BIOLOGICAL ASSESSMENT

on the

PROPOSED ACTIVITIES ON FORT DRUM MILITARY INSTALLATION, FORT DRUM, NEW YORK (2015-2017)

FOR THE INDIANA BAT (*Myotis sodalis*) and NORTHERN LONG-EARED BAT (*Myotis septentrionalis*)

September 2014

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2015-2017 FORT DRUM BIOLOGICAL ASSESSMENT FOR THE INDIANA AND NORTHERN LONG-EARED BAT

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Executive Summary

Fort Drum is a 108,733 acre (ac) US Army installation in northern New York and is the largest military installation in the northeastern United States, serving as home to the 10th Mountain Division-Light Infantry and one of the primary training facilities for National Guard and Army Reserve units throughout the region. Military training has occurred on Fort Drum lands since 1908.

There is one federally-listed endangered species known to occur on Fort Drum, the Indiana bat (*Myotis sodalis*). The Northern long-eared bat (*Myotis septentrionalis*), a species the U.S. Fish and Wildlife Service (USFWS) has proposed listing as an endangered species also occurs on Fort Drum. For the purpose of this Biological Assessment (BA) the northern long-eared bat will be treated under the assumption that it will be listed as an endangered or threatened species as of April 2015. However, conservation measures, and/or terms and conditions as pertaining to this species will not be instituted unless and until the species is officially listed through the Federal Register process. If the species is not listed, the conservation measures and/or subsequent terms and conditions will become null and void as pertaining to this species.

This BA identifies and analyzes potential impacts to both these species from activities that are proposed to occur on Fort Drum from January 1, 2015 – December 31, 2017. It is expected to cover approximately 85%+ of activities that may occur on Fort Drum within the next three years. All other activities not included in this BA will be addressed via individual informal consultation or by reinitiating formal consultation with the USFWS. This BA was prepared pursuant to Section 7 of the Endangered Species Act (16 USC 1536 (c)).

Indiana bats were first confirmed on Fort Drum in 2006. The nearest known Indiana bat hibernaculum, Glen Park, is approximately 6.5 mi (10.5 km) from Fort Drum's Cantonment Area. Approximately 330 Indiana bats now hibernate there annually. Mist-netting and radio-tracking efforts have identified one maternity colony focused within the Cantonment Area of Fort Drum.

Northern long-eared bats were first confirmed on Fort Drum in 1999 when a small survey effort documented four bats in the Training Area. Subsequently, approximately 380 northern long-eared bats have been captured throughout the installation while performing surveys during 2007-2014 to determine presence/probable absence for Indiana bat, as well as, during other mist net surveys. Suspected acoustic detections of the species have also been recorded throughout the installation. Where all evidence for Indiana bat suggests most use is still concentrated within the Cantonment Area and the southern Training Areas, evidence for northern long-eared bat suggests there is no concentrated use, and that they could be found throughout most of installation in appropriate habitat. It is unknown where northern long-eared bats may be hibernating; however, there are dozens of potential hibernacula within range of Fort Drum

Historically, Fort Drum likely contained relatively robust numbers of Indiana bats within the known maternity colony, and high numbers of individuals and maternity colonies of northern long-eared bats. However, impacts from white-nose syndrome (WNS) to Indiana and northern long-eared bats have been severe in New York and on Fort Drum, and the disease has caused drastic declines in their populations. Although acoustic detections of probable Indiana and northern long-eared bats are still being detected on the installation, only 2 Indiana bats have been captured since 2011.

No northern long-eared bats have been captured since 2011. Where it was once relatively easy to capture these species through traditional mistnet efforts, it is now a difficult task. Given this development, the likelihood of finding new maternity colonies of either of these species is unlikely.

Section 1 provides consultation history, abbreviated relevant information on Fort Drum (see previous Fort Drum BAs and BOs regarding Indiana bat for additional information), and the status of the Indiana and northern long-eared bat.

Section 2 describes and assesses the potential effects of the following activities on the Indiana and northern long-eared bat: construction; military training; forest management; mechanical vegetation management; land conversion; use of pesticides; wildlife management/vertebrate pest control; and outdoor recreation. Conservation measures are also outlined to reduce or eliminate adverse impacts of the proposed activities.

Section 3 describes and assesses the potential effects of proposed conservation activities on the Indiana and northern long-eared bat, including: the establishment of a 2,202 ac (891 ha) Bat Conservation Area (BCA) to protect known Indiana bat roosting and foraging areas from permanent development and habitat loss; research and monitoring efforts to provide information for future management actions; outreach efforts; and the Army Compatible Use Buffer (ACUB) program.

Section 4 describes potential cumulative effects, and Section 5 provides an overall conclusion. The 2009-2011and 2012-2014 Fort Drum Biological Assessments and the 2009-2011and 2012-2014 Biological Opionions (references incorporated throughout this document) can be found in Appendix A, B, C, and D, respectively. The northern long-eared bat proposed rule, and the USFWS conference guidance on the northern long-eared bat can be found in Appendix E, and F, respectively. Much information will be referenced from these documents to reduce extraneous verbiage within this BA. All conservation measures and beneficial actions mentioned throughout the document are included in Appendix O.

After reviewing all of the proposed activities, Fort Drum has determined that by following the project descriptions and the conservation measures proposed, there should be no activities within the next three years that are likely to adversely affect Indiana bats on Fort Drum.

Fort Drum has also determined that in season clearing for small scale range construction projects and the use of smoke/obscurants is likely to adversely affect northern long-eared bats on Fort Drum. However, all other proposed activities on Fort Drum will not affect, or may affect, but should not adversely affect northern long-eared bats.

1.0 Background

This section provides abbreviated background information on Fort Drum and Indiana and northern long-eared bat life history as it relates to this Biological Assessment (BA). More detailed information can be found in Appendix A, B, C, D, E, and F.

1.1 Purpose

The purpose of this BA is to identify and analyze potential impacts to the federally-listed endangered Indiana bat (*Myotis sodalis*) and the northern long-eared bat (*Myotis septentrionalis*), a species the US Fish and Wildlife Service (USFWS) has proposed listing as an endangered species, that may arise from activities that are likely to occur on Fort Drum Military Installation from January 1, 2015 – December 31, 2017. This BA will provide Fort Drum flexibility temporally, spatially, and functionally in planning and implementation of activities without delays resulting from sudden changes in plans, priorities, and/or funding. This BA will address activities for the next three years reducing the requirement to initiate or re-initiate Section 7 consultations for individual projects or activities. However, individual Section 7 consultations will still occur for activities not specifically identified in this BA or for other unforeseen activities.

This document was prepared in accordance with Section 7 of the Endangered Species Act (16 USC 1536 (c)). The Indiana bat and the northern long-eared bat are the two known federally listed or proposed threatened or endangered species that occur on Fort Drum or within the action area. The action area is defined in Section 1.4. No critical habitat has been proposed or designated for the northern long-eared bat. There is no designated Critical Habitat for the Indiana bat within the action area.

All federal agencies and tenant organizations that operate on Fort Drum were considered in the effects analysis of activities and are subject to the conservation measures prescribed in this BA. These federal agencies include the US Army; US Army Corps. of Engineers (Engineering – New York District); US Army Corps. of Engineers (Clean Water Act Section 404 Permits); US Air Force (Range 48); and all other military and law enforcement agencies training at Fort Drum. Fort Drum Mountain Community Homes (FDMCH), the Development Authority of the North County (DANC), Verizon, ReEnergy, and ACTUS Lend Lease are currently the private tenant organizations that actively lease Fort Drum property or have other partnership arrangements that could have potential impacts to the Indiana or northern long-eared bat. The US Army Garrison Fort Drum is the lead federal agency for all ESA consultation on Fort Drum.

1.2 Consultation History

The following are highlights of the consultation history between Fort Drum Military Installation (Fort Drum) and the U.S. Fish & Wildlife Service-New York Field Office in Cortland, New York (USFWS) since the 2012-2014 BA was provided to the USFWS.

On **September 22, 2011**, the USFWS received Fort Drum's September 15, 2011, request for initiation of formal consultation for 2012-2014 activities on Fort Drum and the enclosed BA (dated September 2011).

On **November 2, 2011**, the USFWS sent the Army a letter confirming that adequate information was provided to initiate formal consultation.

In **November 2011**, the USFWS and Army exchanged electronic mails regarding specific clarifications (e.g., lighting for wind turbines and distance to roosts for various activities) for the BA.

On **December 1, 2011**, the Army modified the proposed action to remove the use of graphite smoke operations as an anticipated 2012-2014 activity.

On December 28, 2011, the USFWS sent the Army a letter concurring that several categories of activities were not likely to adversely affect the Indiana bat.

On **February 2, 2012**, the USFWS issued a Biological Opinion (BO) to Fort Drum.

On **February 14, 2012**, Fort Drum submitted the 2011 annual report in accordance with the 2009 BO.

On **February 1, 2013**, Fort Drum submitted the 2012 annual report in accordance with the 2012 BO.

On **March 20, 2013**, the USFWS sent a letter to the Army acknowledging the February 2013 submittal.

On **May 6, 2013**, Fort Drum submitted the 2012 annual report of NLTAA activities in accordance with the 2012 BO.

On **May 29, 2013**, the USFWS sent a letter to the Army acknowledging the May 2013 submittal.

On **June 25, 2013**, the USFWS attended ACUB biennial review.

On **November 11, 2013**, Fort Drum and USFWS held a call to discuss northern long-eared bat.

On **February 1, 2014**, Fort Drum submitted the 2013 annual report in accordance with the 2012 BO.

On **February 20, 2014**, the USFWS sent a letter to the Army acknowledging the February 2014 submittal.

On **May 14, 2014**, Fort Drum submitted the 2013 annual report of NLTAA activities in accordance with the 2012 BO.

On **June 10, 2014**, the USFWS sent a letter to the Army acknowledging the May 2014 submittal.

On **July 10, 2014** Fort Drum and USFWS met to discuss development of the 2015-2017 BA.

On **July 22, 2014**, Fort Drum and USFWS held a call discuss development of the 2015-2017 BA.

1.3 Fort Drum Military Installation

Much of the information in this document will be incorporated by reference. As such, please see the 2009-2011 BA (Fort Drum 2009 or Appendix A); the 2012-2014 BA (Fort Drum 2011b or Appendix B); the 2009-2011 BO (USFWS 2009 or Appendix C); the 2012-2014 BO (USFWS 2012 or Appendix D); the proposed rule for the northern long-eared bat (USFWS 2013a or Appendix E); the USFWS conference guidance for the northern long-eared bat (USFWS 2014 or Appendix F); Fort Drum Integrated Natural Resources Management Plan (Fort Drum 2011a or Appendix G); ESI 2008a (Appendix H); ESI 2008b (Appendix I); Copperhead 2009 (Appendix J); ESI 2010 (Appendix K); ESI 2011 (Appendix L); JECS 2012 (Appendix M); and USFS 2011 (Appendix N). Each one of these documents will be extensively referenced throughout.

1.3.1 Regional Description of Fort Drum

Please see Appendix A, Section 1.3.1 for the Regional Description of Fort Drum.

1.3.2 Military Mission & History

Please see Appendix A, Section 1.3.2 for Fort Drum's Military Mission and History.

1.3.3 General Description of Fort Drum

Please see Appendix A, Section 1.3.3 for the General Description of Fort Drum. See Figure 1.1 for a map of Fort Drum showing the Cantonment Area/Wheeler-Sack Army Airfield (WSAAF), Training Area, Bat Conservation Area, and Main Impact Area

1.3.4 General Habitat Information on Fort Drum

Please see Appendix A, Section 1.3.4 for the General Habitat Information on Fort Drum.

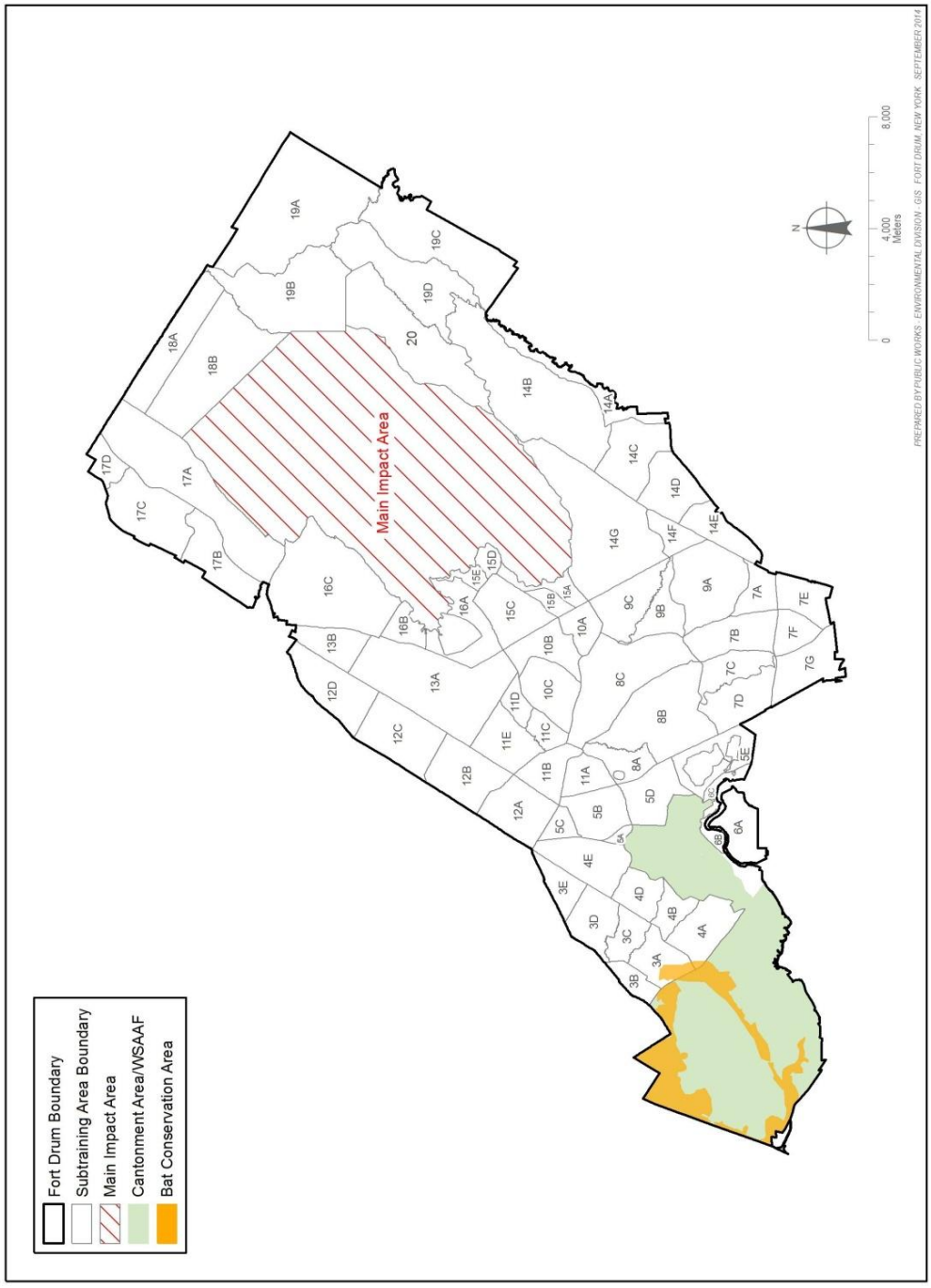

Figure 1.1. Fort Drum Military Installation.

1.4 Action Area

The action area is defined by regulation as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). Hence, this analysis is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority; it is a biological determination of the reach of the proposed action on listed species.

For this BA, the “action area” is the area where all direct and indirect effects of implementing and sustaining the mission of Fort Drum may impact the Indiana and northern long-eared bat.

Therefore, for the purposes of this analysis, the Fort Drum action area includes all of Fort Drum, (with some exceptions related to the Main Impact Area as identified below) and those lands currently, or proposed to be, part of the Army Compatible Use Buffer (ACUB) program (i.e., those areas Fort Drum has third party interest in).

The Main Impact Area is an approximately 20,200 ac (8175 ha) portion of Fort Drum’s Training Area where no human access is allowed (outside of specific training mission requirements). The Main Impacat Area potentially has suitable habitat for both species of bats. However, as all evidence for the last 7 years has suggested that Indiana bats are found primarily in the approximately 11,500 ac (4654 ha) Cantonment Area, and TAs 3 and 4, it is not expected that this species would be found utilizing the Main Impact Area. Conversely, given that northern long-eared bats have historically been captured throughout the installation (except the Main Impact Area), the possibility exists that the species could be utilizing this area to some degree. Unfortunately, as stated above, there is typically no access into the area and no way to adequately or appropriately assess any potential impacts to bats. No surveys have been conducted to date within the Main Impact Area, nor could they be in the foreseeable future. While Fort Drum has a general idea of where ordnance is impacting within this area, the amount, duration, and locations vary temporally and spatially, depending on which ranges and ammunition is being utilized. Subsequently, since we have no way to know utilization areas of the northern long-eared bats within this location, and we cannot predict exact locations of ordnance/ammunition impacts, there is no way to know where these impacts may intersect and affect bats. Additionally, given that this area has been utilized for decades, with ongoing fires, noise, explosions, impacts, etc, if bats are exploiting the area to any degree, we would assume that this would continue to occur. If they are avoiding the area, we would assume that would continue to occur as well. Given these considerations, we have excluded the Main Impact Area from analysis for this BA.

We considered including a buffer that extends outward from the installation boundary for areas potentially impacted by noise and lighting on Fort Drum. However, much of this area is already a commercial area with other lighting and noise more significant (because it is located in the buffer itself) than what would be associated with what may be attributed to Fort Drum. Because there is currently no way to accurately determine if there would be any additional impacts from activities on Fort Drum, no additional buffer was applied to the Fort Drum boundary.

At this time, it is unknown where northern long-eared bats that utilize Fort Drum may be hibernating. There are dozens of potential hibernation sites around Fort Drum that northern long-eared bats could be coming from (Figure 1.17). Therefore it is difficult to determine the extent of use surrounding Fort Drum, or even the direction of travel Fort Drum northern long-eared bats may take coming to and from hibernacula.

Figure 1.2 shows the known Indiana and northern long-eared bat use within and adjacent to the action area. These areas will most likely continue to be used by Indiana and northern long-eared bats after emergence from hibernation, during the reproductive season, and during fall swarming. Fall swarming activity is expected to occur within 10 miles (and up to 20 miles) from hibernation sites during the late summer and fall months. There are no known hibernacula on Fort Drum, therefore no winter use is expected to occur on the installation.

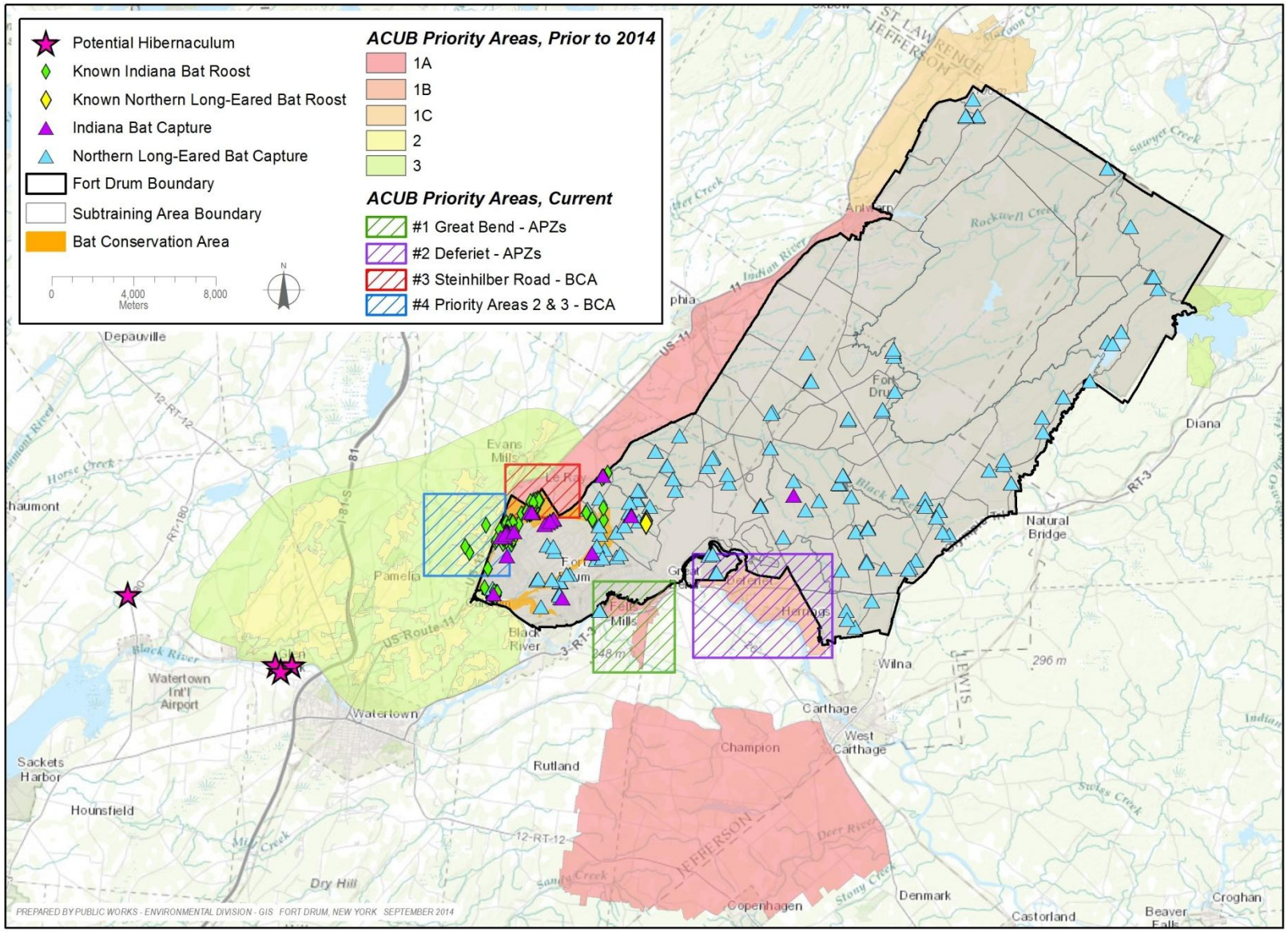

Figure 1.2 Known Indiana and northern long-eared bat use within and adjacent to the Action Area at Fort Drum Military Installation.

The Indiana bat and northern long-eared bat are closely related species in the Genus *Myotis* (Chiroptera: Vespertilionidae), however, they have important biological and ecological distinctions that will be outlined in this section.

1.5 Indiana Bat

1.5.1 General Description

The following is a summary of pertinent Indiana bat information. For additional information on life history, ecology, and threats, see the Indiana Bat Draft Revised Recovery Plan (USFWS 2007).

The Indiana bat is a small-medium-sized bat belonging to the genus *Myotis* (Barbour and Davis 1969; USFWS 2007). On average, it weighs approximately 0.18-0.25 oz (5-7 g) and has a total body length between 2.8-3.5 in (71-90 mm). The Indiana bat is very similar in appearance to the northern long-eared bat and the little brown bat (*Myotis lucifugus*). The Indiana bat is distinguished from northern long-eared bat by the tragus length and shape, which is shorter and rounder. The Indiana bat differs from the little brown bat by the presence of a keeled calcar; by possessing fewer, shorter toe hairs; and its pelage has a dull appearance and does not contrast as starkly with the ears and wing membranes.

The Indiana bat is one of seven hibernating species of bats that is known to be affected by white-nose syndrome (WNS). White-nose syndrome is a disease that has decimated bat populations in eastern North America and poses one of the most serious threats to the continued existence and recovery of the Indiana bat. See the remainder of this section, as well as, *Section 1.6.5 Threats to Indiana and Northern Long-eared Bats* for more information on the impacts of WNS on Indiana bats.

1.5.2 Distribution

The Indiana bat is a temperate, insectivorous, migratory bat that ranges from Oklahoma, Iowa, and Wisconsin, east to Vermont and south to northwestern Florida (USFWS 2007; Figure 1.3).

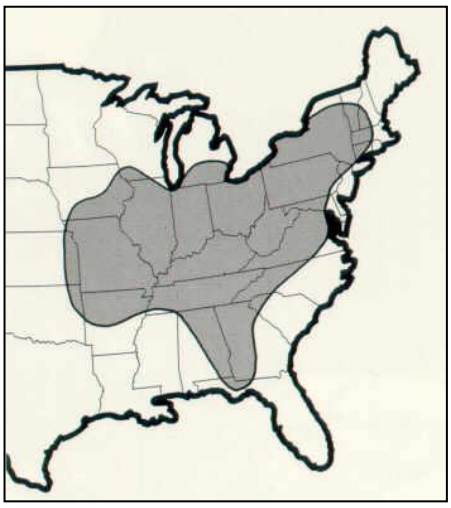

Figure 1.3 Distribution of the Indiana bat. (USFWS)

1.5.3 Population Status

1.5.3.1 Rangewide and New York

The Indiana bat was listed in 1967 as being in danger of extinction under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967). In that same year, it was also listed as a state endangered species by the NYSDEC. Critical habitat for the Indiana bat was designated on September 24, 1976 consisting of 11 mines and two caves in six states (41 FR 41914, September 24, 1976). No Critical Habitat has been designated in New York.

The most recent range-wide population estimate (2013) for Indiana bat is 534,239 individuals (Figure 1.4). This is up from previous estimates in 2011 (424,708), however, the increase is accounted for by the discovery of a previously unknown hibernaculum containing approximately 123,000 bats. Still, even including this new hibernaculum, the species has experienced a overall decrease due primarily to the onset of WNS. The northeast recovery unit alone has experienced a 66% decline in recent years dropping from a high count of 53,763 in 2007 to the low of 16,124 in 2011, with a slight increase to 18,273 in 2013. (USFWS 2013b).

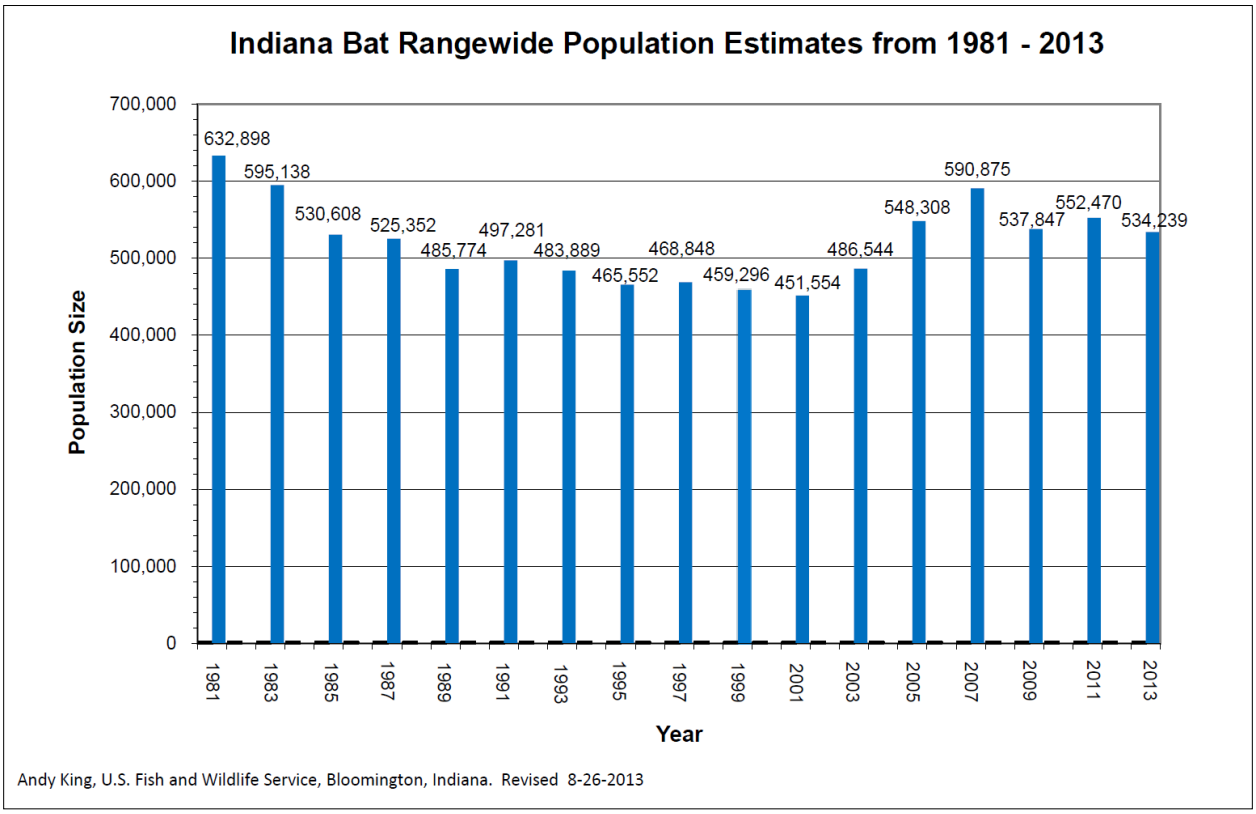

Figure 1.4. Indiana bat range-wide population estimates 1981-2013.

According to hibernacula surveys conducted by the NYSDEC, there were approximately 52,000 Indiana bats that overwintered in New York using 12 hibernacula prior to WNS (NYSDEC, unpublished data). During the winter of 2012-2013, approximately 17,600 individuals were found in 10 hibernaculum sites, with over 75% of the population found in Barton Mine (NYSDEC, unpublished data). In Jefferson County, New York, there is a single known Indiana bat hibernaculum at Glen Park that is classified as a Priority II hibernacula. The site is located approximately 6.5 mi (10.5 km) from Fort Drum, and while it historically provided wintering habitat for approximately 2,000 Indiana bats, only approximately 330 bats now reside in the cave, representing an 84% decline (Table1.1 and Figure 1.5).

***Table 1.1. Population estimates of Indiana bats at the Glen Park* hibernaculum. (Carl Herzog, NYSDEC)**

Year	# Bats
1997	2,535
1999	3,129
2001	2,264
2003	1,704
2005	2,065
2007	1,928
2008	1,247
2009	1,719
2010	509
2011	433
2013	330

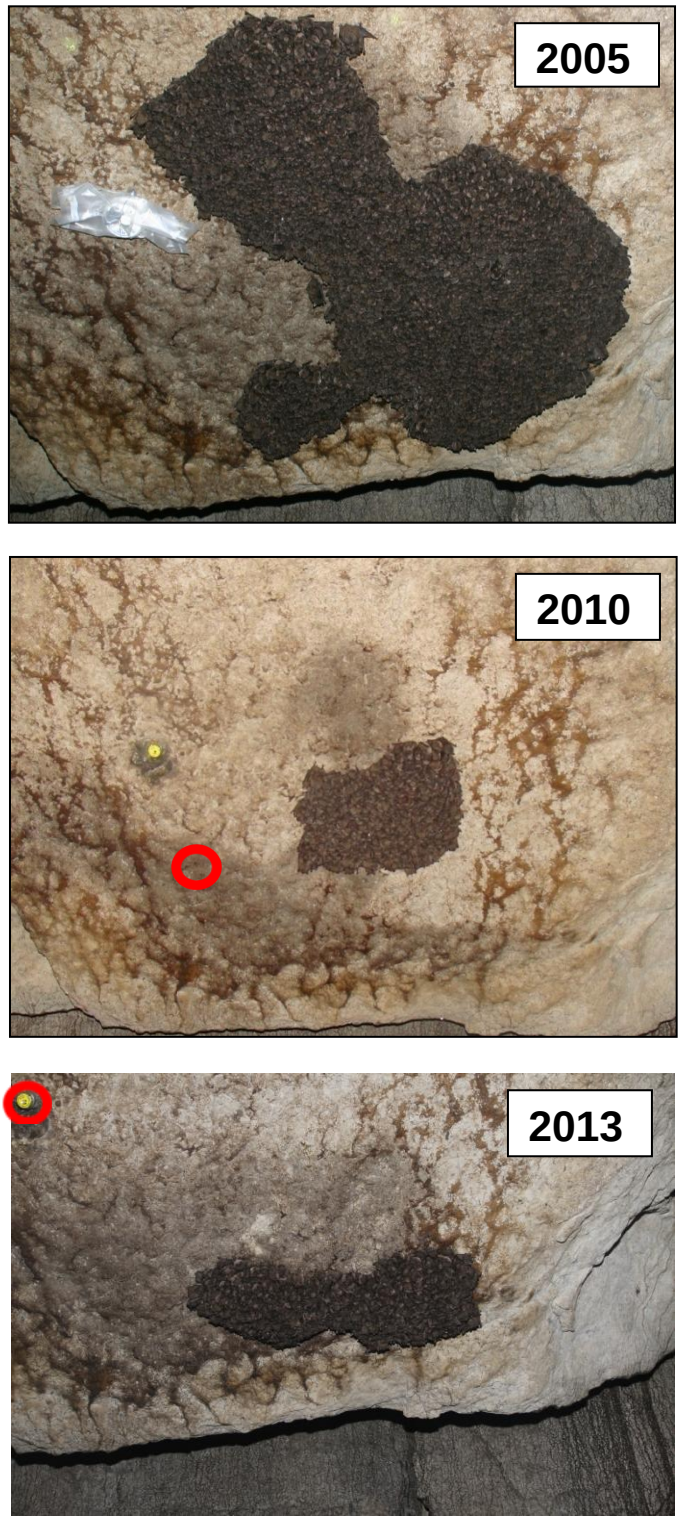

Figure 1.5 Indiana bats hibernating in Glen Park hibernaculum in 2005 before WNS and in 2010 and 2013 after WNS. The red circle denotes the same temperature probe in all photos for comparison.

1.5.3.2 Fort Drum

Indiana bats were confirmed on Fort Drum in 2006 when an off-post study found four bats roosting and foraging in and around Fort Drum's Cantonment Area (ESI 2006). Since that time (2007-2014), summer mist net surveys have been completed on Fort Drum in an attempt to verify Anabat results, to record bat species presence, to assess the summer status of Indiana bats, and to locate Indiana bat maternity colonies on the installation.

From 2007-2014, mist net surveys were conducted at 323 sites on Fort Drum following USFWS guidelines (Figure 1.6). Of the 323 sites, 246 sites were surveyed once, while the remaining 77 sites were surveyed two or more times. In the summer of 2007, 1,369 bats were captured of which 18 were Indiana bats (11 adult females, 2 adult males, 3 juvenile females, 2 juvenile males: ESI 2008a). Seventeen Indiana bats were captured in the Cantonment Area and one in Training Area 4. Ten of the 11 female Indiana bats were considered reproductive (i.e. pregnant, lactating, or post-lactating) and ten Indiana bats (7 adult females, 1 adult male, and 2 juvenile females) were radio-tagged and tracked to roosts. In 2008, mist net surveys were concentrated in the Training Area and captured 380 bats, including two Indiana bats (1 adult male and 1 adult female) in Training Area 3 (Copperhead 2009). Both were radio-tagged and tracked to roosts in the Cantonment Area and TA3 and TA4. In 2009, 394 bats were captured in the Training Area; however, no Indiana bats were captured. Additionally, drastic drops in other myotine bats were first noted. In 2010, 648 bats were captured, of which two were Indiana bats (1 adult male, and 1 juvenile female). The adult male was captured in the Cantonment Area near the known maternity colony, however, the juvenile female was captured in TA 8, marking the first time an Indiana bat had been captured outside the Cantonment Area or the adjacent TA3 or TA4. However, this bat was subsequently tracked back to roosts in the known maternity colony, approximately 8 mi (13 km) away (ESI 2011). Therefore, all bats captured in the Training Area during surveys following USFWS protocol have been tracked back to roosts within the known maternity area in the Cantonment Area. In 2011, 452 bats were captured, of which one was an adult female Indiana bat. This bat roosted within the Bat Conservation Area (BCA; see Section 2.1.2 for more detail) in one of the main known roosting areas that contained dozens of roosts from previous years, but also roosted in an area that, although within 0.5 mi (km) of the main areas, contained only two other roosts within the general area as where this bat roosted (Figure 1.9).

In addition to the above summer mist net surveys, a fall mist net survey was conducted in 2007 to opportunistically monitor the Cantonment Area (Figure 1.7). The study resulted in the capture of 35 bats of which three were Indiana bats (1 adult male, 1 adult female, and 1 juvenile female; ESI 2008b). Each bat was tracked to their diurnal roost, and foraging movements were monitored. These bats too stayed either within the known maternity use area, or immediately adjacent in the lands off post within the Town of Leray north of the Cantonment Area.

In 2008 and 2009, a more extensive project was initiated with the U.S. Forest Service and West Virginia University (WVU) to capture and intensively radio-track Indiana bats in the Cantonment Area to determine foraging areas and roost locations during spring, summer, and fall. Mist netting was targeted in known Indiana bat activity areas to increase the likelihood of capture (Figure 1.7). Between May 13 to the beginning of October in 2008, 12 Indiana bats (5 adult females, 3 adult males, 2 juvenile males, and 2 juvenile females) were captured, and 12 were

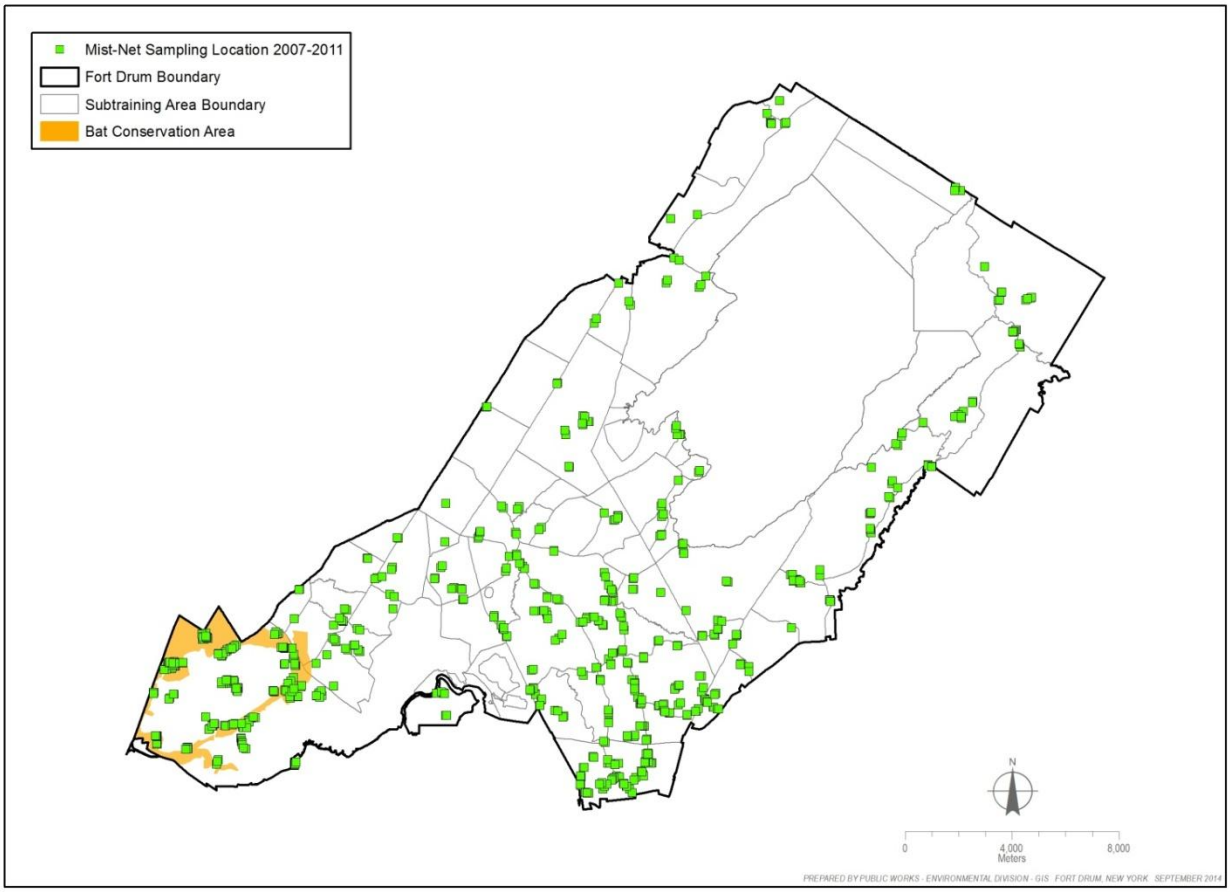

Figure 1.6. Mist net sampling locations on Fort Drum Military Installation (2007-2011) performed to USFWS sampling protocols.

radio-tagged and tracked. One adult female was originally captured in the summer of 2007. Two bats (1 adult male and 1 juvenile female) remained on Fort Drum until October 2. In 2009, 4 Indiana bats (3 adult females, and 1 juvenile male) were captured and subsequently tracked. All bats used the known maternity use area in the Cantonment Area and foraged within the Cantonment Area, BCA and lands adjacent to Fort Drum in the Town of Leray.

Additional small scale mist net surveys were completed by Fort Drum staff between 2012-2014. One juvenile female Indiana bat was captured in 2012 within the BCA, and one suspected non-reproductive female was captured in 2014 near the same area (Figure 1.8). This female roosted in two roost trees over eight days within 425 ft (129 m) of the female that was captured in 2011. These roosts are located within approximately 0.5 miles from the main roost concentrations. Including the 2011 female bat use, there were only three roosts in the immediate area (approximately 75 ac (30 ha)), prior to this female roosting here, but dozens of roosts within 0.5 miles (0.8 km) (Figure 1.9). This area with few roosts seems to be similar in nature to the other main areas in terms of forest tree species composition, however, although not measured, qualitatively, there may be some differences in terms of stand structure. There appears to be less of a mid-story and under-story in the "new" area with few roosts, and less invasive species (e.g., European buckthorn (*Rhamnus cathartica*) and honeysuckle (Lonicera *spp.*) colonization. Perhaps this means nothing, or perhaps the colony and roost dynamics have changed to initiate a move to exploit a "new" area nearby. Emergence counts at the first roost documented 5-7 individuals.

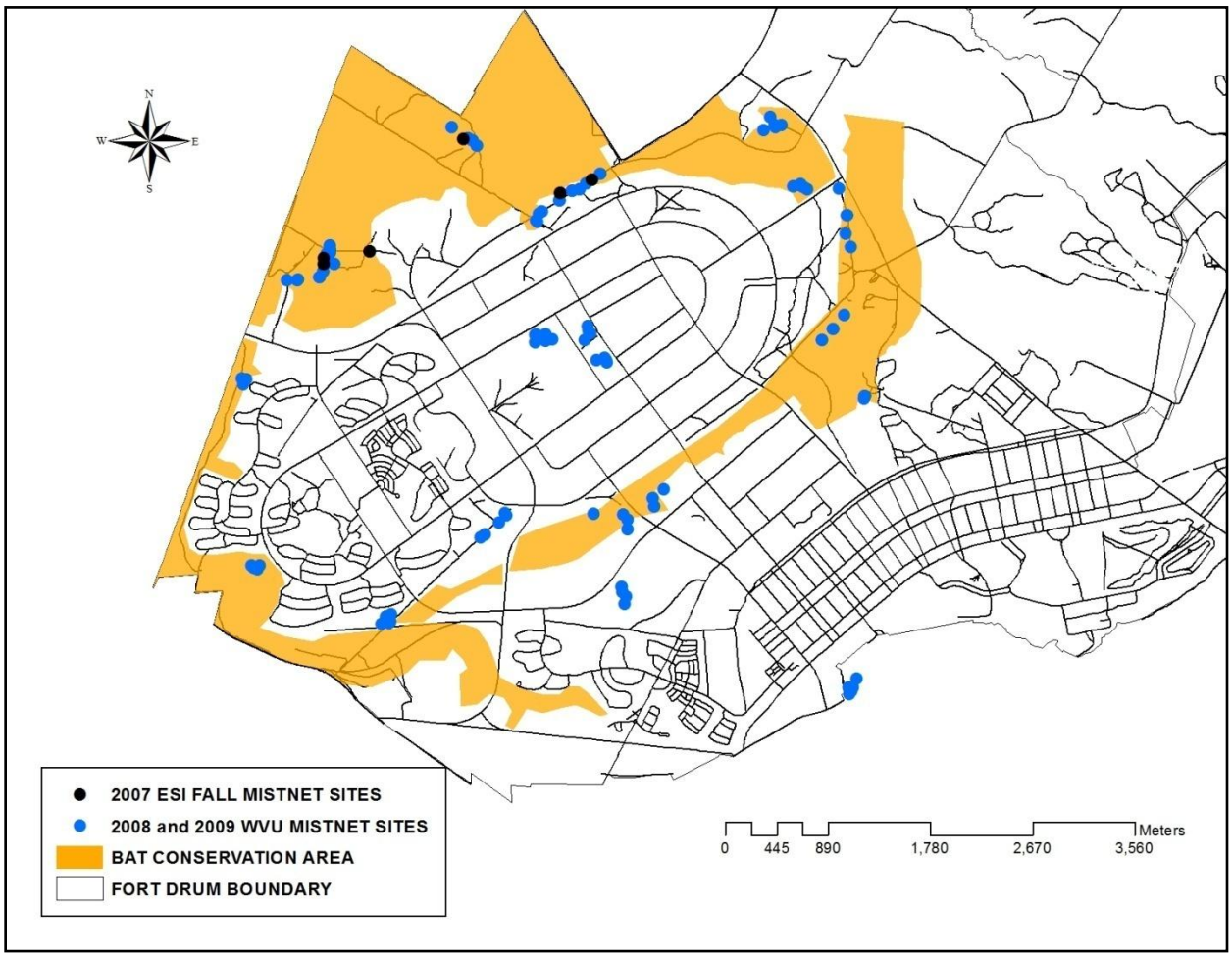

Figure 1.7. Opportunistic mist net sampling locations on Fort Drum Military Installation, 2007-2009.

Using 2007 USFWS netting guidelines, Fort Drum would have needed to net at 384 sites to estimate baseline presence/probable absence throughout the installation. Three hundred and twenty three sites were netted following the 2007 USFWS protocol. Although Fort Drum did not survey the projected 384 sitses following USFWS guidelines, we feel with all our efforts that an adequate survey effort was completed from 2007-2014 to determine probable use of Indiana bats (Figures 1.6 and 1.7). After 7 years of mistnetting, only 4 Indiana bats have been captured in the Training Area (Figure 1.8). Each of those bats were subsequently determined to be part of the known colony via radio tracking. Because of this new information, in 2012 Fort Drum revised its original (2009) determination that there may be an undiscovered colony in the Training Area. All information suggests that suspected Indiana bat use within the Training Area is most likely periodic foraging or exploratory movements from the known colony in the Cantonment Area. There has been no new evidence in the past 3 years since the 2012 BA was written to suggest otherwise.

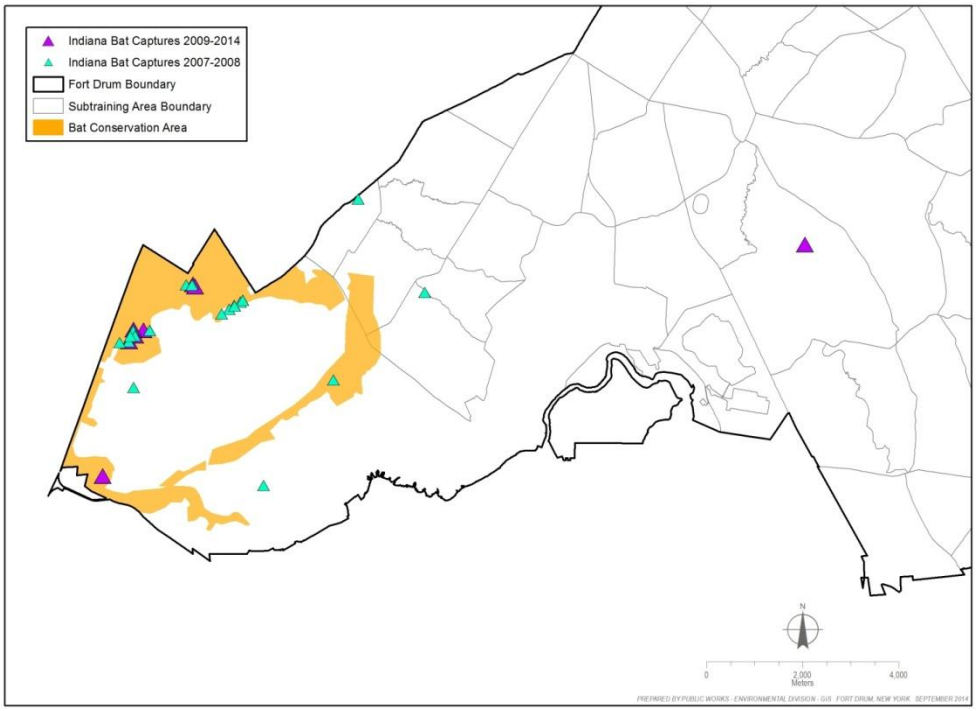

Figure 1.8. Indiana bat captures on Fort Drum Military Installation, 2007-2014.

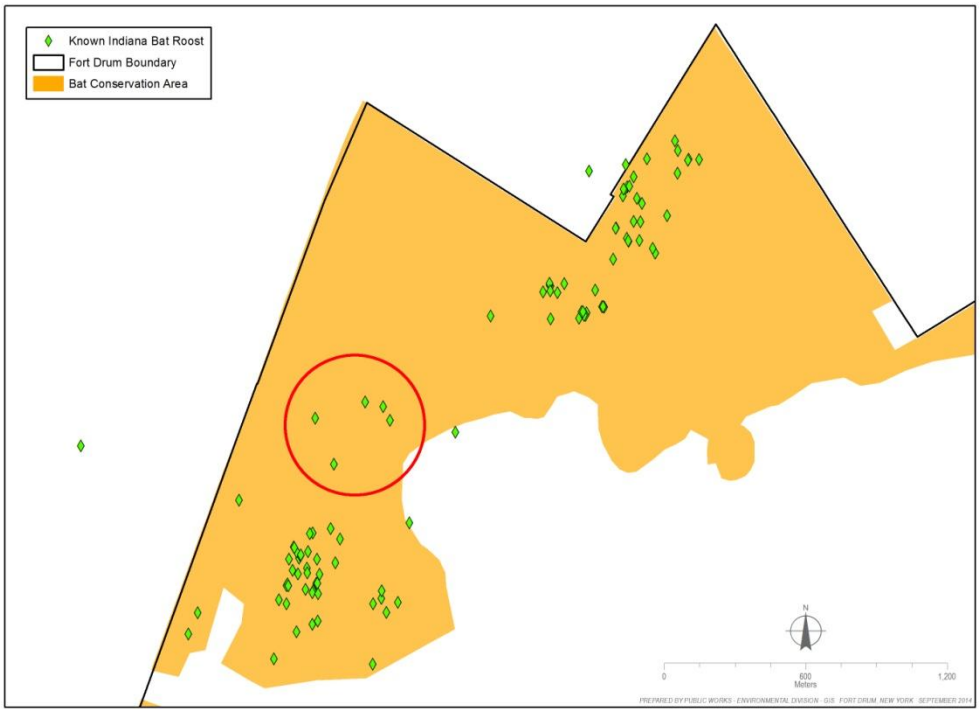

Figure 1.9. Indiana bat roosts in "new" area on Fort Drum Military Installation, 2011-2014.

1.5.4 Background Ecology

1.5.4.1 Hibernation

Indiana bats spend the winter months hibernating in caves or mines (Tuttle and Kennedy 2002). In northern New York, Indiana bats typically hibernate from October to mid-April (Kurta et al. 1997; USFWS 2007). Within these winter hibernacula, Indiana bats form dense clusters ranging from 300 to 484 bats/sq ft (USFWS 2007). Indiana bats are most susceptible to injury or death at this stage because of their clustering behavior and their need to minimize energy loss. Disturbances may cause Indiana bats to wake prematurely, which can increase energy use and decrease their chances of survival. Repeated arousals can deplete their fat reserves thus leading to Indiana bats' death via starvation. Additionally, events, such as vandalism, disease, flooding or extremely cold conditions, can have devastating effects on hibernating Indiana bats and can substantially reduce the overall population after a single occurrence.

There are no known hibernacula on Fort Drum. The nearest known hibernaculum is located at Glen Park approximately 6.5 mi (10.5 km) west of Fort Drum. It is assumed that all Indiana bats on Fort Drum utilize the Glen Park hibernaculum. Some bats that have been tagged on Fort Drum have been radio-tracked (ESI 2008b) or observed (Alan Hicks, retired NYSDEC; Robyn Niver, USFWS; Raymond Rainbolt, Fort Drum, personal communications) at Glen Park. Glen Park has experienced an approximate 85% decline since the onset of WNS, with numbers dropping from approximately 2000 animals pre-WNS to approximately 330 post-WNS in 2013 (NYSDEC, unpublished data).

Figure 1.10 Indiana Bat roost tree on Fort Drum with a large crack where bats were roosting.

1.5.4.2 Spring Emergence

Spring is a critical time of year for Indiana bats due to low fat reserves and potentially limited food availability. Bats must replenish themselves after hibernation, and migrate to summer roosting areas. At this time females initiate fertilization and become pregnant.

Typically spring emergence in New York occurs in mid-April when outside temperatures are suitable for insects—Indiana bats arouse from hibernation at the Glen Park hibernaculum approximately April 13-17 (Al Hicks, retired NYSDEC, personal communication). Some bats may remain in close proximity of the hibernacula for a few days before migrating to summer habitats. This activity is known as spring staging. Others head directly to summer habitat. Roost trees used by adult females during this mid-spring period are similar to those used during the summer in terms of species, size, and structure (Britzke et al. 2006).

On Fort Drum, the earliest mist-netting that has been conducted is May 11 and the earliest capture of an Indiana bat has been May 13; however, it is assumed that Indiana bats are present on Fort Drum in mid-April given the proximity to the Glen Park hibernaculum and because bats have been found on the installation through the summer and autumn seasons. Pregnant females, males, and non-reproductive females have all been found roosting on Fort Drum after spring emergence.

1.5.4.3 Summer Roosting and Reproductive Behavior

In late spring or early summer—shortly after spring emergence— female Indiana bats form maternity colonies that usually consist of reproductive and/or non-reproductive females and pups that roost together; males generally roost in the same area individually or in small groups, but separate from females. Bat pups are typically born in June-July and will stay with the mother until they are volant (i.e., capable of flight) in July-August. Both juvenile and adult Indiana bats of both sexes have been documented on Fort Drum (ESI 2006, ESI 2008a, ESI 2011, USFS 2011).
Summer sites that have a variety of suitable roosts are essential to the reproductive success of local populations. Once Indiana bats find these areas, they typically exhibit strong site fidelity, returning to the same traditional summer maternity colony location (and specific trees) annually to bear their young (USFWS 1999; Kurta et al. 2002).

