay Class
407	Northern red oak	*Quercus rubra*	33.7	40	Live	2
408	Big-tooth aspen	*Populus grandidentata*	32.5	22.5	Dead	6
409	Red maple	*Acer rubrum*	34.3	55	Live	2
410	Black walnut	*Juglans nigra*	62.7	40	Dead	6
416	Big-tooth aspen	*Populus grandidentata*	10.7	22.5	Dead	7
419	Northern red oak	*Quercus rubra*	34.2	55	Live	2
420	Northern red oak	*Quercus rubra*	57.9	50	Live	2
421	Northern red oak	*Quercus rubra*	56.0	50	Live	2
423	Basswood	*Tilia americana*	39.3	55	Live	2
424	American elm	*Ulmus americana*	50.2	45	Dead	4
428	Green ash	*Fraxinus pennsylvanica*	107.1	55	Live	2

Appendix B. Maps of Bat Movement

Map showing the site at which bats were mist-netted on June 15th, 2016 (yellow triangle) near the south picnic area in Whitewater State Park. The map also shows the locations of the roost trees (colored circles) used by the female northern long-eared bats that were captured on June 15th and given radio-transmitters. Multi-colored circles indicate a roost tree that was used by multiple transmittered bats.



Map showing the site at which bats were mist-netted on June 17th, 2016 (yellow triangle) in Whitewater WMA just south of the Crystal Springs State Fish Hatchery. The map also shows the locations of the roost trees (colored circles) used by the female northern long-eared bat that was captured on June 14th and given a radio-transmitter. One of the roost trees used by this bat was located on private property just outside the WMA.