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Hanford Site Winter Bat Monitoring Report for Fiscal Year 2013

Prepared for the U.S. Department of Energy
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1.0 Introduction

Bats belong to the order *Chiroptera*, which means "hand-wing". They use a thin membrane of skin stretched between their fingers to fly. All bat species known to occur in the state of Washington are insectivorous, and each bat can consume 600-1000 insects per hour while feeding. Unlike rodents that can give birth to multiple litters of several young each year, bats typically give birth once per year to only one pup, making bat populations extremely vulnerable to impacts and slow to recover. Several species of bats have been documented on the Hanford Site, with nine species identified during the Nature Conservancy (TNC) surveys in 1997 and 1998, and by Mission Support Alliance (MSA) during 2012 (Soll 1999, Lindsey et al. 2012, Table 1).

Table 1. Species Encountered During Studies Performed by TNC and MSA on the Hanford Site

Common Name	Scientific Name	Abbreviation	TNC Acoustic	TNC Captured	MSA Acoustic 2012
Pallid bat	Antrozous pallidus	Anpa	X		X
Big brown bat	Eptesicus fuscus	Epfu	X		X
Silver-haired bat	Lasionycteris noctivagans	Lano	X		X
Hoary bat	Lasiurus cinereus	Laci	X		X
California myotis	Myotis californicus	Myca		X	X
Western small-footed myotis	Myotis ciliolabrum	Myci		X	X
Little brown myotis	Myotis lucifigus	Mylu		X	X
Yuma myotis	Myotis yumanensis	Myyu		X	X
Canyon bat	Parastrellus hesperus	Pahe	X		X

Of the species confirmed on the Site, pallid bats, small-footed myotis, and canyon bats are listed as Washington Department of Fish and Wildlife (WDFW) State Monitor Species. In addition, roosting concentrations of big-brown bats, pallid bats, and all roosts for bats in the genus *Myotis* are considered Priority Habitats by the WDFW (WDFW 2008). Roosting congregations can be maternity colonies, winter roosts, or night roosts. Males typically day-roost alone or in small groups, and do not have the same strict roosting habitat requirements as maternity colonies. Maternity colonies are specialized locations where groups of female bats roost together to give birth and raise their young. Individuals show strong fidelity to these roosting locations, and the same roosts are used year-after-year. These locations are selected for proximity to food and water resources, as well as appropriate temperature, humidity, and light conditions. The bats congregate to share body heat in order to conserve energy. These maternity locations are vital to successful reproduction. Night roosts are located close to feeding areas and are used by bats for resting and digestion between feeding bouts. Bats are known to habitually use night roosts from night-to-night and from year-to-year (Ormsbee et al. 2007). Although some species are migratory (silver-haired bat, hoary bat), most bats remain in the region during the winter, roosting alone or in small groups. Due to cold temperatures and lack of available food (insects), bats must use winter roosts to survive. Winter roosts are selected for cold and constant temperatures so that bats can down-regulate their body temperature, slowing their metabolism and conserving energy, to survive through

the winter. Bats select all communal roost types for very specific conditions, which may not be otherwise available in the same area, potentially making roost availability population limiting.

Identification and protection of roosting locations is becoming increasingly important with the outbreak of the fungal infection referred to as White Nose Syndrome (WNS). White nose syndrome is affecting bats in the eastern United States, and is rapidly expanding westward. Bats save energy during the winter by reducing their body temperature and entering a state of hibernation called torpor. They break these torpor bouts by warming their body temperature back up at regular intervals throughout the winter; these events are termed "arousals". Bats often leave the roost locations during this time and are therefore detectible using acoustic monitoring equipment. Bats are thought to use these arousals for depuration, defecation, grooming, breeding, and possibly drinking. Although these arousals represent a relatively small portion of the time the bats spend winter roosting, a large amount (up to 80 percent) of their energy stores for the season are burned during arousals (Thomas et. al. 1990). Bats are thought to increase the number of arousals due to WNS, likely for additional grooming. This causes the bats to exhaust their energy stores prior to the end of the winter, resulting in starvation. This disease spreads quickly through roosting colonies and causes fatality rates up to 100 percent at infected winter roosts (more information available at whitenosesyndrome.org). Because of the collapse of these bat colonies and the potential expansion of this disease westward, it is extremely important to identify and characterize roosts to provide a baseline in case the disease reaches this area. Bat researchers must follow strict WNS Protocols established by the U.S. Fish and Wildlife Service (USFWS) and other agencies when working with bats (WNS 2012).