It is not known how long or how far female Indiana bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded during the winter. If they are required to search for new roosting habitat in the spring, it is assumed that additional stress is placed on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration and pregnancy.

Fort Drum has abundant potential roosting habitat for bats with forested land and snags common throughout the installation. In 2008, 2009, 2010, and 2011, 2012, and 2014 (ESI 2010, ESI 2011, USFS 2011, JECS 2012, Fort Drum unpublished data) Indiana bats on Fort Drum demonstrated site fidelity by returning to several of the same areas—and in some cases the same roost trees—that had been previously identified.

Even after several years of WNS impacts, portions of Fort Drum's Cantonment Area appear to still be important areas for Indiana bats. Captures and radio-tracking of Indiana bats in 2011, 2012, and 2014 continues to indicate roosting and foraging use within the same historic areas that were used prior to WNS (ESI 2006, USFWS 2008, ESI 2008a, ESI 2011, USFS 2011, JECS 2012, Fort Drum unpublished data). Historically, within and immediately adjacent to the Cantonment Area on lands in the Town of LeRay, Indiana bats were found in distinct clusters of activity (Figures 1.9 and 1.12) with documented roost switching and forage overlap by individual Indiana bats between these activity clusters (ESI 2008a, ESI 2008b, USFS 2011, Fort Drum unpublished data). It is unknown if these other areas off Fort Drum are still used by Indiana bats as part of an overall maternity colony home range.

Numbers of female Indiana bats vary within individual roosts. Roosts that contain 30+ bats on multiple days are typically defined as a "primary" roost (Callahan et al. 1997), however, primary maternity roost numbers appear to be lower in New York. On Fort Drum in 2007, five roosts were considered primary roosts when there were greater than 12 bats using the roosts on multiple nights. Only two of the five roosts had $\geq$ 20 bats (ESI 2008a). The largest number of Indiana bats ever emerging from a roost on Fort Drum in a single night was 64 in 2008 (USFS 2011). Based on this information, it had previously been assumed that between 75-100 Indiana

bats were present within this known maternity colony, however, due to impacts from WNS, this colony size has likely decreased substantially. Bat emergence has declined post-WNS with 13 bats leaving a single roost in 2009, 12 bats in 2010, 25 bats leaving a roost in 2011, and 7 bats leaving a roost in 2014 (ESI 2011, USFS 2011, JECS 2012, Fort Drum, unpublished data). It is assumed that all bats observed emerging from a roost are Indiana bats (Belwood 1996; USFWS 2007). Due to the impact of WNS, any roost with more than one reproductive female bat could potentially be a primary maternity roost.

Figure 1.11 Indiana bat roost tree with sloughing bark and exposure to the sun.

Although primary roosts are central to Indiana bat reproduction and social organization during the summer months, Indiana bats are known to utilize multiple roost trees during the non-hibernation period (USFWS 2007). Usually, alternate roost trees are located in close proximity to primary roosts—distances between roosts can be a few meters to a few kilometers. Primary roosts are often located in openings or at the edge of forest stands, while alternate roosts can be in either openings or the interior of the forest stand. Primary roosts are generally taller than surrounding trees and are more exposed to solar radiation (Britzke et al. 2006). Alternate roosts may be used when temperatures are above normal or during precipitation. Weather has been found to influence bat behavior and habitat use (Humphrey et al. 1977). It has been suggested that Indiana bats use alternate roosts due to the ephemeral nature of snags and the need to locate future suitable roosts (Kurta et al 1997; USFWS 2007). Because of roost tree characteristics, Indiana bats tend to select forested areas that have high snag densities (Callahan et al. 1997). Fort Drum has abundant potential roosting habitat for bats with forested land and snags common throughout the installation.

Most roosts are located in dead or dying trees or within crevices of live trees that are located within riparian, bottomland, or upland forests (USFWS 2007). Summer roost selection is primarily based on tree structure, amount of solar exposure, and ease of accessibility. Although roost trees vary in species and size, primary roost trees are frequently large diameter trees that have exfoliating bark and that receive adequate amounts of sunlight. This type of tree structure is important for reproductive bats, because it provides a stable, warm environment necessary for rearing young. Cool temperatures can delay development of fetal and juvenile young thus selection of maternity roost sites may be critical to reproductive success.

As of September 2014, 76 summer maternity roosts (those used by adult and juvenile females and juvenile males spring-August 15) have been located on Fort Drum (ESI 2006, ESI 2008a, Copperhead 2009, ESI 2011, USFS 2011, JECS 2012, and Fort Drum unpublished data). Some of these roosts were also used after August 15 for fall roosting. Confirmed roosts on Fort Drum have been primarily located in standing dead or dying trees or within dead tree limbs. The average diameter (measured in Diameter Breast Height-DBH) for summer maternity roost trees on Fort Drum is approximately 13.3 in DBH (33.8 cm) with a range of 4.5-31.5 in DBH (11.4-80.0 cm). Although other projects (e.g., Interstate 81 Connector) have identified individual Indiana bats roosting both within and outside the boundaries of the BCA, all but six roosts found from Fort Drum-initiated projects have been located inside the BCA.

To date, American elm (*Ulmus Americana*; n = 42) is the most frequently used summer roost tree on Fort Drum. Additionally, 9 other species have been used as summer roosts on Fort Drum: bitternut hickory (*Carya cordiformis*; n = 7), black cherry (*Prunus serotina*; n = 3), butternut (*Juglans cinerea*; n = 1), red maple (*Acer rubrum*; n = 3), Scotch pine (*Pinus sylvestris*; n = 2), silver maple (Acer *saccharinum*; n = 1), sugar maple (*Acer saccharum*; n = 8), white pine (*Pinus strobus*; n = 4) and quaking aspen (*Populus tremuloides*; n = 5). The diversity of tree species used as roosts reinforces the fact that it is the structure of the tree, not the species that is important (Figures 1.10 and 1.11). Canopy cover varied around each roost tree, but most roosts were dominate or co-dominate in the canopy (USFS 2011). While Indiana bats primarily roost in trees, some maternity colonies have been found in buildings (USFWS 2007) and individual bats have been found in bat houses. To date, no Indiana bats have been recorded in a building or bat house on Fort Drum.

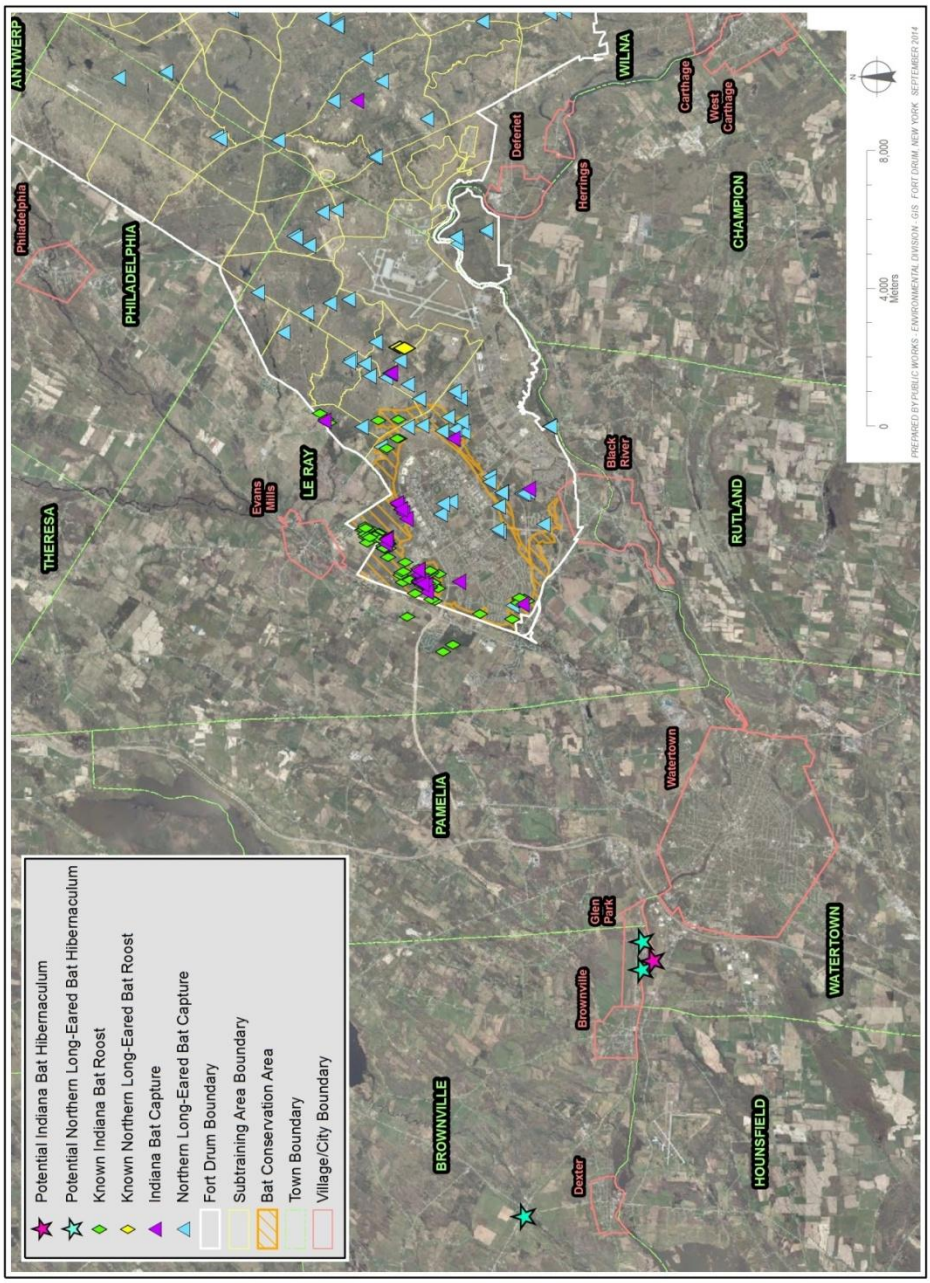

Figure 1.12. Known Indiana and northern long-eared bat capture, roost locations, and potential hibernaculum on, or in close proximity, to Fort Drum Military Installation.

1.5.4.4 Foraging/Traveling Movements

Indiana bats are selective opportunistic insectivores that feed on a number of insect species, predominantly Lepidopterans (e.g., moths), Dipterans (e.g., flies and mosquitoes), Coleopterans (e.g., beetles), and Hymenopterans (e.g., wasps, sawflies) (Murray and Kurta 2002, USFWS 2007). Research has suggested that insect consumption varies by season, location, and reproductive condition of the Indiana bat (Tuttle et al. 2006). In an urban-rural interface, Lepidopterans were consumed the most in June while Coleopterans were the predominant prey in early August (Tuttle et al. 2006).

The USFWS routinely suggests that agencies use a 2.5 mi (4 km) buffer around roost trees when analyzing impacts to foraging Indiana bats, unless there is site specific information to suggest otherwise. Research has shown that female Indiana bats forage 0.3 - 5.2 mi (0.5 - 8.4 km) from roost sites (Murray and Kurta 2004, Sparks et al. 2005, USFWS 2007). On Fort Drum, echolocation surveys using Anabat II detectors have identified probable Indiana bat call sequences throughout much of the installation (Figure 1.13). Radio–telemetry studies have confirmed foraging and movement activities in the Cantonment Area, Training Areas 3 and 4, and off-post up to 4 mi (6.4 km) from the traditional roosting clusters (ESI 2006, ESI 2008a, ESI 2008b, Copperhead 2009, ESI 2011, and USFS 2011; Figures 1.14 and 1.15). The longest confirmed movement was documented in 2010, when a juvenile female Indiana bat was captured in Training Area 8 and tracked back approximately 8 miles (13 km) to where it roosted in the known use cluster within the Cantonment Area (Figure 1.8 and 1.12).

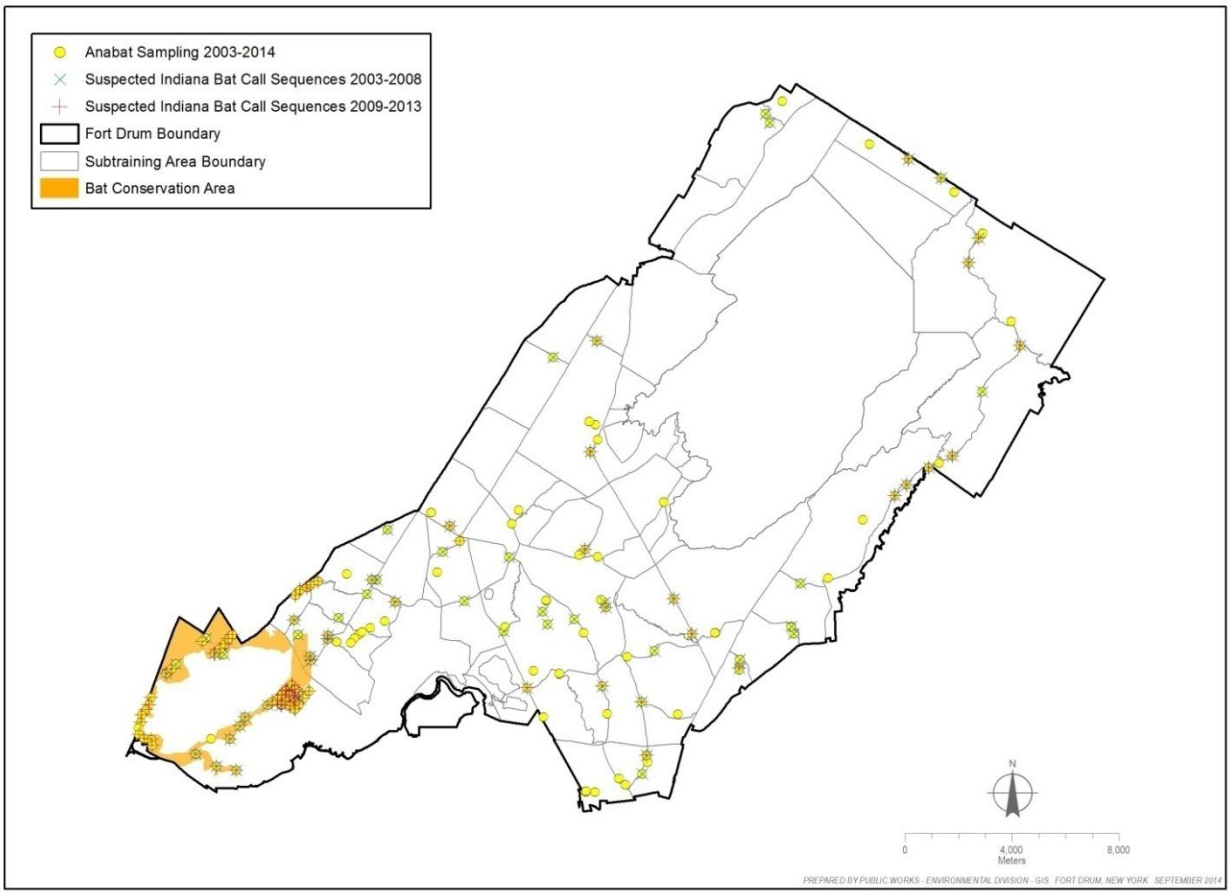

Figure 1.13. Anabat acoustical sampling locations on Fort Drum Military Installation, 2003-2014.

Indiana bats forage 6 - 90 ft (2 - 30 m) above the ground near the treetops along riparian forests and floodplains, as well as in upland forests and in low fields and pastures (Humphrey et al. 1977, Brack 1983). On Fort Drum, Indiana bats have been found foraging within riparian areas in close proximity to forest edge, reinforcing this association (Jachowski et al. 2014a). Approximately, 92% of Fort Drum is covered by a variety of natural habitats which may be utilized by Indiana bats.

The home range size (fixed kernel) of three Indiana bats radio-tracked in the fall of 2007 varied from 1,267 - 5,295 ac (513 – 2,143 ha) with a mean range of 4,720 ac (1,910 ha) (ESI 2008b; Figure 1.15). Although these bats foraged both on and off of Fort Drum property, approximately two-thirds of the foraging movements were within the Cantonment Area and BCA. Results from extensive radio-tracking efforts of 14 bats in the summer and early fall of 2008-2009 suggests Indiana bats may exhibit smaller home range sizes during these months (Figure 1.14). The average 95% fixed kernel home range was 322.40 ac (130.47 ha, range 46.80 – 785.84 ac (18.94 – 318.02 ha)). Results from both studies suggest that adequate foraging resources exists for bats either within or adjacent to Fort Drum's Cantonment Area. In these studies, we found evidence for use of wide variety of habitats during the fall, however, during the summer and early fall we found evidence of avoidance of open shrub wetlands, agricultural habitats, and disturbed areas, but use was positively associate with riparian areas and proximity to forest edge. Collectively, this suggests that forested habitats and edges of forest habitat in close proximity to riparian areas may be the most important foraging areas for Indiana bats on Fort Drum and the adjacent land area (ESI 2008b, USFS 2011, Jachowski et al. 2014a).

Very little research has focused on the use of travel corridors by Indiana bats. Most information pertaining to bat movements and travel corridors is incidental to other portions of a study and/or general observations. However, Murray and Kurta (2004) showed that Indiana bats increased commuting distance by 55% to follow tree-lined paths rather than flying over large agricultural fields, some of which were at least 0.6 mi (1 km) wide. The maximum size of an opening Indiana bats may cross is unknown.

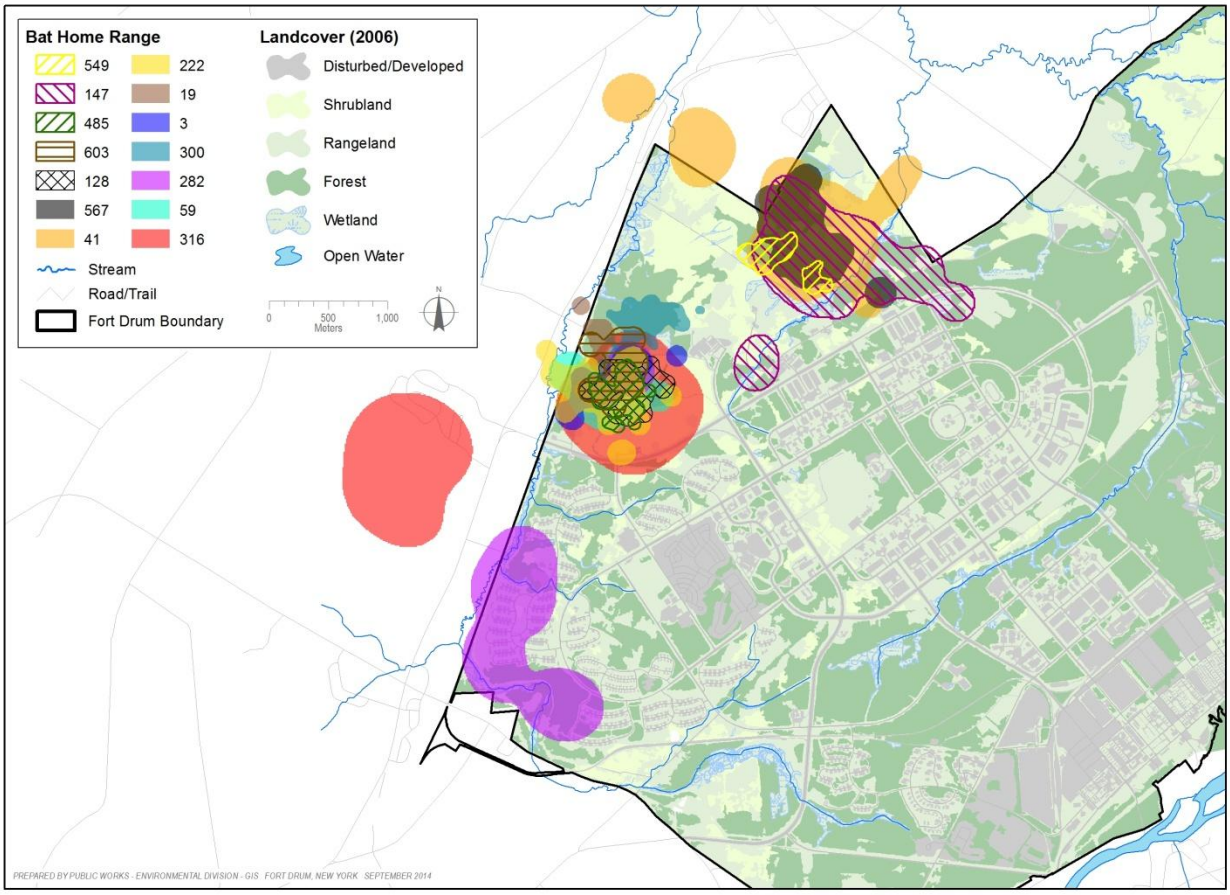

Figure 1.14. Foraging areas of Indiana bats on Fort Drum Millitary Installation in 2008 and 2009.

There are numerous observations of Indiana bats crossing interstate highways and open fields. Recent work found that on average, Indiana bats crossed a road 11.5 times per night with small unpaved and gravel roads being readily crossed (Dale Sparks, Indiana State University, personal communication). Bats did cross an interstate highway, but much less frequently at <0.5 times per night. In New York, Indiana bats tracked from hibernacula to spring and summer roosts have crossed Interstate 81, the Hudson River, Interstate 87, and other highways. These crossings primarily occurred during the initial migration from hibernacula to spring and summer habitats, rather than during nightly foraging bouts (NYSDEC, unpublished data). However, radio tracked bats readily crossed 2-3 sizeable state (4 lanes) and/or county routes (2 lanes) adjacent to Fort Drum from 2007-2010 to roost and forage (ESI 2008b, USFS 2011)

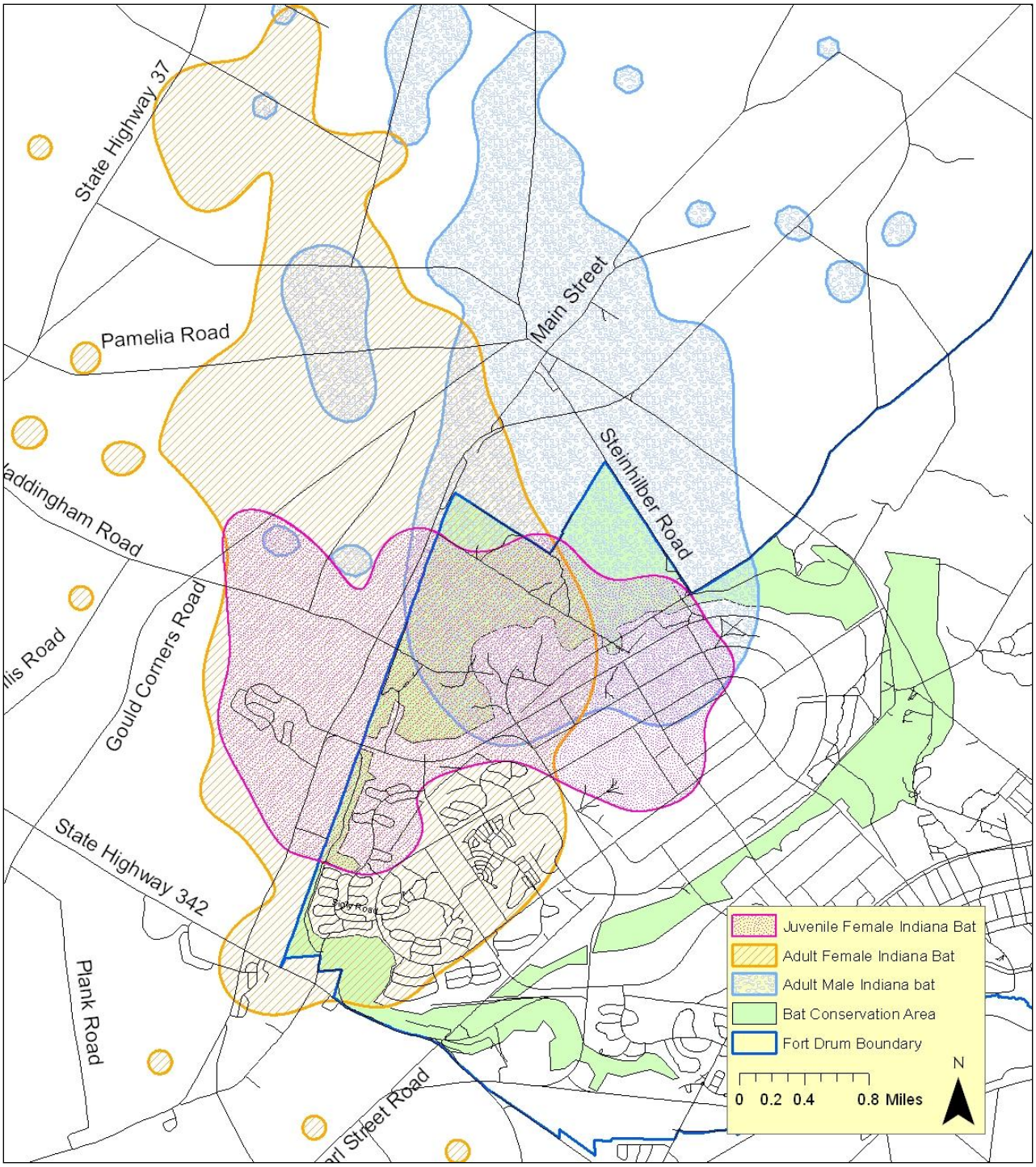

Figure 1.15. Fall home range for three foraging Indiana bats captured on Fort Drum in 2007 (ESI 2008b).

1.5.4.5 Fall Swarming

Forested habitat surrounding winter hibernacula provide important foraging and roosting sites during the autumn swarming period (USFWS 2007). Swarming typically occurs between August and October (Cope and Humphrey 1977). During the swarming period, Indiana bats replenish fat reserves that may have been depleted during migration in order to sustain them through winter hibernation. In the fall, Indiana bats frequently enter and exit winter hibernacula during the night with few remaining to roost during the day. It is assumed this behavior is used to facilitate mating, and to familiarize young with an area (Cope and Humphrey 1977).

Because of Fort Drum's proximity to a hibernaculum, the potential exists for Indiana bats to use part of the installation for swarming. Indiana bats have been recorded using areas between 0.2 – 20.0 mi (0.32 – 32.0 km) from winter hibernacula during fall swarming (USFWS 2007). Studies conducted on Fort Drum (2007-2010) have documented the presence of 13 (6 juvenile females, 3 adult males, 2 adult females, and 2 juvenile males) roosting and foraging Indiana bats utilizing the Cantonment Area later than August 15 (ESI 2008b, USFS 2011). One juvenile female was present on Fort Drum until October 10 and was subsequently tracked to the Glen Park hibernaculum, where it presumably spent the winter (ESI 2008b). Two other Indiana bats (1 juvenile female, 1 adult male) were present on Fort Drum until at least October 2, one adult male was present until at least October 8, and one adult female was present until at least October 12. Unfortunately, it is unknown whether these four bats left Fort Drum for the hibernaculum on their last recorded date or whether the transmitters fell off or their batteries died. In total, 60 fall roosts were located after August 15 within the Cantonment Area during surveys in 2007-2010, and 16 of these roosts were located between October 1 and October 12 (ESI 2008b, ESI 2011, USFS 2011). Some of these roosts are also used as summer maternity roosts prior to August 15. Confirmed fall roosts on Fort Drum have been primarily located in standing dead or dying trees or within dead tree limbs. The average diameter (measured in Diameter Breast Height-DBH) for fall roost trees on Fort Drum is approximately 15.3 in DBH (38.9 cm) with a range of 4.5-49.0 in DBH (11.4-124.46 cm).

As with summer roosting, American elm (n = 30) was the most used fall roost tree on Fort Drum. There were also 6 other species were used as fall roosts on Fort Drum: American beech (*Fagus grandifolia*; n=3) bitternut hickory (n = 4), black cherry (n = 3), red maple (n = 3), sugar maple (n = 14), white pine (n = 3). Fourteen of these roosts (9 elm, 2 sugar maples, and 1 each of bitternut hickory, white pine, and red maple) were used both during the summer and winter.

It is assumed fall swarming activities are mostly completed on Fort Drum by October 15 of any given year primarily based on the drop in temperatures experienced in this area of northern New York. Over an 11 year period from 2000-2010, the average minimum temperature on Fort Drum from October 1 – October 15 was 44 ºF (6.7 ºC), with 18 out of a possible 165 days (or on average 1.6 out of every 15 days) during that period dropping to or below freezing at night. Conversely, during the same period in 2000-2010, from October 16 – October 31, the average minimum temperature was 38 ºF (3.3 ºC), with 54 of a possible 176 days (or on average 4.9 out of every 16 days) during the period dropping to or below freezing. Additionally, from November 1 – November 15, the average minimum temperature on Fort Drum was 33.8 ºF (1 ºC), with 80 of a possible 165 days (or on average 7.3 out of every 15 days) during the period dropping to or below freezing (Fort Drum, unpublished data). Insect activity is greatly reduced at these lower temperatures, and bats would have great difficulty maintaining fat resources previously acquired if they routinely stayed active and on the landscape after October 15. Data collection from fall studies on Fort Drum supports the idea that Indiana and northern long-eared bats are mostly gone from the installation by mid-October. The last known capture date of Indiana and northern

long-eared bats on Fort Drum is September 12, and October 1, respectively (ESI 2008b, Fort Drum, unpublished data). During 2011-2013 Fort Drum performed acoustic surveys continuously from May through November 15 to determine temporal presence on the property. Although analysis is not complete, during 2011 and 2012, there has only been one suspected Indiana bat call collected after 15 October (on 10/16/2011).

1.6 Northern long-eared Bat

1.6.1 General Description

The following is a summary of pertinent northern long-eared bat information. For additional information on life history, ecology, and threats, see proposed rule for the northern long-eared bat (USFWS 2013a or Appendix E); the interim conference and planning guidance for the northern long-eared bat (USFWS 2014 or Appendix F)

The northern long-eared bat is a small-medium-sized bat belonging to the genus *Myotis* (Barbour and Davis 1969; Caceres and Barclay 2000, USFWS 2013a). On average, it weighs approximately 0.18-0.30 oz (5-8 g) and has a total body length between 3.0-3.7 in (77- 95 mm). The northern long-eared bat is similar in appearance to the Indiana bat and the little brown bat. It can be distinguished from both those species by the tragus length and shape, which is longer and pointed in the northern long-eared bat. Additionally, the presence of a keeled calcar separates the Indiana bat from the northern long-eared bat.

The northern long-eared bat is one of seven hibernating species of bats that is known to be affected by WNS. As with Indiana bats, WNS has decimated northern long-eared populations in eastern North America. See the remainder of this section, as well as, *Section 1.6.5 Threats to Indiana and Northern Long-eared Bats* for more information on the impacts of WNS on northern long-eared bats.

1.6.2 Distribution

The northern long-eared bat is patchily distributed across much of eastern and central North America, ranging from the Southern Yukon Territory southeast to the western Florida panhandle covering 39 states within the United States (Figure 1.16). Historically, the northern long-eared bat was considered to be more abundant in the eastern portions of its range (USFWS 2013a).

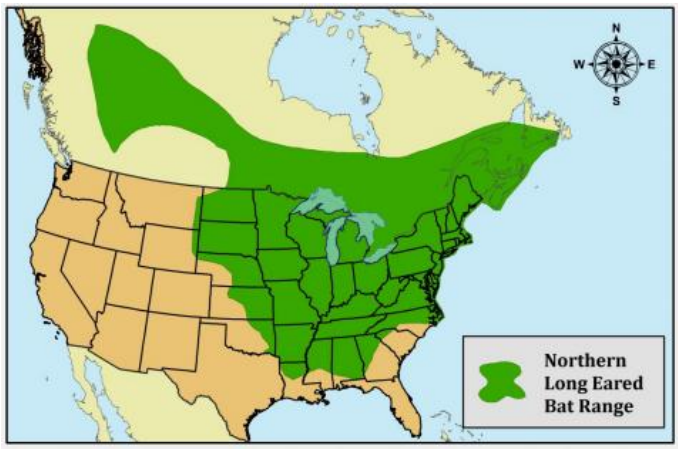

Figure 1.16 Northern long-eared bat distribution (USFWS 2014).

1.6.3 Population Status

1.6.3.1 Rangewide and New York

The USFWS recently proposed listing the northern long-eared bat as an endangered species (50 CFR Part 17; October 2, 2013). Currently, the final listing determination for the species will be made no later than April 2, 2015. The proposed rule stated that critical habitat for the species was not determinable at that time.

Over 780 hibernation sites have been identified for the species in the United States (Whitaker and Hamilton 1998), however, no range wide estimates of the species suspected population size are available. Because they typically hibernate in inaccessible cracks, crevices, etc, it is very difficult to count during typical hibernaculum surveys (Carl Herzog, NYSDEC, Personal communication). For ease of discussion in the proposed rule, the USFWS split the US portion of the northern long-eared bat's range into four parts: the eastern population, Midwestern population, the southern population, and the western population (USFWS 2013a). Historically, northern long-eared bats were found in larger numbers in the eastern portion of the range and were easily caught in mistnet surveys or documented with acoustic detectors (Caceres and Barclay 2000, USFWS 2013a). With the onset of WNS in these populations, drastic declines have occurred throughout the eastern and Midwestern portions of the range.

There are approximately 89 known northern long-eared hibernation sites in New York. The NYSDEC completed surveys at 18 of those sites during the winter of 2012-2013 and documented only 14 northern long-eared bats. Historically, these sites held a maximum total of approximately 1151 northern long-eared bats. This represents an approximate 99% decline in the species at these locations (NYSDEC, unpublished data).

1.6.3.2 Fort Drum

Northern long-eared bats were confirmed on Fort Drum in 1999 when a small scale mistnet survey identified four bats (two post-lactating adult females, one lactating adult female, and one juvenile male) in the Training Area. Acoustic surveys from 2003-2014 have identified suspected use of northern long-eared bats across most of Fort Drum (Figure 1.17). Summer mist net surveys during 2007-2014 that were completed to record any Indiana bat species presence, to assess the summer status of Indiana bats, and to locate Indiana bat maternity colonies on the installation, also documented extensive use of the installation by northern long-eared bats (Figure 1.18).

From 2007-2014, mist net surveys were conducted at 323 sites on Fort Drum following USFWS guidelines. Of the 323 sites, 246 sites were surveyed once, while the remaining 77 sites were surveyed two or more times. In the summer of 2007, 1,369 bats were captured of which 260 were northern long-eared bats (99 adult females, 112 adult males, 25 juvenile females, 24 juvenile males: ESI 2008a). Seventy nine northern long-eared bats were captured in the Cantonment Area and 181 were captured in the Training Areas. Eighty-four of the 99 adult female bats were considered reproductive (i.e. pregnant, lactating, or post-lactating). In 2008, mist net surveys were concentrated in the Training Area and captured 380 bats, including 37 northern long-eared bats (19 adult females, 12 adult males, 1 juvenile female, 2 juvenile males, and 3 unknown sex and age bats that escaped before processing: Copperhead 2009). Sixteen of the 19 adult females were considered reproductive. In 2009, 391 bats were captured in the Training Area, including five northern long-eared bats (5 adult females). All females showed

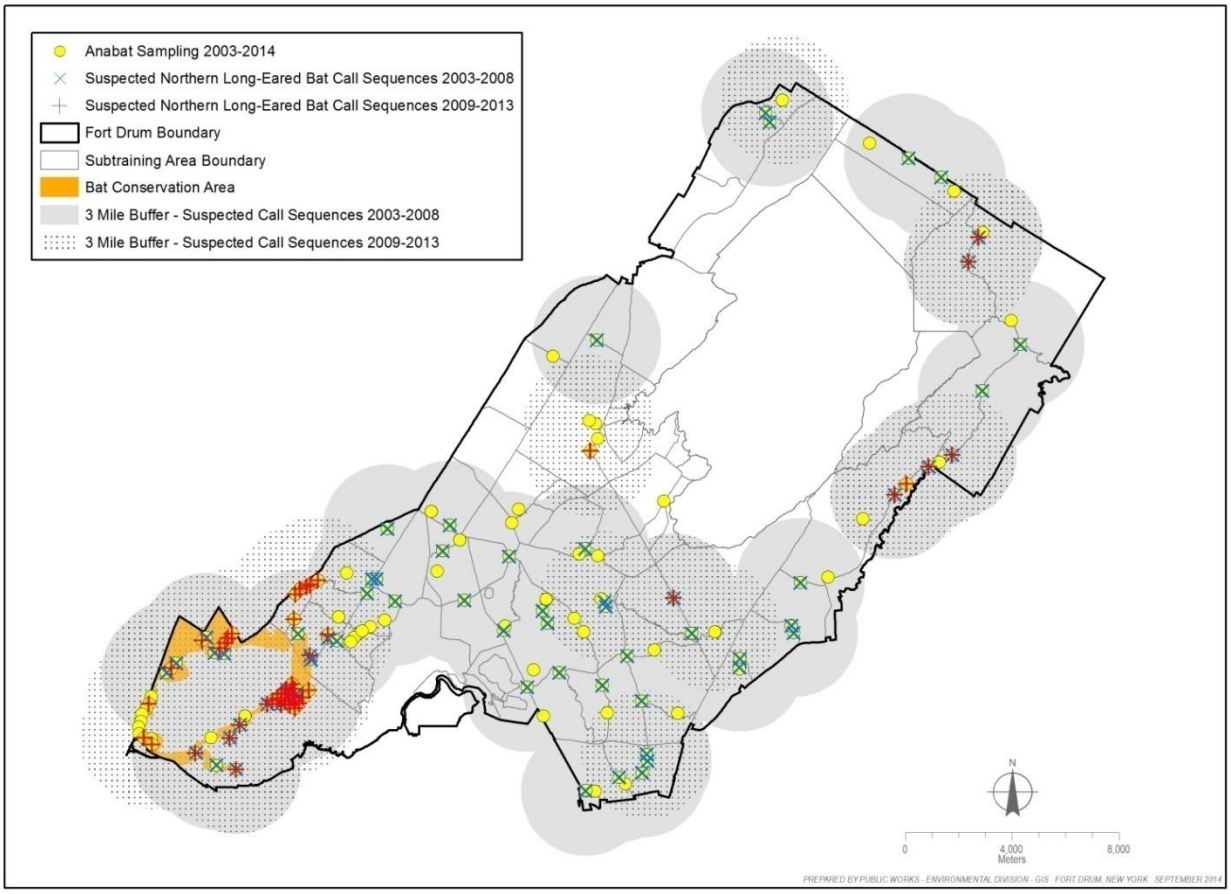

Figure 1.17. Suspected acoustic detections of northern long-eared bats pre-WNS (2003-2008) and post-WNS (2009-2013) on Fort Drum Military Installation.

evidence of reproduction. This drastic drop in northern long-eared bats (and other myotine bats) was when we first considered that impacts from WNS were being manifested in the summer landscape. In 2010, 647 bats were captured, of which five were northern long-eared bats (2 adult females, 2 juvenile females, and 1 juvenile male). Only one of the adult females was considered to be reproductive. The only known roosts for northern long-eared bats on the property were documented in 2010 when one of the juvenile females was radio-tracked to three different roosts in Training Area 4 (Figure 1.12). The first roost was in the cavity of a dead 7.5 in (19cm) red maple (*Acer rubrum*), the second was under the bark or in the crack of an 8.0 in (20.3 cm) white-pine (*Pinus strobus*), and the third roost was in the crack of a 11.5 in (29.2 cm) eastern hemlock (*Tsuga Canadensis*) (Figure 1.20). Emergence counts ranged from 2-4 individuals over the 5 days it was tracked. In 2011, 456 bats were captured, of which only one was a northern long-eared bat, an adult male.

In addition to the above summer mist net surveys, a fall mist net survey was conducted in 2007 to opportunistically monitor the Cantonment Area (Figure 1.7). The study resulted in the capture of 35 bats, of which 23 were northern long-eared bats (11 adult females, 7 adult males, 2 juvenile females, 3 juvenile males; ESI 2008b).

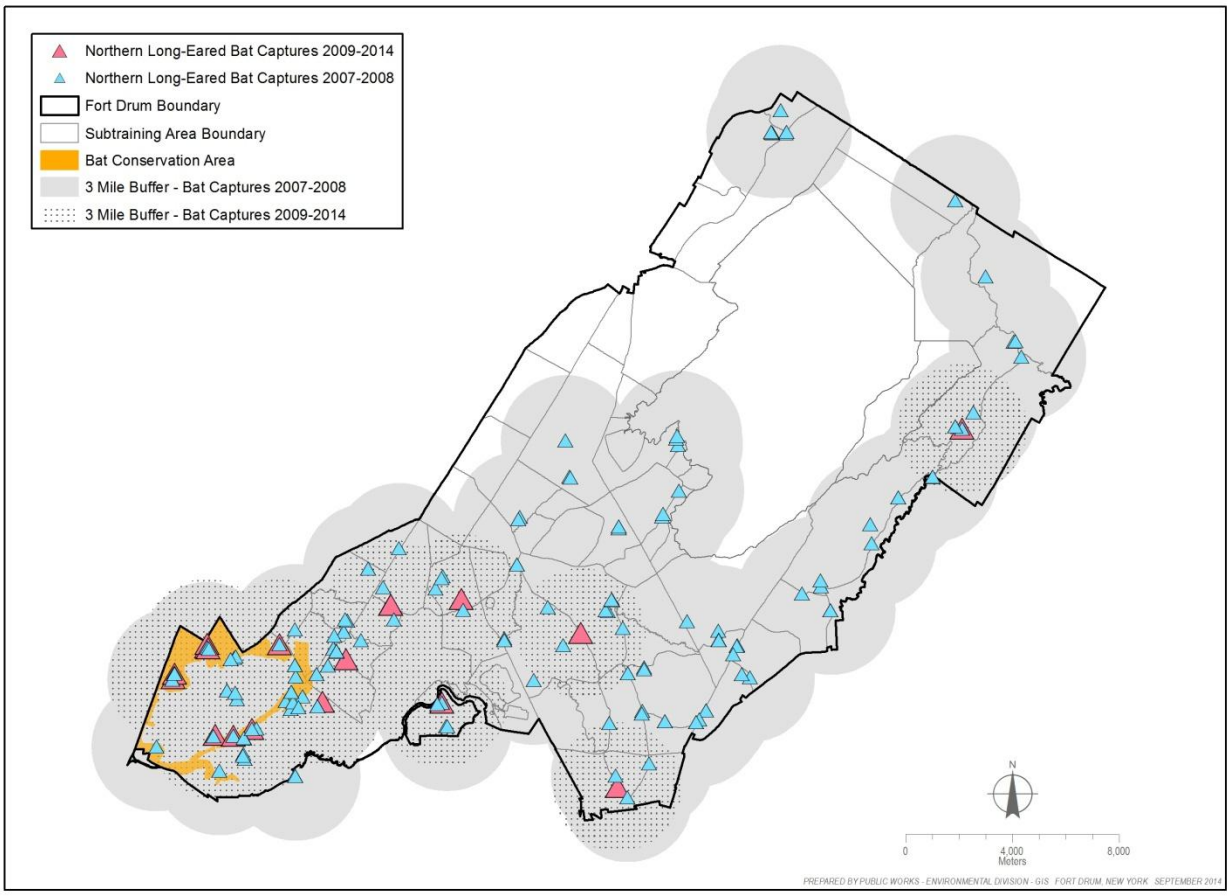

Figure 1.18. Northern long-eared bat captures pre-WNS (2007-2008) and post-WNS (2009-2014) on Fort Drum Military Installation.

In 2008 and 2009, a more extensive project was initiated with the U.S. Forest Service and West Virginia University (WVU) to capture and intensively radio-track Indiana bats in the Cantonment Area to determine foraging areas and roost locations during spring, summer, and fall. As part of this effort, 68 northern long-eared bats (34 adult females, 25 adult males, 1 unknown adult that escaped before processing, 3 juvenile females, 4 juvenile males, and 1 unknown sex and age bat that escaped before processing) were captured (USFS 2011).

Additional small scale mist net surveys were completed by Fort Drum staff between 2007-2014. During that time, 5 additional northern long-eared bats (4 adult males and 1 adult female) were captured.

It is quite obvious from these survey efforts and acoustic detections across Fort Drum (Figures 1.17 and 1.18) that the installation was historically used quite extensively and likely held high numbers of individuals and maternity colonies. However, after the impacts from WNS, acoustic detections have decreased and captures across the landscape have plummeted (Ford et al. 2011, Fort Drum, unpublished data). A northern long-eared bat has not been captured in a mistnet since 2011, and although current acoustic survey work is still picking up small numbers of suspected northern long-eared calls in some areas of Fort Drum, it is obvious the population is a small fraction of what it was.

1.6.4 Background Ecology

1.6.4.1 Hibernation

Northern long-eared bats spend the winter months hibernating predominately in large caves and mines, and to a lesser extent places like abandoned railroad tunnels, aqueducts, or storm sewers (USFWS 2013a). Within these winter hibernacula, these bats typically roost in small numbers in cracks and crevices in areas of high humidity (Barbour and Davis 1969, USFWS 2013a).

It is currently unknown where northern long-eared bats found on Fort Drum overwinter. There are no known hibernacula on Fort Drum. The nearest known hibernaculum where northern long-eared bats have been found is located at Glen Park and Limerick Caves, approximately 6.5 mi (10.5 km) and 10.5 mi (16.9 km) west of Fort Drum, respectively. There are also over 40 caves and mines within approximately 168 mi (270 km)-the longest migratory movement noted in the literature (Griffin 1945)-of Fort Drum where northern long-eared bats have historically been known to hibernate (Figure 1.19). Many of these potential hibernation sites have experienced tremendous declines due to WNS impacts (Carl Herzog, New York State Department of Environmental Conservation (NYSDEC), personal communication).

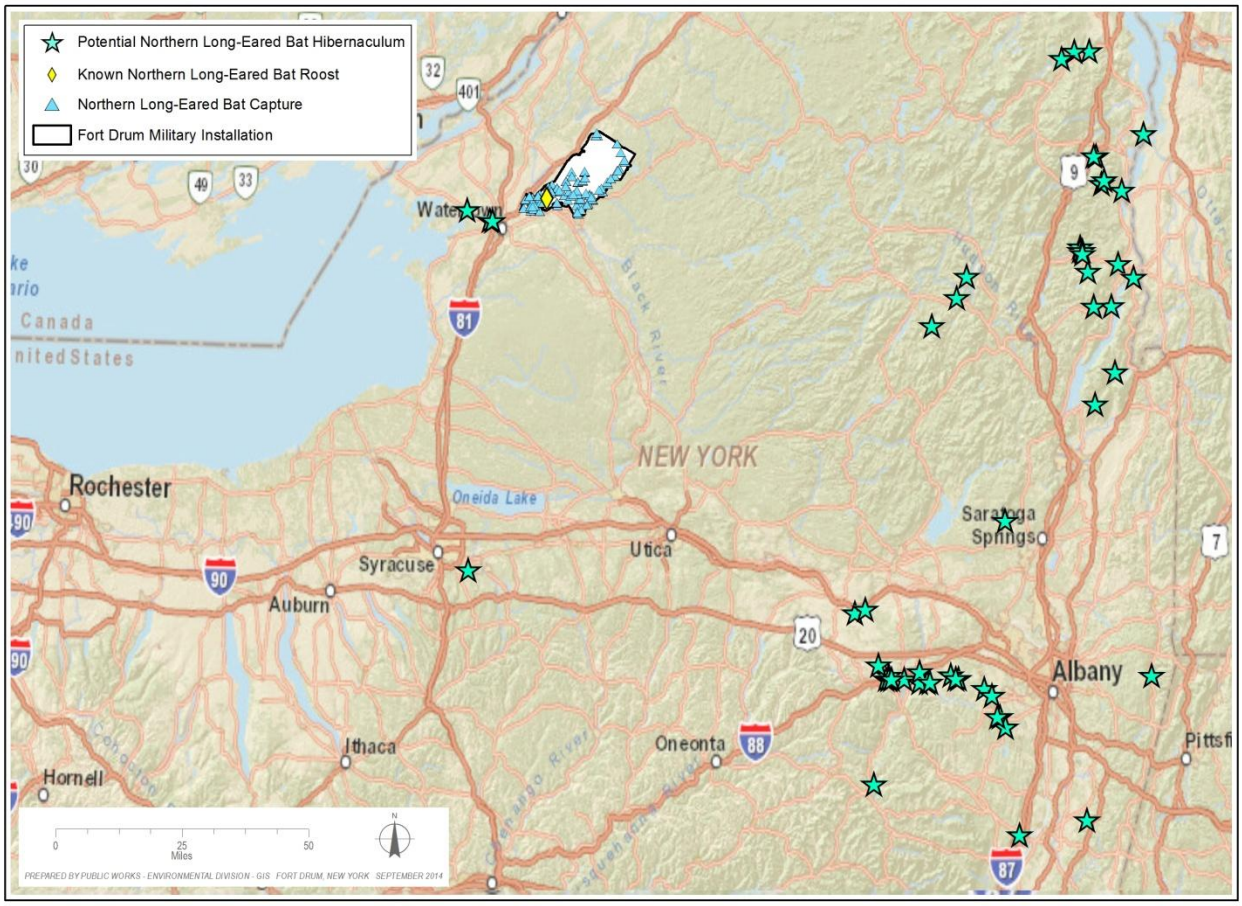

Figure 1.19. Potential hibernation sites for northern long-eared bats utilizing Fort Drum Military Installation.

1.6.4.2 Spring Emergence

Typically spring emergence in New York occurs in mid-April when outside temperatures are suitable for insects to be present on the landscape. It is unknown when northern long-eared bats first appear on Fort Drum, however, mist-netting on the installation has documented them as early as 12 May. Other myotid bat species such as little brown bats have been found on Fort Drum as early as mid-April (Fort Drum, unpublished data), indicating suitable insect abundance is present. Therefore, it is assumed that northern long-eared bats are present starting around the same time as well.

1.6.4.3 Summer Roosting and Reproductive Behavior

Northern long-eared bats are known to roost alone or in small colonies during the summer months. Typically females will roost colonially in small numbers under bark or in cavities of larger diameter live and dead trees (Sasse and Pekins 1996, Lacki and Schwierjohann 2001, Whitaker and Mumford 2009), where males appear to be more flexible in roost tree selection, often roosting alone and utilizing smaller diameter trees (Lacki and Schwierjohann 2001; Broders and Forbes 2004; USFWS 2013a). Maternity colonies have also been found in constructed structures such as buildings and barns (Barbour and Davis 1969, USFWS 2013a). Northern long-eared bats give birth to a single pup typically from late May through July, depending on the geographic location (Broders *et al.* 2006, Whitaker and Mumford 2009). The pups will typically stay with the mother until they are volant (i.e., capable of flight) in July-August. Both juvenile and adult northern long-eared bats of both sexes have been documented on Fort Drum (ESI 2006, ESI 2008a, ESI 2011, USFS 2011).

Summer sites that have a variety of suitable roosts are essential to the reproductive success of local populations. Once bats find these areas, they typically exhibit strong site fidelity, returning to the same traditional summer maternity colony location (and sometimes specific trees) annually to bear their young (Sasse and Pekins 1996, Foster and Kurta 1999, Jackson 2004, and Johnson et al. 2009, USFWS 2014). Northern long-eared bats are known to switch roosts fairly often and utilize multiple species of both live and dead trees, as long as suitable roosting structure (i.e., cavities, cracks/crevices, or exfoliating bark) is present (Menzel et al. 2002, Owen et al. 2002, Carter and Feldhammer 2005, Johnson et al. 2009, Timpone et al. 2010). Female Indiana bats are often considered to utilize primary and secondary roosts that are central to their reproduction and social organization during the summer months (Callahan et al. 1997, Barclay and Kurta 2007). However, this doesn't necessarily appear to be the case with northern long-eared bats. Johnson et al. (2011a) suggested that instead they may have a central node tree that functions similar to a primary roost. Where the Indiana bat primary tree is typically characterized by the number of individuals using the roost, the central node tree may be more accurately identified by the degree of connectivity with other colony roost trees.

It is not known how long or how far northern long-eared bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded during the winter. If they are required to search for new roosting habitat in the spring, it is assumed that additional stress is placed on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration and pregnancy. However, Johnson et al. (2009) found that northern long-eared bats readily exploited changes to forested areas when a reintroduction of fire created new snags and forest canopy gaps. Additionally, Silvis et al (2014) suggested that northern long-eared bat colonies can withstand low levels of roost loss, and any impacts are likely manageable if large areas of available roosting habitat is still present on the landscape. Furthermore, northern long-eared bats are not limited to natural tree roosts

(Timpone et al. 2010, USFWS 2013a). It is possible if suitable natural roosts became limited in an area, but suitable foraging habitat was accessible and constructed roosts were nearby, that northern long-eared bats could still conceivably occupy an area and successfully rear young and maintain social structure.

Forested land and snags are common throughout Fort Drum, and multiple roost trees have been found for other species of bats, including Indiana, big brown, and silver-haired bats (Fort Drum, unpublished data, JECS 2012). Additionally, from 2007-2011, mistnet surveys documented numerous juvenile northern long-eared bats on the installation, indicating that multiple maternity colonies and suitable roosting habitat was likely present throughout the property. The only known roosts for northern long-eared bats on the property were documented in 2010 when a juvenile female was radio-tracked to three different roosts in Training Area 4 (Figure 1.12). The first roost was in the cavity of a dead 7.5 in (19cm) red maple (*Acer rubrum*), the second was under the bark or in the crack of an 8.0 in (20.3 cm) white-pine (*Pinus strobus*), and the third roost was in the crack of a 11.5 in (29.2 cm) eastern hemlock (see Figure 1.20 for roost 2 and 3). Emergence counts ranged from 2-4 individuals over the 5 days it was tracked.

