United States Department of the Interior

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NOV 30 2017

Memorandum

To: Section 7 Administrative File

From: Assistant Regional Director, Ecological Services, Region 3

Subject: Effects to the Northern Long-eared Bat from Section 10(a)(1)(A) Permitting in the Midwest Region – Amendment to Biological Opinion

This memo constitutes an amendment to the June 22, 2015, Biological Opinion on Effects to the Northern Long-eared Bat from Section 10(a)(1)(A) Permitting in the Midwest Region (2015 Biological Opinion). In October 2017, we evaluated a proposal from Western Michigan University, Ball State University, and Bat Conservation International to test the efficacy of a possible treatment application of chitosan to reduce the effects of white-nose syndrome (WNS) on hibernating little brown bats (*Myotis lucifugus*). The proposed scientific investigation has potential to benefit numerous WNS-affected species, including threatened northern long-eared bats (*Myotis septentrionalis*), if efficacy can be demonstrated through this investigation. Specifically, this study is intended to test efficacy of chitosan on the little brown bat; however, adverse effects to northern long-eared bats that hibernate in the same locations may occur due to the need to construct barriers either at the entrance of or within hibernacula proposed for the study. Effects associated with these barriers were not evaluated in the 2015 Biological Opinion. The proposal describes experimental methodology to evaluate the effects of chitosan treatment to combat WNS. If effective, this treatment may provide benefit to northern long-eared bats by reducing mortality caused by WNS. All other actions associated with the proposed study were evaluated in the 2015 Biological Opinion, and relevant conservation measures described in the 2015 Biological Opinion will be incorporated.

Proposed actions not previously considered in the Biological Opinion

Western Michigan University, Ball State University, and Bat Conservation International are working closely with Michigan Department of Natural Resources to identify appropriate study sites to test the efficacy of chitosan applications to reduce WNS-induced mortality of little brown bats. Although the study is designed to test the effect of chitosan on little brown bats,

northern long-eared bats have been documented hibernating alongside the study species at some of the study sites. Several aspects of the study have been previously considered under the Biological Opinion, specifically surveillance and monitoring activities at winter roosts. The effects of those activities are not addressed in this amendment.

To better estimate the efficacy of chitosan on little brown bats, study animals must be recaptured in late winter, just prior to spring arousal to evaluate the effect of the treatment on the development of the disease. To ensure the researcher's ability to recapture study bats, temporary barriers will be installed at entrances to mines or openings to smaller partitioned sections of mines to prevent the study animals from leaving the roosting locations, either immediate (select passages) or collective (entire mine). Subsampling at larger sites will allow for stronger statistical analysis comparing between- and within-site efficacy, thus strengthening final conclusions on the effectiveness of the chitosan trial.

Study sites were chosen to minimize the number of listed species that may be affected by the use of mesh barriers. At ten sites, mesh barriers will be used at the entrances to the mines only (Table 1). In addition, entrances at some of these sites naturally ice over, creating a natural barrier which negates the impact of the constructed barriers. At three sites, mesh barriers will be installed inside the mines to partition the colonies into 2, 4, or 8 subsamples (Table 1). At these three sites, mine entrances will be left open to allow animals to move freely if not confined behind one of the respective mesh barriers. All enclosed areas will be sufficiently large to allow bats to move relatively unrestricted and engage in typical behaviors, including social interactions with other bats within the same enclosed area. Each enclosed area will contain bats (primarily little brown bats), plentiful roosting surfaces, appropriate environmental conditions for hibernation, and access to water. Bats within each enclosed area will be able to complete the following activities:

a) Drink

Leaving to drink is a primary reason bats will exit a site during the winter in some geographic areas (Speakman and Racey 1989, Thomas 1995, Thomas and Geiser 1997, Boyles et al. 2006). Due to sub-freezing temperatures and frozen water resources encountered throughout winter in Upper Michigan, we do not expect bats to need to exit to find external water resources. Water may be consumed inside hibernacula either from standing pools or condensation on mine walls. All sites and sections of sites being used in this study have standing water naturally occurring. If naturally occurring water appears low, temporary pools may be constructed to provide drinking water. In other studies, bats were observed on camera drinking from such artificial pools numerous times during the winter (J. Reichard, pers. comm. November 9, 2017). Thus, availability of water within each enclosure means leaving sites to drink will not be required.