Bats are sensitive to disturbance, especially while hibernating. Disturbance to winter roosts can cause unnecessary arousals from torpor. Too many arousals, and the resulting energy expenditure, can lead to death by starvation of entire colonies. Early identification of roost areas can help avoid impacts to these sensitive species.

We proposed to use acoustic monitoring to detect activity levels near potential winter roosting habitats across the Department of Energy (DOE) managed portion of the Hanford Site in winter of FY2013 (Figure 1).

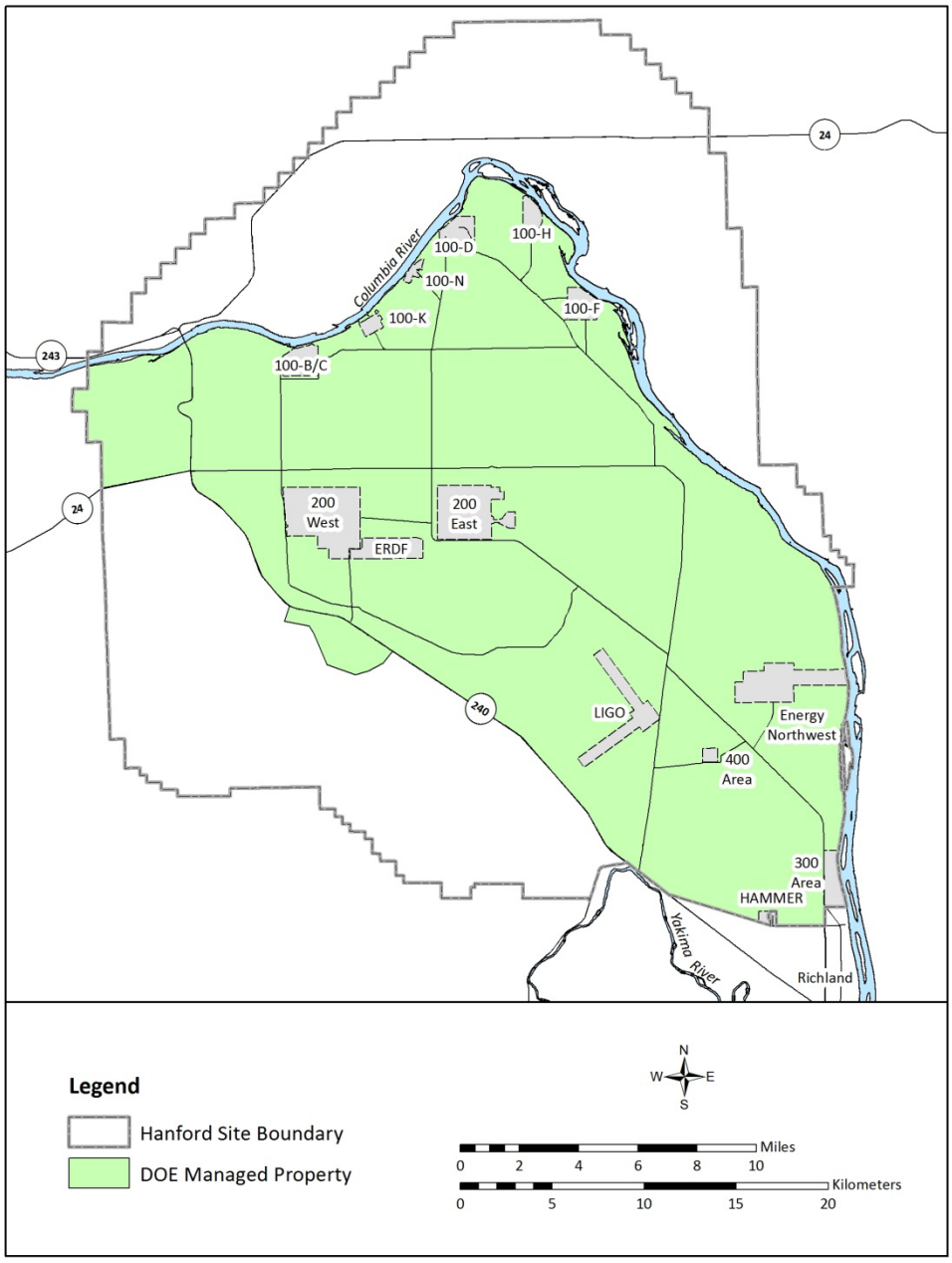

Figure 1. DOE Managed Property Within the Hanford Site Boundary

2.0 Methods

Potential winter roosting habitats were identified initially using aerial photography and walking surveys. It was not necessary for bats to be present during these initial habitat surveys, so work was performed prior to the winter roosting season. Locations that could potentially concentrate bats (i.e. open water sources) were also selected to attempt to document a species list for winter usage on the Hanford Site.

Monitoring at the identified survey locations was performed with an acoustic detector. A Pettersson D500x Bat Detector was selected for its ability to operate remotely and make high-resolution (full spectrum) recordings over extended periods (e.g. >1 week). The detector was placed inside of a 50-caliber ammunition box, used as a weatherproof enclosure, along with a 6-volt 14-amp battery (Figure 2). An external microphone was used by threading a cord through a hole in the side of the ammunition box and sealing it with a cork. A