Other studies have shown that numbers of northern long-eared bats vary greatly within individual maternity roosts, ranging from 1- 100 (Caceres and Barclay 2000, Lacki and Schwierjohann 2001, Johnson et al. 2011b, Menzel *et al.* 2002, Owen *et al.* 2002, Whitaker and Mumford 2009, Silvis et al. 2014). It appears that this number typically decreases from pregnancy to post-lactation (Sasse and Pekins 1996, Lacki and Schwierjohann 2001), perhaps as juveniles become volant and leave the colony. However, this trend may vary across the range, as Johnson et al. (2011b) found no differences in exit counts or acoustic evidence between reproductive periods and roost trees. As the juvenile female on Fort Drum was tracked in early August, it is possible that the numbers of individuals was larger at the small Fort Drum colony earlier in the maternity season. Additionally, it was noted that other bats were seen exiting from other snags in close proximity to the radio-transmittered northern long-eared bat's second and third roos unknown what species of bats these were, it is likely these could have been additional northern long-eared bats.

Figure 1.20. Northern long-eared bat roost on Fort Drum. A second roost is 3 m behind the flagged tree in the foreground. Note other snags surrounding these roosts

While Indiana bats appear to utilize primarily dead trees with exfoliating bark, northern long-eared bats appear to utilize both live and dead trees interchangeably (Carter and Feldhammer 2005, Timpone et al. 2010). Northern long-eared bats have been documented in multiple species of trees of shade tolerant to intolerant species of multiple diameters, ranging from 3- 25 in (7.6-63 cm) dbh indicating opportunistic roost selection across the landscape (Foster and Kurta 1999, Timpone et al. 2010, USFWS 2013a). It appears that as with Indiana bats, summer roost selection is primarily based on tree structure, amount of solar exposure, and ease of accessibility. However, solar exposure appears to be more important to Indiana bats, as they are typically found in taller trees with lower canopy cover than northern long-eared bats (Menzel et al. 2002, USFWS 2013a). Cooler temperatures due to higher canopy may not be an issue for northern long-eared bats, thus allowing it to be more opportunistic in roost selection.

1.6.4.4 Foraging/Traveling Movements

Northern long-eared bats may travel up to 3 mi (4.8 km, Timpone et al. 2010) from roost trees, presumably to forage or switch roosts. The USFWS has recently suggested that agencies use a minimum of 1.5 mi (2.4 km) buffer around roost trees and 3 mi (4.8 km) buffer around capture and suspected acoustic detection locations when analyzing impacts to foraging northern long-eared bats, unless there is site specific information to suggest otherwise (USFWS 2013a). See Figures 1.17 and 1.18 for illustrations of buffers outlining potential areas of use around acoustic detection and capture locations, respectively, on Fort Drum. Northern long-eared bats seem to exhibit a diet preference similar to Indiana bats and other myotids. They are opportunistic insectivores that feed on a number of insect species, predominantly Lepidopterans (e.g., moths), Dipterans (e.g., flies and mosquitoes), Coleopterans (e.g., beetles), and Hymenopterans (e.g., wasps, sawflies) (Feldhammer et al. 2009, USFWS 2013a). Northern long-eared bats often catch prey through aerial hawking, however, they appear to utilize gleaning to as great or larger extent (Nagorsen and Brigham 1993, Brack and Whitaker 2001, Ratcliffe and Dawson 2003, Feldhamer *et al.* 2009). Like with Indiana bats, insect consumption by northern long-eared bats varies by season, location, and reproductive condition (Tuttle et al. 2006, Feldhammer et al. 2009).

Northern long-eared bats are thought to forage primarily sub-canopy 3 - 10 ft (1 - 3 m) above the ground above the understory in mature upland forested areas (Nagorsen and Brigham 1993). In contrast to Indiana bat that prefer to forage along water, streams or riparian areas, northern long-eared bats seem to exhibit or more defined preference for upland forested areas and ridgelines (Brack and Whitaker 2001, USFWS 2014). No foraging information currently exists for northern long-eared bats on Fort Drum. However, acoustic detections of northern long-eared bats (Figure 1.17) suggest that most of the installation is likely being used for foraging and travel.

The home range size of northern long-eared bats may be considerably smaller than Indiana bats. Lacki et al. (2009) documented home range sizes of 47-425 ac (19-172 ha), and Owen et al. (2003) found that northern long-eared bats in the Central Appalachians ranged between 43.7-241 ac (17.7-97.5 ha), with no discernible differences between pregnant or lactating females. Little information exists on the potential homerange size for northern long-eared bats on Fort Drum, however, one juvenile female was documented 0.23 miles (370 m) from where she was captured to her first roost. She then moved approximately 0.08 mi (129 m) to the area she roosted in the rest of the time she was tracked.

1.6.4.5 Fall Swarming

It is known that breeding for this species occurs from late July to early October across the range (Whitaker and Hamilton 1998, Caceres and Barclay 2000, and Whitaker and Mumford 2009); however, there is currently little other information about fall swarming activities for northern long-eared bats. If there are unknown close-by hibernaculum to Fort Drum, fall swarming activity could occur on the property. However, as with Indiana bats, it is assumed that this activity would be mostly completed on by October 15 of any given year primarily based on the drop in temperatures experienced in this area of northern New York. Over an 11 year period from 2000-2010, the average minimum temperature on Fort Drum from October 1 – October 15 was 44 ºF (6.7 ºC), with 18 out of a possible 165 days (or on average 1.6 out of every 15 days) during that period dropping to or below freezing at night. Conversely, during the same period in 2000-2010, from October 16 – October 31, the average minimum temperature was 38 ºF (3.3 ºC), with 54 of a possible 176 days (or on average 4.9 out of every 16 days) during the period

dropping to or below freezing. Additionally, from November 1 – November 15, the average minimum temperature on Fort Drum was 33.8 ºF (1 ºC), with 80 of a possible 165 days (or on average 7.3 out of every 15 days) during the period dropping to or below freezing (Fort Drum, unpublished data). Insect activity is greatly reduced at these lower temperatures, and bats would have great difficulty maintaining fat resources previously acquired if they routinely stayed active and on the landscape after October 15. Data collection from fall studies on Fort Drum supports the idea that northern long-eared bats are mostly gone from the installation by mid-October. The last known capture dates for northern long-eared bats on Fort Drum is September 12, and October 1, respectively (ESI 2008b, Fort Drum, unpublished data). During 2011-2013 Fort Drum performed acoustic surveys continuously from May through November 15 to determine temporal presence on the property. Although analysis is not complete, during 2011 and 2012, there has only been 10 suspected northern long-eared bat calls collected after 15 October (1-10/16/2011; 8-10/17/2012; and 1-11/12/2012).

1.7 Threats to Indiana and Northern Long-eared Bats

While there are a number of documented and suspected reasons for the decline of these species, (see below and USFWS 2007), currently the number one reason is WNS. First detected in Howe's Cave in Schoharie County, New York in the winter 2006, WNS has spread throughout the northeastern United States and portions of Canada, and as far south as Tennessee (Figure 1.21). Additionally, evidence of the presumptive causative agent of the disease, the novel psychrophilic fungus *Pseudogymnoascus destructans* (Blehert et al. 2009, Gargas et al. 2009, USFWS 2011) has been detected on bats as far south and west as Missouri and Arkansas. To date, WNS has severely impacted some of the Northeast's most common bat species, killing greater than six million hibernating bats. This disease poses one of the most serious threats to the continued existence and recovery of both the Indiana and northern long-eared bat. Prior to WNS, the Recovery Priority of the Indiana bat was 8 meaning the species had a moderate degree of threat and high recovery potential; due to WNS, the Recovery Priority is now a 5, meaning the species has a high degree of threat and a low potential for recovery.

The numbers of Indiana bats at Glen Park have always fluctuated due to difficulty of detecting bats inside the labyrinth of caves (Table 1.1), but the overall numbers have definitely declined in the primary hibernation site within the cave (Figure 1.5). The population declines associated with WNS have also made it extremely difficult to locate members of the known colony on Fort Drum through traditional mistnet efforts, where previously colony members were relatively easy to capture. Additionally, the number of bats exiting roosts on Fort Drum that contain reproductive female Indiana bats have also dropped from initial counts in 2007 and 2008. This may indicate that the colony has broken into smaller maternity units, or that the numbers of bats are so low on the summer landscape that bats can no longer find sufficient numbers to form primary maternity roosts with robust numbers.

Prior to WNS, the northern long-eared bat was one of the most abundant bats in the summer landscape. Whereas previously, northern long-eared bats were one of the most readily captured bats during mistnetting efforts (Owen et al. 2004), population declines associated with WNS have now made it extremely difficult to capture individuals on the landscape in many places now. (Francl et al.2012, Fort Drum, unpublished data).

Given the drastic declines in numbers of both species on the Fort Drum landscape and the difficulty in accurately monitoring these bats through currently available methodology, it will be unlikely that much new information will be gathered on either one of these species.

There are also a number of other documented and suspected reasons for the historic decline of bat populations which include disturbance during hibernation, habitat loss, pesticide contamination, persecution, and disease.

Both bats are highly susceptible to injury or death during hibernation. This can be from humans entering hibernacula and disturbing bats thus causing them to expend crucial fat reserves, which can lead to starvation if forced to arouse from sleep too often. Vandalism of hibernacula and the direct killing of hibernating Indiana bats have also contributed to population declines. Natural catastrophes, such as flooding or extreme temperatures, have resulted in the death of hibernating bats. Due to its importance to the survival of the species, the protection of Indiana bat hibernacula had been in the forefront of Indiana bat recovery plans (USFWS 2007). Likely this will become an important consideration for northern long-eared bat hibernacula as well.

The loss of summer habitat is another important factor that could affect both these species. Historically, changing land use practices including urban and agricultural development, as well as fire suppression have reduced available roosting and foraging habitat in some portions of the range for both these species (USFWS 2007 and USFWS 2013a). Timber harvests have the potential to remove important roosting/foraging sites for both bats, but proper forest management can retain and even improve roosting and foraging habitat for these bats by providing or maintaining forest structural features, such as snags, openings in canopy cover, and edge habitats. It is unlikely with the overall reduction in populations due to WNS that summer habitat would now be a limiting factor for either of these species. There are now likely large areas of unoccupied suitable summer habitat. Due to the strong site fidelity exhibited by both species, the larger threat related to this issue would be if specific areas of forest were removed that contained important roosting networks for known or unknown maternity colonies.

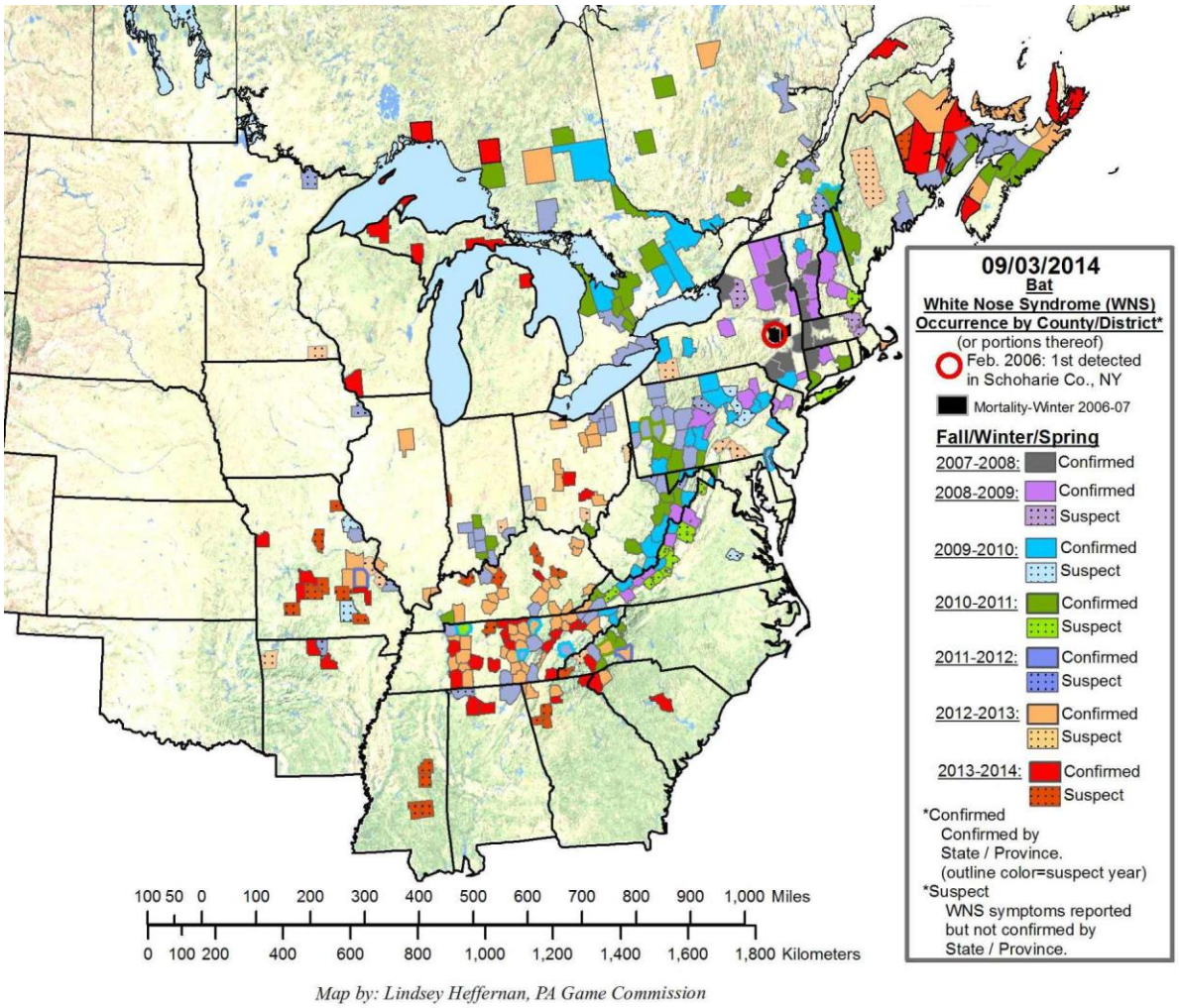

Figure 1.21. **Distribution of white-nose syndrome (WNS) affected areas as of September 4, 2014 (http://whitenosesyndrome.org).**

Bioaccumulation of environmental contaminants has also been identified as a suspected cause for the decline of Indiana bats (USFWS 2007) and could be a concern for northern long-eared bats as well. Organochlorine insecticides which became widely used after World War II are neurotoxic, synthetic chemicals of which many are resistant to metabolism in mammals (O'Shea and Clark 2002). Organochlorine insecticides may have resulted in chronic mortality of bats (O'Shea and Clark 2002). For example, guano collected from an Indiana bat roost in Indiana, in the 1970s, had concentrations of dieldrin in their guano comparable to the levels found in colonies of gray bats that suffered mortality from dieldrin poisoning (O'Shea and Clark 2002). Schmidt et al. (2002) measured levels of Polycyclic Aromatic Hydrocarbons (PAH) and organochlorine pesticides in surrogate bat species to ascertain potential affects to the Indiana bat. At low concentrations, these chemicals cause cancer and cellular mutations in mammals, and may affect reproductive success by reducing viability of gametes or offspring.

Another relatively recent threat to bats in the last decade has been wind power facilities (Kunz et al. 2007). Numerous wind power facilities have been recently constructed in northern New York, with more planned (Figure 1.22). A Bats and Wind Energy Cooperative (www.batsandwind.org) has been launched to conduct research on mortality causes and to

develop solutions to prevent or minimize fatalities at wind farms. Monitoring at large wind facilities has documented multiple Indiana and northern long-eared bat mortalities to date (Robyn Niver, USFWS, personal communication), but the possibility exists that additional mortalities have gone undiscovered.

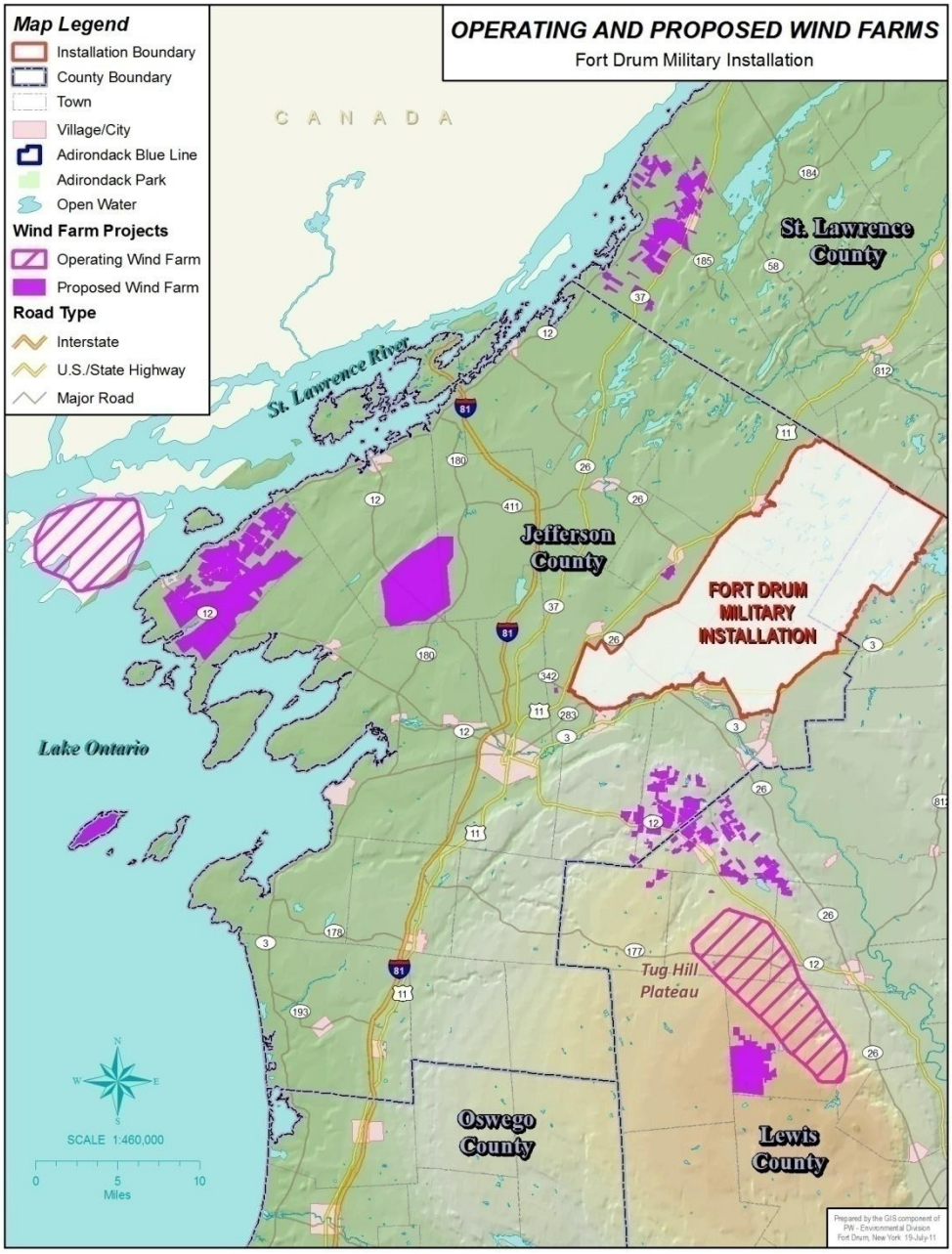

Figure 1.22. Operating and proposed wind farms within Fort Drum's operational airspace.

2.0 Proposed Activities

This section assesses activities on Fort Drum that have the potential to affect the Indiana and northern long-eared bat. These activities include: construction; military training; forest management; mechanical vegetation management; land conversion; prescribed burning; use of pesticides; wildlife management/vertebrate pest control; outdoor recreation; and the ACUB program.

2.1 Construction

There are approximately 30 projects proposed for construction during January 2015 -December 2017 on Fort Drum that may result in the loss of roosting or foraging habitat. Approximately 15 projects will be concentrated in the Cantonment Area and the area surrounding Wheeler-Sack Army Airfield (WSAAF), and the remaining 15 are in the Training Area. All projects are subject to funding, mission priorities, and other factors, and although 30 are proposed, it is unknown how many will actually be constructed. As long as the scope is not greater than discussed here, no further coordination is needed beyond annual reporting.

Given the total proposed impact, Fort Drum considers that the Conservation Measures presented in the 2009-2011 and 2012-2014 BAs for construction are still appropriate and propose only a few modifications related to active season clearing and size of trees to be cleared. Please see below for these modifications.

2.1.1 Construction Activities

2.1.1.1 Cantonment Area/WSAAF Construction

During January 2012- December 2014, Fort Drum anticipated construction activities to occur on up to 410 ac (1,004 ha) of land in and around the Cantonment Area and WSAAF (Table 2.1). During these three years, approximately 226 ac (91 ha; 55%) were actually cleared for construction (Table 2.1; Figure 2.1), which included the loss of approximately 136 ac (55 ha) of natural vegetation. The remaining approximately 90 ac (36 ha) were on already disturbed and/or developed land. We anticipate construction of approximately 15 new projects on up to 300 ac (121 ha) in the Cantonment Area during January 2015-December 2017 (Table 2.3).

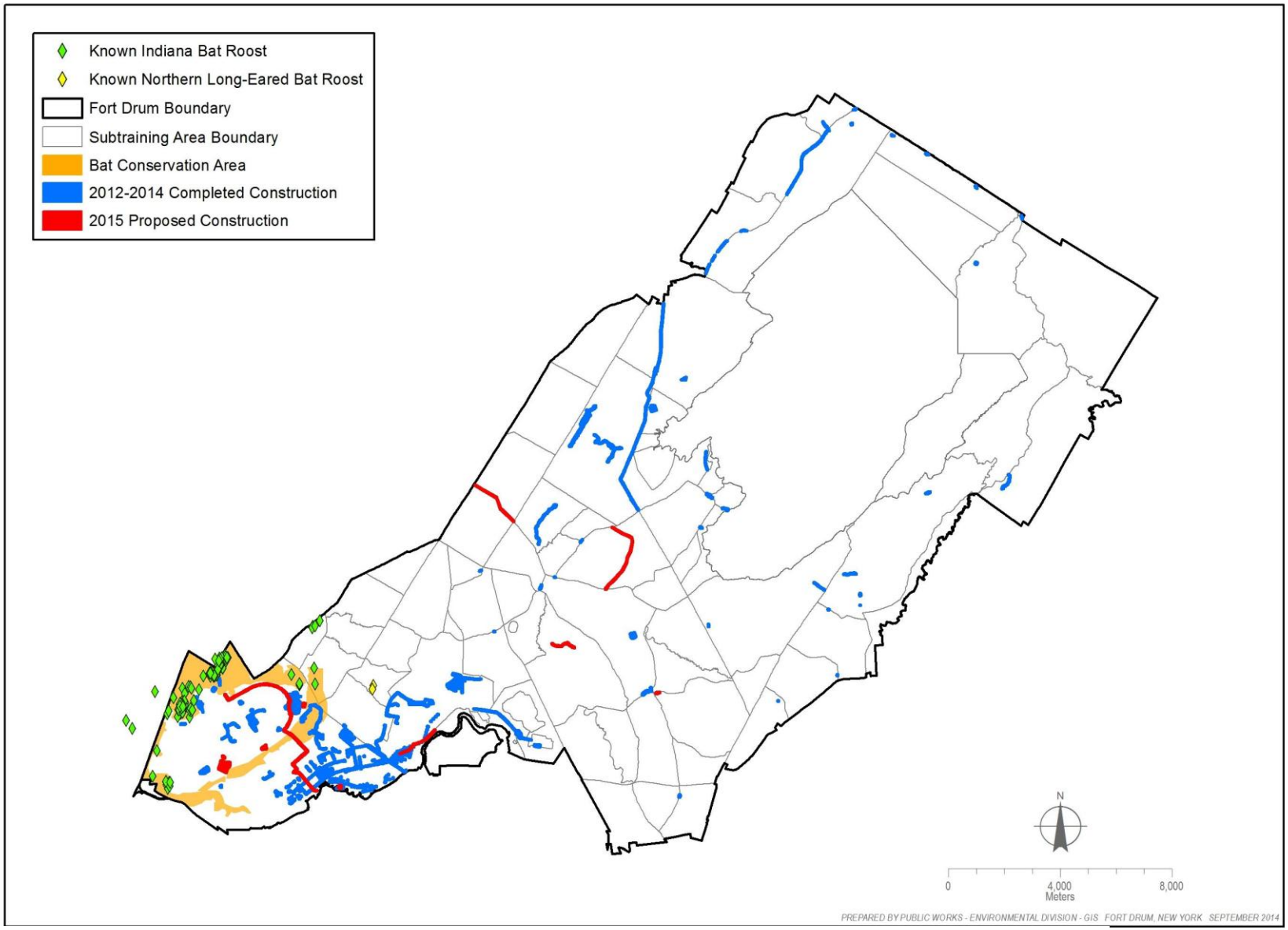

Figure 2.1. Completed and proposed construction between January 2012 – December 2014 and January 2015 -- December 2017, respectively, on Fort Drum Military Installation.

Table 2.1. Amount of landcover by type (buffered by 25 ac/vegetation type, excluding wetlands) proposed for removal during 2012-2014 construction activities in the Cantonment Area and WSAAF, and actual landcover impacts from construction activities on Fort Drum Military Installation.

Landcover Type	Proposed Acres	Actual Acres
Conifer Forest	45	1.01
Deciduous Forest	110	71.54
Disturbed/Developed	50	42.12
Grassland/Rangeland	30	44.84
Landscaped Yard	35	41.09
Mixed Forest	75	11.62
Sand Dunes/Flats	25	6.92
Shrublands	30	6.61
Water/Wetlands*	10	0.49
Total	410	226.24

***** Approximate wetland impacts based on generic landcover. Total wetland impacts calculated for construction projects and submitted for ACOE review will vary from this number slightly.

Table 2.2. Amount of landcover by type (buffered by 25 ac/vegetation type) proposed for removal during 2012-2014 construction activities in the Training Area, and actual landcover impacts from construction activities on Fort Drum Military Installation.

Landcover Type	Proposed Acres	Actual Acres
Conifer Forest	100	0.00
Deciduous Forest	75	24.53
Disturbed/Developed	25	25.05
Grassland/Rangeland	30	27.69
Landscaped Yard	25	11.60
Mixed Forest	150	2.45
Sand Dunes/Flats	25	0.13
Shrublands	50	9.81
Water/Wetlands*	35	1.25
Total	515	102.51

***** Approximate wetland impacts based on generic landcover. Total wetland impacts calculated for construction projects and submitted for ACOE review will vary from this number slightly.

Table 2.3. Amount of landcover by type (buffered by 25 ac/vegetation type, excluding water/wetlands) proposed for removal during 2015-2017 construction activities in the Cantonment Area and WSAAF, on Fort Drum Military Installation.

Landcover Type	Proposed Acres
Conifer Forest	25
Deciduous Forest	50
Disturbed/Developed	45
Grassland/Rangeland	35
Landscaped Yard	45
Mixed Forest	35
Sand Dunes/Flats	25
Shrublands	35
Water/Wetlands*	5
Total	300

***** Approximate wetland impacts based on generic landcover. Total wetland impacts calculated for construction projects and submitted for ACOE review will vary from this number slightly.

2.1.1.2 Training Area Construction

Fort Drum anticipated clearing up to 515 ac (208 ha) of land in the Training Area between January 2012 – December 2014 for construction (Table 2.2). However, only approximately 103 ac (42 ha; 20%) were actually developed (Table 2.2 and Figure 2.1), removing approximately 66 ac (27 ha) of natural vegetation and 37 ac (15 ha) of previously disturbed and or developed area. We anticipate construction of approximately 15 new projects on up to 300 ac (121 ha) in the Training Area during January 2015 -December 2017 (Table 2.4). Refer to Table 2.3 for acreages of impacted vegetative cover types from 2012-2014, and Table 2.4 for the proposed impacts for 2015-2017.

Table 2.4. Amount of landcover by type (buffered by 25 ac/vegetation type, excluding water/wetlands) proposed for removal during 2015-2017 construction activities in the Training Area on Fort Drum Military Installation.

Landcover Type	Proposed Acres
Conifer Forest	25
Deciduous Forest	45
Disturbed/Developed	35
Grassland/Rangeland	50
Landscaped Yard	30
Mixed Forest	40
Sand Dunes/Flats	30
Shrublands	40
Water/Wetlands*	5
Total	300

2.1.1.3 Active Season Clearing

As discussed in Fort Drum's previous BAs, in order to facilitate small, unanticipated training-related projects, Fort Drum may need to clear trees in the Training Area during the time of year bats may be present on the property.

While Fort Drum will wait until after maternity colony activity has decreased (after August 15), we may need to clear trees prior to when bats have left the installation for hibernation.

As part of the 2012-2014 BA, it was determined the boundary for clearing trees after August 15 would only occur north and east of US Military Highway (Figure 2.2). This area is adjacent to most of the range facilities, is most likely where small projects covered under this scenario would be sited. While this area is outside the area of known maternity colony use by the Indiana bat, it is within the known use area of the northern long-eared bat. Therefore, the following only applies to the northern long-eared bat.

In 2012-2014, up to 25 ac (10 ha) per year were anticipated to be cut during the active season; however, no actions were required. Given that no active season clearing was needed in previous years, for the purposes of analysis, we consider there may now only be up to 10 ac per year (with no more than 5 ac total in one contiguous location) that would be removed for an immediate construction need during 2015-2017. There may be many combinations of forested habitat removal as part of this requirement (e.g., 2 projects that could remove up to 5 ac (2 ha) each, 5 projects that could remove 2 ac (0.8 ha) each , etc.). Although projects are subject to change, typical projects tend to be adjacent to existing trails or roads and are roughly 2 ac (0.8 ha) in size. Additionally, these projects would be anticipated to occur near existing ranges.

Before construction begins, each project will be evaluated for potential northern long-eared bat habitat. If the project site has no suitable roosting habitat (i.e., all trees are less than 3 in DBH, there are no dead/dying large diameter trees), roosting is unlikely, and there are no potential impacts to roosting bats.

If suitable roosting habitat is present and the project cannot be delayed until after October 15, there is the potential that a small number of northern long-eared bats to be present during tree removal activities. All northern long-eared bats will be volant and most would be anticipated to fly away unharmed. However, some bats may be trapped within a cavity or crevice and subsequently crushed and killed.

No land clearing for construction projects will occur between 16 April and 15 August anywhere on Fort Drum, and no construction projects will occur south/west of US Military Highway between August 16 - October 15. If an action is required south/west of US Military Highway, then additional consultation is needed with the USFWS. If Indiana bats are captured north/east of US Military Highway, then additional consultation is needed with the USFWS. Further consultation is also needed if a project exceeds 5 ac (2.02 ha) per site or if the cumulative acreage exceeds 10 forested ac (4 ha) per year.

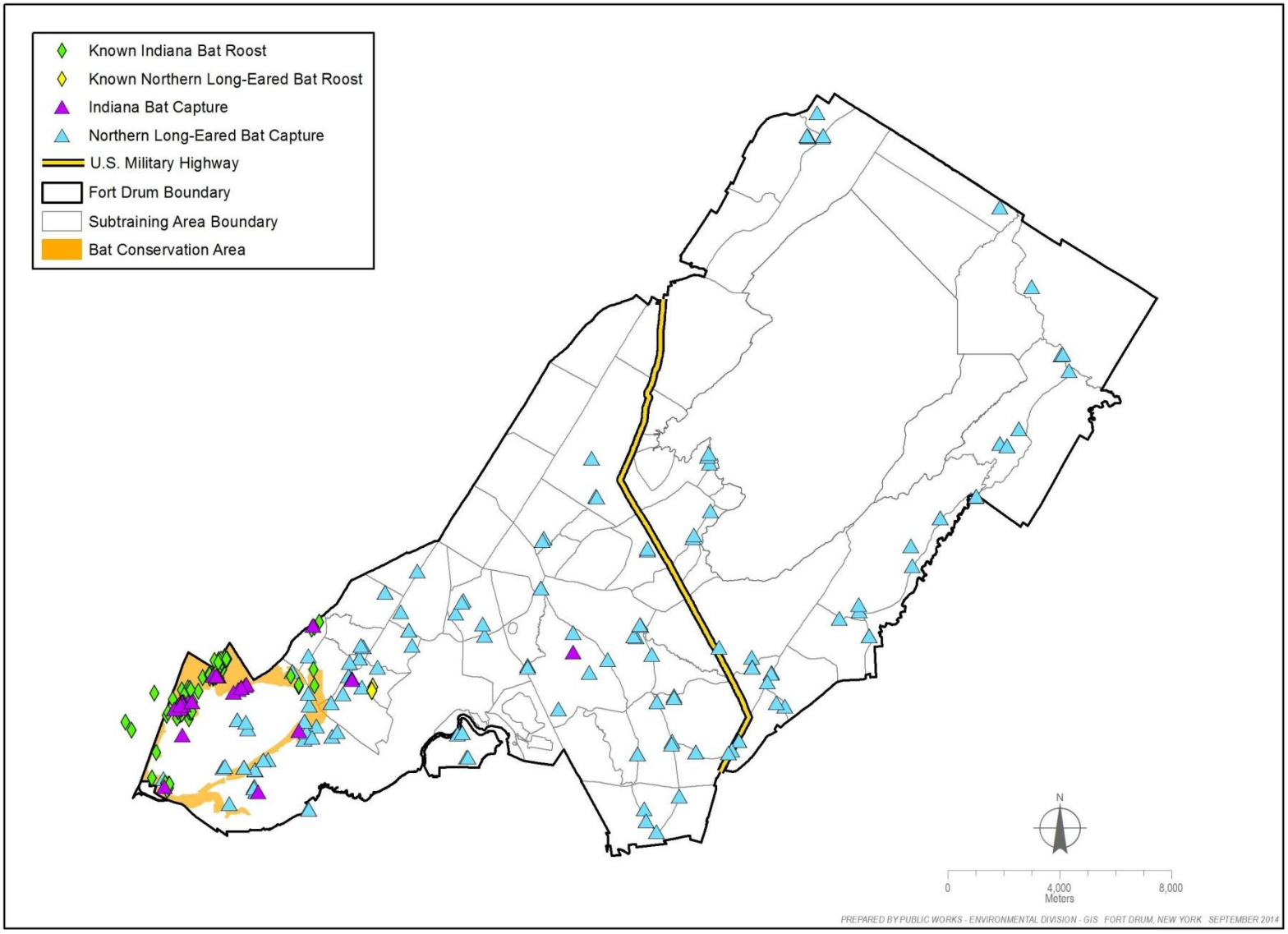

Figure 2.2. Location of US Military Highway boundary for active season clearing for construction projects on Fort Drum Military Installation.

2.1.1.5 Demolition

We anticipate up to approximately 200 buildings on the installation may be demolished between 2015 - 2017. The majority of buildings scheduled for demolition were built in the 1940s and are in the Cantonment Area. Demolition will occur any time of the year as long as no bats are documented in the structure. The LeRay Mansion is the only building on Fort Drum known to have bats—a maternity colony of little brown bats. If bats of any species are discovered prior to, or during the course of demolition, then all work must cease and Fort Drum's Fish and Wildlife Management Program must be immediately contacted. If bats are identified as Indiana or northern long-eared bats, then additional steps will be taken to try and minimize impacts to the species. If the structure is safe to leave as is, then it will be left until after the bats have stopped using the structure. If the structure is unsafe and poses a risk to human health and safety, Fort Drum will attempt to exclude the bats immediately. If this is not possible, or bats are found to be using a structure during the maternity season when pups are not volant, the Fort Drum Fish and Wildlife Management Program will contact USFWS to discuss the most appropriate course of action.

2.1.1.6 Borrow Pits

There are several quarries/borrow pits on the installation (encompassing approximately 188 ac (76 ha)) that provide sand and gravel primarily for construction. Current borrow pit sites are disturbed sites with minimal vegetation. There are no current plans to clear any additional land to establish new borrow pits. The general operation of borrow pits would not remove any additional vegetative cover, however, the potential exists that dust and noise generated from the operation could have some harmful impacts to Indiana and northern long-eared bats. These potential impacts associated with dust and noise will be addressed below.

2.1.1.7 Wetland Mitigation

Fort Drum has established a wetland mitigation bank to offset impacts to wetlands (when appropriate). No new wetland mitigation projects were constructed during 2012-2014, and Fort Drum's wetland mitigation bank was utilized when wetland impacts exceeded established thresholds. There are no current plans for wetland construction during 2015-2017. However, small onsite wetland creation could occur to offset impacts, and/or the wetland bank will continue to be utilized when appropriate. The mitigation bank currently contains three sites (North Corner, Antwerp, and Range 37 Borrow Pit; Figure 2.3). There is no anticipated maintenance or management required at these sites, other than minor vegetation management (e.g., invasive species control). The mitigation bank was developed in accordance with US Army Corps of Engineers Mitigation Guidelines (33 CFR Parts 325 and 332; 40 CFR Part 230).

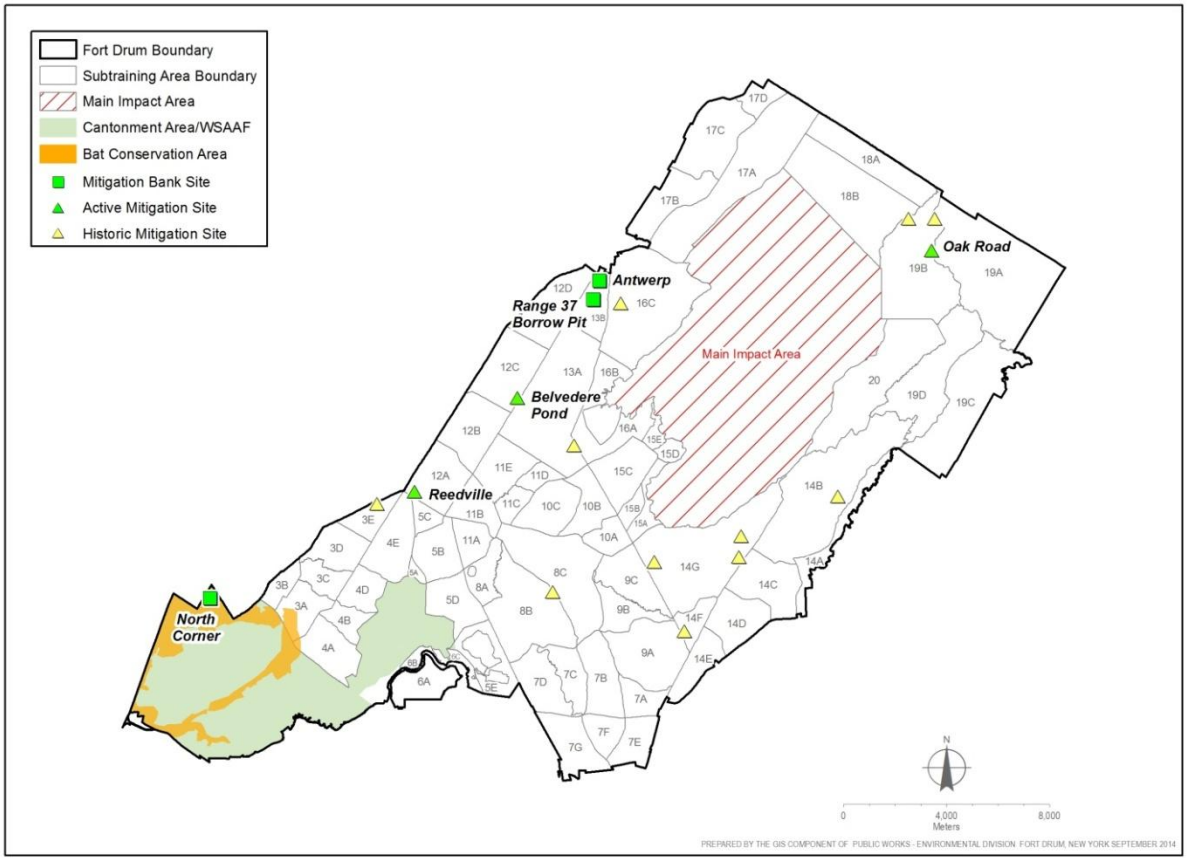

Figure 2.3. Constructed wetland mitigation sites and wetland bank sites on Fort Drum Military Installation.

2.1.2 Conservation Measures for Construction Activities

1. Bat Conservation Area. A 2,200+ ac (890 ha) Bat Conservation Area (BCA) is established to protect known Indiana bat roosting and foraging areas from permanent development within the Cantonment Area. The BCA attempts to provide connectivity of existing habitat in the Cantonment Area along the West Creek and Pleasant Creek corridors and the relatively undeveloped northern portion of the Cantonment Area where most of the known primary and maternity roosts are known. The BCA accounts for more than 20% of the total land area in the Cantonment Area. See *Section 3.1* for more information about the BCA. The BCA will also provide protection for northern long-eared bats within the Cantonment Area.

2. Roost Tree Protection. All female roosts, including roosts identified in the future, will be protected from construction for the lifespan of the roost tree. Additionally, a buffer will be placed around all female roosts to protect the roost from disturbance and to maintain a semblance of a natural environment for Indiana and northern long-eared bats. The size and shape of a buffer will be determined on a case by case basis by Fort Drum's Fish and Wildlife Management Program in consultation with the USFWS. Factors that will be considered will include surrounding landscape, habitat connectivity, distance to other roosts, distance to known foraging areas, and any other issue important to target species.

3. Time of Year Restriction for Tree Falling. A time of year restriction for clearing trees (> 3 in DBH) has been established to protect roosting Indiana and northern long-eared bats during non-hibernation seasons. For the majority of construction activities, felling of trees must take place between October 16 - April 15 while most bats are at the hibernaculum. This will greatly reduce the risk of accidentally harming bats that may potentially be present in trees scheduled to be removed. Specifically, maternity colonies and their associated non-volant young will be protected from disturbance.

4. Flagging or signs will be used to demarcate areas to be cleared vs. not cleared prior to any construction activities for a given project. Flagging will be removed upon completion of the project.

5. Via Environmental Protection Plans, Scope of Works, Contracts, etc., all personnel responsible for construction activities will be informed about the need to follow design plans, stay within flagging, minimize impacts to wildlife and other environmental concerns.

6. Outdoor Lighting Minimization. For all future projects, Fort Drum will evaluate the use of outdoor lighting and seek to minimize light pollution by angling lights downward or via other light minimization measures following Appendix P. High light levels may deter bats from areas as their nocturnal behavior may have evolved in response to predation risks (Speakman 1995, Sparks et al. 2005). By angling the light away from potential foraging and roosting areas, the area will be darker thus providing bats more protection from predators.

7. Demolition. If the building has pre-existing known bat colonies, then Fort Drum's Fish and Wildlife Management must be contacted before demolition is to occur. If during the course of demolition, bats of any species are discovered, then all work must cease and Fort Drum's Fish and Wildlife Management Program must be immediately contacted. If bats are identified as Indiana or northern long-eared bats, then additional steps will be taken to try and minimize impacts to the species. If the structure is safe to leave as is, then it will be left until after October 15, or until bats have stopped using the structure. If the structure is unsafe and poses a risk to human health and safety, Fort Drum will attempt to exclude the bats immediately. If this is not possible, or bats are found to be using the structure during the maternity season when pups are not volant, the Fort Drum Fish and Wildlife Management Program will contact USFWS to discuss the most appropriate next course of action.

8. Water Quality. All construction activities with ground disturbance greater than one acre or that meets another requirement of the New York State Department of Environmental Conservation, are required to follow standards in New York State Pollutant Discharge Elimination System: Storm water General Permit for Storm water Discharges (Permit No. GP-0-08-001 Issued Pursuant to Article 17, Titles 7, 8 and Article 70 of the Environmental Conservation Law). All construction projects over an acre are required to prepare a sediment and erosion control plan or a storm water pollution prevention plan (SWPPP), which details all erosion and sediment control practices and, when necessary, post-construction storm water management practices. Practices mentioned within the SWPPP will be in accordance with the New York State Stormwater Management Design Manual ("Design Manual") dated August 2003, or the most current version or its successor. Erosion and sediment controls vary, depending on individual impacts from

each project. Some temporary examples of erosion and sediment controls include silt fences, check dams, and sediment traps. Permanent controls may include retention ponds, detention ponds, and grass lined swales. With water quality control measures in place, it is expected that declines in water quality will be minimal and thus will continue to provide adequate habitat for Indiana bat prey and drinking water for Indiana bats. In fact, water quality may actually improve during the construction of future projects due to new stormwater practices that mitigate for old water quality issues when no conservation measures were required or implemented.

9. Record-keeping and Reporting. For annual reporting purposes, all entities responsible for construction activities on Fort Drum will submit electronic shapefiles of clearing limits to Fort Drum's Fish and Wildlife Management Program. This information will be used to describe vegetative cover types and habitat loss on Fort Drum and reported annually to the USFWS.

2.1.3 Effects to Indiana and northern long-eared bats

During 2009-2014, Fort Drum had anticipated that construction could occur on up to approximately 7685 ac (3110 ha) of which approximately 6544 ac (2648 ha) could impact natural habitat (see Appendix A and B, Section 2.1). Construction actually occurred on only approximately 929 ac (376 ha) of which 647 ac (262 ha) occurred within natural habitat. Although multiple construction projects are scheduled for completion during 2015-2017, many of those projects will remove limited potential roosting and foraging habitat for Indiana or northern long-eared bats. Given that only a small portion of previously anticipated habitat has been lost, there are currently no large scale construction projects scheduled for the next 3 years (only approximately 600 acres (worst case scenario) total are scheduled for removal, and projects are spread out across the Cantonment and Training Areas, Fort Drum anticipates limited potential impacts from construction activities to either species of bats. Please see below for further documentation and analysis.

2.1.3.1 Direct Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore, construction activities are anticipated to have no direct effects to hibernating Indiana or northern long-eared bats.

Roosting

Spring/Summer Tree Clearing

While the continued presence of Indiana bats on Fort Drum has been documented, WNS impacts have reduced the available population that could be present on the property. The same is true for northern long-eared bats. While acoustic detections still suggest this species is present in certain locations of Fort Drum, population impacts from WNS have been severe, thus reducing the available population of this species on the property as well. Historically, these bats were readily captured throughout Fort Drum, however, it has now been three years since a northern long-eared bat was captured. Regardless, the majority of tree clearing will occur from October 16 – April 15 when most (or perhaps all) Indiana and northern long-eared bats are

absent from the installation. On the low chance that Indiana or northern long-eared bats are present prior to April 15, no young would be present and all bats should be able to leave the project footprint, once disturbance starts. Because of these considerations, it is unlikely that a summer maternity roost with bats will be impacted, or individual males or females will be impacted. Therefore, clearing for construction is unlikely to directly affect Indiana or northern long-eared bats during the spring or summer, and any effects are discountable.

Fall/Winter Tree Clearing

August 16- October 15

Acoustic and mistnetting efforts conducted on Fort Drum (2007-2014) have documented the presence of both species of bats (females, males, adults and juveniles) utilizing the Cantonment and Training Area later than August 15 (ESI 2008b, USFS 2011, Fort Drum, unpublished data).

Historically, Indiana bats have been found present in Fort Drum's Cantonment Area until at least 12 October and northern long–eared bats have been found as late as 1 October. Sixty two fall roosts were located after August 15 within the Cantonment Area during surveys in 2007-2010 for Indiana bats, and 16 of these roosts were located between October 1 and October 12 (ESI 2008b, ESI 2011, USFS 2011). No roosts have been found for northern long-eared bats within the Cantonment Area; however, captures and acoustic detections suggest maternity use was likely. Seven years of radio tracking Indiana bats has documented approximately 93% (114/122) of all roosts, including all fall roosts, to be within the BCA or nearby (within 25 m). Given the conservation measures established for the BCA, known fall roost locations/areas would not be cleared for construction. Therefore, Indiana bats that use the BCA for fall roosting will not be adversely affected by construction activities. The BCA likely provides protection for northern long-eared bat roosting as well. Still, the possibility exists that land clearing activities that require immediate construction may occur in areas where northern long-eared bats are roosting outside of the BCA during late August through October, and bats could potentially be adversely affected if roosts are removed before all bats have returned to a hibernation site.

As part of the 2012-2014 BA, in order to facilitate small, unanticipated training-related projects, Fort Drum anticipated needing to clear trees in the Training Area during the time of year bats may be present on the property (August 16 - October 15) north and/or east of US Military Highway. While no need arose during 2012-2014, Fort Drum would like to retain the option to deal with these projects in a similar manner. It is expected that up to five projects per year may need to occur in this timeframe during 2015-2017. However, no more than 10 total forested ac (4 ha), (with no more than 5 forested ac (2 ha) contiguous in one area) will be cleared, and projects would still only occur north and/or east of US Military Highway to minimize potential impacts to bats.

Although there is acoustic documentation suggesting Indiana bats could be found north and east of US Military Highway, no Indiana bats have been caught beyond Training Area 8, and currently, all 122 (summer and fall) known Indiana bat roosts found from Fort Drum-initiated studies have either been located inside the BCA or nearby. After 7 years of mist-netting, only 4 Indiana bats have been discovered in the Training Area, and all those bats were all subsequently determined to be part of the known colony via radio tracking. Northern long-eared bats have been captured throughout the installation, however, population decreases has made it difficult to determine to what extent they are still present in the area. There are no known Indiana or northern long-eared roost sites within approximately 11 km of U.S. Military Highway, and no impacts to Indiana bats are anticipated from the proposed active season clearing.

However, little is known about northern long-eared roosting on Fort Drum, and there is potential for northern long-eared bats to roost in the project locations. No tree clearing will occur before 16 August to avoid impacts to non-volant pups, and all bats should be able to leave the project footprint, once disturbance starts. However, a small number of individual northern long-eared bats may be crushed if they cannot exit their roosts in time.

October 16 to April 15

It is assumed fall swarming activities are mostly completed on Fort Drum by October 15 of any given year primarily based on the drop in temperatures experienced in this area of northern New York. Over an 11 year period from 2000-2010, the average minimum temperature on Fort Drum from October 1 – October 15 was 44 ºF (6.7 ºC), with 18 out of a possible 165 days (or on average 1.6 out of every 15 days) during that period dropping to or below freezing at night. Conversely, during the same period in 2000-2010, from October 16 – October 31, the average minimum temperature was 38 ºF (3.3 ºC), with 54 of a possible 176 days (or on average 4.9 out of every 16 days) during the period dropping to or below freezing. Additionally, from November 1 – November 15, the average minimum temperature on Fort Drum was 33.8 ºF (1 ºC), with 80 of a possible 165 days (or on average 7.3 out of every 15 days) during the period dropping to or below freezing (Fort Drum, unpublished data). It would be unlikely that bats would still be active in the landscape after October 15, given the lack of insect abundance that would be present and the energy that it would require to adequately deal with these low temperatures. Data collection from fall studies on Fort Drum supports the idea that Indiana and northern long-eared bats are mostly gone from the installation by mid-October. The last known capture date of Indiana and northern long-eared bats on Fort Drum is September 12, and October 1, respectively (ESI 2008b, Fort Drum, unpublished data). During 2011-2013 Fort Drum performed acoustic surveys continuously from May through November 15 to determine temporal presence on the property. Although analysis is not complete, during 2011 and 2012, there has only been one suspected Indiana bat call collected after 15 October (on 10/16/2011), and 10 suspected northern long-eared bat calls collected after 15 October (1-10/16/2011; 8-10/17/2012; and 1-11/12/2012).

It is unlikely that clearing trees after October 15 will adversely impact fall/winter roosting Indiana or northern long-eared bats.

Dust/Noise

Although tree removal will primarily occur when bats are not present on the installation, other construction related effects (i.e. creation of dust and noise and the addition of exterior lighting as part of construction projects) that occur during the non-hibernation season have the potential to impact roosting bats.

The creation of airborne dust by construction equipment is likely to occur in all earth moving projects, the magnitude is dependent on many factors, including humidity, wind velocities and direction, and location of soil disturbances. Dust will be created during the spring, summer, and autumn when bats are roosting in adjacent forested habitats and possibly foraging throughout the project areas. Any potential effects from dust would be very local, short term, within and immediately adjacent to the project areas, and is not anticipated to result in any discernable effect to Indiana or northern long-eared bats.

Noise from equipment and personnel nearby may disturb roosting bats, which may also cause them to abandon a roost. Callahan (1993) noted that bats abandoned a primary roost when a

bulldozer cleared brush adjacent to the tree. However, Indiana and northern long-eared bats have also been noted to tolerate noise. For example, a primary maternity colony identified along I-81 in Jefferson County did not appear to be affected by noise from travelling vehicles (USFWS 2008). Additionally, Indiana bats have been documented roosting within approximately 300 meters of a busy state route adjacent to Fort Drum and immediately adjacent to housing areas on Fort Drum (Fort Drum, unpublished data). Several construction projects, particularly around the Guthrie Ambulatory Health Care Clinic, are adjacent to multiple known Indiana bat roosts in the BCA. Construction around the clinic has been on-going off and on for the last 5 years during the non-hibernation season, but has not seemingly appeared to affect known roosts or Indiana bat behavior. The last known capture and roosting locations have been within approximately 800 and 400 meters, respectively. While little information is known about northern long-eared bat roosting on Fort Drum, there is extensive habitat available for the species to roost in that is not adjacent to any ongoing construction project. A military installation in general has large amounts of noise and disturbance, and these bat species continue to occupy Fort Drum. We anticipate Indiana and northern long-eared bats to continue to acclimate to noise associated with operation and maintenance activities. Therefore, we do not anticipate any discernable direct effect to roosting Indiana or northern long-eared bats from noise from construction activities.

Foraging

Spring/Summer Tree Clearing

All tree clearing will occur after August 15 to avoid impacts to non-volant pups. No impacts to foraging Indiana or northern long-eared bats in the spring/summer period will occur from tree removal associated with construction.

Fall/Winter Tree Clearing

August 16- October 15

Most clearing will occur between October 16 – April 15 when the majority of bats are absent from Fort Drum. Although up to 10 forested ac (4 ha; with no more than 5 ac (2.02 ha) per project) in the Training Area may be removed between August 16 - October 15 this should not directly impact foraging Indiana or northern long-eared bats. Although this removal could immediately reduce potential available foraging habitat for these species, approximately 73,000 ac (29,542 ha) of forested habitat would still be present within the Main Impact Area, the surrounding Training Areas, and the Cantonment Area. Therefore, there will be no lack of forage base, and habitat will be available to bats at all times during and after construction. Additionally, Indiana or northern long-eared bats are likely to shift their foraging behavior slightly to natural habitats adjacent to construction projects and avoid these areas.