b) Carry out social behaviors such as mating

Although bats are long-lived mammals, being unable to pursue social activities outside of the hibernaculum for part of a single winter could be considered a negative effect of this experiment. One hypothesis is that they leave the hibernaculum to engage in social interactions including mating (Thomas et al. 1979, Boyles et al. 2006). However, cold winter conditions in northern Michigan are likely unsuitable for bats to emerge from hibernacula for any purpose during the study period. Use of mesh barriers at the openings of mines or sections of mines does not preclude them from interacting with roost mates. Furthermore, the mesh barriers will only be in place after fall activity has subsided and before spring activity has commenced, reducing the potential for significant impacts to mating opportunities.

c) Relocate to other roost locations

Hibernating bats periodically move within hibernacula throughout the winter to mate, access water, or simply spend periods with warm body temperatures (euthermia) in slightly warmer areas of the mine (Boyles and Willis 2010, Hayman et al. 2017). By utilizing warmer areas of the site, bats expend less energy to maintain elevated body temperature during these arousal bouts. Extensive movement during these periods of euthermia have not been widely reported and are unlikely to be obligatory when important resources are accessible to the bats within the mine or select passage (Boyles et al. 2006). Hardin and Hassell (1970) noted that clusters of hibernating Indiana bats in Kentucky were consistently observed in the same locations of a cave from December through February. Active bats observed during this period did move away from clusters temporarily while generally staying within the same chamber of the cave as the larger clusters. Still, not all tagged bats could be accounted for during these observations and it is possible they moved temporarily to other areas of the cave or other caves altogether (Hardin and Hassell 1970).

Interactions with mesh barriers as a result of bats attempting to relocate are expected to be minimal and unlikely to result in harm. Previous observations indicate bats are able to detect mesh barriers visually and/or acoustically, which permits them to safely approach and interact with the barriers (Vonhoff and Carter, unpubl. data 2017; Britzke 2014). Barriers have been used in several hibernacula studies where investigators did not observe injury or mortality caused by bats colliding with the barriers (e.g. Britzke et al. 2014, Carter and Vonhof, unpubl. data 2017, S. Hicks, pers. comm. August 29, 2016, Herzog, pers. comm. August 29, 2016).

Table 1. Most recent bat population estimates at proposed study sites in Dickinson, Ontonagon and Houghton Counties, Michigan.

Hibernacula	Unidentified *Myotis*	*M. lucifugus*	*M. septentrionalis*	*P. subflavus*	*E. fuscus*	Total Bats	Estimated total MYSE
Sites with barrier at entrance only							
Adventure Adit	0	165	0	0	0	165	2
Derby Adit	0	126	4	0	3	133	4
Flintsteel Adit	63	132	3	0	15	213	3
Iron Mt Iron Mine	395	710	0	0	13	1,118	17
Keel Ridge Mine	2	43	0	-	1	46	1
Merchant Mine	0	48	1	0	5	53	1
Norway Mine	8,317	142	0	0	188	8,647	127
S Bluff E Adit	2	110	3	0	1	116	3
Young's Adit	3	47	0	2	8	60	1
Sites with barriers at entrance and interior							
S Lake Mine (8 subdivs)	199	1,599	0	0	168	1,966	27
Silver Mt Mine (2 subdivs)	0	244	3	0	0	247	4
Adventure Mine (4 subdivs)	19,347	1,013	13	9	453	20,854	306

All framing for mesh barriers was previously installed by project personnel in partnership with Michigan Department of Natural Resources. These activities involved attaching wooden frames to the walls of mines either at the entrances or at constrictions between subsections of the mines. Installation of these frames was done under the Section 6 authority for the State of Michigan between October 25 - November 5, 2017. No mesh barriers were installed at this time.

Mesh barriers will be installed from late November 2017 until mid-April 2018 to restrict movement of bats within and/or among known hibernacula. This period of time was chosen to coincide with the time when bats are expected to have settled into torpor in these sites based on: 1) consistently cold outside temperatures limiting access to above-ground water (frozen), a reduction in flying insect prey, and challenging conditions for thermoregulation; 2) social activity and microclimate selection that occurs during early hibernation will have decreased; and 3) resources identified as potentially essential to survival (suitable microclimates, drinking water, and roost mates) will be sufficiently available within all enclosed areas.

In all study hibernacula, colonies are predominantly non-listed species of bats, primarily little brown bats, the target species. Because not every bat was identified to species during recent surveys at most sites, the number of northern long-eared bats at each site was estimated as the greater of the following values: a) 1.5% of the total number of myotis bats counted at the site (including unidentified myotis, little brown, and northern long-eared bats; Kurta and Smith 2016), or b) the total number of northern long-eared bats identified and counted at a site. See Table 1.