water-resistant windscreen was placed over the external microphone to minimize noise recordings that occur during high winds and a tripod was used to extend the microphone off the ground by approximately 6 feet to increase recording quality (Szewczak (N.D.) (Figure 3).

Detector settings were selected using recommendations from Tyburec 2011, and then adjusted for local conditions. Settings were:

Sampling Frequency: 500
Pre-Trig: off
Recording Length: 1.0 second
High Pass Filter: Yes
Auto Record: Yes
Trigger Sensitivity: High
Input Gain: 80
Trigger Level: 200

The detector was deployed at each location for a minimum of three qualifying weather nights, in order to minimize weather-related impacts on level of activity calculations. A qualifying weather night, for the purposes of this project, consisted of average wind speed of less than 15 mph, minimum temperature greater than 17 degrees Fahrenheit (Lausen and Barclay 2006), and no measurable precipitation, as recorded by the Hanford Meteorological Station's (HMS) nearest weather monitoring station. Acoustic recordings were analyzed, using Sonobat 3™ automated analysis software and manual review, to help determine the species present and the relative level of activity (calls/bat-night). A bat-night, for the purposes of this project, occurred between sunset and sunrise of the following day. Therefore, the bat detector was set to begin recording at sunset, and to stop at sunrise; these times were adjusted throughout the season.

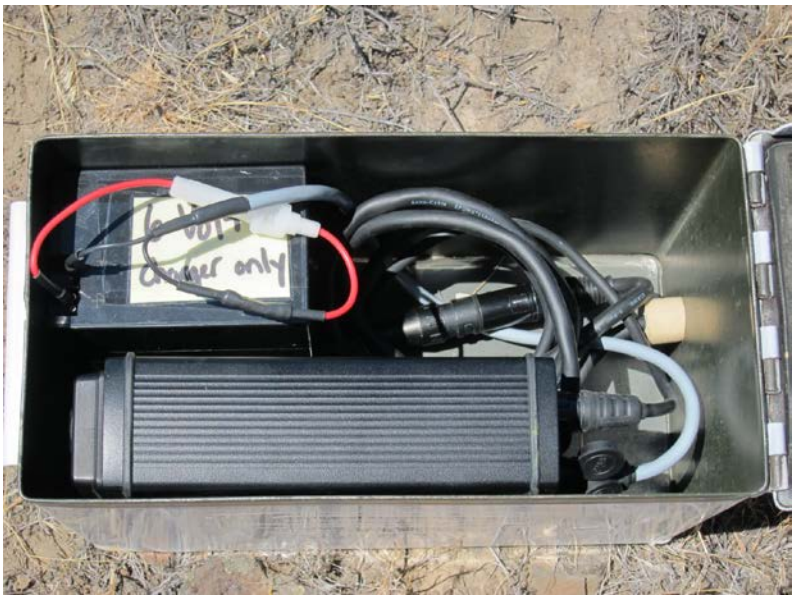

Figure 2. Pettersson D500x and External Battery Inside of Ammunition Box Weather Enclosure