October 16- April 15

Beginning October 16, forested habitat may be permanently removed for construction. Myotid bats are mostly gone from the Fort Drum landscape by this time. The last known capture date of Indiana and northern long-eared bat use on Fort Drum is September 20, and October 1, respectively (ESI 2008b, Fort Drum, unpublished data). The last known suspected Indiana bat call collected after 15 October was on 10/16/2011. There have only been 10 suspected northern long-eared bat calls collected after 15 October (1-10/16/2011; 8-10/17/2012; and 1-11/12/2012). Even if a small number of bats are present, while trees are being cleared in the

fall, trees are not cut down at night during the time bats would be foraging. Therefore, removing forested habitat during the fall and winter is unlikely to directly impact any foraging Indiana bats.

Dust/Noise

Dust from construction activities is known to coat adjacent vegetation, thus possibly reducing insect production locally along a narrow band; this may result in decreased foraging opportunities adjacent to the construction area. Data are not available for the effect of dust on bats. However, Indiana bats were noted to forage adjacent to construction projects on Fort Drum in 2008 and 2009 (Figure 1.14). Given the small area of potential dust impacts per project and the large amounts of foraging habitat available to bats, we do anticipate that any decreased localized insect abundance will result in any discernable impacts to Indiana or northern long-eared bats.

Typically construction does not occur at night, therefore noise from the activity should not cause any effects to foraging Indiana or northern long-eared bats.

2.1.3.2 Indirect Effects

Construction may indirectly impact Indiana or northern long-eared bats via habitat fragmentation/degradation, loss of roosting and foraging habitat, loss or decline of prey availability, decline in water quality, increased risk of predation due to exterior lighting, and closer association to human activities.

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore, construction activities will have no indirect effects to hibernating Indiana or northern long-eared bats.

Roosting

Indiana and northern long-eared bats may be indirectly affected by habitat loss due to construction, regardless of time of year restrictions for vegetation clearing. If extensive suitable habitat was lost in the Cantonment Area, Indiana bats may have to travel farther in the spring, thus expending more energy, in order to locate suitable roost sites to raise young. However, there are few construction projects scheduled for the next three years that would reduce any appreciable potential roosting habitat in this area. Additionally, the vast majority (114/122, ~ 93%) of all known Indiana bat summer and fall roosts identified on Fort Drum are found within the BCA or nearby (within 25 m) and are protected from construction. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. No documented female roosts will be removed at any time for new construction if the roosts are still useable. Although construction activities in the Cantonment Area and around WSAAF during the next three years could remove undiscovered roosts, the likelihood is low.

Little is known on the roosting requirements or locations on Fort Drum for northern long-eared bats, however, summer sites that have a variety of suitable roosts are essential to the reproductive success of local populations. Once bats find these areas, they typically exhibit strong site fidelity, returning to the same traditional summer maternity colony location (and sometimes specific trees) annually to bear their young (Sasse and Pekins 1996, Foster and Kurta 1999, Jackson 2004, and Johnson et al. 2009, USFWS 2014).

Mistnet surveys during 2007-2011 documented numerous reproductive females and juvenile northern long-eared bats on the installation, indicating that multiple maternity colonies and suitable roosting habitat was likely present throughout the property. The only known roosts for northern long-eared bats on the property were documented in 2010 when a juvenile female was radio-tracked to three different roosts in Training Area 4 (Figure 1.12). Emergence counts ranged from 2-4 individuals over the 5 days it was tracked.

Since little is known about the locations of important roosting areas for northern long-eared bats, removal of woodlands or previous roost sites during winter hibernation may provide some measurable level of stress after these bats emerge in the spring if they must find new roost locations. It is not known how long or how far northern long-eared bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded during the winter. If they are required to search for new roosting habitat in the spring, it is assumed that additional stress is placed on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration and pregnancy. Research has suggested that big brown bats (*Eptesicus fuscus*) suffered more than a 50% decline in reproductive success when excluded from a maternity area (Brigham & Fenton 1986). Sparks et al. (2003) noted that an Indiana bat colony became more fragmented the year following the loss of a maternity roost, so they used more roosts and congregated less. It is reasonable that northern long-eared bats on Fort Drum could also suffer a decline in reproductive success since more energy could be expended locating new suitable roosts.

However, Johnson et al. (2009) found that northern long-eared bats readily exploited changes to forested areas when a reintroduction of fire created new snags and forest canopy gaps. Northern long-eared bats seem to exhibit more roost flexibility than Indiana bats, switching roosts fairly often and utilizing multiple species of both live and dead trees, as long as suitable roosting structure (i.e., cavities, cracks/crevices, or exfoliating bark) is present (Menzel et al. 2002, Owen et al. 2002, Carter and Feldhammer 2005, Johnson et al. 2009, and Timpone et al. 2010). Northern long-eared bats have been documented in multiple species of shade tolerant to intolerant tree species of multiple diameters, ranging from 3- 25 in (7.6-63 cm) dbh, indicating opportunistic roost selection across the landscape (Foster and Kurta 1999, Timpone et al. 2010, USFWS 2013a). It appears that as with Indiana bats, summer roost selection is primarily based on tree structure, amount of solar exposure, and ease of accessibility. However, solar exposure appears to be more important to Indiana bats, as they are typically found in taller trees with lower canopy cover than northern long-eared bats (Menzel et al. 2002, USFWS 2013a). Cooler temperatures due to higher canopy may not be an issue for northern long-eared bats, thus allowing it to be more opportunistic in roost selection.

Silvis et al (2014) suggested that northern long-eared bat colonies can withstand low levels of roost loss, and any impacts are likely manageable if large areas of available roosting habitat is still present on the landscape. Additionally, many roosts are dead and/or dying and thus ephemeral in nature. Bats are used to constantly finding new potential roosts to deal with this fact. Furthermore, northern long-eared bats are not limited to natural tree roosts (Timpone et al. 2010, USFWS 2013a). Maternity colonies have been found in constructed structures such as

buildings and barns (Barbour and Davis 1969, USFWS 2013a). It is possible if suitable natural roosts became limited in an area, but suitable foraging habitat was accessible and constructed roosts were nearby, that northern long-eared bats could still conceivably occupy an area and successfully rear young and maintain social structure.

The amount of potential roosting habitat that will be lost over the next three years is negligible in regards to overall roosting habitat available for northern long-eared bats. In the next three years, construction impacts are proposed on approximately 220 ac (89 ha; less than 1% of the available wooded habitat) of woodlands on Fort Drum. While these could remove unknown roost trees across the installation for this species, the likelihood is low. Forested land and snags of various sizes and species are common throughout Fort Drum. There is ample suitable habitat immediately adjacent to the proposed construction sites, and there are multiple smaller construction projects spread over the Cantonment and Training areas. Given the extensive declines in population sizes due to WNS, it is unlikely that habitat loss over the next three years would cause any discernible impacts to northern long-eared bats.

During 2009-2014, Fort Drum had anticipated that construction could occur on up to approximately 7685 ac (3110 ha) of which approximately 6544 ac (2648 ha) could impact natural habitat. Construction actually occurred on only approximately 929 ac (376 ha) of which 647 ac (262 ha) occurred within natural habitat. Subsequently, a very small percentage of available roosting and foraging habitat has been lost on Fort Drum. While up to 390 ac (158 ha) of natural habitat are expected to be cleared during the next three years, current conservation measures should be adequate to minimize any adverse impacts. Given the extensive declines in population sizes due to WNS, the protected core roosting area for Indiana bats, and the large amount of available roosting habitat for northern long-eared bat, the likelihood that either bats would be negatively (indirectly) impacted by tree removal for construction projects is unlikely.

Increased development may lead to more artificial lighting for parking lots, security, etc. Indiana and northern long-eared bats are nocturnal and more light may increase their risk of predation by birds of prey (Speakman 1995, Sparks et al. 2005). Projects on Fort Drum are being constructed throughout the Cantonment Area, including next to the BCA, an area with known roost and foraging locations for Indiana bats. These projects could increase the amount of light pollution within the area to the known Indiana bat maternity colony, and likely northern long-eared bats utilizing the area. However, Indiana bats have utilized this area for roosting during the highest amounts of construction that Fort Drum has experienced in the last decade. They continue to utilize these areas as demonstrated by the Indiana bat captured in 2014.

While it is possible that lighting levels from construction could impact these species and cause them to avoid an area, Fort Drum has been implementing light minimization measures since 2009 on newly constructed buildings, on buildings surrounding the BCA, and as old lights are replaced to help reduce these impacts. We will continue these efforts through the foreseeable future. Additionally, there is ample suitable roosting habitat within the Cantonment Area and Training Area adjacent to construction zones that both species of bats could readily exploit and avoid lit developed areas.

Foraging

Indiana and northern long-eared bats may be indirectly affected by habitat loss due to construction, particularly in the Cantonment Area where most of Fort Drum's development has been concentrated. Further urbanization in the Cantonment Area could reduce the amount of available foraging habitat, and construction activity could cause shifts in homeranges or foraging

behavior. As more habitat is permanently lost, the remaining natural habitat typically becomes more fragmented, leading to increased predation risks and all around avoidance. With the discovery of WNS, the amount of energy required by bats after hibernation for migration and reproduction as well as prior to hibernation, take on greater significance. Additional stress could weaken bats and make them more susceptible to the effects of WNS.

With increased development and more impervious surfaces, there could be higher levels of sediment and pollution run-off within the Cantonment Area (Klein 1979, Lenat & Crawford 1993). Urban environments have typically been shown to have less biotic diversity and abundance than agricultural or forested habitat types (Lenat & Crawford 1993). Thus an increase in urbanization may lead to declines in potential prey for Indiana or northern long-eared bats.

Increased development, may lead to more artificial lighting for parking lots, security, etc. Indiana and northern long-eared bats are nocturnal and more light may increase their risk of predation by birds of prey (Speakman 1995, Sparks et al. 2005). Projects on Fort Drum are being constructed throughout the Cantonment Area, including next to the BCA, an area with known roost and foraging locations for Indiana bats. These projects could increase the amount of light pollution within the area to the known Indiana bat maternity colony, and likely northern long-eared bats utilizing the area. Foraging bats, including newly volant young, in this area may become more susceptible to predation.

Urbanization and fragmentation are positively associated with the spread of invasive species (Yates et al. 2004). With a higher number of roads and closer proximity to human habitation, there is a greater risk for invasive species to spread into forests. Invasive shrub species, such as buckthorn (*Rhamnus* spp.) and honeysuckle, may alter forest structure and subsequently reduce the quality of habitat for bats. Recent research has shown that bat activity was lower in urban forests with a dense shrub understory than in more open forest fragments (Smith & Gehrt 2010). Dense forest structure may hinder bats' foraging and commuting capabilities, and it could potentially affect roost selection. Buckthorn and honeysuckle are currently found within the Cantonment Area and the BCA. Woodland interiors have isolated patches of these invasive shrubs, but the overall forest understory within the Cantonment Area is relatively open. At the present time, Indiana or northern long-eared bats are not expected to be impacted by invasive plant species on Fort Drum, however, this is a concern for the future, as dense invasive patches will hinder foraging and future recruitment of roost trees. In order to address this issue, the Fort Drum Fish and Wildlife Management Program will begin initiating appropriate measures to remove invasive species. This may be through mechanical or chemical means and will be addressed in later sections of this document.

Construction projects could impact wetlands. Wetlands and riparian corridors provide important foraging habitat for both species. However, Indiana bats are known to prefer these areas more so than northern long-eared bats that typically exploit more upland forest interiors for foraging. Loss of these habitats could result in short-term indirect effects on foraging behaviors, such as temporary reduction in insect prey.

While it is possible that construction activities could impact foraging for these species, it is likely any fragmentation, sedimentation issues, water quality, lighting impacts, etc have already occurred during 2005-2014, when the majority of construction was completed. Even during this time, only a very small percentage of the projected total habitat loss was realized. There are very few construction projects scheduled during 2015-2017 (or the foreseeable future) that will result in any appreciable loss of habitat or increase sedimentation or water quality issues. Even

if some fragmentation occurred within the Cantonment Area, un-fragmented foraging areas and habitat corridors are still protected within the 2,200 ac (890 ha) BCA. The BCA provides habitat connectivity throughout the Cantonment Area by following portions of West and Pleasant Creeks. Habitat connectivity by this conduit potentially minimizes the affect of habitat fragmentation by providing continuous natural areas for travel and foraging. Vegetation protection within the BCA along the main stream and wetland corridors within the Cantonment Area also aids in filtering water before it returns to streams and it provides natural habitat for insect production. Impacts to water quality will be reduced as vegetative buffers minimize sediment and pollution run-off into streams. Temporary effects on water quality could occur during construction, which could reduce local insect populations. Insects associated with aquatic habitats make up part of the diet of Indiana bats; therefore, impacts to water quality may result in temporary, short-term indirect effects on foraging Indiana bats during spring, summer, and autumn. Given the other water quality beneficial actions that are implemented for construction, it is expected that declines in water quality will not be of significant concern. In fact, water quality may actually improve during future development due to new storm water practices in place that did not exist during earlier construction. Additionally, both bat species are considered selective, opportunistic foragers and should be able to locate additional aquatic and/or terrestrial insects nearby since ample habitat will remain throughout the Cantonment Area and Training Area and within the BCA. All efforts will be made to minimize impacts to wetlands and water bodies, however impacted waters will be mitigated appropriately.

While it is possible that lighting levels from construction could impact these species and cause them to avoid an area, Fort Drum has been implementing light minimization measures since 2009 on newly constructed buildings, on buildings surrounding the BCA, and as old lights are replaced to help reduce these impacts. We will continue these efforts through the foreseeable future. Additionally, there is ample suitable foraging habitat within the Cantonment Area and Training Area adjacent to construction zones that both species of bats could readily exploit and avoid lit developed areas.

Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize these areas as long as suitable foraging areas remain available. Given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting and foraging area to exploit new areas any distance away. So while it is possible Indiana bats could be impacted by these actions, it is unlikely that construction activities would cause any discernible indirect effects to Indiana bats during foraging. Given the protection of the BCA, the limited loss of suitable habitat, the availability of ample water sources and wetlands, and the WNS induced reductions of Indiana bats on Fort Drum, there should be ample foraging area available for the remaining population of Indiana bats.

Although little information exists for foraging use of northern long-eared bats on Fort Drum, acoustic detections of northern long-eared bats (Figure 1.13) suggest that most of the installation is likely being used for foraging and travel. Northern long-eared bats seem to exhibit a diet preference similar to Indiana bats and other myotids. They are opportunistic insectivores that feed on a number of insect species, predominantly Lepidopterans (e.g., moths), Dipterans (e.g., flies and mosquitoes), Coleopterans (e.g., beetles), and Hymenopterans (e.g., wasps, sawflies) (Feldhammer et al. 2009, USFWS 2013a). Northern long-eared bats often catch prey through aerial hawking, however, they appear to utilize gleaning to as great or larger extent (Nagorsen and Brigham 1993, Brack and Whitaker 2001, Ratcliffe and Dawson 2003, Feldhamer *et al.* 2009). Insect consumption by northern long-eared bats varies by season, location, and reproductive condition (Tuttle et al. 2006, Feldhammer et al. 2009). Given that northern long-eared bats are gleaners and hawkers, there are suitable opportunities for both

foraging strategies throughout Fort Drum. Even in areas with limited understory, northern long-eared bats may still be able to pull insects from the boles of remaining trees as well as off the grasses, as they are known to forage only a short distance above the ground (Nagorsen and Brigham 1993). In contrast to Indiana bat that prefer to forage along water, streams or riparian areas, northern long-eared bats seem to exhibit or more defined preference for upland forested areas and ridgelines (Brack and Whitaker 2001, USFWS 2014).

Given the protection of the BCA, the limited loss of suitable foraging habitat, the vast amount of natural habitat available and the amount expected to remain in the Training Areas, and the WNS induced reductions of northern long-eared bats on Fort Drum, there should be ample foraging area available for the remaining population of northern long-eared bats.

2.1.4 Conclusion

Most construction activities in 2015-2017 may affect, but are not likely to adversely affect Indiana or northern long-eared bats.

Although there will be a cumulative, permanent loss of some potential foraging and roosting habitat within the Cantonment and Training Area, conservation measures are in place that will minimize potential direct and indirect impacts to these species. The BCA will continue to protect 2200 acres that encompasses the known maternity colony of Indiana bats, with all associated known primary maternity roosts, approximately 93% of all known roosts, and the majority of known foraging habitat on Fort Drum. As northern long-eared bats have historically been captured throughout the Cantonment Area, the BCA will provide protection for that species as well. Additionally, a tree cutting restriction between April 15–October 15 will protect the majority of Indiana and northern long-eared bats on the property outside of the BCA.

Normal construction activities in the Training Area are likely to have minimal effects on the known maternity colony of Indiana bats. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize these areas as long as suitable roosting and foraging areas remain available. Given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting and foraging area to exploit new areas.

Normal construction activities in the Training Area are also likely to have minimal effects on northern long-eared bats. Given the limited loss of suitable habitat, the vast amount of natural habitat available and the amount expected to remain in the Training Areas, and the WNS induced reductions of northern long-eared bats on Fort Drum, there should be ample roosting and foraging area available for the remaining population of northern long-eared bats.

However, given that immediate need construction for range projects may clear up to 10 acres/year during the time of year bats are present on Fort Drum, the potential exists that some bats may not be able to exit a roost quickly enough during tree clearing activities at the project location and will subsequently be crushed and killed.

2.2 Military Training

Fort Drum has been used as a military training site since 1908, and military training continues to be the primary purpose of the installation. Training is somewhat dictated by weather and climate; however, training occurs on Fort Drum year-round at all times of the day and night. The majority of training is conducted in the Training Area. The Training Area comprises approximately 97,737 ac (39,533 ha)—over 90% of the entire installation—and can be roughly divided into three components: maneuver area, ranges, and the Main Impact Area. Additional training activities also occur in the Local Training Areas (LTAs) within the Cantonment Area.

2.2.1 Military Training Activities

Fort Drum does not anticipate that there will be any significant change from the amount, type, and/or duration of military training that was previously analyzed in the 2009-2011 or 2012-2014 BAs and that will occur on Fort Drum over the next 3 years. While training type and/or intensity may vary annually as differing numbers of soldiers utilize the facilities, we do not anticipate any activity that would cause any additional or unaddressed impacts not previously covered under the previous BA for sustainment operations, engineering operations, air operations, water operations, field training operations, live munitions training, and demolition. After reviewing the project description and effects analysis for this section in the previous BAs, we feel that it is suitable in scope to include any potential impacts to northern long-eared bats. Additionally, we feel that the conservation measures are suitable for both species. Therefore, we affirm that the effects analysis is appropriate from the previous BAs, and the conservation measures are suitable to address both Indiana and northern long-eared bat. Please see Appendix A, Section 2.2 for a more detailed description and background of these activities as well as maps of the Training Area, LTAs, and range facilities.

Smoke/Obscurants

Smoke/obscurants are used to conceal military movements and help protect troops and equipment. They can be used throughout the Training Area as part of another military operation, or as part of an independent training scenario. Although they would be primarily used during the day, smoke/obscurants may be deployed at night.

For the purposes of this BA smoke/obscurants are classified into three categories: (1) smoke operations-operations that utilize fog oil to produce large amounts and sustained smoke; (2) colored smoke, smoke grenades, and smoke pots (aka pyrotechnics) -items that typically utilize terephthalic acid (TPA) to produce smoke; and (3) smoke munitions-those items that typically utilize white phosphorous (WP) for signaling, screening and incendiary purposes.

Category 1

Although Category 1 smoke operations have not been utilized on Fort Drum in the past 8+ years, this type of training could occur on approximately 30,000 ac (12,140 ha) of the Training Area. Smoke training would be rotated regularly among multiple areas to minimize impacts to any one area of the installation. A typical training exercise that uses smoke/obscurants and smoke generators would normally last from 1 to 4 hours. Smoke generators may generate smoke from fixed locations or during mobile operations covering up to several hundred acres or more. Smoke dispersion is variable depending on means of dispersing smoke (i.e., fixed or static) and weather conditions (i.e., wind). Refer to Appendix A for representative examples of fog oil dispersion from static and mobile smoke training areas in Pasquill atmospheric stability

category E (3D/International 1997). Fog oil (i.e., Standard Grade Fuel #2) would be generated the majority of the time, while graphite could also be generated about 25% of the training time (ENSR 2006). Graphite smoke is currently not approved for large scale use on the installation, therefore it will be excluded from analysis. If a graphite smoke operation is planned, further consultation with the USFWS will be required.

Potentially up to 200 days of training could be conducted using fog oil smoke each year. In those 200 days, approximately 270 generator-hours (number of hours each generator would operate annually x number of generators used on installation) would produce fog oil smoke per year. Approximately 22,120 gallons of fog oil per year could be used on Fort Drum to produce fog oil smoke.

Category 2

TPA is used in Category 2 floating or ground smoke pots, and in smoke grenades (aka pyrotechnics). TPA is ignited and burned to produce smoke. The primary combustion products of TPA are carbon monoxide, carbon dioxide, sulfur dioxide, benzene, toluene, and formaldehyde. It is used alone, or in combination with fog oil to fill in incomplete fog oil screens. Smoke grenades would typically generate 30 seconds to 2 minutes of smoke and smoke pots would typically generate up to 5 minutes of smoke. Refer to Appendix A for past usage of smoke/obscurants for concentrations of TPA at varying distances (Pasquil Category B).

Category 3

Category 3 WP is used for signaling, screening, and incendiary purposes, and is usually dispersed by explosive munitions. WP is used only on the Range facilities and in the Main Impact Area. WP flame produces a hot, dense white smoke composed of particles of phosphorus pentoxide, which are converted by moist air into phosphoric acid. WP ignites when it is exposed to air and may cause burns. Smoke typically lasts up to 15 min.

2.2.2 Conservation Measures for Military Training

1. a) No Category 1 smoke operation will be conducted within 1,000 m of the installation boundary, public roads, Cantonment Area, ammunition supply point or WSAAF in accordance with *Fort Drum Regulation 350-4 Range Regulation* and *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas (LTAs)*. This restriction currently protects all known Indiana roosts and the majority of the known maternity use area (i.e., roosting and core foraging area) from close proximity smoke exposure (Figure 2.4).

   b) In the Training Area, Category 1 smoke and obscurants must be used >100 m from any known Indiana or northern long-eared bat maternity roost areas between April 16 – October 15. This will help to protect Indiana and northern long-eared bat roosts into the future. The 100 m buffer serves to minimize the effects of smoke and obscurants by providing distance between the roost and the densest amount of the smoke/obscurants. Training missions will be aware of maternity areas via the NEPA process and will be directed to avoid these areas (Appendix S).

   c) Category 1 smoke operations must also be rotated among training areas to minimize impacts to any one area.

d) The use of Category 2 smoke (aka pyrotechnics) may be used in the Training Areas at any time within 1,000 m of the installation boundary, but will not be used within 100 m of any known Indiana or northern long-eared bat roost areas between April 16 - October 15.

e) Category 2 smoke may not be used within 100 m of any forested areas within the LTAs between April 15 - October 15, (with the exception of use at the mobile MOUTs as identified in f) below). Approval from Range Control and NEPA review is required prior to any use of Category 2 smoke, and these reviews will help ensure that Category 2 smoke use is in accordance with this conservation measure.

f) Category 2 smoke may be periodically used at four mobile MOUTs within the LTAs during April 15- October 15. All mobile MOUTs are currently outside of the BCA, but three are in relatively close proximity (approximately 25, 35, 140m, respectively). The fourth is approximately 4000m away (Figure 2.5). Only infrequent use of colored smoke is expected to be used in around the mobile MOUTs. The closest known roost tree to the Mobile MOUTs is approximately 270m away. With the exception of the Category 2 colored smoke used at the mobile MOUTS, no other smoke or obscurant may be used in the BCA. Currently, all known Indiana bat maternity roosts are found within the BCA or within a 1,000 m from the installation boundary.

2. In the Training Area and LTAs, the cutting of trees and tree removal is prohibited without approval by Fort Drum's Forest Management Program in accordance with current Environmental Guidelines. If approved, actions will be in accordance with all conservation measures in *Section 2.3 Forest Management*. In general, this is a relatively rare military training action. No female roosts, including roosts identified in the future, will be felled for training for the lifespan of the roost. No tree felling will occur in the BCA for training purposes.

3. In the LTAs, vehicular traffic is restricted to open grassy areas within easy access of the road in accordance with *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas*. Vehicles are not permitted to cross streams, ditches, wetlands, or dense vegetation in order to reach grassy areas without prior NEPA review, thus minimizing impacts to natural habitats.

4. In the LTAs, POL operations are prohibited in accordance with *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas.* This helps to minimize the risk of accidental water/ground contamination.

5. Fort Drum will abide by the Fort Drum Integrated Wildland Fire Management Plan (Fort Drum 2013) which includes fire danger ratings, unless under special circumstances that are approved by the commander. Military activities that may spark fires will not be conducted during moderate to high danger ratings in order to prevent unintentional wildfires. Although unintentional fires will still ignite and burn, this conservation measure will help protect Indiana and northern long-eared bats from smoke exposure and from roost destruction. Burn bans are most likely implemented during the summer months when reproductive bats are present on Fort Drum.

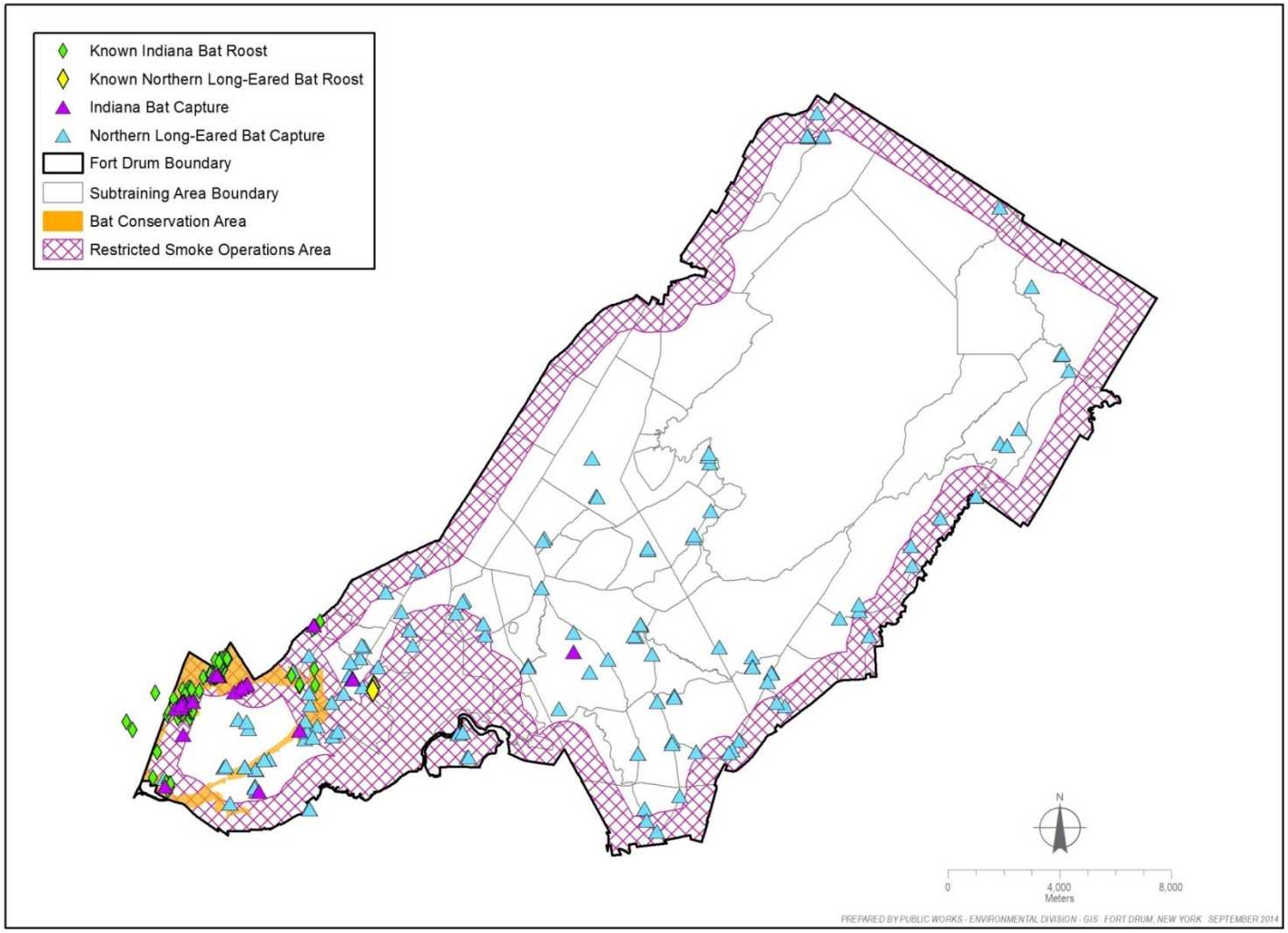

Figure 2.4. Buffer (1000 m) around Fort Drum Military Installation where Category 1 smoke operations are prohibited per Fort Drum Regulation 350-4.

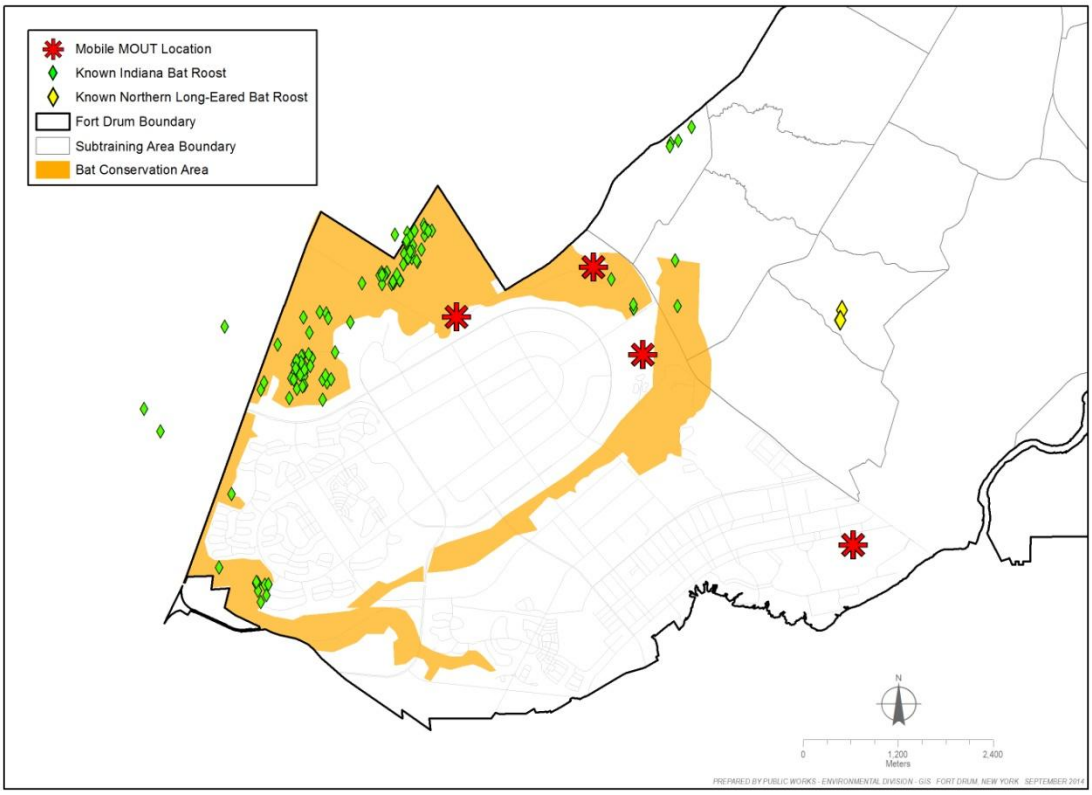

Figure 2.5. Mobile MOUT locations in the LTAs within the Fort Drum Cantonment Area.

2.2.3 Effects to Indiana and Northern Long-eared Bats

Please see Appendix A, Section 2.2.3 for the effects analysis for all operations and activities, except smoke/obscurants. After reviewing the project description and effects analysis for this section in the previous BAs, Fort Drum has determined they are suitable in scope to include any potential impacts to both Indiana and northern long-eared bats. We have also determined that the conservation measures are suitable for both species. Subsequently, we have reaffirmed that those activities (except smoke/obscurants) may affect, but are not likely to adversely affect Indiana bats, as they should have no different impacts in the next three years as they had in the previous six covered under the 2009-2011 and 2012-2014 BAs. Additionally, we have determined those activities may also affect, but are not likely to adversely affect northern long-eared bats for the same reasons identified through the previous analysis.

Please see below for the effects analysis of smoke and obscurants on Indiana and northern long-eared bats on Fort Drum. Updated information on the distribution of Indiana bats will be presented from the past three years from studies conducted on Fort Drum, and information will be presented for northern long-eared bats for this new analysis.

2.2.3.1 Direct Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore smoke and obscurant use will have no direct effects to hibernating Indiana or northern long-eared bats.

Roosting

Smoke and obscurants have the potential to infiltrate bat roost trees (Guelta & Balbach 2006), which may expose Indiana or northern long-eared bats (volant and non-volant) to potentially harmful chemicals via ingestion, inhalation, or through the skin. The smoke itself may force bats to abandon the roost, and smoke exposure can have harmful effects.

For the purposes of this BA smoke/obscurants will be classified into three categories: 1) smoke operations-operations that utilize fog oil to produce large amount and sustained smoke; 2) colored smoke, smoke grenades, and smoke pots (aka pyrotechnics) -items that typically utilize terephthalic acid (TPA) to produce smoke; and 3) smoke munitions-those items that typically utilize white phosphorous for signaling, screening and incendiary purposes.

<u>Category 1</u>

Fog Oil

There are limited data on the toxicity of fog oil to wildlife, however, smoke operations utilizing fog oil have the potential to impact roosting Indiana and northern long-eared bats.

No Category 1 Smoke Operations have been completed on Fort Drum in the past 6+ years; however, the possibility exists that they could. Fog oil is expected to have low oral toxicity to Indiana bats, as it is not likely that bats would be ingesting large amounts of oil. Up to 40% of fog oil evaporates in the air within an hour, and up to 90% of fog oil has evaporated within a week and it does not seem to readily adhere to soil, vegetation or wildlife (Driver et al. 1993 and ENSR 1999). Therefore it would not be expected that Indiana bats in the known roosting area would have large amounts of fog oil directly deposited on them to groom off and ingest. Additionally, given current restrictions, the closest a smoke operation could occur to a known Indiana bat roost is approximately 550 m away in Training Area 3A. However, the likelihood that a smoke operation would occur there is extremely low. If unfavorable wind and weather conditions develop, smoke produced in that area (and up through Training Area 5B; Figure 2.4) would travel into the restricted smoke operation area (i.e., WSAAF, the Cantonment Area, or public highways). It is more likely that smoke operations would occur in areas far enough away from these restricted areas as to not cause conflicts. Thus the closest smoke operation to the known roost areas would more likely be greater than 7,000 m away. If a smoke operation occurs near an unknown roost out in the Training Area, the possibility exists that bats could be exposed to fog oil. Once again, oil could be directly deposited on them of which they could groom off and ingest. It is likely that Indiana bats would temporarily abandon the roost if they were being exposed to large amounts of fog oil. However, the vast majority (114/122, ~ 93%) of all known Indiana bat summer and fall roosts identified on Fort Drum are found within the BCA or nearby (within 25 m) and are protected from Category 1 smoke operations. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosts remain available. Indiana

bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. It is unlikely that the maternity colony is making the same types of exploratory movements into the Training Area as it had in previous years. Due to the impacts of WNS, the potential number of Indiana bats that would present on Fort Drum is a fraction of what it once was. Additionally, over 7 years, there have been only a small number of roosts (6 known roosts of which 2 are maternity roosts) found in the Training Area, and there have been no new roosts found in the past three years. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. Given all these considerations, the likelihood that there will be direct adverse effects to Indiana bats from fog oil is discountable.

Little is known on the roosting requirements or locations on Fort Drum for northern long-eared bats, however, mist-net surveys during 2007-2011 documented numerous reproductive females and juvenile northern long-eared bats on the installation, indicating that multiple maternity colonies and suitable roosting habitat was likely present throughout the property. The only known roosts for northern long-eared bats on the property were documented in 2010 when a juvenile female was radio-tracked to three different roosts in Training Area 4 (Figure 1.12).

Since little is known about the locations of roosting areas for northern long-eared bats, the use of Category 1 smoke operations could impact this species. If adult bats are within an area that a smoke operation is being performed, oil could be directly deposited on them of which they could groom off and ingest. In most cases, however, it is assumed that they would leave the area if they were irritated by the activity. Additionally, given that up to 40% of fog oil evaporates in the air within an hour, and up to 90% of fog oil has evaporated within a week and it does not seem to readily adhere to soil, vegetation or wildlife (Driver et al. 1993 and ENSR 1999), it would not be expected that there would be a large amount of oil for them to contend with. However, non-volant young could potentially be exposed to significant oil amounts. If pups were left behind, there could be the potential for acute toxicity and it may cause slight to moderate irritation after a single exposure to the skin (National Research Council 1997).

Seemingly the highest likelihood for exposure and adverse effects are through inhalation. The concentration of fog oil aerosols and rates of deposition are dynamic and highly dependent on local conditions such as the length of the military training exercise, distance from the source (i.e., generator), wind currents, temperature, humidity, local terrain, and precipitation (Smith et al. 2005). Some studies (Driver et al. 1993) have attempted to model the complex atmospheric conditions that affect fog oil smoke dispersion and deposition and determine estimates of fog oil concentrations in the atmosphere that could result from a typical smoke operation (Table 2.5). Other studies (Liljegren et al. 1988 and Policastro et al. 1989) have attempted to develop more realistic estimates of fog oil by sampling concentrations of fog oil in the field at various distances from the source (Table 2.5).

Studies examining exposure concentrations from smoke produced from various oils typically found in smoke operations are quite variable. These studies (summarized in Getz et al. 1996) have examined acute and chronic exposure concentrations to other small mammals (e.g., mice, guinea pigs, hamsters, and rats). Although limited in some scope and applicability, these studies do provide some continuity in exposure risk. They determined that only minimal adverse affects (no deaths) were observed in small mammals at exposures up to 200 mg/m^3.

Additionally, Driver et al. (2002) exposed red-winged blackbirds (*Agelaius phoeniceus*) to concentrations up to 400 mg/m^3 that resulted in no adverse affects to the birds. Although not directly analogous, it provides additional continuity in exposure risk to small wildlife species in general.

Bringing together the two types of studies (i.e., potential exposure concentrations at a given distance and the potential unsafe concentrations) there is still some inherent variability based on all the unknowns that accompany this type of analysis, however, even at the closest distance (25 m) during a typical fog oil operation, the concentration in the air is not expected to exceed 200 mg/m^3 (Table 2.5). As the distance increases to 100 m, the average concentrations decrease, suggesting that at this distance, fog oil is unlikely to reach high enough concentrations to result in the death of any roosting northern long-eared bats. In order to protect bats in known roosts from high concentrations of fog oil, a conservation measure will limit smoke operations within 100 m of known maternity roost trees during the time of year Indiana or northern long-eared bats are present on the installation (April 16 - October 15). By minimizing the concentration of smoke around maternity roosts at this time, it will reduce the risk of bats from abandoning roosts and/or non-volant pups. At this distance, bats (including pups) are unlikely to suffer acute effects. The likelihood that adult northern long-eared bats would initially be within 100 m of the smoke operation is low, and the likelihood that they would remain and be exposed to high concentrations of smoke is low. Therefore, fog oil operations is unlikely to directly adversely affect adult northern long-eared bats.

While it is unlikely that the use of fog oil would have any direct adverse affects to adult northern long-eared bats, young non-volant pups could still be adversely impacted by this operation. If the operation occurs near an unknown roost (within 100 m) with non-volant young, the possibility exists that fog oil could have acute affects on pups by causing the young to suffocate, causing the adult to abandon the roost (resulting in death of the young), or causing the young to fall out of the roost and die. Given that this possibility cannot be discounted, fog oil smoke operations are likely to adversely affect non-volant northern long-eared bats.

Although no adverse affects are anticipated to Indiana bats within the known roosts within the Cantonment Area and Training Areas 3 and 4, and future roosts will be protected for both species as they are found, northern long-eared bats in unknown roosts may be adversely affected by fog oil. Repeated exposure within 100 m over the course of a smoke operation training mission would most likely cause adult northern long-eared bats to abandon the roost, potentially leaving non-volant pups. These pups could be killed by the fog oil exposure, or by the adults abandoning the roost, or by falling from the roost. Therefore, fog oil operations may affect and will adversely affect a small number of northern long-eared bats in unknown roosts in the Training Area.

Category 2

Overall data on the toxicity of colored smoke and TPA is limited, however there is concern about effects regarding dermal and respiratory-tract sensitization (National Research Council 1999b). From the available information, it appears colored smoke has varying effects to small mammals dependent on color type and formulation (National Research Council 1999b). Some symptoms that were observed in mammals after exposure included reduced growth rate in juveniles, respiratory afflictions, and sensitization of skin. Because the potential toxicity of colored smokes is unknown, it was recommended by the Subcommittee on Military Smokes and Obscurants (National Research Council 1999b) that soldiers only use colored smoke for signaling and

marking and not obscuring. This measure was to minimize exposing soldiers to colored smoke before appropriate acute toxicity and inhalation studies could be conducted. By using colored smoke as a signaling/marking tool, it will not be broadly dispersed, which also minimizes the risk of smoke exposure to bats.

Category 2 colored smoke is utilized around known Indiana bat areas on Fort Drum, however, the closest deployment of smoke has been approximately 250 m away from a historic roost. An Ecological Risk Assessment prepared by 3D/International found that Indiana bats within 30 m of deployed colored smoke grenades may inhale unsafe quantities of colored smoke, which could result in acute effects (3D/International 1997). Within the known maternity roosting area, it is unlikely that this would ever happen. Category 2 smoke typically lasts only approximately 2 min in duration, making the likelihood of exposure extremely limited. In the BCA (where 93% of known roosts are located), smoke will not be used within 100 m of forested areas during the non-hibernation season, but could be used at the four MOUTs (Figure 2.5) between April 16 - October 15.

However, the nearest mobile MOUTs (Figure 2.5) is approximately 250m from known maternity roosts. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. It is unlikely that the maternity colony is making the same types of exploratory movements into the Training Area as it had in previous years. Due to the impacts of WNS, the potential number of Indiana bats that could present on Fort Drum is a fraction of what it once was. Additionally, over 7 years, there have been only a small number of roosts (6 known roosts of which 2 are maternity roosts) found in the Training Area, and there have been no new roosts found in the past three years. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. The likelihood that the known colony would utilize roosts within 100 m of the MOUT sites where smoke could deployed during the time bats are present in low. Given all these considerations, the likelihood that there will be direct adverse effects to Indiana bats from Category 2 smoke is discountable.

Although no adverse affects are anticipated to bats within the known roosts within the Cantonment Area and Training Areas 3 and 4, northern long-eared bats in unknown roosts may be adversely affected by Category 2 smoke. Since little is known about the locations of roosting areas for northern long-eared bats, the use of Category 2 smoke could impact this species. Category 2 Smoke is deployed throughout the Training Areas, and amounts typically vary spatially and temporally across the installation on any given year (Figures 2.6, 2.7, and 2.8). If adult bats are within an area that Category 2 smoke is being performed, it is assumed that they would leave the area if they were irritated by the activity. However, Category 2 smoke typically lasts only approximately 2 min in duration, making the likelihood of exposure extremely limited unless multiple grenades are utilized all at one time in the same location. Therefore, it would not be expected that adults would be directly adversely affected from Category 2 smoke. However, if enough Category 2 smoke was deployed at once (e.g., 10 grenades at 2 mins each), the adults may become irritated enough to abandon a roost, potentially leaving non-volant young behind. If colored smoke or other smoke grenades are deployed within 30 m of the unknown roosts, young bats may inhale unsafe quantities of smoke, which could result in acute effects (3D/International 1997). Although exact locations where smoke is deployed within the Training Areas are typically not known, it is apparent that some Training Areas are utilized for Category 2 smoke training activities more than others (Figures 2.6 and 2.7).

Table 2.5 Estimates of fog oil concentrations resulting from typical smoke screening operations at given distances from the source.

Study	Distance from source (meters)	Average (mg/m3)	Range (mg/m3)	Maximum (mg/m3)
Lilegren et al. 1988[A]	100	7.7		
	200	3.6		
	400	2.6		
Policastro et al. 1989[A]	25	116		
	100	8		
	200	3		
Driver et al. 1993[B] (30 min release)	100	64.3	27-120	
	200	51.8	7-140	
	400	27.9	1.8-93	
	1000	6.9	1.6-24	
Driver et al. 1993[B] (300 min release)	100	64		
	200	29		
	400	8.7		
	1000	1.6		
Getz et al. 1996 (120 min release)	100	64	25-102	
	200	56	8-105	
	500	46	1.3-90	
	1000	13	0.8-25	
US Army 1997[B]	100	3.8		13.5
	250	3.5		12.7
	500	2.7		11.2
	1,000	1.2		4.3
Department of the Army 1997 (30 min release)	100		0-14	
	1000		0.1-1	

A- Results from studies conducted in the field
B- Results from modeling

Table is summarized from Getz et al.1996 and ENSR 1999.

While it is unlikely that the use of Category 2 smoke would have any direct adverse affects to adult northern long-eared bats, young non-volant pups could still be adversely impacted by this operation. If the operation occurs near an unknown roost (within 30 m) with non-volant young, the possibility exists that smoke could have acute affects on pups by causing the young to suffocate, causing the adult to abandon the roost (resulting in death of the young), or causing the young to fall out of the roost and die. Given that this possibility cannot be discounted, Category 2 smoke operations are likely to adversely affect non-volant northern long-eared bats.

Although no adverse affects are anticipated to Indiana bats within the known roosts within the Cantonment Area and Training Areas 3 and 4, and future roosts will be protected for both species as they are found, northern long-eared bats in unknown roosts may be adversely affected by Category 2 smoke use. Repeated exposure within 30 m over the course of a training mission would most likely cause adult northern long-eared bats to abandon the roost,

potentially leaving non-volant pups. These pups could be killed by the smoke exposure, or by the adults abandoning the roost, or by falling from the roost. Therefore, Category 2 operations may affect and will adversely affect a small number of northern long-eared bats in unknown roosts.

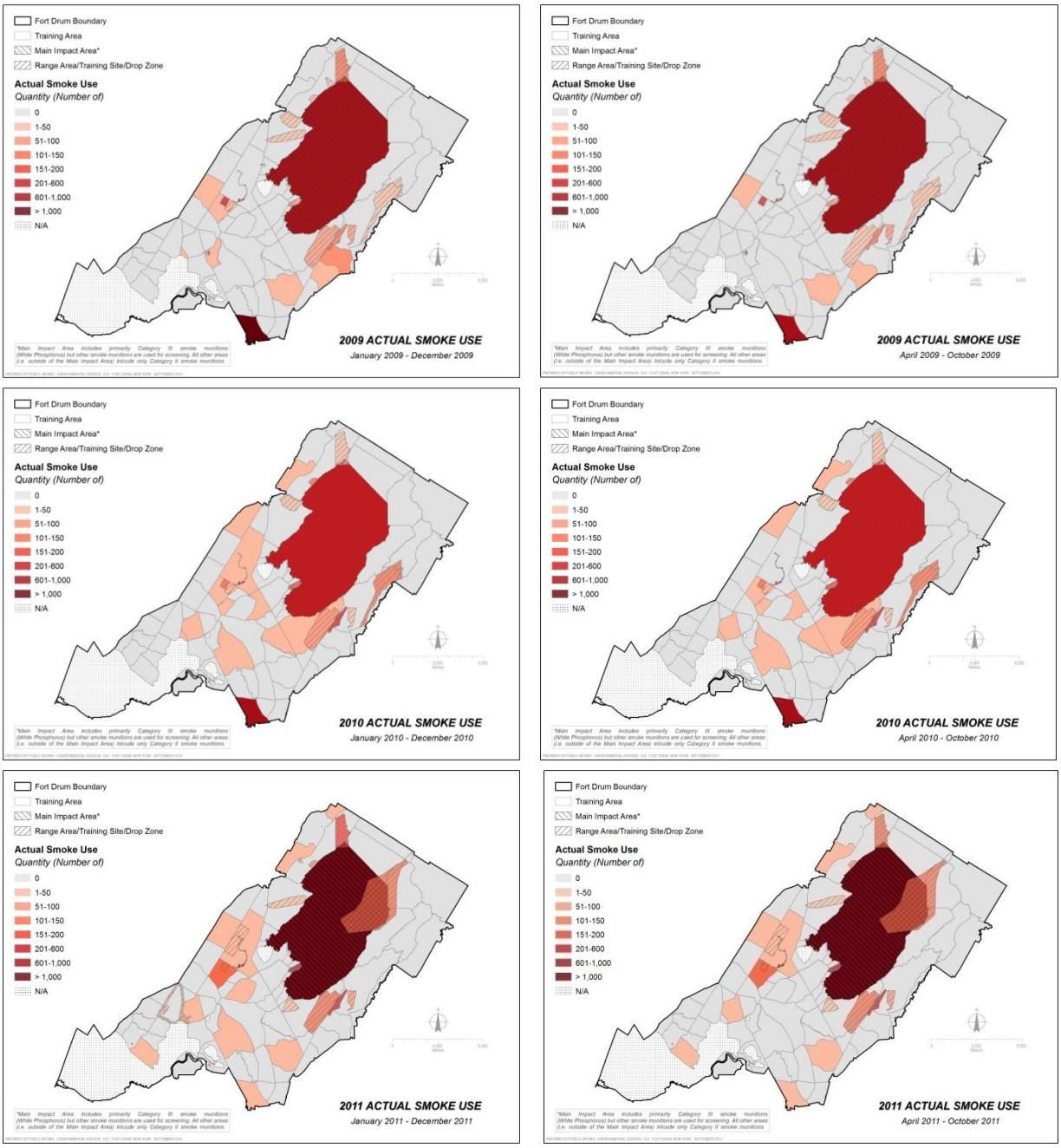

Figure 2.6. Smoke use on Fort Drum Military Installation during 2009-2011 (left side-full year, right side-April-October). The Main Impact Area includes primarily Category 3 smoke (white phosphorus), but other smoke munitions may be used for screening as well. All other areas (i.e., outside of the Main Impact Area) include only Category 2 smoke.

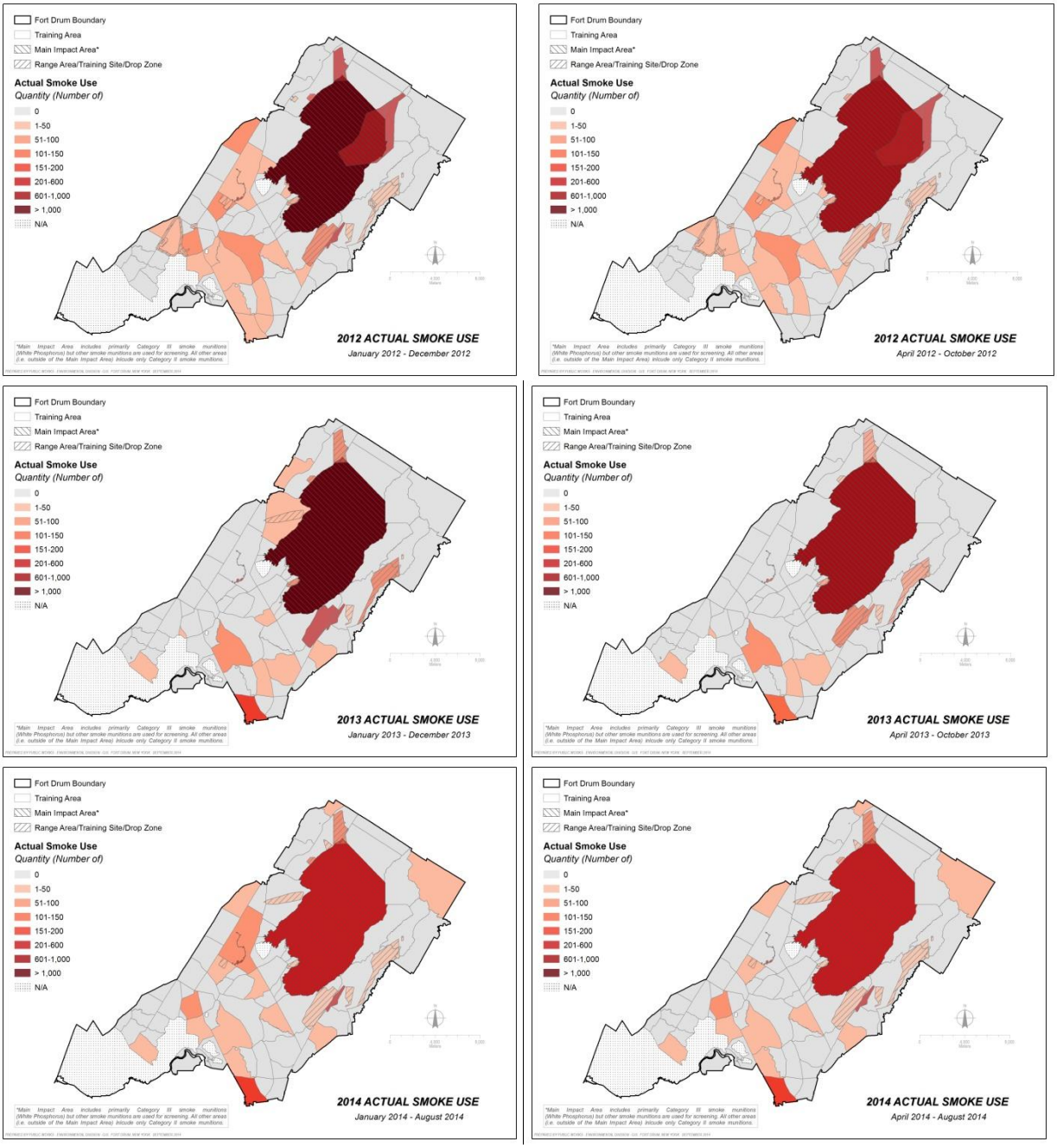

Figure 2.7. Smoke use on Fort Drum Military Installation during 2012-2014 (left side-full year, right side-April-October). The Main Impact Area includes primarily Category 3 smoke (white phosphorus), but other smoke munitions may be used for screening as well. All other areas (i.e., outside of the Main Impact Area) include only Category 2 smoke.