If the proposed actions successfully demonstrate efficacy of chitosan as a treatment that reduces mortality from WNS, northern long-eared bats stand to benefit. WNS was identified as the primary threat facing this federally threatened bat and efforts to manage the disease could have a positive impact on the species. Although chitosan, as a treatment, is limited in application to locations where hibernating bats can be safely accessed, northern long-eared bats that hibernate in these sites would be potentially be treatable with this compound. Demonstration of effectiveness could also prove beneficial to other bat species currently and potentially affected by WNS in the future.

As described herein, the potential for negative effects from temporary barriers is limited and will be minimized to the greatest extent possible for this study. Because only a small proportion of northern long-eared bats are expected to be exposed to these potentially negative effects, the proposed actions are not likely to jeopardize the species. Effects on the numbers of northern long-eared bats, even within the affected hibernacula, are expected to be low and not detectable. In fact, we do not expect the proposed use of mesh barriers to affect the number of northern long-eared bats that survive the winter in the affected hibernacula. Plentiful mating opportunities are likely to exist before and after the barriers are in place, but they may affect

behaviors associated with reproduction for up to 10% of the northern long-eared bats in the three mines where internal barriers will be placed (Table 1). In light of the minimal level of adverse effects expected at the hibernacula, we do not expect any significant effects to the distribution of the northern long-eared bat. The benefits of developing a treatment with the potential to reduce the ongoing severe threat of WNS to this species outweigh the potential negative effects.

Revision to Anticipated Incidental Take

Amount of Extent of Take Anticipated

A proportion of the northern long-eared bats in the three mines where internal barriers will be installed may be taken in the form of harassment as a result of the activities associated with the proposed action. We do not expect any incidental take to occur at the sites with only external barriers. Pre-WNS surveys conducted in Michigan indicated that northern long-eared bats represented 10% of the total Myotis count (Kurta and Smith 2014); Kurta and Smith (2016) more recently estimated that northern long-eared bats now represent only 1.5% of the Myotis species after the latest post-WNS counts (Kurta and Smith 2016). Therefore, we will assume that northern long-eared bats comprise 1.5% of all Myotis species in the three mines where internal barriers will be installed – i.e., there are 337 northern long-eared bats in these three mines (Table 1).

We anticipate that incidental take in the form of lost reproduction will occur at study mines where internal barriers are installed. Incidental take is only expected to occur for a portion of the bats present at the three mines with internal barriers. Many of the northern long-eared bats in these mines will have already mated or will roost in areas not affected by the internal barriers. We estimate that mesh barriers will affect no more than 10% of the 337 northern long-eared bats – 34 northern long-eared bats – among 14 isolated areas in these three mines. About half of the affected bats will be males and thus, about 17 female northern long-eared bats could be taken in the form of harassment. We expect no long term harm or loss of fitness to these bats as a result of the proposed action, only disruption of movements that facilitate reproduction during the period when the internal barriers are in place. We do not anticipate take in the form of injury or death from encountering the barriers to occur for any of the northern long-eared bats in sites where entrance-only or internal mesh barriers will be installed.

Effect of the Take

As stated above the extent of incidental take anticipated to result from the proposed chitosan study is not likely to jeopardize the species. Up to 34 northern long-eared bats – about half of them female – could be affected via disruption of normal behaviors associated with mating. We do not expect any adverse effects to the survival of the affected bats. Moreover, the proposed action may yield information that could improve our ability to reduce the threat posed by WNS.

The Service realizes that the incidental taking of northern long-eared bats may be difficult to detect and assess in real-time without posing additional harm or harassment to the listed species at these sites. Due to the difficulty of detecting take of these species, the Service will better understand the amount and extent of the take based on observations recorded during the population surveys conducted at the beginning and end of the season to determine efficacy of the treatment. If the initial project activities indicate that northern long-eared bat populations were underestimated as part of this analysis (i.e., new information is available that suggests adverse effects may occur to more than 34 northern long-eared bats enclosed by barriers at the three sites with internal barriers), then the permittees will be instructed to not erect any additional barriers, and the Service will reinitiate consultation for this additional barrier installation as described below. Likewise, consultation would be reinitiated if additional barriers are installed that would partition the three mines more than was originally proposed (Table 1).

This amendment to the Biological Opinion for the Effects to the Northern Long-eared Bat from Section 10(a)(1)(A) Permitting in the Midwest Region will not require any changes to the Reasonable and Prudent Measures or Terms and Conditions.

Reinitiation Notice

This concludes formal consultation on the actions outlined above. As written in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Service involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the Service action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the Service action is later modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease until reinitiation.

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