Figure 3. Pettersson D500x Deployed Near Potential Winter Roosting Habitat

3.0 Results

Eight sites were identified and surveyed during the winter of fiscal year (FY) 2013 (Figure 4). Acoustic monitoring began on January 9 and concluded on March 21. Seventy-one of the 72 total nights during the survey period were recorded between the 8 locations. However, while the detector was deployed at 100-F Slough it was tipped over at some point during the survey, presumably by a bald eagle trying to use the tripod as a perch (a large regurgitated pellet containing duck feathers was found at base of tripod), and while it continued to function, recording efficiency and quality may have suffered. The detector was also tipped over at Umtanum 2, presumably by high winds. The number of bat passes documented and the number of suitable-weather recording nights at each location is shown in Table 2. A total of 5 bat passes were recorded during the FY2013 winter monitoring period conducted between January 9, 2013 and February 28, 2013. Acoustic monitoring continued from February 28 until March 21 at the "West Lake" site as an attempt to document the timing of the early-season increase in bat activity on the Hanford Site. Due to the late timing of these deployments, the data were not considered part of the winter roosting period.

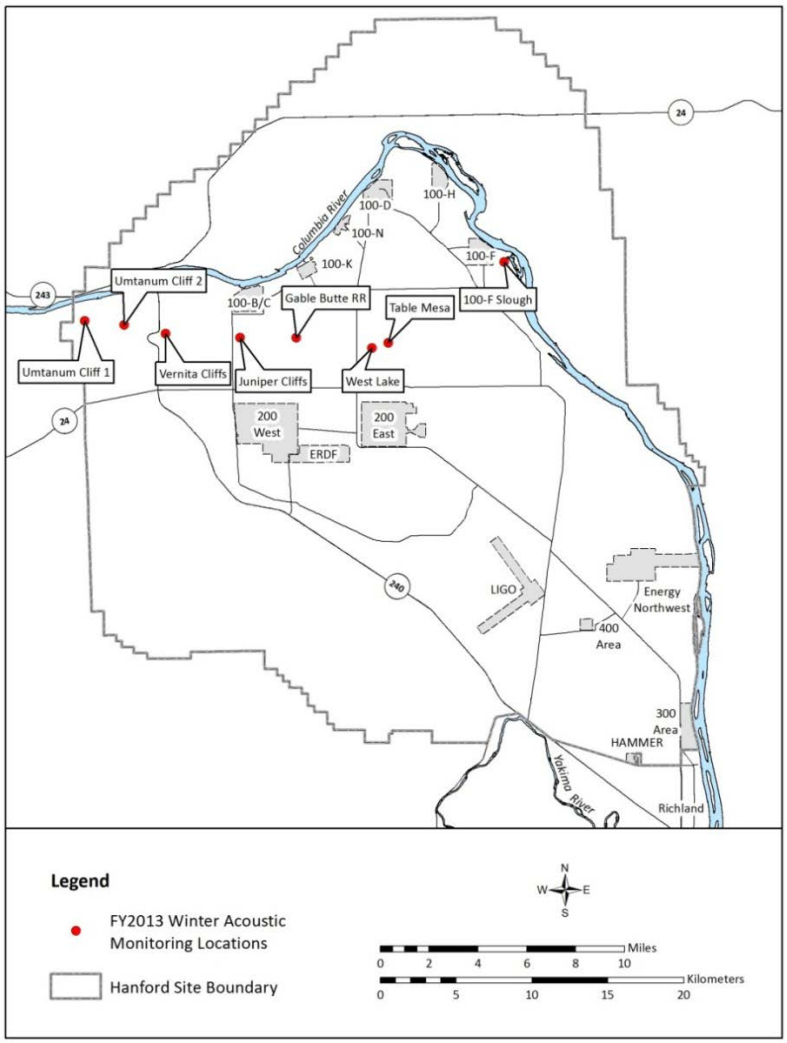

Figure 4. Acoustic Monitoring Locations for FY2013

Table 2. Total Bat Passes Recorded and Species Detected

Site	Total Nights	Suitable Weather Nights	Bat Passes	Species
Table Mesa	6	4	0	n/a
Gable Butte RR Cliffs	6	5	0	n/a
Juniper Cliffs	7	6	0	n/a
Vernita Cliffs	7	7	0	n/a
Umtanum Cliffs 1	8	8	1	Mylu
100-F Slough	8	8	2	Mylu
Umtanum Cliffs 2	8	6	2	Mylu
West Lake 1*	8	4	1	Mylu
West Lake 2*	7	7	2	Mylu
West Lake 3*	7	5	0	n/a
*Monitored for early season bat activity (not for winter roosting)				

4.0 Discussion

As was observed during the summer acoustic monitoring (Lindsey et al. 2012), little brown bats were the most abundant bat, and in fact the only bat species recorded during winter monitoring in FY2013. The data collected indicate that little brown bats are using the Hanford Site for winter roosting, and while it is not possible to determine the precise number of bats based on the number of acoustic detections, it appears the usage of the areas monitored during FY2013 is low. Four of the seven sites monitored during the winter roosting period had no detections, and three sites had only five bat passes between them. One of the sites where bats were detected (100-F Slough) is adjacent to the Columbia River and may indicate that bats were seeking hydration during their arousal periods. The two remaining