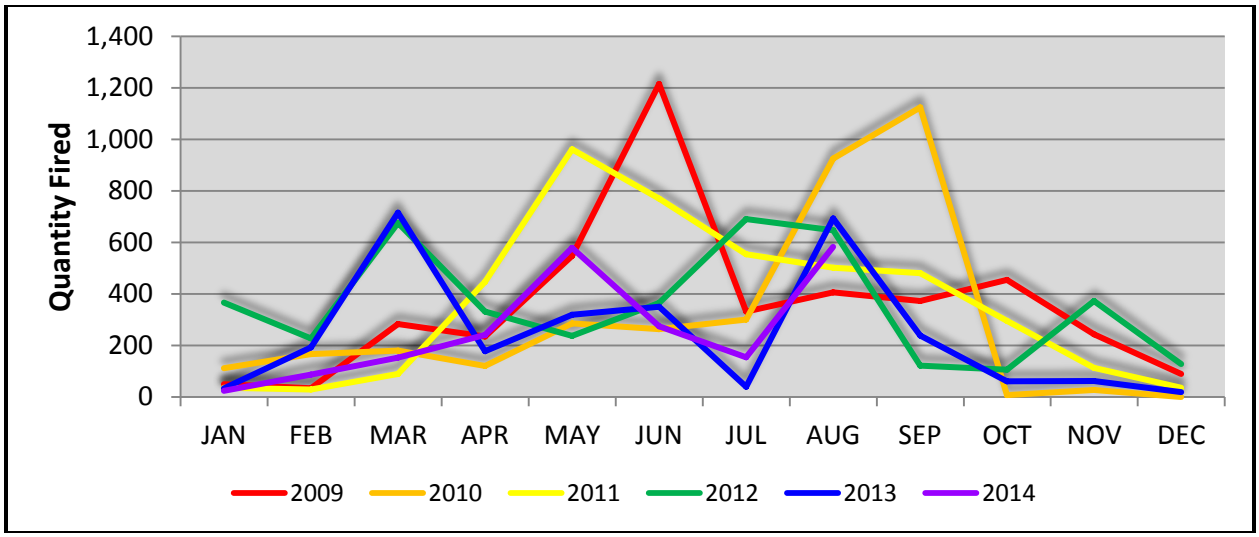

Figure 2.8. Combined Smoke use on Fort Drum Military Installation during 2009-2014.

Category 3

WP can result in severe burns if it comes into contact with the skin; and it is highly toxic if ingested (National Research Council1999a). Inhalation studies of WP on mice, rats, and goats showed signs of respiratory tract irritation (National Research Council 1999a). Rats exposed to WP for 15 min/day, 5 days/week for 13 weeks at 1,740 mg/m^3 (H_3PO_4) resulted in the death of 32% of the rats within 6 weeks. LC_{50} for rats exposed to WP for 1 hour ranged from 1,300 to 4,800 mg/m^3. Reproduction and development of rats showed that higher WP exposure (1,742 mg/m^3 for 15 min/day, 5 days/week for 10 weeks) were associated with lower natal weights and had severe effects on survivability (National Research Council 1999a). Indiana or northern long-eared bats exposed to WP smoke will likely show signs of respiratory irritation, and if pregnant bats are exposed to WP in high concentrations over a period of time, it could result in negative effects to offspring including lower fecundity and/or natal weights.

Currently, the use of WP is restricted to the Main Impact Area. Although wind could disperse WP out of those areas, there are currently no known Indiana bat roosts located within approximately 14 km (~8.5 mi) of Main Impact Area. Indiana bats have used the same general areas within the BCA, Cantonment Area and TAs 3 and 4 on Fort Drum since 2007, and it is expected that they will continue to utilize these areas as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. It is unlikely that the maternity colony is making the same types of exploratory movements into the Training Area as it had in previous years. Due to the impacts of WNS, the potential number of Indiana bats that could present on Fort Drum is a fraction of what it once was. Additionally, over 7 years, there have been only a small number of roosts (6 known roosts of which 2 are maternity roosts) found in the Training Area, and there have been no new roosts found in the past three years. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. Because of the distance between the known roosting area of the colony and WP training sites and the infrequent and variable deployment of WP, the effects of WP on Indiana bats roosting within the known maternity colony are discountable.

Although no adverse affects are anticipated to Indiana bats, little is known about the locations of roosting areas for northern long-eared bats. Therefore, the possibility exists that WP smoke may drift from the Main Impact Area and impact unknown roosts for northern long-eared bats. If adult bats are within an area that Category 3 smoke is being utilized, it is assumed that they would leave the area if they were irritated by the activity; however, even short duration of exposure can result in severe skin irritation and burns. WP smoke can last for minutes at a time depending on how it is deployed, making the likelihood of exposure potentially higher. If adults become irritated enough to abandon a roost, non-volant young could be left behind. If the WP smoke is close enough to the roost, they could be adversely impacted resulting in acute effects.

If WP smoke is deployed within close proximity of unknown roosts, adult and young bats may inhale unsafe quantities of smoke leading to death. They may also be adversely affected by WP smoke via ingestion or dermal absorption. The possibility exists that smoke could have acute affects on pups by causing the young to suffocate, causing the adult to abandon the roost (resulting in death of the young), or causing the young to fall out of the roost and die. Although WP smoke is deployed only a handful of times only in the Main Impact Area, the likelihood of exposure and death is low, but not discountable. Given that this possibility cannot be discounted, Category 3 smoke operations are likely to adversely affect a small number of northern long-eared bats.

Foraging

Category 1

Fog Oil

Most known foraging for Indiana bats typically occurs within the Cantonment Area, the BCA, and off post. Given current restrictions, the closest a smoke operation would occur to these known foraging areas is approximately 2000 m away in Training Area 3A. However, the likelihood that a smoke operation would occur there is extremely low. If unfavorable wind and weather conditions develop, smoke produced in that area (and up through Training Area 5B; Figure 2.4) would travel into the restricted smoke operation area (i.e., WSAAF, the Cantonment Area, or public highways). It is more likely that smoke operations would occur in areas far enough away from these restricted areas as to not cause conflicts. Thus the closest smoke operation to the known foraging areas would more likely be greater than 8,000 m away. Additionally, up to 40% of fog oil evaporates in the air within an hour, and up to 90% of fog oil has evaporated within a week and it does not seem to readily adhere to soil, vegetation or wildlife (Driver et al. 1993 and ENSR 1999). Therefore it would not be expected that Indiana bats in the known foraging area would have large amounts of fog oil deposited on their skin and fur to be groomed off and ingested, nor is it expected that they would inhale unsafe quantities as they foraged. Additionally, it is not expected that smoke operations would be conducted during hours that Indiana bats will be active for foraging, however, if they were conducted when Indiana bats are foraging, bats have the ability to avoid the smoke and chemicals and can forage in adjacent areas, thus limiting exposure. Given all these considerations, the likelihood that there will be adverse effects to Indiana bats in the known foraging area from fog oil ingestion or inhalation is discountable.

Little is known about foraging locations on Fort Drum for northern long-eared bats, however, mist-net surveys and acoustic documentation during 2007-2011, and 2007-2014, respectively documented numerous northern long-eared bats throughout the installation, indicating that suitable foraging habitat was likely present throughout the property. Since little is known about

the locations of foraging areas for northern long-eared bats, the use of Category 1 smoke operations could impact this species. If northern long-eared bats are foraging in the Training Area and encounter a smoke operation, or it is being conducted during the time when bats are actively foraging, there is a possibility that bats could be exposed to potentially harmful chemicals. If adult bats are within an area that a smoke operation is being performed, oil could be directly deposited on them of which they could groom off and ingest. In most cases, however, it is assumed that they would leave the area if they were irritated by the activity. Bats have the ability to avoid the smoke and chemicals and can forage in adjacent areas, thus limiting exposure. There are large areas of suitable foraging habitat to exploit if necessary. Smoke operations have not been conducted on Fort Drum in the last 8 years, and it is currently not anticipated that there would be a large number to contend with in the next 3 years. Subsequently, any area a smoke operation would be conducted in would only be potentially unsuitable and avoided for a short duration while the activity was occurring. Additionally, given that up to 40% of fog oil evaporates in the air within an hour, and up to 90% of fog oil has evaporated within a week and it does not seem to readily adhere to soil, vegetation or wildlife (Driver et al. 1993 and ENSR 1999), it would not be expected that there would be a large amount of oil for them to contend with. As such, smoke and obscurants may affect, but should not adversely affect northern long-eared bats as they forage in unknown areas in the Training Area.

Category 2

Most known Indiana bat foraging typically occurs within the Cantonment Area, the BCA, and off post. Although Category 2 colored smoke has been utilized around this known Indiana bat foraging areas in the past, it has been infrequent, and is typically utilized at the Mobile MOUT locations. An Ecological Risk Assessment prepared by 3D/International found that Indiana bats within 30 m of deployed colored smoke grenades may inhale unsafe quantities of colored smoke, which could result in acute effects (3D/International 1997). In the BCA smoke will not be used within 100 m of forested areas during the non-hibernation season, but could be used at the four mobile MOUTs (Figure 2.5) between April 16 - October 15. However, Category 2 smoke typically lasts only approximately 2 minutes in duration, making the likelihood of exposure extremely limited even if bats were flying near the MOUTs. However, if enough Category 2 smoke was deployed at once (e.g., 10 grenades at 2 mins each), the adults may become irritated enough to avoid the area temporarily until the training mission is completed. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize these areas as long as suitable foraging areas remain available. Due to the impacts of WNS, the potential number of Indiana bats that could present on Fort Drum is a fraction of what it once was. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. The likelihood that the known colony would forage within 100 m of the MOUT sites where smoke could deployed during the time training missions are deploying smoke is low. Given all these considerations, the likelihood that there will be direct adverse effects to Indiana bats from Category 2 smoke is discountable.

Little is known about foraging locations on Fort Drum for northern long-eared bats, however, mist-net surveys and acoustic documentation during 2007-2011, and 2007-2014, respectively, documented numerous northern long-eared bats throughout the installation, indicating that suitable foraging habitat was likely present throughout the property. Because of the same rational for Indiana bats above, it is unlikely northern long-eared bats would encounter enough Category 2 smoke within the Cantonment Area to lead to direct adverse effects.

If northern long-eared bats are foraging in the Training Area and encounter Category 2 smoke, there is a possibility that bats could be exposed to potentially harmful chemicals. However, smoke grenades and colored smoke typically last only a couple of minutes in duration, and bats have the ability to avoid these areas, thus limiting exposure. Unless large numbers of grenades were deployed continuously for a lengthy period of time (which is not how this smoke is typically used), there should be no direct adverse affects. Additionally, Category 2 Smoke is deployed throughout the Training Areas, and amounts typically vary spatially and temporally across the installation on any given year (Figures 2.6, 2.7, and 2.8). Although exact locations where smoke is deployed within the Training Areas are typically not known, it is apparent that some Training Areas are utilized for Category 2 smoke training activities more than others (Figures 2.6 and 2.7). Thus bats will have many areas on any given year where smoke is not utilized at all. Subsequently, there are large areas of suitable foraging habitat that bats could easily travel into without much additional energy expenditure or risk of predation. As such, Category 2 smoke may affect but should not adversely affect northern long-eared bats as they forage in the Training Area.

Category 3

Currently, the use of WP is restricted to the Main Impact Area. Although wind could disperse WP out of those areas, there are currently no known foraging locations within approximately 14 km (~8.5 mi) of the Main Impact Area for Indiana bat.
Indiana bats have used the same general areas within the BCA, Cantonment Area and TAs 3 and 4 on Fort Drum since 2007, and it is expected that they will continue to utilize these areas as long as suitable foraging areas remain available. It is unlikely that the maternity colony is making the same types of exploratory movements into the Training Area as it had in previous years. Due to the impacts of WNS, the potential number of Indiana bats that could present on Fort Drum is a fraction of what it once was. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. Because of the distance between the known core area of the colony and WP training sites and the infrequent and variable deployment of WP, the effects of WP on Indiana bats foraging are discountable.

Although no adverse affects are anticipated to Indiana bats within the Cantonment Area and Training Areas 3 and 4, little is known about the locations of foraging areas for northern long-eared bats. Therefore, the possibility exists that WP smoke may drift from the Main Impact Area and impact unknown foraging for northern long-eared bats, thus exposing them to potentially harmful chemicals. However, bats have the ability to avoid these areas, thus limiting exposure. There are large areas of suitable foraging habitat throughout the Training Area. As such, Category 3 smoke may affect but should not adversely affect northern long-eared bats as they forage in the Training Area.

2.2.3.2. Indirect Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore military training activities currently have no indirect effects to hibernating Indiana bats.

Roosting

Category 1

Fog Oil

Smoke operations are not expected to have any indirect effects to Indiana bats within the known core roosting area. Based on current restrictions, the closest a smoke operation could occur to a known Indiana bat roost is approximately 550 m away in Training Area 3A. However, the likelihood that a smoke operation would occur in that location is extremely low. If unfavorable wind and weather conditions develop, smoke produced in that area (and up through Training Area 5B; Figure 2.4) would travel into the restricted smoke operation area (i.e., WSAAF, the Cantonment Area, or public highways). It is more likely that smoke operations would occur in areas far enough away from these restricted areas as to not cause conflicts. Thus the closest smoke operation to the known roost areas would more likely be greater than 7,000 m away. Additionally, up to 40% of fog oil residue evaporates within an hour, and up to 90% within one week (Driver et al. 1993). Therefore it would not be expected that Indiana bats in the known roosting area would have large amounts of fog oil directly deposited on them to groom off and ingest, potentially leading to latent health issues. The likelihood that fog oil would have any indirect chronic affect on bats in the known roosting area is unlikely. At these distances, the likelihood that fog oil would reach sufficient levels to result in sublethal effects for individuals in the known colony and affect reproduction, natal weights, etc. is unlikely.

If a smoke operation occurs near an unknown roost out in Training Area 3 or 4, the possibility exists that bats could be exposed to fog oil. Oil could be directly deposited on them of which they could groom off and ingest. It is likely that Indiana bats would temporarily abandon the roost if they were being exposed to large amounts of fog oil. However, the vast majority (114/122, ~ 93%) of all known Indiana bat summer and fall roosts identified on Fort Drum are found within the BCA (or within 25 m of it) and are protected from Category 1 smoke operations. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. It is unlikely that the maternity colony is making the same types of exploratory movements into the Training Area as it had in previous years. Due to the impacts of WNS, the potential number of Indiana bats that would present on Fort Drum is a fraction of what it once was. Additionally, over 7 years, there have been only a small number of roosts (6 known roosts of which 2 are maternity roosts) found in the Training Area, and there have been no new roosts found there in the past three years. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. Given all these considerations, the likelihood that there will be indirect adverse effects to Indiana bats from smoke operations is discountable.

Little is known on the roosting requirements or locations on Fort Drum for northern long-eared bats, however, mist-net surveys during 2007-2011 documented numerous reproductive females and juvenile northern long-eared bats on the installation, indicating that multiple maternity colonies and suitable roosting habitat was likely present throughout the property. The only known roosts for northern long-eared bats on the property were documented in 2010 when a juvenile female was radio-tracked to three different roosts in Training Area 4 (Figure 1.12).

Since little is known about the locations of roosting areas for northern long-eared bats, the use of Category 1 smoke operations could impact this species. If adult bats are within an area that a smoke operation is being performed, oil could be directly deposited on them of which they could groom off and ingest. Given that up to 40% of fog oil evaporates in the air within an hour, and up to 90% of fog oil has evaporated within a week and it does not seem to readily adhere to soil, vegetation or wildlife (Driver et al. 1993 and ENSR 1999), it would not be expected that there would be a large amount of oil for them to contend with. However, prolonged and repeated exposure of fog oil may cause adverse pulmonary and systemic affects which could reduce fitness and fecundity of bats (3D/International 1997). The rotation of smoke/obscurants between areas will help minimize the bats' risk to chronic exposure, however, repeated exposure over the course of a smoke operation training mission would most likely cause adult northern long-eared bats to abandon roosts, and potentially abandon (permanently or temporarily) non-volant pups. If the adult female were to permanently abandon the pup, her reproductive effort would be eliminated for that year. Additionally, even if pups are abandoned only temporarily, this reduced parental care could ultimately lead to increased predation risk for the pup, increased potential for chronic toxicity, and it may cause slight to moderate irritation after a single exposure to the skin (National Research Council 1997). Either way, exposure to fog oil could ultimately result in reduced fitness for the adult female and added energy expenditure to avoid smoke. Therefore, fog oil operations may affect and will likely adversely affect a small number of northern long-eared bats in the Training Area.

Category 2

Category 2 colored smoke is utilized around known Indiana bat areas on Fort Drum, however, the closest deployment of smoke has been approximately 250 m away from a historic roost. An Ecological Risk Assessment prepared by 3D/International found that Indiana bats within 30 m of deployed colored smoke grenades may inhale unsafe quantities of colored smoke, which could result in acute effects (3D/International 1997). Within the known maternity roosting area, it is unlikely that this would ever happen. Category 2 smoke typically lasts only approximately 2 min in duration, making the likelihood of exposure extremely limited. In the BCA (where 93% of known roosts are located), smoke will not be used within 100 m of forested areas during the non-hibernation season, but could be used at the four mobile MOUTs (Figure 2.5) between April 16 - October 15. However, the nearest mobile MOUT is still approximately 250m from known maternity roosts. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. It is unlikely that the maternity colony is making the same types of exploratory movements into the Training Area as it had in previous years. Due to the impacts of WNS, the potential number of Indiana bats that could present on Fort Drum is a fraction of what it once was. Additionally, over 7 years, there have been only a small number of roosts (6 known roosts of which 2 are maternity roosts) found in the Training Area, and there have been no new roosts found in the past three years. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. The likelihood that the known colony would utilize roosts within 100 m of the MOUT sites where smoke could deployed during the time bats are present in low. Given all these considerations, the likelihood that there will be any indirect adverse effects to Indiana bats from Category 2 smoke is discountable.

Although no adverse affects are anticipated to bats within the known roosts within the Cantonment Area and Training Areas 3 and 4, northern long-eared bats in unknown roosts may be adversely affected by Category 2 smoke. Since little is known about the locations of roosting areas for northern long-eared bats, the use of Category 2 smoke could impact this species. Category 2 Smoke is deployed throughout the Training Areas, and amounts typically vary spatially and temporally across the installation on any given year (Figures 2.6, 2.7, and 2.8). Although exact locations where smoke is deployed within the Training Areas are typically not known, it is apparent that some Training Areas are utilized for Category 2 smoke training activities than others (Figures 2.6 and 2.7). If adult bats are within an area that Category 2 smoke is being performed, it is assumed that they would leave the area if they were irritated by the activity, potentially leading to additional stress. However, Category 2 smoke typically lasts only approximately 2 min in duration, making the likelihood of exposure extremely limited. However, if enough Category 2 smoke was deployed at once (e.g., 10 grenades at 2 mins each), the adults may become irritated enough to abandon a roost, potentially leaving non-volant young behind.

If the adult female were to permanently abandon the pup, her reproductive effort would be eliminated for that year. Additionally, even if pups are abandoned only temporarily, this reduced parental care could ultimately lead to increased predation risk for the pup, reduced nutritional intake, or increased exposure to unsafe quantities of smoke leading to latent chronic effects. Either way, exposure to Category 2 smoke could ultimately result in reduced fitness for the adult female and added energy expenditure to avoid smoke. Given that this possibility cannot be discounted, Category 2 smoke may affect and will likely adversely affect a small number of northern long-eared bats in the Training Area.

Category 3

Currently, the use of WP is restricted to the Main Impact Area. Although wind could disperse WP out of those areas, there are currently no known Indiana bat roosts located within approximately 14 km (~8.5 mi) of Main Impact Area. Indiana bats have used the same general areas within the BCA, Cantonment Area and TAs 3 and 4 on Fort Drum since 2007, and it is expected that they will continue to utilize these areas as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. It is unlikely that the maternity colony is making the same types of exploratory movements into the Training Area as it had in previous years. Due to the impacts of WNS, the potential number of Indiana bats that could present on Fort Drum is a fraction of what it once was. Additionally, over 7 years, there have been only a small number of roosts (6 known roosts of which 2 are maternity roosts) found in the Training Area, and there have been no new roosts found in the past three years. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. Because of the distance between the known roosting area of the colony and WP training sites and the infrequent and variable deployment of WP, the effects of WP on Indiana bats roosting within the known maternity colony are discountable.

Although no adverse affects are anticipated to Indiana bats within the Cantonment Area and Training Areas 3 and 4, little is known about the locations of roosting areas for northern long-eared bats. Therefore, the possibility exists that WP smoke may drift from the Main Impact Area and impact unknown roosts for northern long-eared bats. If adult bats are within an area that Category 3 smoke is being utilized, it is assumed that they would leave the area if they were

irritated by the activity; however, even short duration of exposure can result in severe skin irritation and burns. WP smoke can last for minutes at a time depending on how it is deployed, making the likelihood of exposure potentially higher. If adults become irritated enough to abandon a roost, non-volant young could be left behind. Exposure within close proximity may cause adult northern long-eared bats to abandon the roosts, and potentially abandon (permanently or temporarily) non-volant pups. If the adult female were to permanently abandon the pup, her reproductive effort would be eliminated for that year. Additionally, even if pups are abandoned only temporarily, this reduced parental care could ultimately lead to increased predation risk for the pup or reduced nutritional intake. Either way, exposure to Category 3 smoke could ultimately result in reduced fitness for the adult female and added energy expenditure to avoid smoke. Additionally, if WP smoke is deployed within close proximity of unknown roosts, adult and young bats may inhale unsafe quantities of smoke leading to chronic latent health impacts. They may also be adversely affected by WP smoke via ingestion or dermal absorption. Although WP smoke is deployed only a handful of times only in the Main Impact Area, the likelihood of exposure is low, but not discountable. Given that this possibility cannot be discounted, Category 3 smoke operations are likely to adversely affect a small number of northern long-eared bats.

Foraging

Indiana bats are likely to remain within the same documented historical foraging locations in the Cantonment Area, BCA, and off post. Indiana bats have used the same general core area on Fort Drum since 2007, and it is expected that they will continue to utilize this area as long as suitable foraging sites remain available. Due to the impacts of WNS, the potential number of Indiana bats that would present on Fort Drum is a fraction of what it once was. The likelihood that the remaining population of Indiana bats would use anything outside of the historic roosting and foraging area to any measurable degree is low. No Category 1 or 3 smoke operation would be allowed in close proximity to this area based on current restrictions, and given current conservation measures, Category 2 smoke is unlikely to cause any discernible changes in foraging behavior. Therefore, no category of smoke/obscurant use is anticipated to have any indirect effects on the behavior of foraging Indiana bats.

While little is known about foraging locations on Fort Drum for northern long-eared bats, however, it is unlikely that smoke/obscurants will affect foraging behavior to any measurable degree. Category 1 smoke has not been used in 8+ years, and even if it were, northern long-eared bats could avoid the area for a short duration and forage in the extensive available habitat surrounding the smoke operation. Given current conservation measures, the allowable locations for deployment, and the short duration, Category 2 smoke is unlikely to cause any discernible changes in foraging behavior. Category 2 Smoke is deployed throughout the Training Areas, and amounts typically vary spatially and temporally across the installation on any given year (Figures 2.6, 2.7, and 2.8). There are extensive areas for foraging bats to utilize while avoiding any potential smoke use. Additionally, there are extensive areas that never or rarely utilized for smoke use on Fort Drum (Figures 2.6 and 2.7). Thus bats should be able to easily travel into without much additional energy expenditure or risk of predation.

Finally, Category 3 smoke is deployed rarely and is only deployed within the Main Impact Area. There are extensive areas of available habitat that northern long-eared bats should easily be able to exploit while temporarily avoiding these areas. Therefore, no category of smoke/obscurant use is anticipated to have any indirect effects on the behavior of foraging northern long-eared bats.

It is unlikely that any smoke/obscurant will have any adverse affect on the prey base for Indiana or northern long-eared bats, or cause bioaccumulation of harmful toxins leading to chronic, latent health impacts. 3/D International (1996) evaluated the environmental fate of fog oil at Fort McClellan, Alabama. No increase of fog oil hydrocarbons were noted in soil, surface water, sediment, tree bark, leaf, insect, or bat tissue samples taken from fog oil exposure sites. Fog oil is biodegradable and will remain in soil only a few days, depending on soil fauna present and time of year fog oil is released (3D/International 1997, ENSR 1999). Harmful quantities of fog oil are not expected to accumulate in the environment at Fort Drum because fog oil is readily biodegraded by aerobic microorganisms and undergoes chemical degradation in aqueous environments. Prey are unlikely to be affected by exposure to fog oil through aquatic pathways.

Prey species are unlikely to be affected by exposure to terephthalic acid (TPA) in smoke through aquatic pathways (3D/International 1997). The primary combustion products of TPA are carbon monoxide, carbon dioxide, sulfur dioxide, benzene, toluene, and formaldehyde. These compounds are released in a gaseous state. It is very unlikely they will accumulate in soil or water because they volatilize and are transformed by photochemical reactions. If small quantities enter groundwater or surface water systems, they will be biodegraded by microorganisms. The particulate matter of TPA may be removed from the atmosphere by dry or wet deposition. TPA is relatively insoluble in water, but certain combustion products may enter water systems. Quantities that enter water systems (i.e., groundwater or surface water) will be rapidly degraded through photochemical reactions or through biodegradation as TPA is an organic acid that many terrestrial and aquatic microorganisms can utilize in metabolic processes.

As a part of sustainment operations, POL Spill Prevention plans and procedures are in place and implemented to minimize the impact of POL spills when they occur. POL spills may contaminate water bodies, thus impacting aquatic species, including insect prey of bats. However, because of these procedures, insect prey should not be adversely affected by POL activities. Thus Indiana and northern long-eared bats will not be adversely affected.

2.2.4 Conclusion

Considering their presence on Fort Drum and the length of time Fort Drum has been an active military installation, it is assumed that Indiana and northern long-eared bats have adapted to military noise, training, and subsequent activities. However, given the impacts of WNS, small adverse impacts to the species that previously could have been benign, can now exacerbate the disease impacts. No type of military training is expected to do that, except the use of smoke/obscurants. While the use of smoke and obscurants is not anticipated to adversely affect Indiana or northern long-eared bats within the Indiana bat core roosting and foraging area, northern long-bats using unknown areas in the Training Area for roosting and foraging are likely to experience direct adverse affects primarily through smoke inhalation and indirect effects through reduced fitness.

2.3 Forest Management

2.3.1 Forest Management Activities

Please see Appendix A, Section 2.3 for more detailed information about the Forest Management Program on Fort Drum

In the 2012-2014 BA, it was anticipated that up to 2295 ac (929 ha) of forests would be harvested (Table 2.6). However, actual harvest during that time was approximately 666 ac (270 ha; Table 2.6 and Figure 2.9). The Forest Management Program anticipates cutting up to 1,500 ac (607 ha) during the next 3 years, however for the purposes of this BA, that number will be buffered by an additional 1000 ac (405 ha) to deal with unforeseen military training support or other contingencies (Table 2.7). This acreage will also include all potential standing firewood sales that remove trees greater than 3" DBH.

In addition to timber harvesting, up to 300 ac (121 ha) within forested stands will be managed between August 16 - April 15 to support tree regeneration and control unwanted vegetation. This site preparation will remove vegetation less than 3 in DBH to prepare the area for seed drop and subsequent regeneration. Site preparation within a stand will typically occur via mechanical or herbicide application the year following a timber harvest. If site preparation is required at other sites, then further consultation will be needed.

Forest management on Fort Drum utilizes both even-aged (e.g., clearcutting or shelterwood) and uneven-aged (e.g., thinning or group selection) harvest methods to manage forests to support military training, timber production/health, and wildlife habitat creation/enhancement. Environmental conditions (e.g., wet or rocky soils), training requirements, and stand characteristics dictate harvest methods. It is anticipated that approximately one quarter (up to 625 ac) of the harvesting would be completed for military training, one half (up to 1250 ac) completed for uneven-aged management, and one quarter (up to 625 ac) completed for even-aged management. It is also anticipated that even aged management will occur on sites no larger than 50 ac in one contiguous location, and no more than 208 ac per year.

Table 2.6. Approximate acreage of forests that were proposed for harvest between January 2012 -December 2014, and acreages actually harvested on Fort Drum Military Installation.

Forest Type	Proposed Acres	Actual Acres
Conifer	200	81
Deciduous	313	332
Mixed	782	253
Unknown	1000	0
Total	2295	666

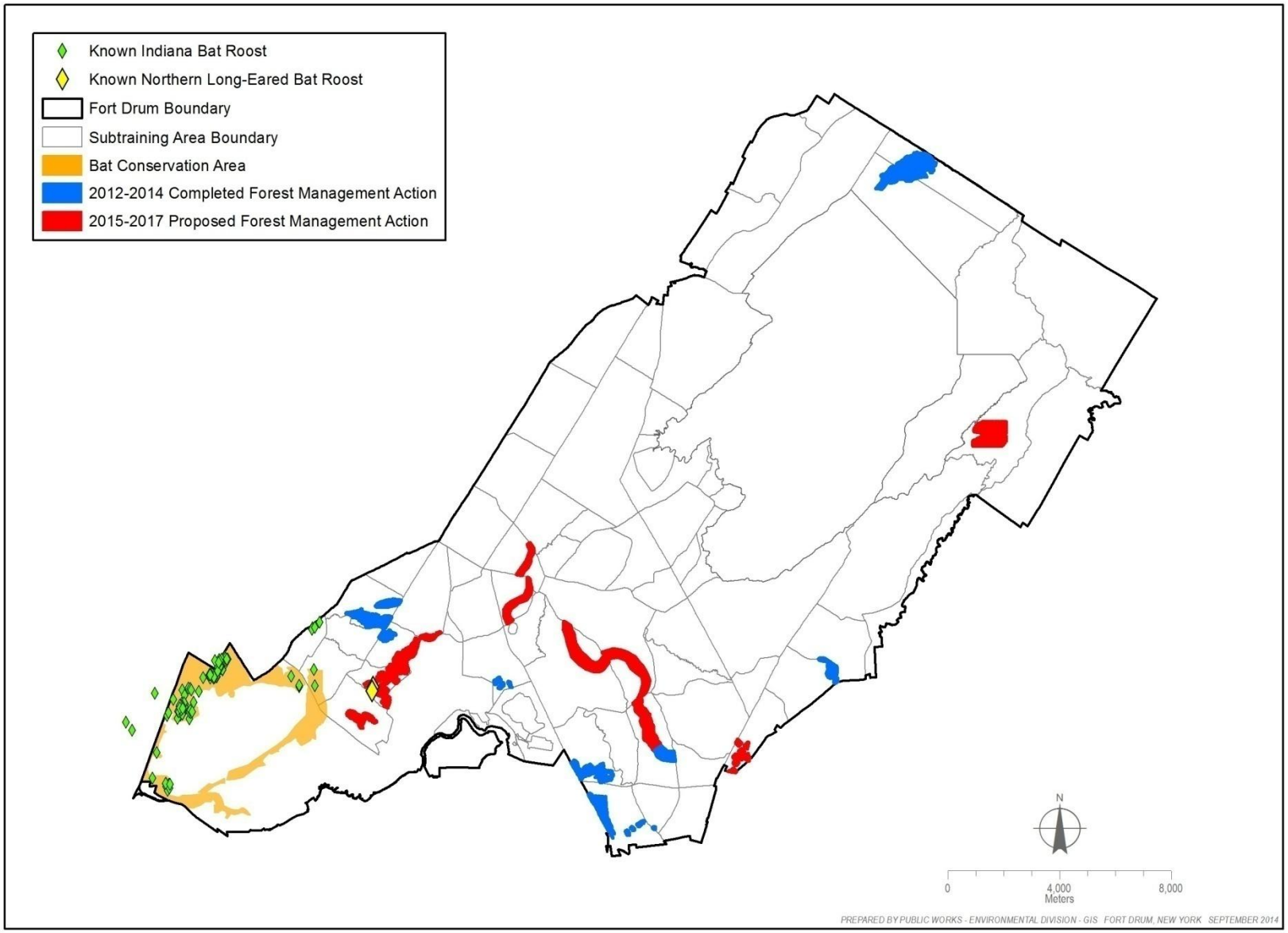

Figure 2.9. Completed and proposed Forest Management actions on Fort Drum Military Installation, 2012-2014 and 2015-2017, respectively.

Table 2.7. Approximate acreage of forests (buffered by 1000 ac) that are proposed to be harvested for all Forest Management actions between January 2015 -December 2017 on Fort Drum Military Installation.

Forest Type	Proposed Acres
Conifer	400
Deciduous	300
Mixed	800
Buffer	1000
Total	2500

Most timber harvesting is expected to occur within the Training Area, and no treatments are currently scheduled within the Cantonment Area. Other actions (e.g., tree clearing for construction or maintenance activities) may require the removal of trees in the Cantonment Area, however, these are not sustainable forestry actions and are addressed in *Section 2.1 Construction* and *Section 2.4 Vegetation Management*, respectively.

Military Training Support

Military training support actions in the next three years are expected to be similar to those covered under the 2009-2011 and 2012-2014 BAs, with the exception of the creation of military maneuver corridors as described below. The creation of maneuver corridors has been addressed in previous analysis, however, the overall scope and execution (both how they are created and the scale of application) of these corridors has changed enough where we feel it warrants additional discussion. Additionally, we have readdressed much of the overall analysis for forest management for military training support to incorporate new information regarding Indiana bats and potential impacts to the northern long-eared bats into this document. Please see below for the new effects analysis and conservation measures. Please also see Appendix A, Section 2.3 for more information regarding forest management for military training support.

Timber Production/Forest Health

Actions carried out to support timber production/forest health in the next three years are expected to be similar to those covered under the 2009-2011and 2012-2014 BAs. However, we have readdressed much of the overall analysis for forest management for timber production/forest health to incorporate new information regarding Indiana bats and potential impacts to the newly listed northern long-eared bats into this document. Please see below for the new effects analysis and conservation measures. Please also see Appendix A, Section 2.3 for more information regarding forest for timber production/forest health.

Wildlife Habitat Management

Actions carried out to support wildlife habitat management in the next three years are expected to be similar to those covered under the 2009-2011 and 2012-2014 BAs. While amount, type, and/or duration may vary annually, we do not anticipate any activity that would cause any additional or unaddressed impacts not previously covered under the 2009-2011and 2012-2014 BAs. We do not feel that any additional effects analysis is needed for northern long-eared bats, as the majority of impacts under this activity would be covered under the impacts from timber production/forest health. Therefore, we affirm that the effects analysis and conservation

measures from the previous BAs remain appropriate. Please see Appendix A, Section 2.3 for more information. Please see Appendix A, Section 2.3 for more information regarding forest management for wildlife habitat management.

Water Quality Protection

Fort Drum's Forest Management Program and Wetlands Management Program developed several measures to minimize the risks of impacting water quality from soil disturbance, which also provide a benefit to a variety of wildlife.

1. If possible, new log landings will be constructed at least 200 ft (61 m) from water bodies and wetlands.

2. Spill kits and oil absorbent mats will be present on log landings in case of fuel, lubricant or hydraulic fluid spills or leaks.

3. If necessary, soil will be stabilized by seeding and mulching at the end of the operation.

4. Where possible, skid trail grade will be maintained at less than 15%. Where higher grade is unavoidable, the grade will be broken, drainage structures will be installed, and soil stabilization practices will be used where needed to minimize runoff and erosion.

5. Debarking and other damage to residual trees will be minimized wherever possible.

6. Stream crossings will be used only when absolutely necessary. If necessary, bridges will be deployed to minimize damage to bed and bank of the stream.

7. Streams will be crossed by the most direct route.

8. Ruts will be filled in, and water bars and erosion barriers will be installed to prevent or minimize erosion and sedimentation from roads, skid trails and log landings.

9. Erosion control measures will be inspected within 24 hours after a rain event and checked once per week. Erosion controls will be maintained or removed as needed.

10. No machinery will be operated in streams protected under Article 15 of the New York State Environmental Conservation Law without first obtaining a permit from NYSDEC.

Firewood Cutting

The Forest Management Program issues approximately 300 firewood permits annually, which results in the removal of about 400 cords of firewood per year. Firewood is collected only from trees that are dead AND downed (i.e., laying on the ground) throughout the installation. The Main Impact Area, active construction sites, and environmental or archeological sensitive areas marked with "Off-Limits by Order of the Commander" signs or Seibert Stakes are off-limits to firewood collection. Firewood may be removed via tractors, four wheelers, bobcats, or other mechanical means. Historically, soil disturbances and water quality concerns from these activities have been minimal.

2.3.2 Conservation Measures for Forest Management Activities

To minimize the risks of impacting Indiana and northern long-eared bats during forest management activities, while benefiting bat habitat, several conservation measures have been implemented.

1. Bat Conservation Area. Approximately 2,200 ac (890 ha) have been set aside for Indiana bats. This BCA will also provide the same protections to northern long-eared bats. Timber harvests will not occur within the BCA until an appropriate management plan is developed and the plan has been consulted on. If timber harvesting is needed within the BCA, then consultation with the USFWS is needed.

2. Roost Tree Protection. No female roost trees, including roosts identified in the future, will be felled for the lifespan of the roost, unless there is a human health and safety concern. This includes roost trees in and outside of the BCA.

3. Roost Tree Avoidance. Clearcutting and overstory roost tree removal will not occur within 0.75 mi (1.2 km) of known maternity roost trees located outside the BCA without further consultation with the USFWS. An exception to this requirement is a small number of small forested patches (ranging from ~5-15 acres) that will be clearcut at or near WSAAF to meet federal regulations for air safety. The majority of these patches contain trees primarily less than 4 in dbh. They will be maintained as forest, but will be clearcut approximately every 5-10 years to keep them at the appropriate height. Selective thinning will not occur within one tree height of the known roost tree to minimize the risk of accidentally felling a known maternity roost during the non-hibernation season. Tree height is based on the average height of the stand (~80 ft (24 m)) surrounding the roost tree. For selective thinning harvests within 0.75 mi of a known maternity roost, all snags will be retained, and live trees > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will be favored as residuals. Further consultation will be needed with the USFWS for timber harvests that do not follow this conservation measure.

4. Firewood Cutting Restriction. The known primary Indiana bat roosting areas (those areas behind Guthrie Clinic and Cool Road) have been made off limits to firewood cutting during April 16- October 15. Although firewood harvest only removes trees that are lying on the ground, this restriction will help avoid any associated noise or disturbance in the roosting areas from chainsaws and/or tractors used in the harvest of the wood.

5. Time of Year Restriction. A time of year restriction for clearing trees (> 3 in DBH) has been established to protect roosting bats during non-hibernation seasons. Felling of trees must take place between October 16 - April 15 while most Indiana or northern long-eared bats are at the hibernaculum.

6. Snag Retention. Indiana and northern long-eared bats typically select areas that have high snag densities for establishment of maternity colonies, so snag retention will benefit roosting bats by providing areas to rear young. All snags will be left in silvicultural treatments unless there is a safety concern for the contractor or the military units training in the stands (e.g., maneuver corridors), or unless the treatment is a salvage harvest or clearcut. Snags should be distributed and retained throughout the landscape.

7. No cutting of trees will occur within or along the bed or bank of streams protected under Article 15 of the New York State Environmental Conservation Law unless required to meet specific management goals and only after obtaining a permit from NYSDEC.

8. A minimum of 70 sq ft of residual basal area, all snags, and all live trees > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will be retained around all perennial streams and open waterbodies (2 ac or greater in size) on Fort Drum. A perennial stream is defined as having flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow. If silvicultural treatments are needed that do not meet this conservation measure and that do not have a "no effect" determination, then individual consultation will be required with the USFWS. This buffer protects water quality and provides foraging habitat for Indiana bats. Indiana bats are known to utilize riparian corridors that have suitable vegetative cover for foraging and for roosting in nearby trees (Jachowski et al. 2014a, Garner & Gardner 1992).

9. For annual reporting purposes, the Forest Management Program will provide shapefiles of harvested areas, vegetative cover types pre- and post-harvest (within a scaled map), and the harvesting method used to Fort Drum's Fish and Wildlife Management Program. This information will be used to describe the vegetative cover types and habitat modification on Fort Drum and will be reported annually to the USFWS.

2.3.3 Effects to Indiana and Northern Long-eared Bats

Unlike construction, forest management actions are not designed to result in the permanent loss of habitat. In fact, forest management has the potential to provide long-term beneficial effects for Indiana and northern long-eared bats with only short-term negative effects in many cases.

2.3.3.1 Direct Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore forest management activities are not anticipated to have any known direct effects on hibernating Indiana or northern long-eared bats.

Roosting

Spring/Summer Tree Clearing

While the continued presence of Indiana bats on Fort Drum has been documented, WNS impacts have reduced the available population that could be present on the property. The same is true for northern long-eared bats. While acoustic detections still suggest this species is present in certain locations of Fort Drum, population impacts from WNS have been severe, thus reducing the available population of this species on the property as well. Historically, these bats were readily captured throughout Fort Drum, however, it has now been three years since a northern long-eared bat was captured. Regardless, all tree clearing for Forest Management activities will occur between October 16 – April 15 when most Indiana and northern long-eared bats are absent from the installation. The vast majority of all known primary and most secondary summer roosts for Indiana bats fall within the BCA within the Cantonment Area. At

this time, there is no Forest Management clearing planned within the Cantonment Area. On the low chance that Indiana or northern long-eared bats are present on Fort Drum prior to April 15, no non-volant young would be present and all bats should be able to leave the forested stand once disturbance from logging starts. It is unlikely that a summer maternity roost with bats will be impacted, or individual males or females will be impacted. Because of these considerations, the potential for timber harvests to directly affect maternity colonies of Indiana or northern long-eared bats during the spring or summer is unlikely and effects are discountable.

Fall/Winter Tree Clearing (October 16-April 15)

Acoustic and mistnetting efforts conducted on Fort Drum (2007-2014) have documented the presence of both species of bats (females, males, adults and juveniles) utilizing the Cantonment and Training Area later than August 15 (ESI 2008b, USFS 2011, Fort Drum, unpublished data).

Historically, Indiana bats have been found present in Fort Drum's Cantonment Area until at least 12 October and northern long–eared bats have been found as late as 1 October. Sixty two fall roosts were located after August 15 within the Cantonment Area during surveys in 2007-2010 for Indiana bats, and 16 of these roosts were located between October 1 and October 12 (ESI 2008b, ESI 2011, USFS 2011). No roosts have been found for northern long-eared bats within the Cantonment Area, however, captures and acoustic detections suggest maternity use was likely. Although suspected acoustic detections of Indiana bats are still collected in the Training Area, seven years of radio tracking Indiana bats has documented approximately 93% (114/122) of all roosts, including all fall roosts, to be within the BCA or nearby. Given the conservation measures established for the BCA, no timber harvests would remove any potential roosts within the Cantonment Area. Therefore, Indiana and northern long-eared bats that use the BCA for fall roosting will not be adversely affected by timber harvests. Still, the possibility exists that timber harvests may occur in undiscovered Indiana bat or unknown northern long-eared bat fall roosting areas during October. Undiscovered roost locations that may be present outside the BCA and within timber harvests could potentially be adversely affected by cutting activities if roosts are removed before all Indiana bats have returned to the hibernaculum.

The likelihood of this happening is small. It is assumed fall swarming activities are mostly completed on Fort Drum by October 15 of any given year primarily based on the drop in temperatures experienced in this area of northern New York. Over an 11 year period from 2000-2010, the average minimum temperature on Fort Drum from October 1 – October 15 was 44 ºF (6.7 ºC), with 18 out of a possible 165 days (or on average 1.6 out of every 15 days) during that period dropping to or below freezing at night. Conversely, during the same period in 2000-2010, from October 16 – October 31, the average minimum temperature was 38 ºF (3.3 ºC), with 54 of a possible 176 days (or on average 4.9 out of every 16 days) during the period dropping to or below freezing. Additionally, from November 1 – November 15, the average minimum temperature on Fort Drum was 33.8 ºF (1 ºC), with 80 of a possible 165 days (or on average 7.3 out of every 15 days) during the period dropping to or below freezing (Fort Drum, unpublished data). It would be unlikely that bats would still be active in the landscape after October 15, given the lack of insect abundance that would be present and the energy that it would require to adequately deal with these low temperatures. Data collection from fall studies on Fort Drum supports the idea that Indiana and northern long-eared bats are mostly gone from the installation by mid-October. The last known capture date of Indiana and northern long-eared bat use on Fort Drum is September 20, and October 1, respectively (ESI 2008b, Fort Drum, unpublished data). The latest Indiana bats have been radio-tracked on Fort Drum has been October 12. During 2011-2013 Fort Drum performed acoustic surveys continuously from May through November 15 to determine bat temporal presence on the property. Although

analysis is not complete, during 2011 and 2012, there has only been one suspected Indiana bat call collected after 15 October (on 10/16/2011), and 10 suspected northern long-eared bat calls collected after 15 October (1-10/16/2011; 8-10/17/2012; and 1-11/12/2012).

Because of all these considerations, it is unlikely that timber harvests after October 15 will adversely impact fall/winter roosting Indiana or northern long-eared bats, and any effects are discountable.

Noise

Noise is a likely by-product of all timber harvests. However, given that timber harvests will only occur during 16 October – 15 April, when the vast majority of Indiana and northern long-eared bats are not present, the likelihood that bats will be disturbed by noise is low. Even if bats are present for a short period of time when timber harvests are occurring in the fall after October 15, they would be in such low numbers that the probability that harvesting is occurring in the same locations those low numbers of bats are present is unlikely. There should be no direct effects from noise from timber harvests on Indiana or northern long-eared bats.

While noise from chainsaws and equipment used to move firewood (i.e., tractors, trailers, etc.) has the potential to disturb roosting Indiana or northern long-eared bats during spring, summer, and fall seasons while bats are present on the property, it is unlikely that it would cause any discernible effects other than some temporary short term avoidance of an area during the short time a firewood cutter is present. There should be no direct effects from firewood cutting to Indiana or northern long-eared bats on Fort Drum.

Foraging

All tree clearing for Forest Management activities will occur between October 16 – April 15 when most Indiana and northern long-eared bats are absent from the installation. Additionally, forestry actions are not expected to occur in the evening, during the night, or in the early morning when bats are active. Subsequently, even if a small number of bats were present, they should not be impacted while foraging. Therefore, forest management activities are anticipated to have no direct effects to foraging Indiana or northern long-eared bats.

2.3.3.2 Indirect Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore, forest management activities are expected to have no known indirect effects to hibernating Indiana or northern long-eared bats.

Roosting

Military Training Support

Harvesting for training purposes generally encourages growth of large diameter trees, which may lead to future recruitment of large diameter live trees and snags for both bat species. Additionally, harvesting for training typically creates a forest structure that has intact canopy coverage and a managed understory. As stands are utilized by training, areas are maintained as relatively open for bivouac areas and travel corridors for units and vehicles. Subsequently,

the understory and mid-story is usually minimal in these areas. As the understory of the stand is reduced, this may result in improved potential utilization of that forested area for movement to and from roosting areas. However, because long-term training in these stands may suppress forest regeneration to a point of concern for long term sustainability of the forest, the understory and mid-story are allowed to regenerate outside of the heavily used areas to account for future recruitment of trees for the stand. As large diameter trees die within these forests, these newly created snags will receive large amounts of sunlight due to the distance between large trees potentially benefitting both species of bats. Additionally, there will often be mid-story roosting options available that northern long-eared bats would take advantage of.

The majority of harvesting for military training support is outside the known Indiana maternity colony core area within the BCA, so while Indiana bats may benefit from this harvesting scenario in some cases, it is more likely northern long-eared bats will take advantage to a larger degree. Studies have shown that northern long-eared bats often select for areas with more intact canopy coverage (Owen et al. 2003, and Ford et al., 2005). Both species often select roosts that are exposed to solar radiation and have few understory trees nearby (Kurta et al. 1993, Kurta et al. 2002). However, northern long-eared bats seem to be more flexible in roosting choices, and often solar exposure may not be as important of a consideration as it generally is for Indiana bats (Carter and Feldhammer 2005, Timpone et al. 2010, USFWS 2014). Due to these considerations and the conservation measures in place, managing forested stands for military training may have some short term roosting impacts, however, ultimately, there should be no adverse effects to these species.

Specific management for maneuver corridors is similar to the majority of forest management for military training with a main important distinction that leads to different potential impacts within the corridors. Typical management for military training often targets tree spacing of approximately 3-5 meters, while maneuver corridors need a wider spacing of approximately 5-8 meters. Because of this difference, there will be less available roosting options immediately remaining within the stand due to less tree retention. Additionally, because of the wider tree spacing (i.e., less trees per acre), the number of available future snag recruitment is also reduced. Furthermore, because the area is expected to have high military personnel use, snags that would have normally been left as part of the conservation measures established for snag retention for forest management, will likely be eliminated due to life, health, and safety concerns. It is also possible that snags that do develop will be available only for a short period of time until they progress into a hazard to military personnel and are likely removed. Lastly, because of the reduced numbers of trees per acre, it will take only a limited number of trees to die and fall or be blown over in storm events to reduce canopy coverage and create a more "open" stand.

Currently maneuver corridor harvesting is outside the known Indiana maternity colony core area. So while there could be some adverse impacts to Indiana bats from this activity, it is unlikely due to the roosting site fidelity within the BCA. Potential positive and negative impacts would likely be isolated to northern long-eared bats.

Northern long-eared bats are often more generalist in forested stand selection, and these areas could be utilized by that species for roosting. If extensive suitable habitat was lost northern long-eared bats may have to travel farther in the spring, thus expending more energy, in order to locate suitable roost sites to raise young. Little is known on the roosting requirements or locations on Fort Drum for northern long-eared bats, however, summer sites that have a variety of suitable roosts are essential to the reproductive success of local populations. Once bats find these areas, they typically exhibit strong site fidelity, returning to the same traditional summer

maternity colony location (and sometimes specific trees) annually to bear their young (Sasse and Pekins 1996, Foster and Kurta 1999, Jackson 2004, and Johnson et al. 2009, USFWS 2014).

It is not known how long or how far northern long-eared bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded during the winter. If they are required to search for new roosting habitat in the spring, it is assumed that additional stress is placed on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration and pregnancy.

However, Silvis et al (2014) suggested that northern long-eared bats maternity colonies can withstand low levels of roost loss, and any impacts are likely manageable if large areas of available roosting habitat is still present on the landscape. Additionally, Johnson et al. (2009) found that northern long-eared bats readily exploited changes to forested areas when a reintroduction of fire created new snags and forest canopy gaps. Northern long-eared bats seem to exhibit more roost flexibility than Indiana bats, switching roosts fairly often and utilizing multiple species of both live and dead trees, as long as suitable roosting structure (i.e., cavities, cracks/crevices, or exfoliating bark) is present (Menzel et al. 2002, Owen et al. 2002, Carter and Feldhammer 2005, Johnson et al. 2009, Timpone et al. 2010). Northern long-eared bats have been documented in multiple species of shade tolerant to intolerant tree species of multiple diameters, ranging from 3- 25 in (7.6-63 cm) dbh, indicating opportunistic roost selection across the landscape (Foster and Kurta 1999, Timpone et al. 2010, USFWS 2013a). It appears that as with Indiana bats, summer roost selection is primarily based on tree structure, amount of solar exposure, and ease of accessibility. However, solar exposure appears to be more important to Indiana bats, as they are typically found in taller trees with lower canopy cover than northern long-eared bats (Menzel et al. 2002, USFWS 2013a). Cooler temperatures due to higher canopy may not be an issue for northern long-eared bats, thus allowing it to be more opportunistic in roost selection.

Given that northern long-eared bats prefer more “intact” forested stands with closed canopies, there is the potential that those bats may avoid some of these areas if trees fall and open the canopy within the corridors, or if the spacing is too wide resulting in gaps in the canopy. However, as with regular harvests for other military training, potential roosting benefits can still be realized. Northern long-eared bats are known to be quite flexible in roosting choices, and these areas are likely to still contain trees with cavities, cracks, and crevices northern long-eared bats can exploit.

These areas will not be clearcut, and all harvests will occur in winter to avoid any direct impacts to bats. There will only be up to five maneuver corridors totaling 640 acres (259 ha) over the next three years. They are curvi-linear in nature, ranging from approximately 1200-2500 meters in length and 175-350 meters in width (approximately 50-190 acres (20-77 ha); Figure 2.9). Typically only 1 corridor (no more than two) will be cut per year, so there will never be extensive habitat being removed. More than likely, only up to approximately 200 acres will be thinned annually to support the creation of the corridors. Given the location and the design of the corridors, there will always be suitable habitat available immediately adjacent and surrounding the project locations. While it is possible northern long-eared bats could be utilizing stands that will undergo harvest for these corridors, the likelihood is low for any given corridor area given the curvi-linear design of the corridor, the amount of suitable habitat available across Fort Drum and the small post-WNS population of northern long-eared bats. Given that alternative roosting/foraging habitat will be available directly adjacent to any of these projects, no large shifts in home ranges would be anticipated even if northern long-eared bats had been using

portions of the corridor areas as part of their home range. Given the large areas of intact forest across Fort Drum, and the minimal acreage that would be placed into corridor creation in a given year, it is unlikely that corridor construction would remove large areas of potential roosting habitat for this species. Therefore, it is unlikely that cutting for maneuver corridors would adversely affect northern long-eared bats, and any effects are discountable.

Given that the location of harvests are outside the core Indiana bat home range, forest management for maneuver corridors may affect, but is unlikely to adversely affect either species.

Timber Production/Forest Health

Uneven-aged Management

Harvesting for timber production/forest health often involves uneven-aged harvesting, including intermediate thinning, crown thinning, thinning from below, and group selection, and is sometimes similar in nature to management for military training. Timber harvesting under these scenarios may alter the forest structure and composition, which could impact bats either positively or negatively. Depending on harvest methodology, remaining snags could become more exposed to incremental weather (i.e., winds, snow) and therefore more susceptible to falling, however, they could also become more exposed to solar penetration, making them more attractive and suitable for use by bats. Harvesting could inadvertently remove an undiscovered roost, which can negatively impact bats, however, harvesting may create a forested stand structure more suitable for the creation of roosts. It may also open the understory of the stand, improving potential utilization of that forested area for movement to and from roosting areas. While these management scenarios may reduce some trees in an area immediately, ultimately trees of various species and size classes will be retained in the stand. Some of these trees are allowed to grow to a larger size, potentially providing additional roosting habitat for Indiana and northern long-eared bats.

Currently, there are no uneven-aged management harvests planned for the Cantonment Area or BCA, however, there are some actions planned within the potential range of the known Indiana bat maternity colony (Figure 2.9). Regardless, the vast majority (114/122, ~ 93%) of all known Indiana bat summer and fall roosts identified on Fort Drum are found within the BCA and are protected. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. Additionally, given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting area to exploit a new area. Therefore it is unlikely that uneven-aged management would adversely affect Indiana bats. No impacts are anticipated to Indiana bats given the project locations compared to the core roosting/foraging areas within the BCA

However, northern long-eared bats have historically been found throughout all of Fort Drum, including the areas scheduled for uneven-aged harvests (Figures 1.18 and 2.9). Little is known on the roosting requirements or locations on Fort Drum for northern long-eared bats, however, summer sites that have a variety of suitable roosts are essential to the reproductive success of local populations. Once bats find these areas, they typically exhibit strong site fidelity, returning to the same traditional summer maternity colony location (and sometimes specific trees)

annually to bear their young (Sasse and Pekins 1996, Foster and Kurta 1999, Jackson 2004, and Johnson et al. 2009, USFWS 2014).

Mistnet surveys during 2007-2011 documented numerous reproductive females and juvenile northern long-eared bats on the installation, indicating that multiple maternity colonies and suitable roosting habitat was likely present throughout the property. The only known roosts for northern long-eared bats on the property were documented in 2010 when a juvenile female was radio-tracked to three different roosts in Training Area 4 (Figure1.12). The first roost was in the cavity of a dead 7.5 in (19cm) red maple, the second was under the bark or in the crack of an 8.0 in (20.3 cm) white-pine, and the third roost was in the crack of a 11.5 in (29.2 cm) eastern hemlock (see Figure 1.20 for roost 2 and 3). Emergence counts ranged from 2-4 individuals over the 5 days it was tracked. This roosting area is within and adjacent to one of the stands scheduled for harvest in the next three years.

Since little is known about the locations of important roosting areas for northern long-eared bats on Fort Drum, removal of woodlands or previous roost sites during winter hibernation may provide some measurable level of stress after these bats emerge in the spring if they must find new roost locations. It is not known how long or how far northern long-eared bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded during the winter. If they are required to search for new roosting habitat in the spring, it is assumed that additional stress is placed on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration and pregnancy. Research has suggested that big brown bats suffered more than a 50% decline in reproductive success when excluded from a maternity area (Brigham & Fenton 1986). Sparks et al. (2003) noted that an Indiana bat colony became more fragmented the year following the loss of a maternity roost, so they used more roosts and congregated less. It is reasonable that northern long-eared bats on Fort Drum could also suffer a decline in reproductive success since more energy could be expended locating new suitable roosts.

However, Silvis et al (2014) suggested that northern long-eared bat colonies can withstand low levels of roost loss, and any impacts are likely manageable if large areas of available roosting habitat is still present on the landscape. Additionally, Johnson et al. (2009) found that northern long-eared bats readily exploited changes to forested areas when a reintroduction of fire created new snags and forest canopy gaps. Northern long-eared bats seem to exhibit more roost flexibility than Indiana bats, switching roosts fairly often and utilizing multiple species of both live and dead trees, as long as suitable roosting structure (i.e., cavities, cracks/crevices, or exfoliating bark) is present (Menzel et al. 2002, Owen et al. 2002, Carter and Feldhammer 2005, Johnson et al. 2009, Timpone et al. 2010). Northern long-eared bats have been documented in multiple species of shade tolerant to intolerant tree species of multiple diameters, ranging from 3- 25 in (7.6-63 cm) dbh, indicating opportunistic roost selection across the landscape (Foster and Kurta 1999, Timpone et al. 2010, USFWS 2013a). It appears that as with Indiana bats, summer roost selection is primarily based on tree structure, amount of solar exposure, and ease of accessibility. However, solar exposure appears to be more important to Indiana bats, as they are typically found in taller trees with lower canopy cover than northern long-eared bats (Menzel et al. 2002, USFWS 2013a). Cooler temperatures due to higher canopy may not be an issue for northern long-eared bats, thus allowing it to be more opportunistic in roost selection.

Approximately half of the total harvesting scenario (up to 1,250 ac) over three years would employ uneven-aged management. The largest potential area harvested within this 1,250 ac is expected to be approximately 300 ac. All tree cutting will occur only when the majority (if not all) northern long-eared bats are at hibernation sites. Given the large acreage of intact forest

available across Fort Drum (including immediately adjacent to any proposed areas for harvest) it is unlikely that uneven-aged management would remove areas of potential roosting habitat for this species that would result in significant changes in roosting behavior. Also, any known (current or future) roosts will be protected. Snags will also be left throughout the stands leaving suitable roosts for northern long-eared bats within any harvested areas. Finally, we consider the likelihood of any given potential harvest area being used by northern long-eared bats to be low given the significant declines observed on Fort Drum due to WNS. Therefore, it is unlikely that uneven-aged forest management would adversely affect northern long-eared bats, and any affects are discountable.

Given the extensive declines in both species of bats due to WNS, it is unlikely that uneven-aged forest management would have any discernible impacts to either species of bats. Annual harvesting typically occurs on a very small percentage of the total amount of available roosting habitat, and is in varied locations across Fort Drum (Figure 2.9). Positive benefits from this type of management should far outweigh any short term negative impacts. Given the conservation measures in place, and these considerations, managing forests for timber production/forest health through uneven-aged management on Fort Drum is unlikely to adversely affect (indirect) Indiana and northern long-eared bats, and ultimately may provide long-term benefits.

Even-aged Management

While uneven-aged management typically only removes a percentage of the available forested stand, even-aged management usually employs the removal and complete regeneration of the entire stand. This could remove entire areas of potential roosting habitat on any given year and potentially eliminate a roost network. However, typically, even aged harvesting is utilized for regenerating early successional habitat primarily for specific wildlife management goals. These harvests are often in areas composed of mid to late maturity early successional species. These early successional forests are characterized by a dense forest structure and usually smaller trees, which are not typically optimal for roost locations. Often these areas are not typically associated with ideal Indiana bat roosting habitat. Currently, there are no even-aged management harvests planned for the Cantonment Area or BCA, however, there are some actions planned within the potential range of the known Indiana bat maternity colony (Figures 1.12 and 2.9). Regardless, the vast majority (114/122, ~ 93%) of all known Indiana bat summer and fall roosts identified on Fort Drum are found within the BCA (or nearby) and are protected. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. Additionally, given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting area to exploit a new area. No impacts are anticipated to Indiana bats given the project locations compared to the core roosting/foraging areas within the BCA. Therefore it is unlikely that even-aged management would adversely affect Indiana bats.

However, northern long-eared bats are often more generalist in forested stand selection, and these areas could be utilized by that species for roosting. If extensive suitable habitat was lost northern long-eared bats may have to travel farther in the spring, thus expending more energy, in order to locate suitable roost sites to raise young. Little is known on the roosting requirements or locations on Fort Drum for northern long-eared bats, however, summer sites that have a variety of suitable roosts are essential to the reproductive success of local populations. Once bats find these areas, they typically exhibit strong site fidelity, returning to the

same traditional summer maternity colony location (and sometimes specific trees) annually to bear their young (Sasse and Pekins 1996, Foster and Kurta 1999, Jackson 2004, and Johnson et al. 2009, USFWS 2014).

Since little is known about the locations of important roosting areas for northern long-eared bats, removal of entire woodlands or previous roost sites during winter hibernation may provide some measurable level of stress after these bats emerge in the spring if they must find new roost locations. It is not known how long or how far northern long-eared bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded during the winter. If they are required to search for new roosting habitat in the spring, it is assumed that additional stress is placed on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration and pregnancy. Research has suggested that big brown bats suffered more than a 50% decline in reproductive success when excluded from a maternity area (Brigham & Fenton 1986). Sparks et al. (2003) noted that an Indiana bat colony became more fragmented the year following the loss of a maternity roost, so they used more roosts and congregated less. It is reasonable that northern long-eared bats on Fort Drum could also suffer a decline in reproductive success since more energy could be expended locating new suitable roosts.

However, Silvis et al (2014) suggested that northern long-eared bat colonies can withstand low levels of roost loss, and impacts are likely manageable if large areas of available roosting habitat is still present on the landscape. Additionally, Johnson et al. (2009) found that northern long-eared bats readily exploited changes to forested areas when a reintroduction of fire created new snags and forest canopy gaps. Northern long-eared bats seem to exhibit more roost flexibility than Indiana bats, switching roosts fairly often and utilizing multiple species of both live and dead trees, as long as suitable roosting structure (i.e., cavities, cracks/crevices, or exfoliating bark) is present (Menzel et al. 2002, Owen et al. 2002, Carter and Feldhammer 2005, Johnson et al. 2009, Timpone et al. 2010). Northern long-eared bats have been documented in multiple species of shade tolerant to intolerant tree species of multiple diameters, ranging from 3- 25 in (7.6-63 cm) dbh, indicating opportunistic roost selection across the landscape (Foster and Kurta 1999,Timpone et al. 2010, USFWS 2013a). It appears that as with Indiana bats, summer roost selection is primarily based on tree structure, amount of solar exposure, and ease of accessibility. However, solar exposure appears to be more important to Indiana bats, as they are typically found in taller trees with lower canopy cover than northern long-eared bats (Menzel et al. 2002, USFWS 2013a). Cooler temperatures due to higher canopy may not be an issue for northern long-eared bats, thus allowing it to be more opportunistic in roost selection.

Only approximately a quarter of the total harvesting scenario (up to 625 ac over three years, with no more than 208 ac/yr, with no clearcut larger than 50 ac in size in one contiguous location) would employ even-aged management. All harvests will occur in winter to avoid any direct impacts to bats. While it is possible northern long-eared bats could be utilizing stands that would be clearcut, the likelihood is low for any given 50 ac area given the amount of suitable habitat available across Fort Drum and the small post-WNS population. Given that alternative roosting/foraging habitat will be available directly adjacent to any 50 acre clearing, no large shifts in home ranges would be anticipated even if northern long-eared bats had been using the 50 acre patch as part of their home range. Given the large areas of intact forest across Fort Drum, and the minimal acreage that would be clearcut in a given year, it is unlikely that even-aged management would remove large areas of potential roosting habitat for this species. Therefore, it is unlikely that even-aged forest management would adversely affect northern long-eared bats, and any affects are discountable.

Firewood harvest

Firewood permits are issued for dead and downed timber only. Indiana and northern long-eared bats are not known to use fallen timber for roosts (primary, maternity, or singly), and firewood cutting is off limits in the known Indiana bat primary roosting areas while bats are present. Thus the act of firewood cutting is expected to have no known indirect effects to Indiana bats. The resultant noise from this activity is addressed below.

Noise

Noise is a likely by-product of all timber harvests and firewood cutting. However, given that timber harvests will only occur during 16 October – 15 April, when the vast majority of Indiana and northern long-eared bats are not present, the likelihood that bats will disturbed by noise from harvests is low. Even if bats are present for a short period of time when timber harvests are occurring in the fall after October 15, they would be in such low numbers that the probability that harvesting is occurring in the same locations those low numbers of bats are present is unlikely. There should be no direct effects from noise from timber harvests on Indiana or northern long-eared bats.

While noise from chainsaws and equipment used to move firewood (i.e., tractors, trailers, etc.) has the potential to disturb roosting Indiana or northern long-eared bats during spring, summer, and fall seasons while bats are present on the property, it is unlikely that it would cause any discernible effects other than some temporary short term avoidance of an area during the short time a firewood cutter is present. There should be no indirect effects from firewood cutting to Indiana or northern long-eared bats on Fort Drum.

Foraging

Military Training Support

Harvesting for training typically creates a forest structure that has intact canopy coverage and a managed, thinned mid and understory. As stands are utilized by training, areas are maintained as relatively open for bivouac areas and travel corridors for units and vehicles. Subsequently, the understory and mid-story is usually minimal in these areas. As the understory of the stand is reduced, this may result in improved potential utilization of that forested area for movement to and from roosting and foraging areas. However, because long-term training in these stands may suppress forest regeneration to a point of concern for long term sustainability of the forest, the understory and mid-story are allowed to regenerate outside of the heavily used areas to account for future recruitment of trees for the stand. This creates a highly varied stand structure, with areas of mid and understory quite lacking, with limited vegetative cover present, to areas with highly developed mid and understory adjacent. Subsequently insect production is likely quite varied across the stand as well.

Although little information exists for foraging use of northern long-eared bats on Fort Drum, acoustic detections of northern long-eared bats (Figure 1.17) suggest that most of the installation is likely being used for foraging and travel. Northern long-eared bats seem to exhibit a diet preference similar to Indiana bats and other myotids. They are opportunistic insectivores that feed on a number of insect species, predominantly Lepidopterans (e.g., moths), Dipterans (e.g., flies and mosquitoes), Coleopterans (e.g., beetles), and Hymenopterans (e.g., wasps, sawflies) (Feldhammer et al. 2009, USFWS 2013a). Northern long-eared bats often catch prey through aerial hawking, however, they appear to utilize gleaning to as great or larger extent

(Nagorsen and Brigham 1993, Brack and Whitaker 2001, Ratcliffe and Dawson 2003, Feldhamer *et al.* 2009). Insect consumption by northern long-eared bats varies by season, location, and reproductive condition (Tuttle et al. 2006, Feldhammer et al. 2009). Given that northern long-eared bats are gleaners and hawkers, these stands should provide suitable opportunities for both foraging strategies. Even in areas with limited understory, northern long-eared bats may still be able to pull insects from the boles of remaining trees as well as off the grasses. They are known to forage only a short distance above the ground (Nagorsen and Brigham 1993, USFWS 2014). As large diameter trees die within these forests, these newly created gaps in the canopy will create opening where sunlight will reach the forest floor, promoting the growth of new herbaceous and woody vegetation and increasing foraging opportunities.

The majority of harvesting for military training support is outside the known Indiana maternity colony core area within the BCA, so while Indiana bats may benefit from this harvesting scenario in some cases, it is more likely northern long-eared bats will take advantage to a larger degree. Due to these considerations and the conservation measures in place, managing forested stands for military training may have some short term foraging impacts in certain segments of the managed stands, however, ultimately, this management should benefit both species.

Management for maneuver corridors and the increased tree spacing may result in some different impacts, but largely they should be similar in nature to the normal harvesting for training support. Currently maneuver corridor harvesting is outside the known Indiana maternity colony core area. So while there could be some adverse impacts to Indiana bats from this activity, it is unlikely due to the roosting site fidelity within the BCA. Potential positive and negative impacts would likely be isolated to northern long-eared bats.

Ultimately, the goal in these areas is to convert the understory to a herbaceous species composition to facilitate movement and utilization by troops and vehicles. However, because long-term training in these stands may suppress forest regeneration to a point of concern for long term sustainability of the forest, the understory and mid-story will be allowed to regenerate outside of the heavily used areas to account for future recruitment of trees for the stand (i.e., the edges of the stands). Additionally, islands of regeneration will be allowed to develop around retained trees to support the future recruitment of trees to sustain the stand. Initially, these stands may not provide much utilization for bats for foraging, however, it is not likely that they would avoid them completely. There is still intact overhead canopy coverage that will provide them movement corridors traveling to and from other roosting and foraging areas.

As the islands of vegetation within the stands and edges of the stands regenerate, the resulting structure within the mid and understory will be suitable for the clutter adapted northern long-eared bat to utilize both gleaning and hawking foraging strategies. Even with the limited understory, northern long-eared bats should still be able to glean insects from the boles of remaining trees as well as off herbaceous grasses. As large diameter trees die and fall over within these forests, newly created gaps in the canopy will create opening where sunlight will reach the forest floor, promoting the growth of new herbaceous and woody vegetation and increasing foraging opportunities. A concern could be that because of the reduced numbers of trees per acre, it would only take a limited number of trees dying and falling or being blown over in storm events to reduce canopy coverage and create a more “open” stand. Additionally, if tree spacing was initially cut too wide, it may take time for the canopy to close back over, creating an “open” stand. However, even under these scenarios, northern long-eared bats would likely not

avoid these areas completely, only modify their movements to avoid unsuitable areas as they would in any stand.

These areas will not be clearcut, and all harvests will occur in winter to avoid any direct impacts to bats. There will only be up to five maneuver corridors totaling 640 acres over the next three years. They are curvi-linear in nature, ranging from approximately 1200-2500 meters in length and 175-350 meters in width (approximately 50-190 acres; Figure 2.9). Typically only 1 corridor (no more than two) will be cut per year, so there will never be extensive habitat being removed. More than likely, only up to approximately 200 acres will be thinned annually to support the creation of the corridors. Given the location and the design of the corridors, there will always be suitable habitat available immediately adjacent and surrounding the project locations. Given that alternative foraging habitat will be available directly adjacent to any of these projects, no large shifts in home ranges would be anticipated even if northern long-eared bats had been using portions of the corridor areas as part of their home range. Given the large areas of intact forest across Fort Drum, and the minimal acreage that would be placed into corridor creation in a given year, it is unlikely that corridor construction would remove large areas of potential foraging habitat for this species. Therefore, it is unlikely that cutting for maneuver corridors would adversely affect northern long-eared bats, and any effects are discountable.

Given that the location of harvests are outside the core Indiana bat home range, forest management for maneuver corridors may affect, but is unlikely to adversely affect either species.

Timber Production/ Forest Health

Uneven-aged Management

Currently, there are no uneven-aged management harvests planned for the Cantonment Area or BCA, however, there are some actions planned within the potential range of the known Indiana bat maternity colony (Figures 1.12 and 2.9). These timber harvests could temporarily shift Indiana bat foraging behavior to adjacent woodlands. However, due to the amount of available habitat and time of year restrictions for cutting trees, the impact to foraging bats is discountable in the short-term and ultimately positive in the long-term. Timber harvests may alter the components of a forest resulting in a diversity of forest types and structure. The diversity of forest types and structures may be beneficial to Indiana bats. Indiana bats utilize a variety of forest types and structure for foraging (Menzel et al. 2001). Studies have shown that bat activity is highest along edges and within forest openings, and Indiana bats are known to use gaps in the forest (Crampton & Barclay 1998; Menzel et al. 2001). Owen et al. (2004) noted *Myotis* spp. activity was higher in closed canopy forests and lower in open habitats. In general, the effects of forest management activities (during the hibernation season) are discountable, if not actually beneficial, for foraging bats as long as adequate forest habitat remains. Furthermore, the majority of harvesting is outside the known Indiana maternity colony core area within the BCA, so it is unlikely Indiana bats will be impacted positively or negatively by uneven-aged harvesting in the Training Area. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable foraging areas remain available. Given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting and foraging area to exploit new areas. So while it is possible Indiana bats could be impacted by these actions, it is unlikely that uneven-aged management would adversely affect Indiana bats.

Although little information exists for foraging use of northern long-eared bats on Fort Drum, acoustic detections of northern long-eared bats (Figure 1.17) suggest that most of the installation is likely being used for foraging and travel. Northern long-eared bats seem to exhibit a diet preference similar to Indiana bats and other myotids. They are opportunistic insectivores that feed on a number of insect species, predominantly Lepidopterans (e.g., moths), Dipterans (e.g., flies and mosquitoes), Coleopterans (e.g., beetles), and Hymenopterans (e.g., wasps, sawflies) (Feldhammer et al. 2009, USFWS 2013a). Northern long-eared bats often catch prey through aerial hawking, however, they appear to utilize gleaning to as great or larger extent (Nagorsen and Brigham 1993, Brack and Whitaker 2001, Ratcliffe and Dawson 2003, Feldhamer *et al.* 2009). Insect consumption by northern long-eared bats varies by season, location, and reproductive condition (Tuttle et al. 2006, Feldhammer et al. 2009). Given that northern long-eared bats are gleaners and hawkers, these stands should provide suitable opportunities for both foraging strategies.

Currently there is only approximately (up to 1250 ac) over three years would employ uneven-aged management. The largest potential area harvested within this 1,250 acres is expected to be approximately 300 acres. Given the large acreage of intact forest available across Fort Drum (including immediately adjacent to any proposed areas for harvest) it is unlikely that uneven-aged management would remove areas of potential foraging habitat for this species that would result in significant changes in behavior. All tree cutting will occur during the time of year when bats are in hibernation, so active harvesting will have no impact on causing bats to avoid an area. Even if bats did avoid newly harvested stands, ample forests of varying size classes and types and are present in the Training Areas and are adjacent to proposed timber harvests units. Thus, sufficient habitat is available nearby for all foraging bats. So while there could be impacts to northern long-eared bats, it is unlikely. Finally, we consider the low likelihood of any given harvest as currently being used by northern long-eared bats to be low given the significant declines observed on Fort Drum due to WNS. Therefore, it is unlikely that uneven-aged forest management would adversely affect northern long-eared bats, and any affects are discountable.

Given that the location of harvests are outside the core Indiana bat home range, uneven-aged forest management may affect, but is unlikely to adversely affect either species.

Even-aged Management

Of the up to 2500 acres of timber planned for harvest over the next three years, only approximately a quarter (up to 625 ac) of the total acreage will be in even-aged management, and no more than 208 ac/yr will be harvested, on stands no larger than 50 ac in one contiguous location. These harvests are often in areas composed of mid to late maturity early successional species. Currently, there are no even-aged management harvests planned for the Cantonment Area or BCA, however, there are some actions planned within the potential range of the known Indiana bat maternity colony (Figures 1.12 and 2.9). These clearcut harvests could temporarily shift Indiana bat foraging behavior to adjacent woodlands. However, due to the amount of available habitat and time of year restrictions for cutting trees, the impact to foraging bats is discountable in the short-term and ultimately positive in the long-term. Indiana bats utilize a variety of forest types and structure for foraging (Menzel et al. 2001). Studies have shown that bat activity is highest along edges and within forest openings, and Indiana bats are known to use gaps in the forest (Crampton & Barclay 1998; Menzel et al. 2001). In general, the effects of forest management activities (during the hibernation season) are discountable, if not actually beneficial, for foraging bats as long as adequate forest habitat remains. Furthermore, the majority of harvesting is outside the known Indiana maternity colony core area within the BCA, so it is unlikely Indiana bats will be impacted positively or negatively by even-aged harvesting in

the Training Area. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable foraging areas remain available. Given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting and foraging area to exploit new areas. So while it is possible Indiana bats could be impacted by these actions, it is unlikely that even-aged management would adversely affect Indiana bats. No impacts are anticipated to Indiana bats given the project locations compared to the core roosting/foraging areas within the BCA.

Although little information exists for foraging use of northern long-eared bats on Fort Drum, acoustic detections of northern long-eared bats (Figure 1.17) suggest that most of the installation is likely being used for foraging and travel. Given that northern long-eared bats are primarily gleaners, clearcutting forested stands would not be beneficial to this species, as little vegetation would remain, and there would be no overhead cover. Studies have shown that they likely prefer to forage in more intact forested areas (Caceres and Pybus 1998, Brack and Whitaker 2001, USFWS 2014). Likely bats would avoid these areas. Creation of large open patches would create areas that northern long-eared bats avoid and could cause them to alter their foraging into nearby forests. Shifts in foraging could increase time and energy spent foraging. This is of particular note in the spring when bats are emerging from hibernation with low body weights and are under stress due to pregnancy and relocation to summer roosts. Additional stress could lead to lower reproductive success, increase risk to disease and/or predation, or result in death. Given the fact that clearcuts will be fairly small (largest=36 acres; with < 100 ac total projected over 3 years) and distributed throughout the installation, it is unlikely that northern long-eared bats would have much of an increased energy expenditure to avoid these areas. Fort Drum has ample vegetative cover throughout the Training Areas and nearby to the clearcut areas that is suitable for foraging. Additionally, within a few years after harvest, small even-aged harvests are beneficial for a variety of shrub and early forest dwelling species, and they can provide habitat that promotes a diversity of insects (e.g. Werner & Raffa 2000). Northern long-eared bats could benefit from the available abundant food source and from the creation of edges between forest types if they chose to exploit this resource.

Although decreased water quality may result from improperly performed timber harvests and lead to declines in insect diversity and abundance (Hilsenhoff 1982), as well as drinking water, the conservation measures in place for forest management activities should prevent this from happening. In the unlikely event that contamination does occur, the impacted area will be small in size and ample water sources are available throughout Fort Drum for Indiana and northern long-eared bats and their prey.

Only approximately a quarter of the total harvesting scenario (up to 625 ac over three years, with no more than 208 ac/yr, with no clearcut larger than 50 ac in size in one contiguous location) would employ even-aged management. All clearing will occur in winter to avoid any direct impacts to the bats. While it is possible northern long-eared bats could be utilizing stands that would be clearcut, the likelihood is low for any given 50-acre area given the amount of suitable habitat available across Fort Drum and the small post-WNS population. Given that alternative foraging habitat will be available directly adjacent to any 50-acre clearing, no large shifts in home ranges would be anticipated even if northern long-eared bats had been using the 50 acre area as part of their home range. Given the large areas of intact forest across Fort Drum, and the minimal acreage that would be clearcut in a given year, it is unlikely that even-aged management would remove large areas of potential foraging habitat for this species. Therefore, it is unlikely that even-aged forest management would adversely affect northern long-eared bats, and any effects are discountable.

With the declines from WNS to the populations of northern long-eared bats, and the large amount of available habitat, it is unlikely that large areas of potential foraging would be removed through these actions. Given that the location of harvests are outside the core Indiana bat home range, forest management for maneuver corridors may affect, but is unlikely to adversely affect either species.

Noise

Noise is likely to be a by-product of all timber harvests. However, given that timber harvests will only occur during 16 October – 15 April, when the vast majority of Indiana and northern long-eared bats are not present, the likelihood that bats will disturbed by noise is low. Even if bats are present for a short period of time when timber harvests are occurring in the fall after October 15, they would be in such low numbers that the probability that harvesting is occurring in the same locations those low numbers of bats are present is unlikely. Currently, there are only approximately 10-12 timber harvests planned over the next 3 years encompassing approximately 2500 acres, and these are spread out across the installation. Finally, Indiana bats are mainly present within the Cantonment Area in both the summer and fall where no timber harvests would occur.

Noise is a likely by-product of all timber harvests and firewood cutting. However, given that timber harvests will only occur during 16 October – 15 April, when the vast majority of Indiana and northern long-eared bats are not present, the likelihood that bats will disturbed by noise from harvests is low. Even if bats are present for a short period of time when timber harvests are occurring in the fall after October 15, they would be in such low numbers that the probability that harvesting is occurring in the same locations those low numbers of bats are present is unlikely. There should be no direct effects from noise from timber harvests on Indiana or northern long-eared bats.

While noise from chainsaws and equipment used to move firewood (i.e., tractors, trailers, etc.) has the potential to disturb roosting Indiana or northern long-eared bats during spring, summer, and fall seasons while bats are present on the property, it is unlikely that it would cause any discernible effects other than some temporary short term avoidance of an area during the short time a firewood cutter is present. There should be no indirect effects from firewood cutting to Indiana or northern long-eared bats on Fort Drum.

2.3.4 Conclusion

Suitable habitat has never been considered a limiting factor for viable Indiana bat colonies on Fort Drum given that the core maternity colony habitat has been protected within the BCA. In addition, suitable habitat has not been considered a limiting factor for northern long-eared bats. Given the reduced populations of these bat species due to WNS impacts, and ample suitable forested habitat for roosting and foraging remaining, this is even less of a concern for the remaining bats. Further, forest management on Fort Drum is expected to benefit the remaining Indiana and northern long-eared bats in the long-term by manipulating the structure, species composition, and ages of forests. Although some tree harvesting may temporarily reduce optimal roosting and foraging habitat, based on the type of silvilcultural treatment, the area may actually become more suitable for foraging or roosting over a longer period of time. Conservation measures such as time of year restrictions, snag retention and recruitment, and avoidance of known bat roosting and foraging locations, as well as the vast size of Fort Drum and available forests, reduces potential impacts to Indiana and northern long-eared bats when performing forest management actions. Given this information and conservation measures that

will be employed, potential impacts to Indiana and northern long-eared bats from forest management actions should be minimal. These actions may affect, but should not adversely affect Indiana or northern long-eared bats, and should have beneficial effects in the long-term.

2.4 Mechanical Vegetation Management

2.4.1 Mechanical Vegetation Activities

Fort Drum does not anticipate that there will be any significant change from the amount, type, and/or duration of mechanical vegetation management that was previously analyzed in the 2009-2011 or 2012-2014 BAs and that will occur on Fort Drum over the next 3 years. After reviewing the project description and effects analysis for this section in the previous BAs, we feel that it is suitable in scope to include any potential impacts to northern long-eared bats. Additionally, we feel that the conservation measures (as changed below) should now be suitable for both species. Therefore, we affirm that the effects analysis is appropriate from the previous BAs, and the conservation measures are now suitable to address both Indiana and northern long-eared bat. Please see Appendix A for more information. There are two changes to the conservation measures required for the implementation of this BA. This change to Conservation Measure # 1 (>4 in dbh trees have been reduced to > 3 in trees to account for roosting northern long-eared bats) and Conservation Measure # 3 (No mowing/vegetation removal within 100 ft of known roost trees) should not have any impact on the analysis or implementation of this particular section.

2.4.2 Conservation Measures for Mechanical Vegetation Management Activities

1. Time of Year Restriction for Tree Falling. A time of year restriction for clearing trees (> 3 in DBH) and removing low- to medium-risk hazard trees has been established to protect roosting bats during non-hibernation seasons. Felling of trees must take place between October 16 - April 15 while most Indiana and northern long-eared bats are at hibernation sites. This will greatly reduce the risk of accidentally harming bats that may potentially be present in trees scheduled to be removed. Specifically, maternity colonies and their associated non-volant young will be protected from this disturbance.

2. Roost Tree Protection. No female roost trees, including roosts identified in the future, will be removed unless determined to be high risk hazard trees (see #4 below). Hazard trees that are not considered high risk, will be removed during the winter. Roost trees may not be removed for any other reason (e.g., aesthetically unappealing).

3. Mowing/ vegetation removal will not occur within 100 ft of known roost trees to avoid disturbing roosting bats and maintaining cover around the roosts.

4. High Risk Hazard Trees. For hazard trees that are determined to be high or critical classified between April 16 – October 15, Fort Drum's Fish and Wildlife Management Program personnel will be notified in advance, so they may assess the hazard tree. If appropriate, an emergence survey will be conducted and if no bats are observed, then the roost tree will be promptly removed. This will reduce the risk of removing an undiscovered roost tree. If bats are observed, then further consultation with the USFWS is needed.

5. Reporting. Personnel responsible for each vegetation management action must provide a scaled map of the treated area, specify the type of management action that occurred, report the total acreage of impacted habitat, and the vegetative cover types that were managed (i.e., number of hazard trees removed, amount of shrubland habitat cleared) to Fort Drum's Fish and Wildlife Management Program for annual reporting requirements to the USFWS. Mowing of landscaped grass in the Cantonment Area does not need to be documented.

2.4.3 Effects to Indiana and Northern long-eared bats

Please see Appendix A, section 2.4 for the effects analysis for Mechanical Vegetation Management.

2.4.4 Conclusion

Vegetation management of grass, shrubs, and trees < 3 in DBH has the potential to alter insect diversity and possible abundance, potentially altering roosting habitat and behavior for these species. Hazard tree removal could remove potential roosts for these species, and in season removal could cause harm or adverse effects to non-volant young. However, in general, given the size of Fort Drum and the vast amount of natural areas remaining, management or removal of vegetation through this activity is unlikely to have any discernible effects to Indiana or northern long-eared bats. With the time-of-year restriction for clearing of most trees, and the other conservation measures and screening criteria in place to deal with hazard tree removal, any negative effects should adequately be minimized. Therefore, mechanical vegetation management may affect but is unlikely to adversely affect Indiana and northern long-eared bats.

2.5 Land Conversion

The land conversion category is a new activity for 2015-2017. This activity will be performed primarily for military training requirements or to modify habitat for wildlife goals.

2.5.1 Land Conversion Activities

Military training land conversion will be similar to mechanical vegetation management in many ways, however, mechanical vegetation management typically deals primarily with forested vegetation (< 3 inch dbh), shrubs, or grassland areas. Land conversion for military training will address the small number of activities that result in a change from forested areas ($\geq$ 3 in dbh) to something other than forests (e.g., converting parts of a range from forest to grass/herbaceous cover or converting parts of WSAAF from seedling/sapling forest to grassland for airfield operations requirements). Once these activities have occurred, they would then fall under either mechanical or chemical vegetation management for military training as they are maintained in the desired end state. We would expect that up to 50 ac/year of forested areas would be converted to something other than forest in the next three years for military training benefits. In WSAAF, to meet federal safety requirements, there are approximately 300 ac of forested habitat that will need to undergo land conversion. These areas were initially clearcut in 2005-2006 to comply with tree height restrictions around the runways and minimize wildlife use to reduce BASH concerns (Appendix A, Section 2.7.1). Subsequently, these areas have re-sprouted and will need to be cleared again. The ultimate goal for these areas is to convert all of this forest to grassland/rangeland. As such, instead of addressing this through Wildlife Management

Activities section as done previously, we will address it here. For WSAAF, we would anticipate cutting up to 100 ac/year over the next three years.

Land conversion for wildlife habitat will address those activities that permanently convert one land cover type to another, solely for the benefit of wildlife, with no direct military training connection. This could include going from forested areas to grassland (as previously analyzed within a consultation with the USFWS-dated 16 September, 2013), or shrubland to grassland, forested to shrub, etc. Only forested areas that contain early succesional habitat will be converted to other land covers. There are currently no plans to perform land conversion in stands with late successional stage species. We would expect up to 250 ac/year, with no more than 50 ac/year in forested areas greater than seedling/sapling size class, for the next three years to undergo this type of management for wildlife habitat benefits.

2.5.2 Conservation Measures for Land Conversion Activities

To minimize the risks of impacting Indiana and northern long-eared bats during land conversion activities, several conservation measures have been implemented.

1. Bat Conservation Area. Approximately 2,200 ac (890 ha) have been set aside for Indiana bats. This BCA will also provide the same protections to northern long-eared bats. Land conversion will not occur within the BCA without additional consultation with the USFWS.

2. Roost Tree Protection. No female roost trees, including roosts identified in the future, will be felled for the lifespan of the roost, unless there is a human health and safety concern. This includes roost trees in and outside of the BCA.

3. Roost Tree Avoidance. Land conversion activities will not occur within 0.75 mi (1.2 km) of known maternity roost trees located outside the BCA without further consultation with the USFWS. An exception to this requirement would be the forested areas at WSAAF. In order to meet federal regulations for air safety, some of these areas may be converted from forest to grassland for ease of maintenance. These areas were originally clearcut in 2005 and contain trees primarily less than 4 in dbh. They have now regrown to heights that are once again becoming a safety concern. Some areas will be maintained as forest, but will be clearcut approximately every 5-10 years to keep them at the appropriate height (as described in Section 2.3). Other areas will be completely converted to grass.

4. No more than a total of 50 ac/year in each category (100 ac total for military training and wildlife habitat benefits) of land conversion will occur in forested areas with > 3 in dbh trees. This will help to ensure large areas within a contiguous area will not be removed, minimizing the potential to remove a large percentage of unknown roost trees.

5. Time of Year Restriction. A time of year restriction for clearing trees (> 3 in DBH) has been established to protect roosting bats during non-hibernation seasons. Felling of trees must take place between October 16 - April 15 while most Indiana or northern long-eared bats are not on Fort Drum.

6. No cutting of trees will occur within or along the bed or bank of streams protected under Article 15 of the New York State Environmental Conservation Law unless required to meet specific management goals and only after obtaining a permit from NYSDEC.

7. A minimum of 70 sq ft of residual basal area, all snags, and all live trees > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will be retained around all perennial streams and open waterbodies (2 ac or greater in size) on Fort Drum. A perennial stream is defined as having flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow. If land conversion treatments are needed that do not meet this conservation measure and that do not have a “no effect” determination, then individual consultation will be required with the USFWS. This buffer protects water quality and provides foraging habitat for Indiana and northern long-eared bats. Indiana bats are known to utilize riparian corridors that have suitable vegetative cover for foraging and for roosting in nearby trees (Jachowski et al. 2014a, Garner & Gardner 1992).

8. For annual reporting purposes, the proponent of the land conversion activities will provide shapefiles of converted areas and vegetative cover types pre- and post-conversion (within a scaled map to Fort Drum's Fish and Wildlife Management Program. This information will be used to describe the vegetative cover types and habitat modification on Fort Drum and will be reported annually to the USFWS.

2.5.3 Effects to Indiana and Northern Long-eared Bats

2.5.3.1 Direct Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore, land conversion activities have no known direct effects to hibernating Indiana or northern long-eared bats.

Roosting

Spring/Summer Tree Clearing

While the continued presence of Indiana bats on Fort Drum has been documented, WNS impacts have reduced the available population that could be present on the property. The same is true for northern long-eared bats. While acoustic detections still suggest this species is present in certain locations of Fort Drum, population impacts from WNS have been severe, thus reducing the available population of this species on the property as well. Historically, these bats were readily captured throughout Fort Drum; however, it has now been three years since a northern long-eared bat was captured. Regardless, all land conversion activities in forested areas (with trees > 3 in dbh) will be conducted between October 16 – April 15 when most Indiana and northern long-eared bats are absent from the installation.
The vast majority of all known primary and most secondary summer roosts for Indiana bats fall within the BCA within the Cantonment Area. At this time, there is no land conversion planned within the Cantonment Area. On the low chance that Indiana or northern long-eared bats are present on Fort Drum prior to April 15 outside of the BCA, no non-volant young would be present and all bats should be able to leave the forested stand once disturbance from clearing starts. It is unlikely that a summer maternity roost with bats will be affected, or individual males or females will be impacted. Because of these considerations, the potential for land conversion

activities to directly affect roosting Indiana or northern long-eared bats during the spring or summer is unlikely and effects are discountable.

Fall/Winter Tree Clearing

Acoustic and mistnetting efforts conducted on Fort Drum (2007-2014) have documented the presence of both species of bats (females, males, adults and juveniles) utilizing the Cantonment and Training Area later than August 15 (ESI 2008b, USFS 2011, Fort Drum, unpublished data).

Historically, Indiana bats have been found present in Fort Drum's Cantonment Area until at least 12 October and northern long–eared bats have been found as late as 1 October. Sixty two fall roosts were located after August 15 within the Cantonment Area during surveys in 2007-2010 for Indiana bats, and 16 of these roosts were located between October 1 and October 12 (ESI 2008b, ESI 2011, USFS 2011). No roosts have been found for northern long-eared bats within the Cantonment Area, however, captures and acoustic detections suggest maternity use was likely. Seven years of radio tracking Indiana bats has documented approximately 93% (114/122) of all roosts, including all fall roosts, to be within the BCA or nearby. Given the conservation measures established for the BCA, no land conversion activities would remove any potential roosts within the Cantonment Area. Therefore, Indiana and northern long-eared bats that use the BCA for fall roosting will not be adversely affected by land conversion. Still, the possibility exists that clearing may occur in undiscovered Indiana bat or unknown northern long-eared bat fall roosting areas during October. Undiscovered roost locations that may be present outside the BCA and within areas scheduled for land conversion in forested areas could potentially be adversely affected by cutting activities if roosts are removed before all bats have returned to the hibernaculum.

The likelihood of this happening is small. Only up to 100 ac per year would be impacted by land conversion in forested areas that has trees greater than 3 in dbh. This is a very small percentage of the overall roosting habitat on Fort Drum. Additionally, It is assumed fall swarming activities are mostly completed on Fort Drum by October 15 of any given year primarily based on the drop in temperatures experienced in this area of northern New York. Over an 11 year period from 2000-2010, the average minimum temperature on Fort Drum from October 1 – October 15 was 44 ºF (6.7 ºC), with 18 out of a possible 165 days (or on average 1.6 out of every 15 days) during that period dropping to or below freezing at night. Conversely, during the same period in 2000-2010, from October 16 – October 31, the average minimum temperature was 38 ºF (3.3 ºC), with 54 of a possible 176 days (or on average 4.9 out of every 16 days) during the period dropping to or below freezing. Additionally, from November 1 – November 15, the average minimum temperature on Fort Drum was 33.8 ºF (1 ºC), with 80 of a possible 165 days (or on average 7.3 out of every 15 days) during the period dropping to or below freezing (Fort Drum, unpublished data). It would be unlikely that bats would still be active in the landscape after October 15, given the lack of insect abundance that would be present and the energy that it would require to adequately deal with these low temperatures. Data collection from fall studies on Fort Drum supports the idea that Indiana and northern long-eared bats are mostly gone from the installation by mid-October. The last known capture date of Indiana and northern long-eared bat use on Fort Drum is September 20, and October 1, respectively (ESI 2008b, Fort Drum, unpublished data). The latest Indiana bats have been radio-tracked on Fort Drum has been October 12. During 2011-2013 Fort Drum performed acoustic surveys continuously from May through November 15 to determine bat temporal presence on the

property. Although analysis is not complete, during 2011 and 2012, there has only been one suspected Indiana bat call collected after 15 October (on 10/16/2011), and 10 suspected northern long-eared bat calls collected after 15 October (1-10/16/2011; 8-10/17/2012; and 1-11/12/2012).

Because of all these considerations, it is unlikely that land conversion activities after October 15 will directly adversely impact fall/winter roosting Indiana or northern long-eared bats, and any effects are discountable.

Noise

Noise is a likely by-product of all land conversion activities. However, given that conversion activities in forested areas will only occur during 16 October – 15 April, when the vast majority of Indiana and northern long-eared bats are not present, the likelihood that bats will disturbed by noise is low in these areas. Even if bats are present for a short period of time when conversion activities are occurring in the spring before April 15 or the fall after October 15, they would be in such low numbers that the probability that clearing is occurring in the same locations those low numbers of bats are present is unlikely. There should be no direct effects from noise from conversion activities on Indiana or northern long-eared bats.

Foraging

All tree clearing for land conversion activities will occur between October 16 – April 15 when most Indiana and northern long-eared bats are absent from the installation. Additionally, actions outside of forested areas that would occur when bats are present are not expected to occur in the evening, during the night, or in the early morning when bats are active. Subsequently, even if a small number of bats were present, they should not be impacted while foraging. Therefore, land conversion activities are anticipated to have no direct effects to foraging Indiana or northern long-eared bats.

2.5.3.2 Indirect Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore, land conversion activities are expected to have no known indirect effects to hibernating Indiana or northern long-eared bats.

Roosting

Land clearing activities in forested areas where Indiana and northern long-eared bats could be present will employ the removal of the existing forested land cover type (e.g., conifer, deciduous, mixed forest) and conversion to a secondary coverage (e.g., shrubs or grass/rangeland) for the benefit of military training or wildlife. This could remove entire areas of potential roosting habitat on any given year and potentially eliminate a roost network. However, typically, land conversion will only happen on approximately 100 ac total per year in forested areas. Additionally, land conversion specifically for the benefit of wildlife will occur only in areas composed of mid to late maturity early successional species. These early successional forests are characterized by a dense forest structure and usually smaller trees, which are not typically optimal for roost locations. Often these areas are not typically associated with ideal Indiana bat roosting habitat.

Currently, there are no land conversion actions scheduled in the Cantonment Area or BCA, however, there could be some actions within the potential range of the known Indiana bat maternity colony in TAs 3 and 4. Regardless, the vast majority (114/122, ~ 93%) of all known Indiana bat summer and fall roosts identified on Fort Drum are found within the BCA or nearby (within 25 m) and are protected. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosts remain available. Indiana bats are known to display site fidelity to roost locations (Gumbert et al. 2002, Fort Drum, unpublished data). The last 2 Indiana bats that were radio-tracked in 2011 and 2014 each went to the known roosting area within the BCA. Additionally, given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting area to exploit a new area. Therefore it is unlikely that land conversion in forested areas would adversely affect roosting Indiana bats.

However, northern long-eared bats are often more generalist in forested stand selection, and these mid to late maturity early successional species areas could be utilized by that species for roosting. If extensive suitable habitat was lost, northern long-eared bats may have to travel farther in the spring, thus expending more energy, in order to locate suitable roost sites to raise young. Little is known on the roosting requirements or locations on Fort Drum for northern long-eared bats, however, summer sites that have a variety of suitable roosts are essential to the reproductive success of local populations. Once bats find these areas, they typically exhibit strong site fidelity, returning to the same traditional summer maternity colony location (and sometimes specific trees) annually to bear their young (Sasse and Pekins 1996, Foster and Kurta 1999, Jackson 2004, and Johnson et al. 2009, USFWS 2014).

Since little is known about the locations of important roosting areas for northern long-eared bats, removal of entire woodlands or previous roost sites during winter hibernation may provide some measurable level of stress after these bats emerge in the spring if they must find new roost locations. It is not known how long or how far northern long-eared bats will search to find new roosting habitat if their traditional roost habitat is lost or degraded during the winter. If they are required to search for new roosting habitat in the spring, it is assumed that additional stress is placed on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration and pregnancy. Research has suggested that big brown bats suffered more than a 50% decline in reproductive success when excluded from a maternity area (Brigham & Fenton 1986). Sparks et al. (2003) noted that an Indiana bat colony became more fragmented the year following the loss of a maternity roost, so they used more roosts and congregated less. It is reasonable that northern long-eared bats on Fort Drum could also suffer a decline in reproductive success since more energy could be expended locating new suitable roosts.

However, Silvis et al (2014) suggested that northern long-eared bat colonies can withstand low levels of roost loss, and any impacts are likely manageable if large areas of available roosting habitat is still present on the landscape. Additionally, Johnson et al. (2009) found that northern long-eared bats readily exploited changes to forested areas when a reintroduction of fire created new snags and forest canopy gaps. Northern long-eared bats seem to exhibit more roost flexibility than Indiana bats, switching roosts fairly often and utilizing multiple species of both live and dead trees, as long as suitable roosting structure (i.e., cavities, cracks/crevices, or exfoliating bark) is present (Menzel et al. 2002, Owen et al. 2002, Carter and Feldhammer 2005, Johnson et al. 2009, Timpone et al. 2010). Northern long-eared bats have been documented in multiple species of shade tolerant to intolerant tree species of multiple diameters, ranging from 3- 25 in (7.6-63 cm) dbh, indicating opportunistic roost selection across the landscape (Foster and Kurta 1999, Timpone et al. 2010, USFWS 2013a). It appears that as with Indiana bats,

summer roost selection is primarily based on tree structure, amount of solar exposure, and ease of accessibility. However, solar exposure appears to be more important to Indiana bats, as they are typically found in taller trees with lower canopy cover than northern long-eared bats (Menzel et al. 2002, USFWS 2013a). Cooler temperatures due to higher canopy may not be an issue for northern long-eared bats, thus allowing it to be more opportunistic in roost selection.

Only approximately 100 ac per year will employ land conversion to forested areas. The largest contiguous area expected to be converted is 50 acres. Given the large acreage of intact forest available across Fort Drum (including immediately adjacent to any proposed areas for clearing) it is unlikely that land conversion would remove areas of potential roosting habitat for this species that would result in significant changes in roosting behavior. Also, any known (current or future) roosts will be protected. Finally, we consider the likelihood of any given clearing as currently being used by northern long-eared bats to be low given the significant declines observed on Fort Drum due to WNS.

All clearing will take place in the winter when bats are not present. No impacts are anticipated to Indiana bats given the project locations compared to the core roosting/foraging areas within the BCA. While it is possible northern long-eared bats could be utilizing stands that would be converted, it would be unlikely given the large declines this species has experienced due to WNS. Given the large areas of intact forest across Fort Drum, and the minimal acreage that would be converted in a given year, it is unlikely that this activity would remove large areas of potential roosting habitat or entire roost networks for this species. Therefore, it is unlikely that land conversion would adversely affect roosting northern long-eared bats, and any effects are discountable.

Noise

Noise is a likely by-product of all land conversion activities. However, given that conversion activities in forested areas will only occur during 16 October – 15 April, when the vast majority of Indiana and northern long-eared bats are not present, the likelihood that bats will disturbed by noise is low in these areas. Even if bats are present for a short period of time when conversion activities are occurring in the spring before April 15 or fall after October 15, they would be in such low numbers that the probability that clearing is occurring in the same locations those low numbers of bats are present is unlikely. There should be no indirect effects from noise from conversion activities on Indiana or northern long-eared bats.

Foraging

Only approximately 300 ac per year (100 ac within forested areas) will undergo land conversion activities over the next three years. Currently, there are no land conversion activities planned for the Cantonment Area or BCA, however, there are could some actions within the potential range of the known Indiana bat maternity colony in TAs 3 and 4. These clearing activities could temporarily shift Indiana bat foraging behavior to adjacent woodlands. However, due to the amount of available habitat and time of year restrictions for cutting trees, the impact to foraging bats is discountable in the short-term and ultimately positive in the long-term. Indiana bats utilize a variety of forest types and structure for foraging (Menzel et al. 2001). Studies have shown that bat activity is highest along edges and within forest openings, and Indiana bats are known to use gaps in the forest (Crampton & Barclay 1998; Menzel et al. 2001). In general, the effects of land conversion activities (during the hibernation season) are discountable, if not actually beneficial, for foraging bats as long as adequate forest habitat remains. Furthermore, the majority of clearing will probably take place outside the known Indiana maternity colony core

area within the BCA, so it is unlikely Indiana bats will be impacted positively or negatively by these actions in the Training Area. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable foraging areas remain available. Given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting and foraging area to exploit new areas. So while it is possible Indiana bats could be impacted by these actions, it is unlikely that land conversion would adversely affect foraging Indiana bats.

Although little information exists for foraging use of northern long-eared bats on Fort Drum, acoustic detections of northern long-eared bats (Figure 1.17) suggest that most of the installation is likely being used for foraging and travel. Given that northern long-eared bats are primarily gleaners, and prefer using forested cover for foraging, converting forested stands to shrubs or grass would not be beneficial to this species. Studies have shown that they likely prefer to forage in more intact forested areas (Caceres and Pybus 1998, Brack and Whitaker 2001, USFWS 2014), so creation of large open patches would create areas that northern long-eared bats would likely avoid. It could cause them to alter their foraging into nearby forests. Shifts in foraging could increase time and energy spent foraging. This is of particular note in the spring when bats are emerging from hibernation with low body weights and are under stress due to impacts from WNS, pregnancy, and relocation to summer roosts. Additional stress could lead to lower reproductive success, increase risk to disease and/or predation, or result in death. However, given the fact that land conversion in forested areas will at most be up to 50 acres, it is unlikely that northern long-eared bats would have much of an increased energy expenditure to avoid these areas. Fort Drum has ample vegetative cover throughout the Training Areas and nearby to the converted areas that is suitable for foraging. Additionally, as these areas will convert into dense herbaceous grasslands or woody shrublands within a few years after harvest, converted areas may offer some benefit to northern long-eared bats from the available abundant food source and from the creation of edges between forest types if they chose to exploit this resource.

Ultimately, there is only approximately 300 acres total per year (100 ac of forested habitat) scheduled for inclusion into land conversion, which is a small percentage of the available foraging habitat available for bats on the landscape. Even if bats did avoid newly cleared areas, ample forests of varying size classes and types are present in the Training Areas and are adjacent to proposed conversion units. Thus, sufficient habitat is available nearby for all foraging bats. So while there could be impacts to northern long-eared bats, it is unlikely. With the declines from WNS to the populations of northern long-eared bats, and the large amount of available habitat, it is unlikely that large areas of potential foraging or roost networks would be removed through these actions. Given that the location of conversion activities are outside the core Indiana bat home range, these actions may affect, but is unlikely to adversely affect either species.

2.5.4 Conclusion

Suitable habitat has never been considered a limiting factor for viable Indiana bat colonies on Fort Drum given that the core maternity colony habitat has been protected within the BCA. In addition, suitable habitat has not been considered a limiting factor for northern long-eared bats. Given the reduced populations of these bat species due to WNS impacts, and ample suitable forested habitat for roosting and foraging habitat remaining, this is even less of a concern for the remaining bats. Regardless, land conversion activities could have negative impacts if they removed important roosting networks or foraging locations. However, they are scheduled to occur on a very small proportion of the available habitat on Fort Drum, and are not scheduled to

occur within the core roosting and foraging area of Indiana bats. Conservation measures such as time of year restrictions, avoidance of known bat roosting and foraging locations, as well as the vast size of Fort Drum and available forests, reduces potential impacts to Indiana and northern long-eared bats when performing these conversion actions. Given this information potential impacts to Indiana and northern long-eared bats from land conversion actions at the scale they are proposed should be minimal. These actions may affect, but should not adversely affect Indiana or northern long-eared bats.

2.6 Prescribed Fire

Fort Drum does not anticipate that prescribed fire will be utilized in the foreseeable future, therefore it will be removed from consideration as an activity that will occur on Fort Drum within the next 3 years. If something changes, consultation will be re-initiated with the USFWS to address the action.

2.7 Pesticides

In this section, pesticides used on Fort Drum to control vegetation and invertebrates are assessed. For the purposes of this BA, a pesticide would be considered any substance or mixture of substances intended for: preventing, destroying, repelling, or mitigating any pest. It would also include herbicides, fungicides, and various other substances (including biological control agents) used to control pests or vegetation.

2.7.1 Pesticide Activities

Pesticide use on the installation is regulated by a variety of federal and state laws, Department of Defense directives (DoD Instruction 4150.07), and Army Regulations (AR 200-1), as well as the Fort Drum Integrated Pest Management Plan (Fort Drum 2014). All pesticide applications must be done in accordance with label instructions.

Government employees who apply or oversee the application of pesticides are DoD-certified for pesticide application. Certified personnel are recertified every three years. Installation pest management personnel will be certified in the appropriate EPA categories forest pest control (EPA category 2), ornamental and turf pest control (EPA category 3), aquatic pest control (EPA category 5), right-of-way pest control (EPA category 6), industrial, institutional, structural and health-related pest control (EPA category 7), public health pest control (EPA category 8), and aerial application (EPA category 11). Contractor personnel performing pest management services on Fort Drum are certified by the State of New York in the appropriate categories for which work is performed.

All pesticide products, except for those sold over the counter or used by Field Sanitation Teams, go through an annual review and approval process by the pest management staff at the Army Environmental Command. Pesticide use that is implemented by individual Fort Drum programs (e.g. Integrated Training Area Management Program) or that will occur on a large scale (i.e., aerial spraying) must undergo review and approval through the NEPA process (Appendix S). Pesticides used along fence lines, utility corridors, or within and around buildings are reviewed generically by NEPA through an Environmental Assessment of the Integrated Pest Management Plan. The types and amounts of pesticides used are reported to PW-Pest Management and are applied in accordance with the label and with the Integrated Pest Management Plan (Fort Drum 2014). During the NEPA process, potential pesticide actions are analyzed to determine their

impacts to wetlands, vegetation, and wildlife. Proper disposal in accordance with the product label will be followed. Fort Drum will minimize the need for disposal by reusing pesticide rinsate, whenever possible.