detection sites were both on Umtanum Cliffs, which likely represent the most suitable winter roosting habitat on the DOE managed portion of the Hanford Site. The Umtanum Cliffs are characterized by tall (>50 feet (15 meters)), north facing basalt cliff faces. Due to the height of the cliffs and the large talus slopes present at the cliff bases, access for determining precise roost locations would be extremely difficult. The Umtanum Cliffs stretch for over three miles (five kilometers) and thus present a vast area for potential winter roosting. Additional monitoring at various locations across this area during the winter could better define the specific cliff sections used by hibernating bats.

The minimum ambient temperature when bats were detected acoustically near the winter roosting habitat at Umtanum Cliffs ranged from 22 to 34 degrees Fahrenheit (-5.5 to 1.1^{o}Celcius). Insect activity is unlikely at these temperatures, so bats are likely flying to drink water at the Columbia River, located approximately one mile (1.6 kilometers) north of the Umtanum Cliffs. The Umtanum Cliffs are closer to the river than any other north facing cliffs on the Hanford Site. The Vernita, Juniper and Gable Butte Cliffs are located 2 miles from the river, while the cliffs at Gable Mountain are at least three miles from the Columbia River. This proximity could explain why bats are using these cliffs but do not appear to use the other cliffs located on the Hanford Site. Additional monitoring near sloughs on the river near Umtanum Cliffs could support this theory. Temperature information could better define if the suitability

of structures at the Hanford Site for winter roosting varies across the Site. The deployment of temperature dataloggers in a variety of crevices on the different cliff structures located on the Hanford Site could help to determine if the microhabitat present at Umtanum Cliffs is different from Vernita Cliffs, Juniper Cliffs, or the cliffs at Gable Mountain or Gable Butte.

Monitoring for the spring-time increase in bat activity at West Lake was discontinued prematurely due to disturbance of the equipment by elk (*Cervus elaphus*). Elk tracks were present in the area and the microphone had tooth marks on it. Elk are known to use the West Lake area and were likely curious of the new feature in their environment. Due to the potential for damage from the elk the equipment was removed from the location prior to a significant increase in activity being observed. Bat activity typically increases on the Hanford Site during mid-March, but further monitoring could better define this timeframe.

5.0 References

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