Vegetation Control

Herbicides are used to control vegetation for the following purposes:

1) Prevent woody vegetation encroachment on maneuver areas.
2) Remove vegetation on ranges where line-of-sight is impeded for target shooting or along utility corridors where mechanical vegetation control is not possible due to the presence of unexploded ordnance (e.g., ranges and Main Impact Area), uneven or sloped terrain, and/or the size of area.
3) Prevent vegetation from sprouting in paved areas, along fence lines, or in developed areas.
4) Control of invasive species.
5) Research (e.g., comparing tree regeneration between three treatment types).

Herbicides may be distributed via helicopter-mounted, ground vehicle-mounted, backpack, or pull-behind power sprayers. Ground application is the most commonly used method for herbicide application when treatment units are small or scattered, such as shrub clumps within a maneuver corridor, road vegetation, or spot applications to control invasive species. It is used in some forest management activities to selectively kill unwanted trees, in grounds and maintenance to prevent vegetation growth around paved areas or along fence lines, for clearing of select training areas, and a multitude of other small-scale projects. Because herbicides may be selectively/spottily applied, it is difficult to determine an estimated amount of acreage that may be treated via ground applications, however approximate locations are identified in Figure 2.10. Although there is approximately 4,000 ac (486 ha) identified in this coverage, only approximately 250 ac (101 ha) of specific vegetation (e.g., shrubs, < 3 in dbh trees, or invasive plants) within the identified footprints is expected to be treated annually via herbicides. Some of these areas will be mechanically cut on any given year, sometimes they will be treated by both methods, and many areas will not be treated at all. Additionally, the majority of this type of treatment will be in the grassland/shrubland areas on the western side of Fort Drum where we would not expect high utilization by bats.

Aerial applications are most likely to occur in large treatment units and units that are inaccessible due to unexploded ordnance or other safety concerns (i.e., ranges, Main Impact Area). Between 2012-2014, it was anticipated that up to three applications of herbicides would be aerially applied, primarily over the Ranges and Main Impact Area, for line-of-sight issues. Up to 2000 ac (809 ha) per year were anticipated to be treated both within and outside the Main Impact Area. However, because of various factors (e.g., amount of training, problems with funding, etc.) aerial application was only completed in 2013 and 2014, when approximately 4275.4 ac (1730 ha) and 1693.1 ac (685 ha) were treated, respectively. Approximately 5217.8 ac (2112 ha) were treated within the Main Impact Area, and approximately 750.8 acres (304 ha) were sprayed outside the Impact Area (Figure 2.10).

As in the previous BA, it is anticipated during 2015-2017 that approximately 2,000 ac (809 ha) per year will be aerially treated outside the Main Impact Area and approximately 2,000 ac (809 ha) per year will be aerially treated within the Main Impact Area (Figure 2.10). All aerial

spraying is subject to funding, mission priorities, and other factors, and although approximately 4,000 ac (1619 ha) per year are proposed, this number may fluctuate. No aerial applications will occur over the Cantonment Area or Bat Conservation Area without further consultation with the USFWS.

Arthropod Control

Most insect control is conducted in and around buildings or warehouses for human health and safety issues (e.g., fleas, flies, bees), building integrity issues (i.e. termites, carpenter ants), or for nuisance complaints (e.g., ants, cockroaches) (Fort Drum 2014). Refer to Appendix A (within Appendix I) and Appendix R for a list of potential insecticides that will be used.

Insecticides are primarily applied via hand applications and occur in localized areas. Most insecticides proposed to be used on Fort Drum are not expected to affect Indiana or northern long-eared bats because of the limited quantity used, the specific manner of application, the targeted pests, or the location that will be treated. Many insecticides are used in and around food preparation areas or are primarily located indoors. These pesticides are likely to have no effects to Indiana or northern long-eared bats and will not be discussed in further detail.

There are three insecticides that merit further discussion due to their potential to affect (indirectly or directly) on Indiana or northern long-eared bats. These include Altosid (methoprene), Thuricide (*Bacillus thuringiensis* v. Kurstaki (BTK)), and Summit Bactimos (*Bacillus thuringiensis* v. Israelensis (BTI)). These insecticides are used to control mosquitoes, moths/catepillars, and general insects. Altosid and Summit Bactimos are applied to standing water (i.e., Remington Pond, storm retention ponds) within the Cantonment Area or in areas near ranges to control mosquitoes in the larval stage (see Material Safety Data Sheets for more information). These pesticides are applied monthly in tablet form during the summer months. Controlling larvae or eliminating the source of mosquitoes are the recommended practices for managing mosquitoes. These insecticides are primarily used to minimize the risk of spreading disease (i.e., West Nile Virus).

Thuricide has not been previously used on Fort Drum, however it may be used in the future to manage for gypsy moths (*Lymantria dispar*) or American tent caterpillars (*Malacosoma americanum*), which can cause significant damage to trees. If aerial application is needed to control these species, then further consultation is needed with the USFWS.

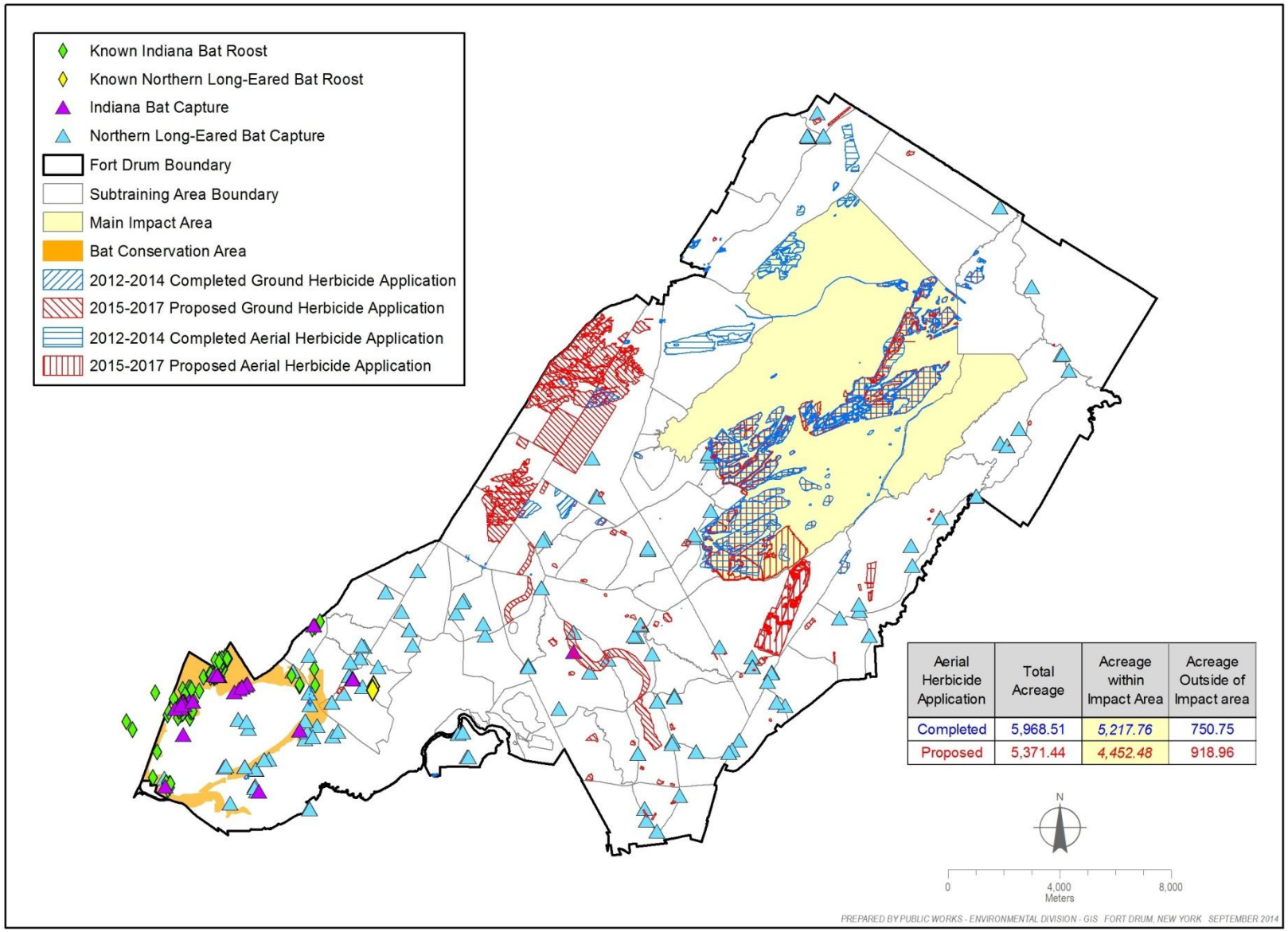

Figure 2.10. Completed and proposed herbicide application on Fort Drum Military Installation, 2012-2014 and 2015-2017, respectively.

2.7.2 Conservation Measures for Pesticide Application Activities

1. Only pesticides registered by the EPA and State of New York may be applied and only in accordance with their label.

2. Aerial applications will occur between the hours of sunrise and one hour before sunset. This will protect foraging bats in undiscovered foraging areas from direct exposure.

3. Aerial application of pesticides in the BCA will not occur without further consultation with the USFWS.

4. Other pesticide application within the BCA will be limited to 50 ac per year (no more than 25 ac in a contiguous block) for tow behind power blowers and 25 ac per year for spot/ground application.

5. Tow behind power blowers will not be utilized until after August 15 in all forested areas to allow pups to reach volancy and exit an area if disturbed by this activity. Deviations from this conservation measure will require further consultation with the USFWS.

6. Whenever possible, herbicides that have low toxicity to mammals will be utilized with the tow behind power blowers. Herbicides that may be somewhat toxic to mammals will be mixed and applied at a rate that should minimize any potential exposure concerns.

7. Application of pesticides from ground mounted vehicles (i.e., ATVs, tractors) that spray chemicals directly onto the ground and do not result in broad dispersal will be conducted at least 100 ft (30 m) from known roost trees (including roosts identified in the future) and 250 ft (76 m) from known primary roosts.

8. Application of pesticides that result in broad dispersal (e.g., tow behind power blowers) will be conducted at least 250 ft (76 m) away from known roost trees (including roosts identified in the future) and 500 ft (152 m) from known primary roosts. Pesticides will be applied between sunrise and one hour before sunset. Location-specific applications (i.e. hatchet or stem injections of trees, individual application to specific plants) may be used within 500 ft (30-76 m) of known roosts. This measure minimizes the risk of exposure to bats and potential effects from pesticides.

9. Pesticides applied from tow behind power blowers will use drift control additives and will be applied using low pressure to reduce drift and potential swirling motion from the blower. All efforts will be made to only spray 10 feet from ground level or below.

10. Pesticides will not be applied outdoors when the wind speed exceeds 8 mi/hr for all applications except power mist blowers. Pesticides applied via power mist blower will only be applied with wind speeds <5 mi/hr. This is to reduce the risk of pesticide drift, which could impact water quality or non-target areas. Care will be taken to make sure that any spray drift is kept away from non-target areas and individuals. Additionally, aerial application will utilize helicopters and employ large droplet technology through special nozzles on drop tubes to ensure the herbicide stays on target.

11. If a bat colony is found roosting in a building, then insecticides will be used sparingly and no foggers will be used. This will minimize impacts to roosting Indiana bats if they are found within a building. Currently, only one colony of bats has been located on Fort Drum. The LeRay Mansion houses several hundred little brown bats according to a survey conducted in 2007. No Indiana bats were identified in the survey.

12. For each pesticide application, Pest Control will report the total amount of PAI used for each pesticide, the size of the treated area (within a scaled map), and the vegetative cover types that were treated to Fort Drum's Fish and Wildlife Management Program for annual reporting purposes to the USFWS. For pesticides applied indoors or immediately along the exterior of the building, only the PAI needs to be reported—no map is required or vegetation types need to be reported.

2.7.3 Effects to Indiana and Northern Long-eared Bats

2.7.3.1 Direct Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore, pesticide application activities are expected to have no direct effects to hibernating Indiana or northern long-eared bats.

Roosting

Pesticides used in or immediately adjacent to buildings will be applied during daylight hours when Indiana and northern long-eared bats are roosting. Insecticides are primarily applied by hand individually or by hand-held sprayers in and around buildings. Known and potential Indiana and northern-long eared bat roosts on Fort Drum have been and will be primarily within snags or live trees within woodland areas in the Cantonment and Training Areas, so insecticides applied within a building should have no effect on individuals or maternity colonies of Indiana or northern long-eared bats. Also, it is unlikely that insecticides applied indoors will directly affect undiscovered roosting Indiana or northern long-eared bats within buildings, given the conservation measure that no broad dispersal of insecticides (i.e., no foggers) be applied within a building that has bats. For this reason, indoor insecticide application is expected to have no known direct effects on Indiana or northern long-eared bats.

BTK and BTI are bio-pesticides that are bacteria specifically designed for the target pest with minimal non-target impacts (Swadener 1994). BTK and BTI can cause mild skin and eye irritation. The USDA Forest Service conducted a risk assessment for the use of BTK and found that through all means of exposure BTK would not adversely impact terrestrial vertebrates as determined through pesticides analysis with mice (Syracuse Environmental Research Associates 2004a). These bio-pesticides are not known to cause birth defect in mammals and are considered non-carcinogenic (http://pmep.cce.cornell.edu/profiles/extoxnet/24d-captan/bt-ext.html). These bio-pesticides are expected to be applied via hand methods in localized areas and will only be applied during favorable weather conditions. This reduces the risk of exposure to Indiana and northern long-eared bats, thus further minimizing the low impacts BTK and BTI may directly have on these species. BTK and BTI may affect, but are unlikely to adversely affect known and undiscovered roosting Indiana or northern long-eared bats during the non-hibernation seasons.

Aerial applications of herbicides will typically be conducted during the growing season on ranges and in the Main Impact Area, which are typically greater than 7.5 mi (12 km), from known roosting locations for Indiana bats. The majority of the acreage scheduled for treatment within the maintained range facility and target areas are mostly areas that have been previously and continually disturbed and consist primarily of grass and shrubs. Furthermore, all of the herbicide application is outside the known Indiana maternity colony core area within the BCA, Cantonment Area, and TAs 3 and 4, so it is unlikely Indiana bats will be negatively impacted by this activity. Indiana bats have used the same general areas on Fort Drum since 2007, and it is expected that they will continue to utilize the protected area as long as suitable roosting and foraging areas remain available. Given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting and foraging area to exploit new areas. Therefore, it is unlikely Indiana bats would be adversely impacted by these actions.

However, northern long-eared bats have historically been found throughout all of Fort Drum, including near areas where aerial application of herbicide is expected to occur over the next three years (Figures 1.18 and 2.10). Little is known on the roosting requirements or locations on Fort Drum for northern long-eared bats, however, summer sites that have a variety of suitable roosts are essential to the reproductive success of local populations. Once bats find these areas, they typically exhibit strong site fidelity, returning to the same traditional summer maternity colony location (and sometimes specific trees) annually to bear their young (Sasse and Pekins 1996, Foster and Kurta 1999, Jackson 2004, and Johnson et al. 2009, USFWS 2014).

Mistnet surveys during 2007-2011 documented numerous reproductive females and juvenile northern long-eared bats on the installation, indicating that multiple maternity colonies and suitable roosting habitat was likely present throughout the property. The only known roosts for northern long-eared bats on the property were documented in 2010 when a juvenile female was radio-tracked to three different roosts in Training Area 4 (Figure 1.12).

Since little is known about the locations of important roosting areas for northern long-eared bats on Fort Drum, it is possible that herbicide could be applied on unknown roost sites. This may cause some irritation and bats may abandon an area to avoid the herbicide. Avoidance of a roost could lead to some level of measurable stress after these bats emerge in the spring if they must find new roost locations. However, it is unlikely the herbicide application would cause enough stress to lead to mortality. A larger concern would be if bats abandon a roost that has non-volant young and the young subsequently die. Or if enough herbicide is directly applied to the young leading to the pup's death in some manner (e.g., causing the young to fall out of the roost). However, the likelihood of this should be very low. The majority of the acreage scheduled for aerial herbicide application is mostly in areas that have been previously and continually disturbed and consist primarily of grass and shrubs (on the range propers). While there could be some potential roost trees that are covered with herbicide, the likelihood that there would be northern long-eared bats in the few remaining trees on ranges and that a non-volant young was within a tree that could not escape is low.

While there could be potential roosting habitat within the Main Impact Area for northern long-eared bats, this area is off limits and not accessible to determine any potential use by, or impacts to these bats. Therefore, while we will consider the potential impacts of drift from applied herbicide to areas outside the Main Impact Area, no additional consideration will be given to potential impacts actually within the Main Impact Area, and it will not be included in any further analysis for herbicide use. With the type of herbicide application currently utilized, the likelihood of drift is extremely low. Large droplets of herbicide are deployed via helicopter

through special nozzles on drop tubes that ensures the herbicide stays on target better than previous, conventional small droplet size technology. This technology, combined with wind speed restrictions during application, reduce the likelihood of drift substantially. Because of the the lack of suitable roosting habitat within the range areas, and measures to control pesticide drift, northern long-eared bats are unlikely to be directly affected by aerial application of herbicide.

Herbicide applications via power sprayers may be utilized in specific applications to address invasive species concerns or prepare areas for forest management applications (Section 2.3.1). Although all efforts will be made to direct nozzles at appropriate angles, and applications will only be made at wind speeds below 5 mi/hr, by their very nature, these sprayers atomize and release small droplets of herbicide into the air. To reduce this possibility, pesticides applied from tow behind power blowers will use drift control additives and will be applied using low pressure to reduce drift and potential swirling motion from the blower. According to the manufacturer of the mist blower, in most cases drift is not likely to rise above 15 feet, however, even at this height, there could be a small chance that Indiana or northern long-eared bats could be roosting. The majority of bat roosts on Fort Drum have been above that height (Fort Drum, unpublished data). Regardless, all efforts will be made to only spray 10 feet from ground level or below to further reduce the possibility of inadvertently applying pesticide to roosting bats. This type of application will potentially be utilized within the BCA to deal with the large amount of invasive plant species that are starting to take over much of the understory in certain areas. However, this application could be utilized in other areas in the Cantonment or Training Areas as well. Therefore, the potential exists that Indiana or northern long-eared bats could be exposed to this type of spraying. Undiscovered roosting Indiana or northern long-eared bats may inhale or could come in direct contact with pesticides, which could result in mild skin irritations or could contribute to body weight loss if exposed to high levels. There is small likelihood of this happening, however. To minimize the potential impacts to bats, whenever possible, herbicides will be utilized that have low toxicity to mammals (bats). If this is not possible, herbicides will be mixed and applied at a rate low enough to ensure minimal exposure impacts to bats. Additionally, this type of application will only occur on a very limited acreage per year within the BCA (approximately 2% of the protected area), and less than 250 ac/ yr in the Training Area (typically much less in forested acres). Due to drastic declines in both species, the likelihood that spraying would occur near individuals or colonies is low. It will not be sprayed within 250 ft of known Indiana or northern long-eared bat roosts (or within 500 ft of known primary roosts). Additionally, while it could be sprayed unknowingly near undiscovered Indiana and northern long-eared roosts, application will only occur after August 15 to allow any bat (to include volant young) to fly away if irritated by the activity. Furthermore, given the small amount of acreage that herbicide would be applied to in this manner, bats would not have to go far or expend energy to the point of mortality to deal with this issue. It is unlikely that shifts in home ranges would occur to avoid the sprayed areas. Therefore, although herbicide application via tow behind power blowers may affect Indiana and northern long-eared bats, it is unlikely to directly adversely affect these bats.

Other ground methods are more controlled. As a conservation measure, no pesticides will be applied within 100 ft (30 m) of known roost trees and 250 ft (76 m) of known primary roosts unless specifically applied to a pre-identified plant or groups of plants; and care will be taken to minimize drift towards roosts. This reduces risk of direct exposure to known bat roosts and protects both juveniles and adults from chemical exposure. Undiscovered roosting Indiana or northern long-eared bats may inhale or could come in direct contact with pesticides, which could result in mild skin irritations or could contribute to body weight loss if exposed to high levels. There is small likelihood of this happening, however. Given the small amount (i.e., 25 ac/yr),

type (spraying for shrubs or invasive plants) and proposed locations of most ground application, the likelihood of encountering an unknown roost is unlikely. If spraying did occur around an unknown roost, there should be no direct exposure to the bat, as most roost locations (i.e., where the bats physically roost) are typically greater than 3 m from the ground (Fort Drum, unpublished data), well above where any herbicide would be sprayed from the ground. Given the small amount, type (spraying for shrubs or invasive plants) and proposed locations of most ground application, the likelihood of encountering an unknown roost is unlikely. Additionally, the toxicity ratings of most of the herbicides to be used on Fort Drum are very low to low for small mammals and the half-lives are relatively short. Herbicides will be applied according to label requirements and will not be applied in excess of what is recommended for a given area. With all these considerations, it is unlikely that undiscovered roosts would be negatively affected. Thus, herbicides applied via ground methods are unlikely to directly negatively impact known bat roosts, and thus effects are discountable.

Hand application of pesticides for invasive species or individual unwanted trees within 100-250 ft (30-76 m) of roosts will be applied directly to the targeted plant and will not be broadly dispersed. By direct application, the risk of drift and the risk of exposing roosting bats to pesticides are minimal. With limited to no contact with herbicides, Indiana or northern long-eared bats are not likely to be negatively impacted by herbicides applied within 100-250 ft (30-76 m) and thus effects are discountable.

Foraging

Foraging Indiana or northern long-eared bats are unlikely to be directly affected by pesticides because all pesticides will be applied during the day when Indiana bats are not typically active. The risk of exposure to these bats is not likely given the time of day restrictions in applying pesticides, therefore no known direct effects are anticipated.

2.7.3.2 Indirect Effects

Hibernation

No hibernacula are known to exist on Fort Drum, and the nearest known hibernaculum to Fort Drum is 6.5 mi (10.5 km) away. Therefore pesticide application activities have no known indirect effects to hibernating Indiana or northern long-eared bats.

Roosting

Application of herbicide to trees or forested areas could lead to an increase in snag creation and potential roosts as trees die. This is likely to happen mainly in situations like aerial applications of herbicides in the Main Impact Area. While it is assumed that this has happened to some degree, as mentioned before, because of the off limits nature of this area, this cannot be confirmed at this time. Regardless, these aerial applications are typically greater than 7.5 mi (12 km), from known roosting locations for Indiana bats, outside the known Indiana maternity colony core area within the BCA, Cantonment Area, and TAs 3 and 4. So it is unlikely Indiana bats would benefit from snag creation from this activity anyhow. Because it is unknown if there would be a beneficial effect from this type of activity, and it is unlikely that the remaining population of Indiana bats would abandon a historic roosting and foraging area to exploit new areas, and be negatively affected, aerial herbicide application may affect, but will not adversely affect Indiana bats.

While it is more likely that northern long-eared bats would take advantage of the creation of snags in the Main Impact Area, once again, this cannot be determined at this time. Since little is known about the locations of important roosting areas for northern long-eared bats anywhere on Fort Drum, it is possible that herbicide could be applied on unknown roost sites. This may cause some irritation, and bats may abandon an area to avoid the herbicide. Avoidance of a roost could lead to some level of measurable stress after these bats emerge in the spring if they must find new roost locations. If herbicide is applied directly to roosts containing bats, bats may inhale or come in direct contact with pesticides, which could result in mild skin irritations or could contribute to body weight loss if exposed to high levels. However, the likelihood of this should be very low. The majority of the acreage scheduled for aerial herbicide application is mostly in areas that have been previously and continually disturbed and consist primarily of grass and shrubs (on the range propers). While there could be some potential roost trees that are covered with herbicide, the likelihood that there would be northern long-eared bats in the few remaining trees on ranges and that a non-volant young was within a tree that could not escape is low.

With the type of herbicide application currently utilized, the likelihood of drift is extremely low. Large droplets of herbicide are deployed via helicopter through special nozzles on drop tubes that ensures the herbicide stays on target better than previous, conventional small droplet size technology. This technology, combined with wind speed restrictions during application, reduce the likelihood of drift substantially. Because of the the lack of suitable habitat within the range areas, and measures to control pesticide drift, northern long-eared bats are unlikely to be indirectly affected by aerial pesticide applications.

Herbicide applications via power sprayers may be utilized in specific applications to address invasive species concerns or prepare areas for forest management applications (section 2.3.1). Although all efforts will be made to direct nozzles at appropriate angles, and applications only be made at wind speeds below mi/hr, by their very nature, these sprayers atomize and release small droplets of herbicide into the air. According to the manufacturer of the mist blower, in most cases drift is not likely to rise above 15 feet, however, even at this height, there could be a small chance that Indiana or northern long-eared bats could be roosting. This type of application will potentially be utilized within the BCA to deal with the large amount of invasive plant species that is starting to take over much of the understory in certain areas. However, this application could be utilizing in other areas in the Cantonment or Training Areas as well. Therefore, the potential exists that Indiana or northern long-eared bats could be exposed to this type of spraying.

This type of application may open up a previously extremely cluttered understory, which may lead to increased use in an area by bats. Although both Indiana and northern long-eared bats are clutter adapted species, thick undergrowth of invasive species will still prevent them from being able to fly through certain areas. This may allow them to be able to access roosting areas with less effort.

Undiscovered roosting Indiana or northern long-eared bats may inhale or could come in direct contact with pesticides, which could result in mild skin irritations or could contribute to body weight loss if exposed to high levels. There is small likelihood of this happening, however. To minimize the potential impacts to bats, whenever possible, herbicides will be utilized that have low toxicity to mammals (bats). If this is not possible, herbicides will be mixed and applied at a rate low enough to ensure minimal exposure impacts to bats. Additionally, this type of application will only occur on a very limited acreage per year within the BCA (less than 2% of the protected area), and less than 250 ac/ yr in the Training Area (typically much less in forested acres). Due to drastic declines in both species, the likelihood that spraying would occur near

individuals or colonies is low. It will not be sprayed within 250 ft of known Indiana or northern long-eared bat roosts (or within 500 ft of known primary roosts). Although bats could be roosting at a height that pesticide could reach (at or below 15 feet), the majority of bat roosts on Fort Drum have been above that height (Fort Drum, unpublished data). Additionally, while it could be sprayed unknowingly near undiscovered Indiana and northern long-eared roosts, application will only occur after August 15 to allow any bat (to include volant young) to fly away if irritated by the activity. Furthermore, given the small amount of acreage that herbicide would be applied to in this manner, bats would not have to go far or expend energy to the point of mortality to deal with this issue. Therefore, although herbicide application via tow behind power blowers may affect Indiana and northern long-eared bats, it is unlikely to adversely affect these bats.

Other ground methods are also not likely to adversely affect Indiana or northern long-eared bats. No pesticides will be applied within 100 ft (30 m) of known roost trees and 250 ft (76 m) of known primary roosts unless specifically applied to a pre-identified plant or groups of plants; and care will be taken to minimize drift towards roosts. This reduces risk of direct exposure to known bat roosts and protects both juveniles and adults from chemical exposure. Undiscovered roosting Indiana or northern long-eared bats may inhale or could come in direct contact with pesticides, which could result in mild skin irritations or could contribute to body weight loss if exposed to high levels. There is small likelihood of this happening, however. Given the relatively small amount, type (spraying for shrubs or invasive plants), and proposed locations of most ground application, the likelihood of encountering an unknown roost is unlikely. If spraying did occur around an unknown roost, there should be no direct exposure to the bat, as most roost locations (i.e., where the bats physically roost) are typically greater than 3 m from the ground (Fort Drum, unpublished data), well above where any herbicide would be sprayed from the ground.

Given the small amount, type (spraying for shrubs or invasive plants) and proposed locations of most ground application, the likelihood of encountering an unknown roost is unlikely. Additionally, the toxicity ratings of most herbicides to be used on Fort Drum are very low to low for small mammals and the half-lives are relatively short. Herbicides will be applied according to label requirements and will not be applied in excess of what is recommended for a given area. With all these considerations, it is unlikely that undiscovered roosts would be negatively affected. Thus, herbicides applied via ground methods are unlikely to negatively impact known bat roosts, and thus effects are discountable.

Hand application of pesticides for invasive species or individual unwanted trees within 250-500 ft (76-152 m) of roosts will be applied directly to the targeted plant and will not be broadly dispersed. By direct application, the risk of drift and the risk of exposing roosting bats to pesticides are minimal. With limited to no contact with herbicides, Indiana or northern long-eared bats are not likely to be negatively impacted by herbicides and thus effects are discountable.

Foraging

Indiana and northern long-eared bats are insectivores that may ingest insects that have been exposed to insecticides or herbicides, thus potentially exposing Indiana or northern long-eared bats to the effects of bioaccumulation. Bioaccumulation of toxic substances has been a concern for many cave roosting bats, because it has been suggested that toxins may reach lethal levels in a bat's body as its body weight declines during migration or hibernation (Geluso et al. 1981). This is of particular concern for cave roosting bats in New York where WNS has been reported.

WNS may compound the effects of pesticides. A combination of chemical toxicity and disease may further increase mortality levels in hibernating bats. Of the pesticides used on Fort Drum, methoprene is the only chemical that has been known to bioaccumulate, however, it has not been documented to bioaccumulate in mammals and showed low toxicity even at high oral doses (Csondes 2004). Subsequently, the potential for Indiana or northern long-eared bats to ingest prey items that would lead to bioaccumulation of pesticides is low. Effects to Indiana or northern long-eared bats are discountable from this concern.

Another concern of using pesticides is the loss of potential prey for Indiana and northern long-eared bats. Decreased prey after spring migration and before fall migration may further stress traveling individuals, including reproductive females. Additional stress could result in reduced body weight gain during pregnancy and before entering hibernation. Lower weight gain raises the risks of pup mortality in the spring/early summer and the risk of mortality during hibernation. Indiana or northern long-eared bats may expend extra energy searching for food if insect levels are not adequate for the population in the area. On Fort Drum, insecticides and some of the proposed herbicides have the potential to cause mortality in both aquatic and terrestrial invertebrates. Most insecticides applied on Fort Drum will be used in small doses and applied to localized areas, BTI typically targets dipterans and BTK is used to control lepidopterans, both known prey of Indiana and northern long-eared bats. These insecticides are expected to be selectively applied in areas near known and undiscovered foraging areas. Because of the small scale application, these insecticides may reduce some insect abundance, but not of sufficient numbers to result in noticeable effects to the food web. The majority of known foraging areas for Indiana bats will not be treated with insecticides, and although foraging areas for northern long-eared bats are unknown, there are no plans to treat large areas with insecticides. Given the large decreases in multiple bat species (not just Indiana and northern long-eared), it is not likely that the prey base is a limiting factor for the survivorship of insectivorous bats.
Given the small amount of this type of pesticide application that occurs on an annual basis, it is unlikely that there would be any reduction to the forage base for these bats. Both species are quite adaptable foragers and readily exploit multiple insect species. It is unlikely that other pesticides/herbicides have the potential to impact Indiana and northern long-eared bat insect prey base. When applied in accordance with the label, herbicide impacts to aquatic invertebrates and other non-target organisms should be minimized. Because all pesticides will be applied in accordance with their label and because of the relatively low toxicity to invertebrates, herbicides proposed for Fort Drum are unlikely to have adverse affects on potential prey for the Indiana or northern long-eared bat, thus effects are discountable

Aerial herbicide application may impact potential foraging areas by converted the majority of vegetation to herbaceous habitat with limited predator cover available. Northern long-eared bats may avoid these areas if that is the case. However, there are large amounts of suitable foraging habitat available to these bats. Additionally, given the declines from WNS, it is unlikely that suitable foraging areas are limiting to northern long-eared bats. Aerial herbicide application areas have been managed in the same way for years, so any potential avoidance by this species is likely already occurred. Therefore there should be no additional adverse impacts from aerial application of herbicide.

Herbicide application via power blowers may open up a previously extremely cluttered understory within the Cantonment and Training Areas, which may lead to increased use by bats. Although both Indiana and northern long-eared bats are clutter adapted species, thick undergrowth of invasive species will still prevent them from being able to fly through certain areas. While vegetation reduction/loss may result in decreased insect production and forage base in treated areas, there are large amounts of suitable foraging habitat throughout the

Cantonment and Training Areas. Additionally, only small acreages are scheduled to be treated, and the loss of vegetation will be temporary, as more preferred, non-invasive species are allowed to grow back. Therefore there should be no adverse impacts from power mist blower herbicide applications to either species of bat.

2.7.4 Conclusion

There is limited suitable roosting habitat on the range areas where aerial herbicide application is occurring. These herbicides are sprayed only a few times a year, and will not be sprayed at night. These aerial applications are typically greater than 7.5 mi (12 km), from known roosting locations for Indiana bats, and outside the known Indiana maternity colony core area within the BCA, Cantonment Area, and TAs 3 and 4. Given the declines of Indiana bats due to WNS, it is unlikely that the remaining population would abandon a historic roosting and foraging area to exploit new areas.

Northern long-eared bats have historically been found throughout all of Fort Drum, including near areas where aerial application of herbicide is expected to occur over the next three years. However, the majority of the acreage scheduled for aerial herbicide application is mostly in areas that have been previously and continually disturbed and consist primarily of grass and shrubs (on the range propers). While there could be some potential roost trees that are covered with herbicide, the likelihood that there would be northern long-eared bats in the few remaining trees on ranges and that a non-volant young was within a tree that could not escape is low. Because of the lack of suitable habitat within the range areas, and measures to control pesticide drift, northern long-eared bats are unlikely to be directly affected by pesticides.

While herbicide application via power sprayers will be applied within the BCA, near the core area for Indiana bats, and in other areas near northern long-eared bat use, whenever possible, herbicides will be utilized that have low toxicity to mammals (bats). If this is not possible, herbicides will be mixed and applied at a rate low enough to ensure minimal exposure impacts to bats. Additionally, this type of application will only occur on a very limited acreage per year within the BCA and in the Training Area. Due to population declines in both Indiana and northern long-eared bats, the likelihood that spraying would occur near individuals or colonies is low. While it could be sprayed unknowingly near undiscovered Indiana and northern long-eared roosts, application will only occur after August 15 to allow any bat (to include volant young) to fly away if irritated by the activity. Given the small amount of acreage that herbicide would be applied to in this manner, bats would not have to go far or expend energy to deal with this issue. We would not expect in shifts in home range or roosting or foraging behavior due to this activity. Therefore, although herbicide application via tow behind power blowers may affect Indiana and northern long-eared bats, it is unlikely to indirectly adversely affect these bats.

Pesticide application is not anticipated to reduce any prey within known or unknown foraging areas, and it is not expected to reduce or adversely modify foraging habitat. Additionally, there are adequate foraging locations throughout Fort Drum.

Given these considerations and the proposed conservation measures, the use of pesticides may affect, but is not likely to adversely affect Indiana or northern long-eared bats on Fort Drum.

2.8 Wildlife Management/Vertebrate Pest Control

2.8.1 Wildlife Management/ Vertebrate Pest Control Activities

Fort Drum does not anticipate that there will be any significant change from the amount, type, and/or duration of wildlife management/vertebrate pest control management that was previously analyzed in the 2009-2011 or 2012-2014 BAs that will occur on Fort Drum over the next 3 years. After reviewing the project description and effects analysis for this section in the previous BAs, we believe that it is suitable in scope to include any potential impacts to northern long-eared bats. Additionally, we feel that the conservation measures should now be suitable for both species. Therefore, we affirm that the effects analysis is appropriate from the previous BAs, and the conservation measures are now suitable to address both Indiana and northern long-eared bat. There has been one small change, and habitat management for BASH activities on 300 ac within WSAAF is now addressed in Section 2.5.1 (Land Conversion) of this BA. We affirm that the effects analysis and conservation measures from the previous BA remain appropriate. Please see Appendix A, Section 2.7 for more information.

2.8.2 Conservation Measures for Wildlife Management/Vertebrate Pest Control Activities

1. No Lethal Control. No lethal control methods are permitted for bats unless there is a suspected human health risk for exposure to rabies or other disease. If individual bats are in buildings and there is no evidence of maternity use, then all efforts will be made to safely capture and release individual bats. Or, the bats will be excluded by establishing one-way valves over the roost's exit (if feasible).

2. Time of Year Restriction for Exclusion. The exclusion will only be done during times of the year when pups are not present or when they are volant (i.e., August - early May). The time of year restriction will minimize the risk of separating mothers from non-volant young, so it will prevent potential pup mortality during exclusion activities. Sealing cracks and crevices in buildings will also be done during the late fall or early spring. This is based on the assumption that no bats hibernate in buildings on Fort Drum, which is a valid assumption given the narrow temperature requirements necessary for hibernating bats and the heating of buildings (Tuttle & Kennedy 2002) and the fact that no bats have been found hibernating in buildings to date. Sealing cracks and crevices prevents bats from entering a building and reduces human/bat conflicts.

3. Adhesive Trap Restrictions. No adhesive traps used for rodents or insects will be placed in such a manner that they could capture bats—glue traps will not be placed in any crawl space or attic compartment within buildings or in areas where bats are known to occur.

2.8.3 Effects to Indiana and Northern Long-eared Bats

Please see Appendix A for the detailed effects analysis that was performed for the 2009-2011and 2012-2014 BAs. Fort Drum does not anticipate any change in activities that would require any change to the analysis. After reviewing the project description and effects analysis for this section in the previous BAs, we believe that it is suitable in scope to include any potential impacts to northern long-eared bats. Additionally, we feel that the conservation measures should now be suitable for both species. Therefore, we affirm that the effects analysis is appropriate from the previous BAs, and the conservation measures are now suitable to address both Indiana and northern long-eared bat.

2.8.4 Conclusion

With conservation measures in place, wildlife management/vertebrate pest control activities may affect, but are not likely to adversely affect Indiana or northern long-eared bats.

2.9 Outdoor Recreation

2.9.1 Outdoor Recreation Activities

Fort Drum does not anticipate that there will be any significant change from the amount, type, and/or duration of outdoor recreation that was previously analyzed in the 2009-2011and 2012-2014 BAs that will occur on Fort Drum over the next 3 years. After reviewing the project description and effects analysis for this section in the previous BAs, we believe that it is suitable in scope to include any potential impacts to northern long-eared bats. Additionally, we feel that the conservation measures should now be suitable for both species. Therefore, we affirm that the effects analysis is appropriate from the previous BAs, and the conservation measures are now suitable to address both Indiana and northern long-eared bat. Therefore, we affirm that the previous BA analysis is appropriate. Please see Appendix A, Section 2.8 for more information.

2.9.2 Conservation Measures for Outdoor Recreation Activities

1. Skeet Range. Skeet shooting at the current skeet range is located adjacent to the BCA and fires over a known fall, summer, and assumed spring foraging location of Indiana bats. From April 15 - October 15, the skeet range's hours of operation will be no earlier than 30 minutes after sunrise and no later than one hour before sunset. This measure will prevent the accidental shooting of an Indiana bat during the non-hibernation seasons.

2.9.3 Effects to Indiana and Northern Long-eared Bats

Please see Appendix A for the detailed effects analysis that was performed for the 2009-2011 and 2012-2014 BAs. Fort Drum does not anticipate any change in activities that would require any change to the analysis. After reviewing the project description and effects analysis for this section in the previous BAs, we believe that it is suitable in scope to include any potential impacts to northern long-eared bats. Additionally, we feel that the conservation measures should now be suitable for both species. Therefore, we affirm that the effects analysis is appropriate from the previous BAs, and the conservation measures are now suitable to address both Indiana and northern long-eared bat.

2.9.4 Conclusion

Only ATV use, hunting, and skeet shooting are expected to have any potential impacts to Indiana or northern long-eared bats. However, because of the current restrictions for ATV use, the timing and nature of hunting, and the conservation measure for skeet shooting, these recreational activities may affect but are not likely to adversely affect Indiana bats. Please see Appendix A, Section 2.8 for additional information.

3.0 Conservation Activities

Conservation measures for each action are in the appropriate section throughout *Section 2.0*. (A complete list of conservation measures and other beneficial actions from *Section 2.0* can be found in Appendix O) This section elaborates on the Bat Conservation Area, outlines future monitoring and research efforts, and notes outreach activities and the Army Compatible Use Buffer program.

3.1 Bat Conservation Area

A 2,202 ac (891 ha) Bat Conservation Area (BCA) has been established on Fort Drum for the benefit of Indiana bats (Figure 3.1). This BCA will also benefit northern long-eared bats in many of the same way.

The majority of the BCA occurs in undeveloped portions of the Cantonment Area (2,051 ac (830 ha)) and follows Pleasant Creek northward into Training Areas 4A and 3A (151 ac (61 ha)). These areas were selected for the BCA in order to provide protection for the majority of known Indiana bat roosting and foraging areas based on mist-netting and radio-tracking efforts (ESI 2008a, 2008b) and past acoustical surveys. The BCA now contains 90% (110 out of 122) of all roosts identified on Fort Drum in the past eight years (2007-2014). Four of the roosts not found in the BCA are located within 25 m of the boundary of the BCA, four are located in Training Area 3B, and four of the roosts are located off Fort Drum, within approximately 1,000 m of the BCA.

Historically, the BCA has been an important area for Indiana bats on Fort Drum and in the adjacent Town of LeRay. Indiana bats that have been captured off-post (Fort Drum-I-81 connector project – USFWS 2008, Eagle Ridge housing project – ESI 2006) were noted to roost on Fort Drum for multiple days. In addition, Indiana bats captured and roosting on Fort Drum regularly went off-post into the Town of LeRay to forage (ESI 2008b, USFS 2011). While Indiana bats have continued to be captured on Fort Drum (2011 and 2014) and tracked to roosts within the BCA, the status of Indiana bats off Fort Drum in the Town of LeRay is currently unknown.

Although the BCA was initially established for the benefit of Indiana bats, northern long-eared bats have historically been captured throughout the Cantonment Area and within the BCA. This protected area will likely provide similar benefits to this species of bat as well.

The BCA includes a variety of habitat types and water bodies, including Pleasant and West Creeks. The BCA was configured to allow for continued development approximately 150 m along existing roads and around the Guthrie Ambulatory Health Care Clinic.

Permitted & Restricted Activities in BCA

The intention of the BCA is to not prohibit all actions in the identified areas, but to protect known roosting and foraging habitat from permanent loss to the greatest extent possible. Many activities that currently occur will continue to be conducted within the BCA. The following discusses in detail permitted and restricted activities within the BCA.

1. Roost Tree Protection. No viable roost trees identified within the boundaries of the BCA will be felled. This includes roost trees identified in the future.

2. Construction. The primary activity not allowed in the BCA is construction activities resulting in the permanent loss of natural habitat. No permanent facility will be constructed within the BCA with the exception of some additional facilities (e.g., cabins, picnic shelters, parking lots, a campground, etc.) that may impact up to 7 ac (3 ha) in and around Remington Park. Remington Park is located along the Pleasant Creek corridor of the BCA. The construction of park facilities is included in *Section 2.1 Construction* of this BA. Conservation measures in *Section 2.1 Construction* will also apply. Construction of temporary facilities, primarily for training purposes, may be constructed within the BCA if the impacts to habitats are minimal. Temporary structures are defined as structures that are easy to assemble and disassemble, and easy to move.

   If construction of other permanent structures must occur within the BCA in the future, further consultation with the USFWS is required. This has only happened in a few instances since 2009.

   Although currently not expected to occur within the next three years, the potential exists for the Installation Restoration Program (IRP) to remove trees in order to access contaminated ground water sites in response to a contamination episode. Individual consultation will occur with the USFWS and trees would only be removed during the October 16 - April 15 tree clearing window if in a non-emergency situation.

   By restricting construction within the BCA, habitat connectivity, water sources, and suitable roost and foraging sites are maintained for the known Indiana bat maternity colony in the spring and summer and for individuals associated with the maternity colony in the fall. The BCA provides habitat for all sexes and ages of Indiana and northern long-eared bats.

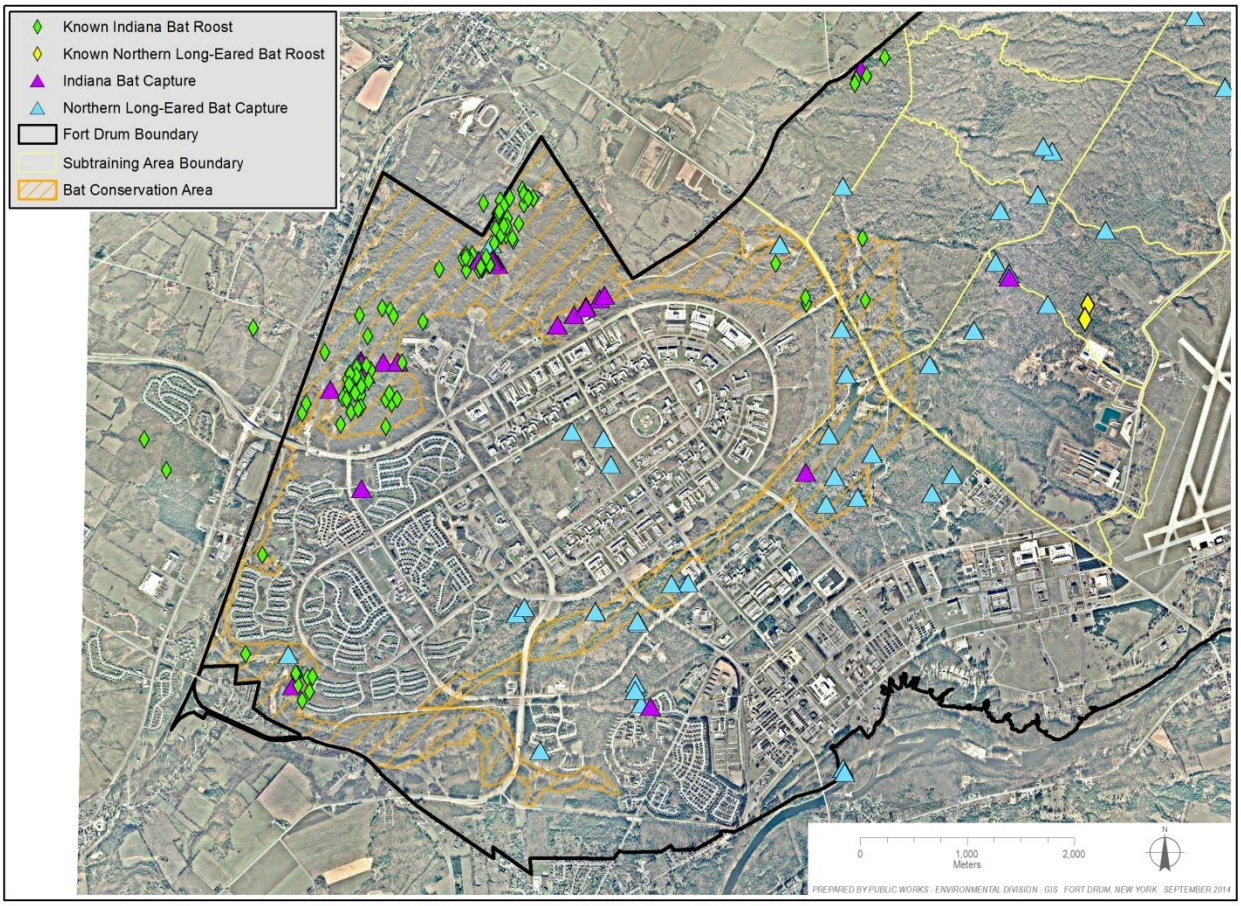

Figure 3.1 Bat Conservation Area on Fort Drum Military Installation

3. Military Training. Relatively low impact military training (e.g., land navigation and small unit tactics) is conducted in the northern portion of the BCA within Local Training Areas (LTAs). No live fire is allowed, however, weapons that fire the equivalent of blanks or paintball rounds are used. Occasionally artillery (with blanks) and other simulated explosives are also used. Current training allowed in the Cantonment Area will continue which may include the construction of small temporary buildings (e.g., mock villages for urban warfare training) as long as no trees or large areas of natural habitat are removed.

   Category 2 smoke may not be used within 100 m of any forested areas within the LTAs between April 16 - October 15 to minimize impacts to roosting bats (with the exception of the MOUT sites as identified below). Approval from Range Control and NEPA review is required prior to any use of Category 2 smoke in the LTAs, and these reviews will help ensure that Category 2 smoke use is in line with this conservation measure. See *Section 2.2 Military Training* for more information on impacts.

   Category 2 smoke may be periodically used at four mobile MOUTs within the LTAs during April 15- October 15. All mobile MOUTs are currently outside of the BCA, but three are in relatively close proximity (approximately 25, 35, 140m, respectively). The fourth is approximately 4000 m away. Only infrequent use of colored smoke is expected to be used in around the mobile MOUTs. The closest known roost tree to the Mobile

MOUTs is approximately 270m away. With the exception of the Category 2 colored smoke used at the mobile MOUTS, no other smoke or obscurant may be used in the BCA. Currently, all known Indiana bat maternity roosts are found within the BCA or within a 1,000 m from the installation boundary.

4. Vegetation Management. Limited tree removal is expected as part of required maintenance activities for the perimeter fence and/or utilities (Refer to *Section 2.4 Vegetation Management*). This is expected to be no more than 20 ac (8 ha). Hazard trees may also be removed for safety concerns along roadways, trails, or parking areas. Conservation measures in *Section 2.4 Vegetation Management* will apply.

   Spraying of herbicides will continue to be conducted along the perimeter fence and utility line corridors to manage vegetation. Conservation measures in *Section 2.6 Pesticides* will also apply.

5. Recreation. Most of the BCA is currently used for recreational purposes. The primary recreational use is Physical Training (PT) by Soldiers, hiking and cross-country skiing throughout an extensive trail system, and archery hunting during the big game season.

   There are currently plans to improve the trail system—both in quantity and quality. Any new trails will avoid trees and wetlands if at all possible—if trees >3 in DBH must be removed, only the minimum required will be removed during the October 16 - April 15 tree clearing window.

6. Natural Resources Management. The management of natural resources is expected to continue throughout the BCA including the control/eradication of invasive species via mechanical, chemical (see also Section 2.7), biocontrol and physical removal. Only small areas (no more than 50 acres per year, with 25 acres in one contiguous block will be mechanically cut or treated with herbicide. All appropriate conservation measures will be followed regarding the respective treatments. Natural resources surveys, inventories, and research will also continue in these areas. In the future, there may be potential to create or enhance wetland and/or stream mitigation sites (one wetland mitigation site is already located within the BCA) and future forest management activities may occur. Mitigation and forest management activities will be addressed in future consultations, biological assessments, and/or management plans.

3.2 Monitoring & Research

Past and Ongoing Efforts

Fort Drum first surveyed for Indiana and northern long-eared bats at eight sites during a two-week period in July 1999. No Indiana bats were captured, however, four northern long-eared bats were captured in the Training Area (BHE 1999).

Subsequently, approximately 380 northern long-eared bats have been captured throughout the installation while performing surveys during 2007-2014. Suspected acoustic detections of the species have also been recorded throughout the installation. All evidence for northern long-eared bat suggests there is no concentrated use, and that they could be found throughout most of installation in appropriate habitat. It is unknown where northern long-eared bats may be hibernating; however, there are dozens of potential hibernacula within range of Fort Drum.

Indiana bats were first confirmed on Fort Drum in 2006. Since that time 44 Indiana bats have been captured (40 in the Cantonment Area, two in Training Area 3, one in Training Area 4, and one in Training Area 8). All bats captured in the Training Area were subsequently radio tracked back to roosts in the known maternity colony use area. All evidence suggests that there is one maternity colony focused within the Cantonment Area of Fort Drum. The nearest known Indiana bat hibernaculum, Glen Park, is approximately 6.5 mi (10.5 km) from Fort Drum's Cantonment Area. Approximately 330 Indiana bats now hibernate there annually.

Historically, Fort Drum likely contained relatively robust numbers of Indiana bats within the known maternity colony, and high numbers of individuals and maternity colonies of northern long-eared bats. However, impacts from white-nose syndrome (WNS) to Indiana and northern long-eared and Indiana bats have been severe in New York and on Fort Drum, and the disease has caused drastic declines in their populations.

Acoustical surveys using Anabat echolocation detectors have been conducted from 2003-2014. Although acoustic detections of probable Indiana and northern long-eared bats are still being detected on the installation, only 2 Indiana bats have been captured since 2011(one in 2012 and one in 2014). No northern long-eared bats have been captured since 2011. Where it was once relatively easy to capture these species through traditional mistnet efforts, it is now a difficult task. Fort Drum may perform additional mist net surveys in an attempt to gain additional information on the spatial and temporal use by northern long-eared bats in the post-WNS landscape. However, given the drastic declines, the likelihood of gaining additional information on this species is low, and attempts will aborted if it determined that efforts are futile.

A detailed multiple acoustical device placement sampling project was developed in 2011 with Virginia Tech University and the US ACOE to examine multiple considerations of acoustical methods in comparison to mist-netting generally, and in the context of declining catch and cost efficiencies following the onset of WNS. This project was completed in the spring of 2013, and multiple publications have resulted (Coleman et al. 2014a, Coleman et al. 2014b, Coleman et al. 2014c). Passive acoustical surveys will be utilized into the foreseeable future.

Conservation Recommendations

Fort Drum recognizes that Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out discretionary conservation programs for the benefit of endangered and threatened species. Within the previous 2012-2014 BO, the USFWS identified the following actions that, if performed, would further the conservation and assist in the recovery of the Indiana bat and assist in collecting information on other potentially imperiled bat species. The following is the progress Fort Drum has achieved to date:

1. Assist with WNS investigations (to include, but not limited to): (a.) Monitoring the status/health of the little brown bat colony at the LeRay mansion/bat houses; (b.) Collecting samples for ongoing or future studies; (c.) Providing funding for off-post WNS research activities; and (d.) Allowing staff to participate in off-post research projects.

In the spring and summer of 2009-2012, Fort Drum examined the effects of WNS on the little brown myotis (*Myotis lucifugus*) maternity colony found in Fort Drum's Historic LeRay area. These efforts focused on the health of the individuals within the colony, the potential ability for bats to survive and heal during the summer months, and the potential persistence and subsequent transmission of WNS within the colony during the summer. Fort Drum published a

manuscript in the December 2011 issue of the Journal of Fish and Wildlife Management (Dobony et al. 2011) presenting the results to date on the little brown myotis' ability to survive, heal and reproduce. This effort has been ongoing, and we will continue to analyze results to determine the potential persistence and transmission of *Pseudogymnoascus destructans* and WNS at the colony. Additionally, we hope to publish an updated manuscript outlining the information collected over the past 4 years.

Acoustical surveys using Anabat echolocation detectors have been conducted since 2003, providing good baseline information about temporal and spatial use of various species of bats on Fort Drum. In 2009, Fort Drum started re-surveying sites that were previously surveyed in to attempt to establish trends and impacts to bat species from WNS. Results from some of these efforts have also been published in the December 2011 issue of the Journal of Fish and Wildlife Management (Ford et al. 2011). In 2011, Fort Drum initiated a project using acoustic methodology to establish monitoring protocols to replace mist-netting as this methodology becomes less effective due to WNS. A Masters graduate student graduated in May of 2013 from Virginia Tech University, and multiple publications are now available outlining the outcome of those efforts (Coleman et al. 2014a, Coleman et al. 2014b, Coleman et al. 2014c).

2. Pursue additional acquisition of parcels or easements to protect Indiana bat roosting, foraging, and commuting habitat through the ACUB program.

Although parcels being protected within the ACUB program have not been used to directly support Indiana bat protection to date, these parcels now likely offer a measure of protection for northern long-eared bats and other bat species and wildlife in general. We are still exploring the possibility of acquiring parcels or easements into the ACUB program to specifically benefit bats, although the future potential of that is unknown.

3. Conduct research on smoke/obscurant impacts to the Indiana bat.

Fort Drum did not conduct any research in regards to smoke/obscurant impacts to the Indiana bat.

4. Conduct research on the summer habitat requirements and distribution of Indiana bats.

Fort Drum has been involved with this type of activity since 2003 with information collected via Anabat detectors. Additional information has been gathered in subsequent years via Anabat and mistnet surveys. As identified in the Monitoring and Research section above, general bat use has been examined via mistnet survey in the Training Area of Fort Drum from 2009 - 2014 with specific goals of determining temporal and spatial use of Fort Drum by the known Indiana bat colony. Additional information has been collected on other species of bats as part of these efforts leading to information about northern long-eared bats on the property. Efforts have documented foraging and roosting areas of the Indiana bat colony within the Cantonment Area, BCA, and adjacent Training Areas (USFS 2011, Jachowski et al. 2014a, Jachowski et al. 2014c). They have documented captures of northern long-eared bats throughout the installation. They have also documented the declines of multiple species of bats due to WNS, and the subsequent change in bat behavior and habitat use (Ford et al. 2011, Jachowski et al. 2014b)

One female Indiana bat was captured and subsequently radio tracked on Fort Drum in 2014. This bat was tracked to two different roosts over the course of eight days. Both roosts were within the known core range. A maximum of seven bats exited the first roost. Additionally,

Acoustic information continues to be collected annually and will continue in the future. As these data are analyzed, the USFWS will be provided any pertinent results.

Fort Drum will continue to examine summer habitat requirements and distribution of Indiana bats as resources allow.

5. Evaluate potential to correlate USFS foraging data with training activities to glean any information on Indiana bat response to night training exercises.

Fort Drum has not performed any actions specific to this recommendation.

Future Planned Efforts

Fort Drum will continue to monitor the Indiana bat maternity colony as resources allow. This will primarily be accomplished through monitoring areas around the known maternity colony with Anabat detectors and mist net efforts.

Fort Drum will continue to assist with WNS related research when able (e.g., Dobony et al. 2011) and other projects and funding opportunities will be explored with NYSDEC, other military installations, universities, etc.

At least one more large scale mist-netting project is planned in CY 2015 in an attempt to capture and radio-track northern long-eared bats to determine roosting and foraging locations. This contracted effort will likely be combined with a graduate project with Virginia Tech University.

3.3 Outreach Efforts

Fort Drum has participated in and facilitated several outreach efforts including publishing articles in local outlets, cooperating with local media, participating in community and school events publishing in peer-reviewed journals, and presenting at professional wildlife workshops, meetings, and conferences. Below are some of the highlights:

Local Publications and Presentations

- March 2009: Spring 2009 Fort Drum Fish & Wildlife Management Program *Blaze Orange* newsletter featured a short article entitled *Bat White-nose Syndrome Update* [The Blaze Orange newsletter is a semi-annual newsletter published by Fort Drum's Fish & Wildlife Management Program and sent to all residents on Fort Drum and all recreation permit holders.

- 16 April 2009: Article in *The Mountaineer* [Fort Drum weekly newspaper] titled: *US Fish, Wildlife Service issues opinion on treatment of Indiana bat* [re: issuance of Biological Opinion]

- 30 April 2009: Article in *The Mountaineer* titled: *Accommodations will expand near LeRay Mansion* [re: installation of new bat hotel].

- 13 May 2009: Featured presentation at the meeting of the North Country Bird Club in Watertown, NY re: bats and bat management at Fort Drum.

- 04 June 2009: Article in *The Mountaineer* titled: *White-Nose Syndrome threatens bat populations: Fort Drum joins research project* [re: NYSDEC project at LeRay bat house]
- August 2009: Fall 2009 Fort Drum Fish & Wildlife Management Program *Blaze Orange* newsletter featured three articles related to bats on Fort Drum titled: *New Bat House at LeRay*, *Year 3 for Indiana Bat Surveys*, and *Activities of the Fort Drum Fish & Wildlife Management Program: Bat Management & White-nose Syndrome*.

- March 2010: Spring 2010 Blaze Orange newsletter featured an article entitled *Bats & White-nose Syndrome on Fort Drum Update* [The newsletter is a semi-annual newsletter published by Fort Drum's Fish & Wildlife Management Program and sent to all housing residents on Fort Drum and all recreation permit holders.]

- April 2010: A Town Hall Meeting for the public was conducted by Fort Drum's Fish & Wildlife Management Program—information about bat management and white-nose syndrome was presented.

- August 2010: Fall 2010 Outdoor News newsletter had a short article entitled: White-nose Syndrome Update [Formerly known as the Blaze Orange, the newsletter is a semi-annual newsletter published by Fort Drum's Fish & Wildlife Management Program and sent to all housing residents on Fort Drum and all recreation permit holders.]

- October 2010: A presentation was given to a group at the Fort Drum Library entitled *Bats and Fort Drum*

- November 2010: Fort Drum helped to coordinate (with Bat Conservation International) a meeting addressing white-nose syndrome concerns on Military Installations.

- July 2011: Fort Drum worked with the local Watertown Channel 7 News, the Watertown Daily Times, the Fort Drum Mountaineer, and North Country Public Radio to distribute information about WNS and some of the results of studies ongoing at the little brown maternity colony at LeRay.

- August 2011: Fort Drum helped to coordinate (with Bat Conservation International) a meeting addressing white-nose syndrome concerns on Military Installations.

- August 2012: Fort Drum presented at the the Sackets Harbor Summer Youth Program. Presentation title: *Going Batty*

- March 2013: Fort Drum Presented at a National Wildlife Week event at Fort Drum's McEwen Library

- March 2013 Fort Drum Established educational signage at two stops along Fort Drum's Maple Days Nature Trail regarding artificial and natural bat roosts.

Future plans consist of including relevant information pertaining to Indiana and northern long-eared bats in the new Fort Drum Environmental Handbook which will be made available to all users-- civilian employees and Soldiers on Fort Drum. An information paper and/or pamphlet will be developed regarding Indiana and northern long-eared bat on Fort Drum and will be made

available on the Fish & Wildlife Management Program web site. Efforts are ongoing to create a poster to integrate the Indiana bat with 10th Mountain Division Soldiers under the common theme of "We Own the Night" similar to the successful US Marine Corps "We're Saving A Few Good Species" posters.

Professional Publications and Presentations

Publications- Peer Reviewed

- Coleman, L.S., W.M. Ford, C.A. Dobony and E.R. Britzke. 2014. Effect of passive acoustic sampling methodology on detecting bats after declines from white nose syndrome. Journal of Ecology and the Natural Environment 6: 56-64.

- Coleman, L.S., W.M. Ford, C.A. Dobony, and E.R. Britzke. 2014. Comparison of radio-telemetric home-range analysis and acoustic detection for little brown bat habitat evaluation. Northeastern Naturalist 21: 431-445.

- Coleman, L.S., W.M. Ford, C.A. Dobony, and E.R. Britzke. 2014. A comparison of passive and active acoustic sampling for monitoring bats impacted by white-nose syndrome. Journal of Fish and Wildlife Management (2014 In Press).

- Jachowski, D.S., C.A. Dobony, L.S. Coleman, W.M. Ford, E.R. Britzke, and J.L. Rodrigue. 2014. Disease and community assemblage: white-nose syndrome alters spatial and temporal niche partitioning in sympatric bat species. Diversity and Distributions 2014: 1-14.

- Jachowski, D.S., J.B. Johnson, C.A. Dobony, J.W. Edwards and W.M. Ford. 2014. Space Use and Resource Selection by Foraging Indiana Bats at Their Northern Distribution. Endangered Species Research 24: 149-157.

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- Dobony, C. A., A. C. Hicks, K. E. Langwig, R. I. v. Linden, J. C. Okoniewski, and R. E. Rainbolt. 2011. Little brown myotis persist despite exposure to white-nose syndrome. Journal of Fish and Wildlife Management 2: 190-195.

- Ford, W. M., E. R. Britzke, C.A. Dobony, J.L. Rodrigue, and J.B. Johnson. 2011. Patterns of acoustical activity of bats prior to and following white-nose syndrome occurrence. Journal of Fish and Wildlife Management 2:125-134.

Publications – Un-refereed Articles

- Dobony, C., E. Britzke, M. Ford, and R. Rainbolt. 2011. DoD Joins the Battle to Save Bats. Endangered Species Bulletin 36(1): 40-41.

- Dobony, C.A., E. Britzke, M. Ford, R. Rainbolt. 2009. Impacts of white-nose syndrome to bat populations and management. Natural Selections [DoD Legacy Resource Management Program newsletter] 5(10):1, 7-8.

- Rainbolt, R. & C. Dobony. 2009. Fort Drum Fish & Wildlife and Cultural Resources: Bats & LeRay Mansion. Natural Selections [DoD Legacy Resource Management Program newsletter] 5(6): 1, 7-8.

Presentations

- Dobony, C.A. 2014. Observed resiliency in little brown bats at Fort Drum Military Installation? White-nose Syndrome Workshop. St. Louis, Missouri. September 8-12.

- Coleman, L.S., W.M. Ford, C.A. Dobony and E.R. Britzke. 2014. Effect of passive acoustic sampling methodology on detecting bats after declines from white-nose syndrome. 2014 Northeast Bat Working Group, Port Clinton, NJ.

- Jachowski, D.S, C. A. Dobony, L. S. Coleman, W.M. Ford, E.R. Britzke, and J.L. Rodrigue. 2014. Disease and community assemblage: white-nose syndrome alters spatial and temporal niche partitioning in sympatric bat species. 2014 Northeast Bat Working Group, Port Clinton, NJ.

- Coleman, L.S., C.A. Dobony, W.M. Ford and E.R. Britzke. 2013. A comparison of passive and active acoustic sampling for monitoring a bat community impacted by white-nose syndrome. Abstracts of the 2013 Wildlife Society Meeting. Milwaukee, WI. October 5-8.

- Coleman, L.S., C.A. Dobony, W.M. Ford and E.R. Britzke. 2013. An overview of little brown bat habitat preferences at the Fort Drum Military Installation. 2013 Colloquium on the Conservation of Mammals in the South. Pikeville, Tennessee. February 14-15.

- Coleman, L.S., W.M. Ford, C.A. Dobony, and E.R. Britzke. 2013. A comparison of mist netting and acoustic sampling for detecting bat species in the post-white nose syndrome world. Virginia Chapter of the Wildlife Society Annual Meeting. Smith Mountain Lake, Virginia. February 12-13.

- Coleman, L.S., C.A. Dobony, W.M. Ford and E.R. Britzke. 2013. Uncertainty in home range estimates of little brown bats at Fort Drum Military Installation. 2013 Northeast Bat Working Group Meeting. Albany, New York. January 9-11.

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- Dobony, C.A. 2011. Impacts of white-nose syndrome at Fort Drum Military Installation, NY. 2011 White-nose Syndrome Symposium. Little Rock, Arkansas, May 16-20.

- Dobony, C.A. 2011. Impacts of white-nose syndrome at Fort Drum Military Installation, NY. DoD Legacy White-nose Syndrome Meeting. Tucson, Arizona, August 30- September 1.

- Dobony, C.A. 2010. Impacts of white-nose syndrome at Fort Drum Military Installation, NY. DoD Legacy White-nose Syndrome Meeting. Nashville, Tennessee, November 2-4.

- Cunningham, K. A., J. B. Johnson, C. A. Dobony, J. W. Edwards, W. M. Ford and J. L. Rodrigue. 2009. Roost tree selection by Indiana bats (Myotis sodalis) on Fort Drum Military Installation, New York. Abstracts of the 19th Colloquium on Conservation of Mammals in the Southeastern United States. 18:8.

- Dobony, C.A., W.M. Ford, A.M. Mann. 2008. Bat use & Activity on Fort Drum Military Installation, NY. Joint Meeting of the Northeast Bat Working Group and Southeastern Bat Diversity Network. Blacksburg, Virginia, February 19-22.

3.4 Army Compatible Use Buffer (ACUB) Program

Under the authority provided in Section 2811, National Defense Authorization Act of 2003 (codified at 10 United States Code Sec. 2684a), Fort Drum received approval August 2007 to work with non-government organizations and/or other government agencies to develop an Army Compatible Use Buffer (ACUB) program.

The ACUB Program was primarily created to establish buffer areas around Army installations to limit effects of encroachment and maximize land use inside the installation to sustain and protect an installation's accessibility, capability and capacity for Soldier training and testing. The ACUB Program can also be used to help meet environmental regulatory requirements for endangered species conservation and off-post wetland mitigation to further minimize the loss of training lands due to environmental restrictions. As a secondary benefit, the ACUB program can conserve agricultural and forestry lands, as well as other wildlife habitats. It is an integral component of the Army's sustainability triple bottom line: mission, environment and community.

Army Headquarters has formalized an ACUB process that is initiated locally at the installation level but reviewed, approved and funded centrally from Army Headquarters. For ACUBs, the Cooperating Partner purchases easements with funding contributed by the Army and other partners. These areas provide a permanent natural buffer between military training lands and residential or commercial activities. The partner, not the Army, receives the deeded interest in the property and provides for long term habitat management. Conservation partners will work directly with willing landowners to secure conservation easements and will also be responsible for recording, monitoring, managing and enforcing the easements. These conservation easements would prohibit incompatible development in perpetuity, while keeping the land in private ownership and allowing for traditional land uses such as farming, forestry, and recreation.

The ACUB program allows Fort Drum to work with partners to provide land easements to protect habitat and training without acquiring any new land for Army ownership. Fort Drum reaches out to partners to identify mutual objectives of land conservation and to protect critical open areas. The program allows the Army to contribute funds to the partner's purchase of easements or properties from ready and willing landowners. The conservation easement allows the property title to be retained by the owner. However, pursuant to the terms of the Cooperative Agreement, Fort Drum and/or the partner may acquire access rights to conduct land management activities. Additionally, the Army retains a contingent right in the deed of conservation easement in the event that the partner organization is unable to uphold the terms of the easement. In this situation, the Army would attempt to find another eligible entity to enforce the easement.

Fort Drum's Planning, Analysis, and Integration Office is responsible for the ACUB program. Natural resources professionals assist in a supporting role whenever called upon and work with the USFWS to ensure that all ESA Section 7 requirements are met. ACUB partners at Fort Drum currently include Ducks Unlimited Great Lakes/ Atlantic Regional Office; Thousand Islands Land Trust; and Tug Hill Tomorrow Land Trust.

As of 2014 the Fort Drum ACUB program has made 20 unique partnerships possible and is working on more. These landowners have had the opportunity to expand on their farmlands and help sustain the mission and secure the future. Approximately 4,987 ac (560 ha) have been protected to date (Figure 3.2).

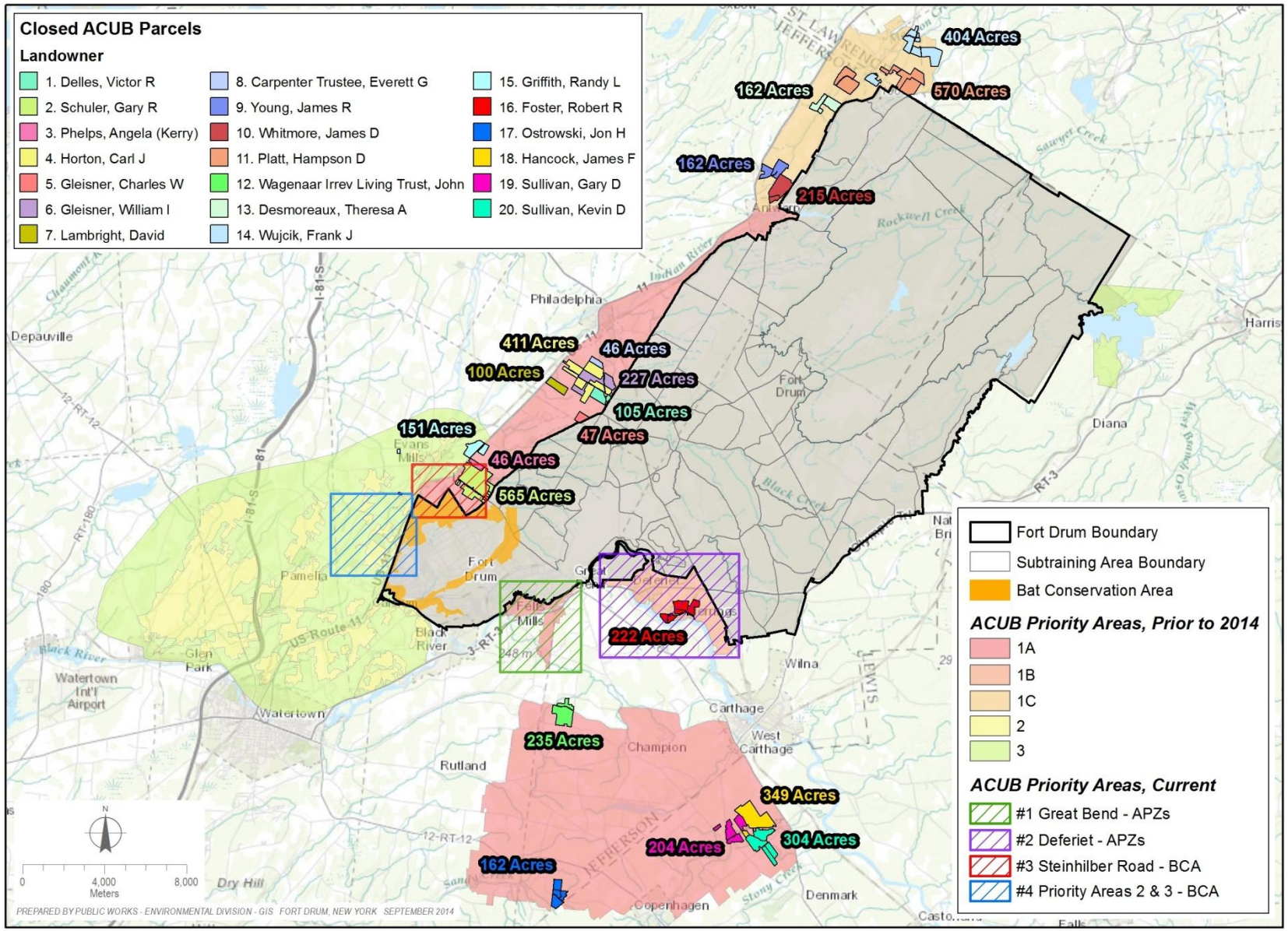

Figure 3.2. Protected Parcels and Priority Areas currently within the Army Compatible Use Buffer Program at Fort Drum Military Installation.

For the purposes of this BA, the ACUB program has been reviewed to: (1) ensure that the inclusion of easements primarily acquired to establish buffer areas around Fort Drum to limit effects of encroachment and maximize land inside the installation that can be used to support the mission do not adversely affect the Indiana and northern long-eared bat; and (2) ensure that the inclusion of easements primarily acquired to sustain natural habitats for the benefit of the Indiana or northern long-eared bat will beneficially affect these species and assist Fort Drum to meet its environmental regulatory requirements for endangered species conservation. The USFWS has identified undeveloped wooded areas near Fort Drum as priority ACUB areas to provide potential habitat for the Indiana bat. It is anticipated that up to 1,300 ac (526 ha) of land along Fort Drum's border with Evans Mills, LeRay, and Philadelphia could be incorporated into the program for the benefit of the species if funding became available (Figure 3.3).

Easements primarily incorporated into the ACUB program to establish buffer areas around Fort Drum to limit effects of encroachment typically consist of agricultural land, either in row crops or dairy production. These lands are typically open landcover types (i.e., grasslands, shrubs, agricultural crops, etc.) that have limited utility for Indiana or northern long-eared bats. However, there are woodlots on some of the properties of various sizes and tree species compositions that may have potential roosting habitat that primarily northern long-eared bats may utilize throughout the year. It is unlikely that any ACUB parcels acquired north of NYS Rt 26 or on the Tug Hill Plateau would be utilized by Indiana bat to any degree given the declines of the known population in Glen Park and on Fort Drum. However, parcels acquired anywhere around Fort Drum may have benefit for northern long-eared bats if there are any intact forested stands on the properties.

Historically, these "Agricultural" easements (Appendix Q) have contained specific language that has been developed between Fort Drum's Planning, Analysis, and Integration Office; Fort Drum's Fish and Wildlife Management Program; and the USFWS to assist a landowner in understanding how they can avoid negative impacts to Indiana bats if they have this type of habitat on their property. A fact sheet is also provided to the landowner to help them understand who they should contact should they wish to undertake any type of land management activity on their property, and that there may be state and federal laws to consider prior to their actions. This information will be updated to incorporate northern long-eared bats if this species is federally-listed in 2015.

As Fort Drum determines potential new parcels for inclusion in the program, we will coordinate with the USFWS to ensure that the latest information about the distribution of the Indiana and northern long-eared bat is utilized to make the best decisions to avoid adverse affects to the species. The "Agricultural" model easement previously developed will be utilized for the foreseeable future. As long as this model easement is utilized, "Agricultural" ACUB parcels may affect, but will not adversely affect the Indiana bat. This easement should also be suitable for northern long-eared bats as well, however, this will be readdressed with the USFWS if/when the species is listed. In the long term, some of these parcels may actually benefit these bats if they are protected from development and have suitable roosting and foraging habitat present.

As opportunities arise, Fort Drum will work with the partners and the USFWS to incorporate parcels into the ACUB program for the specific benefit of the Indiana and northern long-eared bat. This will be done in such a way to help ensure that these easements will be wholly beneficial for the Indiana and northern long-eared bat.

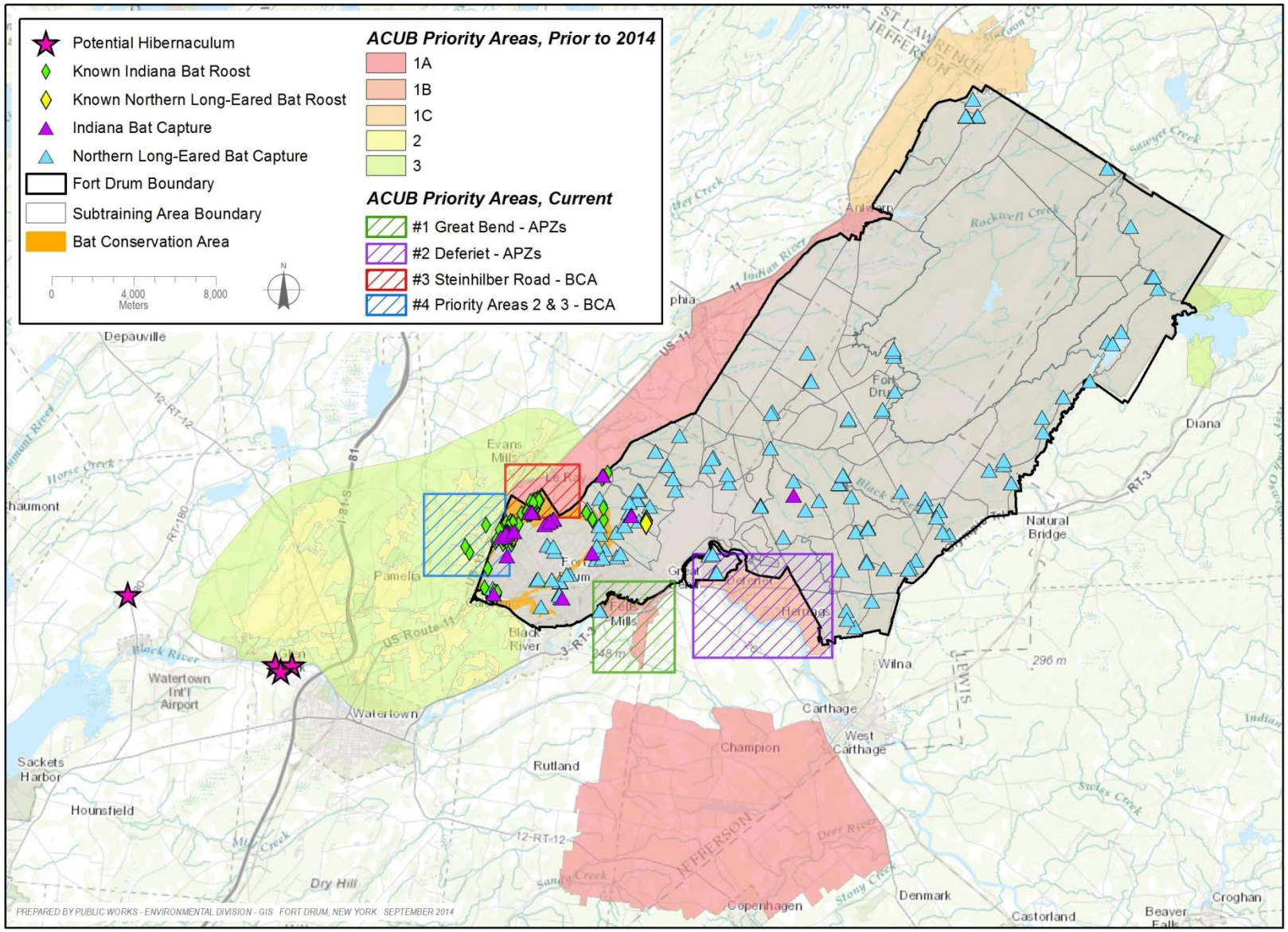

Figure 3.3. Army Compatible Use Buffer Program priority areas at Fort Drum Military Installation.

3.5 Conclusion

The establishment of the Bat Conservation Area, monitoring and research efforts, and outreach efforts will all have discountable or wholly beneficial impacts to the Indiana bat and other forest bat species. The establishment of ACUB areas for noise buffer or encroachment concerns (aka "Agricultural easements") may affect, but should not adversely affect the Indiana or northern long-eared bats as long as the easement language is followed and the landowners contact the NYSDEC or USFWS prior to completing any type of forest clearing or land management action. The establishment of ACUB areas between the Glen Park hibernaculum and Fort Drum will have wholly beneficial impacts to the Indiana bat and other forest bat species as the forested areas will be conserved as part of the easement agreement.

4.0 Cumulative Effects

All future actions on Fort Drum are subject to federal agency involvement, and federal involvement is anticipated in all or most future actions within the Action Area (see *Section1.*4).

Besides those activities occurring on Fort Drum addressed in this BA, there are numerous activities that occur in the action area off-post that affect the Indiana and northern long-eared bat. These activities include residential and commercial development associated with the expansion at Fort Drum, agriculture, timber harvesting, and outdoor recreation. Although many of these are private actions, some involve permitting through the US Army Corps of Engineers due to impacts to waters of the United States. Because of the permitting requirements, the USFWS is engaged in consultation with many of these off-post projects. The USFWS is also engaged with the Town of LeRay in ongoing development in the area, and is actively involved with reviewing most, if not all, development projects within the Town (regardless of USACE involvement). The USFWS are working with the Town and developers to conserve and connect suitable Indiana bat habitat whenever possible and hope to work with other towns in the area in a similar fashion.

Because of the active Federal agency involvement in the immediate area, no detailed cumulative effects analysis is presented here. However, off-post activities in the action area are likely to have direct, indirect, and cumulative effects to Indiana and northern long-eared bats known to utilize Fort Drum.

5.0 Overall Conclusion

Over the past 8 years (2007-2014), Fort Drum has conducted mist net surveys at more than 300 sites throughout the installation and captured more than 3,000 bats, of which, 44 were Indiana bats, and over 375 were northern long-eared bats.

All evidence now suggests that suspected Indiana bat use within the Training Area is most likely periodic foraging or exploratory movement activity by bats from the known colony in the Cantonment Area. Due to the extensive declines of Indiana bats in the Glen Park Hibernaculum and on Fort Drum, we expect even less of these movements to continue. It is unlikely that the Indiana bats utilizing the Cantonment Area and BCA will leave this historic core range as long as suitable roosting and foraging habitat remains available. Utilizing all available information and the revised assumptions, Fort Drum contends that as long as all conservation measures and project descriptions are followed, no proposed activity will have any adverse effect to Indiana bats on Fort Drum Military Installation during 2015-2017.

Historically, Fort Drum likely contained relatively high numbers of individuals and maternity colonies of northern long-eared bats. All evidence suggests that there is no concentrated use for this species, and that they could be found throughout most of installation in appropriate habitat. As with Indiana bats, impacts from WNS have been severe to this species in New York and on Fort Drum, and the disease has caused drastic declines in their populations.

Where it was once relatively easy to capture these species through traditional mistnet efforts, it is now a difficult task, and no northern long-eared bats have been captured since 2011. However, acoustic detections of probable northern long-eared bats are still being detected on the installation. Thus it is likely the installation is still being utilized to some degree by this species.

Subsequently, Fort Drum has determined that in season clearing for small scale range construction projects and the use of smoke/obscurants is likely to adversely affect northern long-eared bats on Fort Drum. However, all other proposed activities on Fort Drum will not affect, or may affect, but should not adversely affect northern long-eared bats. Table 5.1 summarizes the effects analysis of each activity in this BA for Indiana and northern long-eared bat.

Table. 5.1 Overall Effects Summary. (0 = No effect; 1 = may affect, but not likely to adversely affect; 2 = may affect, likely to adversely affect; + = beneficial effect). IBAT=Indiana bat; NLEB= northern long-eared bat.

ACTIVITY	ATTRIBUTE	DIRECT EFFECT		INDIRECT EFFECT	
		IBAT	NLEB	IBAT	NLEB
Construction	Hibernation	0	0	0	0
	Roosting	1	2	1	1
	Foraging	1	1	1	1
Military Training – All Except Smoke/Obscurants	Hibernation	0	0	0	0
	Roosting	1	1	1	1
	Foraging	1	1	1	1
Military Training – Smoke/Obscurants	Hibernation	0	0	0	0
	Roosting	1	2	1	2
	Foraging	1	1	1	1
Forest Management	Hibernation	0	0	0	0
	Roosting	1	1	1	1
	Foraging	1	1	1	1
Mechanical Vegetation Management	Hibernation	0	0	0	0
	Roosting	1	1	1	1
	Foraging	0	0	1	1
Land Conversion	Hibernation	0	0	0	0
	Roosting	1	1	1	1
	Foraging	1	1	1	1
Pesticide Application	Hibernation	0	0	0	0
	Roosting	1	1	1	1
	Foraging	1	1	1	1
Wildlife Management/ Vertebrate Pest Control	Hibernation	0	0	0	0
	Roosting	1	1	1	1
	Foraging	0	0	1	1
Outdoor Recreation	Hibernation	0	0	0	0
	Roosting	1	1	1	1
	Foraging	1	1	1	1
ACUB – Non Indiana Bat Easements	Hibernation	0	0	0	0
	Roosting	1	1	1	1
	Foraging	1	1	1	1
ACUB – Bat Easements	Hibernation	0	0	0	0
	Roosting	+	+	+	+
	Foraging	+	+	+	+

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7.0 Appendices

Appendix A. Fort Drum, New York Biological Assessment for the Indiana Bat (*Myotis sodalis*) 2009-2011. Can be viewed at: http://fortdrum.isportsman.net/publications

Appendix B. Biological Assessment on the Proposed Activities on the Fort Drum Military Installation, Fort Drum, New York (2012-2014) for the Federally-Endangered Indiana bat (*Myotis sodalis*). Can be viewed at: http://fortdrum.isportsman.net/publications

Appendix C. Biological Opinion on the Proposed Activities on the Fort Drum Military Installation (2009-2011) for the Federally-Endangered Indiana Bat (*Myotis sodalis*) in the towns of Antwerp, Champion, LeRay, Philadelphia, and Wilna, Jefferson County and the Town of Diane, Lewis County, New York. Can be viewed at: http://www.fws.gov/midwest/Endangered/mammals/inba/bos/09_NY_Fort Drum.pdf**.**

Appendix D. Biological Opinion on the Proposed Activities on the Fort Drum Military Installation (2012-2014) for the Federally-Endangered Indiana Bat (*Myotis sodalis*) in the towns of Antwerp, Champion, LeRay, Philadelphia, and Wilna, Jefferson County and the Town of Diane, Lewis County, New York. Can be viewed at: http://www.fws.gov/midwest/Endangered/mammals/inba/bos/12_NY_Fort Drum.pdf

Appendix E. 50 CFR Part 17: Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species; Proposed Rule. Can be viewed at: http://www.fws.gov/midwest/endangered/mammals/nlba/pdf/FRpropListNLBA2Oct2013.pdf

Appendix F. USFWS Northern Long-Eared Bat Interim Conference and Planning Guidance. Can be viewed at: http://www.fws.gov/midwest/endangered/mammals/nlba/pdf/NLEBinterimGuidance6Jan2014.pdf

Appendix G. Fort Drum, New York Integrated Natural Resources Management Plan 2011. Can be viewed at: http://fortdrum.isportsman.net/publications

Appendix H. Summer Mist Net and Radio-Telemetry Surveys for the Indiana Bat (*Myotis sodalis*) on Fort Drum, Jefferson and Lewis Counties, New York – 2007. Prepared by Environmental Solutions & Innovations, Inc. Previously Provided to USFWS.

Appendix I. Fall Mist Net and Radio-Telemetry Surveys for the Indiana Bat (*Myotis sodalis*) on Fort Drum, Jefferson and Lewis Counties, New York – 2007. Prepared by Environmental Solutions & Innovations, Inc. Previously Provided to USFWS.

Appendix J. Summer 2008 Bat Survey and Radiotelemetry Study Conducted at Fort Drum, Jefferson and Lewis Counties, New York. Prepared by Copperhead Environmental Consulting. Previously Provided to USFWS.

Appendix K. Summer Mist Net and Radio-Telemetry Surveys for the Indiana Bat (*Myotis sodalis*) on Fort Drum, Jefferson and Lewis Counties, New York – 2009. Prepared by Environmental Solutions & Innovations, Inc. Previously Provided to USFWS.

Appendix L. Summer Mist Net and Radio-Telemetry Surveys for the Indiana Bat (*Myotis sodalis*) on Fort Drum, Jefferson and Lewis Counties, New York – 2010. Prepared by Environmental Solutions & Innovations, Inc. Previously Provided to USFWS.

Appendix M. Bat Species Inventory of the Ft. Drum Military Installation, Jefferson and Lewis Counties, New York – 2012. Prepared by Jackson Environmental Consulting Services, LLC. Previously Provided to USFWS.

Appendix N. Fort Drum Military Installation Cantonment Area Indiana Myotis Survey. 2008 and 2009. Prepared by West Virginia University Under US Forest Service Agreement # 09-PA-11092000-106. Previously Provided to USFWS.

Appendix O. Conservation Measures and Beneficial Actions for Indiana Bats on Fort Drum.

This appendix includes all conservation measures and other beneficial actions that are implemented on Fort Drum which directly or indirectly benefit the Indiana and northern long-eared bat. These measures and actions are consolidated from Section 2. *Proposed Actions* and are in addition to those outlined in Section 3 *Conservation Measures*.

Conservation Measures for Construction Activities

1. Bat Conservation Area. A 2,200+ ac (890 ha) Bat Conservation Area (BCA) is established to protect known Indiana bat roosting and foraging areas from permanent development within the Cantonment Area. The BCA attempts to provide connectivity of existing habitat in the Cantonment Area along the West Creek and Pleasant Creek corridors and the relatively undeveloped northern portion of the Cantonment Area where most of the known primary and maternity roosts are known. The BCA accounts for more than 20% of the total land area in the Cantonment Area. See *Section 3.1* for more information about the BCA. The BCA will also provide protection for northern long-eared bats within the Cantonment Area.

2. Roost Tree Protection. All female roosts, including roosts identified in the future, will be protected from construction for the lifespan of the roost tree. Additionally, a buffer will be placed around all female roosts to protect the roost from disturbance and to maintain a semblance of a natural environment for Indiana and northern long-eared bats. The size and shape of a buffer will be determined on a case by case basis by Fort Drum's Fish and Wildlife Management Program in consultation with the USFWS. Factors that will be considered will include surrounding landscape, habitat connectivity, distance to other roosts, distance to known foraging areas, and any other issue important to target species.

3. Time of Year Restriction for Tree Falling. A time of year restriction for clearing trees (> 3 in DBH) has been established to protect roosting Indiana and northern long-eared bats during non-hibernation seasons. For the majority of construction activities, felling of trees must take place between October 16 - April 15 while most bats are at the hibernaculum. This will greatly reduce the risk of accidentally harming bats that may potentially be present in trees scheduled to be removed. Specifically, maternity colonies and their associated non-volant young will be protected from disturbance.

4. Flagging or signs will be used to demarcate areas to be cleared vs. not cleared prior to any construction activities for a given project. Flagging will be removed upon completion of the project.

5. Via Environmental Protection Plans, Scope of Works, Contracts, etc., all personnel responsible for construction activities will be informed about the need to follow design plans, stay within flagging, minimize impacts to wildlife and other environmental concerns.

6. Outdoor Lighting Minimization. For all future projects, Fort Drum will evaluate the use of outdoor lighting and seek to minimize light pollution by angling lights downward or via

other light minimization measures following Appendix P. High light levels may deter bats from areas as their nocturnal behavior may have evolved in response to predation risks (Speakman 1995, Sparks et al. 2005). By angling the light away from potential foraging and roosting areas, the area will be darker thus providing bats more protection from predators.

7. Demolition. If the building has pre-existing known bat colonies, then Fort Drum's Fish and Wildlife Management must be contacted before demolition is to occur. If during the course of demolition, bats of any species are discovered, then all work must cease and Fort Drum's Fish and Wildlife Management Program must be immediately contacted. If bats are identified as Indiana or northern long-eared bats, then additional steps will be taken to try and minimize impacts to the species. If the structure is safe to leave as is, then it will be left until after October 15, or until bats have stopped using the structure. If the structure is unsafe and poses a risk to human health and safety, Fort Drum will attempt to exclude the bats immediately. If this is not possible, or bats are found to be using the structure during the maternity season when pups are not volant, the Fort Drum Fish and Wildlife Management Program will contact USFWS to discuss the most appropriate next course of action.

8. Water Quality. All construction activities with ground disturbance greater than one acre or that meets another requirement of the New York State Department of Environmental Conservation, are required to follow standards in New York State Pollutant Discharge Elimination System: Storm water General Permit for Storm water Discharges (Permit No. GP-0-08-001 Issued Pursuant to Article 17, Titles 7, 8 and Article 70 of the Environmental Conservation Law). All construction projects over an acre are required to prepare a sediment and erosion control plan or a storm water pollution prevention plan (SWPPP), which details all erosion and sediment control practices and, when necessary, post-construction storm water management practices. Practices mentioned within the SWPPP will be in accordance with the New York State Stormwater Management Design Manual ("Design Manual") dated August 2003, or the most current version or its successor. Erosion and sediment controls vary, depending on individual impacts from each project. Some temporary examples of erosion and sediment controls include silt fences, check dams, and sediment traps. Permanent controls may include retention ponds, detention ponds, and grass lined swales. With water quality control measures in place, it is expected that declines in water quality will be minimal and thus will continue to provide adequate habitat for Indiana bat prey and drinking water for Indiana bats. In fact, water quality may actually improve during the construction of future projects due to new stormwater practices that mitigate for old water quality issues when no conservation measures were required or implemented.

9. Record-keeping and Reporting. For annual reporting purposes, all entities responsible for construction activities on Fort Drum will submit electronic shapefiles of clearing limits to Fort Drum's Fish and Wildlife Management Program. This information will be used to describe vegetative cover types and habitat loss on Fort Drum and reported annually to the USFWS.

Beneficial Actions for Construction Activities

1. Time of Year Restriction for Land Clearing. For all construction activities, a time of year restriction for clearing natural vegetation (i.e. shrubs, grasses and trees-excluding trees > 4 in DBH) was previously established in 2003. Vegetation is typically not removed

between April 15 - August 1. This time of year restriction was established in order to minimize take of migratory birds and their young in accordance with the Migratory Bird Treaty Act. If northern long-eared bats become a federally-listed species, this requirement will change to only include less than 3 in DBH trees. Those trees larger than 3 in DBH will be included in Conservation Measure # 3 above.

2. Minimizing Building Footprints. To minimize environmental impacts, construction activities attempt to minimize building footprints by combining infrastructure (i.e. roads, utility lines, etc.) for multiple buildings or by constructing multi-story versus multiple or expanded single story buildings whenever possible

3. Bat Roost Minimization in Buildings. Buildings will be appropriately designed and constructed so cracks and crevices are not created, vents are screened, etc. Properly constructed buildings will discourage bats from roosting in buildings, thus minimizing human/bat conflicts in occupied dwellings.

4. Stormwater Management. Fort Drum anticipates reviewing stormwater management plans with the objective of moving towards integrated infrastructure to reduce the number or completely eliminate the need for stormwater retention ponds and the excessive land use required.

Conservation Measures for Military Training

1. a) No Category 1 smoke operation will be conducted within 1,000 m of the installation boundary, public roads, Cantonment Area, ammunition supply point or WSAAF in accordance with *Fort Drum Regulation 350-4 Range Regulation* and *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas (LTAs)*. This restriction currently protects all known Indiana roosts and the majority of the known maternity use area (i.e., roosting and core foraging area) from close proximity smoke exposure (Figure 2.4).

   b) In the Training Area, Category 1 smoke and obscurants must be used >100 m from any known Indiana or northern long-eared bat maternity roost areas between April 16 – October 15. This will help to protect Indiana and northern long-eared bat roosts into the future. The 100 m buffer serves to minimize the effects of smoke and obscurants by providing distance between the roost and the densest amount of the smoke/obscurants. Training missions will be aware of maternity areas via the NEPA process and will be directed to avoid these areas (Appendix S).

   c) Category 1 smoke operations must also be rotated among training areas to minimize impacts to any one area.

   d) The use of Category 2 smoke (aka pyrotechnics) may be used in the Training Areas at any time within 1,000 m of the installation boundary, but will not be used within 100 m of any known Indiana or northern long-eared bat roost areas between April 16 - October 15.

   e) Category 2 smoke may not be used within 100 m of any forested areas within the LTAs between April 15 - October 15 (with the exception of use at the mobile MOUTs as

identified in f) below). Approval from Range Control and NEPA review is required prior to any use of Category 2 smoke, and these reviews will help ensure that Category 2 smoke use is in accordance with this conservation measure.

f) Category 2 smoke may be periodically used at four mobile MOUTs within the LTAs during April 15- October 15. All mobile MOUTs are currently outside of the BCA, but three are in relatively close proximity (approximately 25, 35, 140m, respectively). The fourth is approximately 4000 m away. Only infrequent use of colored smoke is expected to be used in around the mobile MOUTs. The closest known roost tree to the Mobile MOUTs is approximately 270m away. With the exception of the Category 2 colored smoke used at the mobile MOUTS, no other smoke or obscurant may be used in the BCA. Currently, all known Indiana bat maternity roosts are found within the BCA or within a 1,000 m from the installation boundary.

2. In the Training Area and LTAs, the cutting of trees and tree removal is prohibited without approval by Fort Drum's Forest Management Program in accordance with current Environmental Guidelines. If approved, actions will be in accordance with all conservation measures in *Section 2.3 Forest Management*. In general, this is a relatively rare military training action. No female roosts, including roosts identified in the future, will be felled for training for the lifespan of the roost. No tree felling will occur in the BCA for training purposes.

3. In the LTAs, vehicular traffic is restricted to open grassy areas within easy access of the road in accordance with *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas*. Vehicles are not permitted to cross streams, ditches, wetlands, or dense vegetation in order to reach grassy areas without prior NEPA review, thus minimizing impacts to natural habitats.

4. In the LTAs, POL operations are prohibited in accordance with *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas.* This helps to minimize the risk of accidental water/ground contamination.

5. Fort Drum will abide by the Fort Drum Integrated Wildland Fire Management Plan (Fort Drum 2013) which includes fire danger ratings, unless under special circumstances that are approved by the commander. Military activities that may spark fires will not be conducted during moderate to high danger ratings in order to prevent unintentional wildfires. Although unintentional fires will still ignite and burn, this conservation measure will help protect Indiana and northern long-eared bats from smoke exposure and from roost destruction. Burn bans are most likely implemented during the summer months when reproductive bats are present on Fort Drum.

Conservation Measures for Forest Management Activities

1. Bat Conservation Area. Approximately 2,200 ac (890 ha) have been set aside for Indiana bats. This BCA will also provide the same protections to northern long-eared bats. Timber harvests will not occur within the BCA until an appropriate management plan is developed and the plan has been consulted on. If timber harvesting is needed within the BCA, then consultation with the USFWS is needed.

2. Roost Tree Protection. No female roost trees, including roosts identified in the future, will be felled for the lifespan of the roost, unless there is a human health and safety concern. This includes roost trees in and outside of the BCA.

3. Roost Tree Avoidance. Clearcutting and overstory roost tree removal will not occur within 0.75 mi (1.2 km) of known maternity roost trees located outside the BCA without further consultation with the USFWS. An exception to this requirement is a small number of small forested patches (ranging from ~5-15 acres) that will be clearcut at or near WSAAF to meet federal regulations for air safety. The majority of these patches contain trees primarily less than 4 in dbh. They will be maintained as forest, but will be clearcut approximately every 5-10 years to keep them at the appropriate height. Selective thinning will not occur within one tree height of the known roost tree to minimize the risk of accidentally felling a known maternity roost during the non-hibernation season. Tree height is based on the average height of the stand (~80 ft (24 m)) surrounding the roost tree. For selective thinning harvests within 0.75 mi of a known maternity roost, all snags will be retained, and live trees > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will be favored as residuals. Further consultation will be needed with the USFWS for timber harvests that do not follow this conservation measure.

4. Firewood Cutting Restriction. The known primary Indiana bat roosting areas (those areas behind Guthrie Clinic and Cool Road) have been made off limits to firewood cutting during April 16- October 15. Although firewood harvest only removes trees that are lying on the ground, this restriction will help avoid any associated noise or disturbance in the roosting areas from chainsaws and/or tractors used in the harvest of the wood.

5. Time of Year Restriction. A time of year restriction for clearing trees (> 3 in DBH) has been established to protect roosting bats during non-hibernation seasons. Felling of trees must take place between October 16 - April 15 while most Indiana or northern long-eared bats are at the hibernaculum.

6. Snag Retention. Indiana and northern long-eared bats typically select areas that have high snag densities for establishment of maternity colonies, so snag retention will benefit roosting bats by providing areas to rear young. All snags will be left in silvicultural treatments unless there is a safety concern for the contractor or the military units training in the stands (e.g., maneuver corridors), or unless the treatment is a salvage harvest or clearcut. Snags should be distributed and retained throughout the landscape.

7. No cutting of trees will occur within or along the bed or bank of streams protected under Article 15 of the New York State Environmental Conservation Law unless required to meet specific management goals and only after obtaining a permit from NYSDEC.

8. A minimum of 70 sq ft of residual basal area, all snags, and all live trees > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will be retained around all perennial streams and open waterbodies (2 ac or greater in size) on Fort Drum. A perennial stream is defined as having flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow. If silvicultural treatments are needed that do not meet this conservation measure and that do not have a “no effect” determination, then

individual consultation will be required with the USFWS. This buffer protects water quality and provides foraging habitat for Indiana bats. Indiana bats are known to utilize riparian corridors that have suitable vegetative cover for foraging and for roosting in nearby trees (Jachowski et al. 2014a, Garner & Gardner 1992).

9. For annual reporting purposes, the Forest Management Program will provide shapefiles of harvested areas, vegetative cover types pre- and post-harvest (within a scaled map), and the harvesting method used to Fort Drum's Fish and Wildlife Management Program. This information will be used to describe the vegetative cover types and habitat modification on Fort Drum and will be reported annually to the USFWS.

Beneficial Actions for Forest Management Activities

1. If possible, new log landings will be constructed at least 200 ft (61 m) from water bodies and wetlands.

2. Spill kits and oil absorbent mats will be present on log landings in case of fuel, lubricant or hydraulic fluid spills or leaks.

3. If necessary, soil will be stabilized by seeding and mulching at the end of the operation.

4. Where possible, skid trail grade will be maintained at less than 15%. Where higher grade is unavoidable, the grade will be broken, drainage structures will be installed, and soil stabilization practices will be used where needed to minimize runoff and erosion.

5. Debarking and other damage to residual trees will be minimized wherever possible.

6. Stream crossings will be used only when absolutely necessary.

7. Streams will be crossed by the most direct route.

8. Ruts will be filled in, and water bars and erosion barriers will be installed to prevent or minimize erosion and sedimentation from roads, skid trails and log landings.

9. Erosion control measures will be inspected within 24 hours after a rain event and checked once per week. Erosion controls will be maintained or removed as needed.

10. No machinery will be operated in streams protected under Article 15 of the NYS Environmental Conservation Law without first obtaining a permit from NYSDEC.

11. Oak Tree Retention. During hardwood removals, dead or dying oak trees that may have been typically removed from the stand will be left in the targeted units. This would be limited to areas that receive large amounts of sunlight during the day (e.g. the edge of the stand, near an opening within the stand, etc.) to provide roost trees for Indiana bats and other wildlife.

12. Live Tree Retention near Wetlands. Whenever possible, a percentage of suitable live trees (i.e., trees that look as if they have the potential to develop into future snags) will be retained, so cavities appropriate for wildlife may develop and for future snag recruitment. Suitable trees will be long lived hardwoods >15 in DBH and have the greatest potential to develop cavities. In wetland areas 10 ac (4 ha) or larger with open

water and shorelines greater than 30 m apart, 20 suitable trees will be left for every 50 ac (20 ha) harvested within 0.5 mi (0.8 km) of wetlands. Although this measure was originally developed to benefit cavity nesting waterfowl species (e.g., wood ducks and hooded mergansers), it can also benefit Indiana bats. By retaining trees near wetlands that have the potential to develop into snags, future potential Indiana bat roosts will be located near water sources and potential foraging areas.

13. Forest Openings. When possible, unique forest openings (e.g. patch cuts of aspen varying from 1-10 ac in size removed from the stand) will be provided. This action will create openings in wooded habitat that can provide foraging opportunities for Indiana bats (Brack 2006).

Conservation Measures for Mechanical Vegetation Management Activities

6. Time of Year Restriction for Tree Falling. A time of year restriction for clearing trees (> 3 in DBH) and removing low- to medium-risk hazard trees has been established to protect roosting bats during non-hibernation seasons. Felling of trees must take place between October 16 - April 15 while most Indiana and northern long-eared bats are at hibernation sites. This will greatly reduce the risk of accidentally harming bats that may potentially be present in trees scheduled to be removed. Specifically, maternity colonies and their associated non-volant young will be protected from this disturbance.

7. Roost Tree Protection. No female roost trees, including roosts identified in the future, will be removed unless determined to be high risk hazard trees (see #4 below). Hazard trees that are not considered high risk, will be removed during the winter. Roost trees may not be removed for any other reason (e.g., aesthetically unappealing).

8. Mowing/ vegetation removal will not occur within 100 ft of known roost trees to avoid disturbing roosting bats and maintaining cover around the roosts.

9. High Risk Hazard Trees. For hazard trees that are determined to be high or critical classified between April 16 – October 15, Fort Drum's Fish and Wildlife Management Program personnel will be notified in advance, so they may assess the hazard tree. If appropriate, an emergence survey will be conducted and if no bats are observed, then the roost tree will be promptly removed. This will reduce the risk of removing an undiscovered roost tree. If bats are observed, then further consultation with the USFWS is needed.

4. Reporting. Personnel responsible for each vegetation management action must provide a scaled map of the treated area, specify the type of management action that occurred, report the total acreage of impacted habitat, and the vegetative cover types that were managed (i.e., number of hazard trees removed, amount of shrubland habitat cleared) to Fort Drum's Fish and Wildlife Management Program for annual reporting requirements to the USFWS. Mowing of landscaped grass in the Cantonment Area does not need to be documented.

Beneficial Actions for Mechanical Vegetation Management Activities

1. Typically, for all mechanical vegetation management not exempted for military readiness activities, a time of year restriction for clearing natural vegetation (i.e. shrubs, grasses and trees-excluding trees > 4 in DBH) was previously established in 2003. Vegetation is typically not removed between April 15 - August 1. This time of year restriction was established in order to minimize take of migratory birds and their young in accordance with the Migratory Bird Treaty Act. If northern long-eared bats become a federally-listed species, this requirement will change to only include less than 3 in DBH trees. Those trees larger than 3 in DBH will be included in Conservation Measure # 1 in this section above

2. Vegetation management for military readiness may be conducted year-round although it is recommended that shrubs, grassess and small trees (< 4 in DBH) not be removed between April 15 - August 1 in order to minimize impacts to migratory birds and to maintain foraging areas for bats.

3. If soils are impacted by vegetation clearing, degraded areas will be repaired via actions that may include grading, compacting, seeding, and application of fertilizer, lime, and mulch. In the past, vegetation management activities typically have not disturbed soils to such an extent that repair work was necessary. This minimizes erosion run-off into waterways, and thus protects water quality and associated invertebrate abundance, including possible prey for Indiana bats.

4. Vegetation management activities typically avoid delineated water bodies/wetlands. Although there is no formal buffer requirement around wetlands, a 20-30 ft (6-9 m) buffer is typically maintained around identified wetlands. By retaining shrubs and small trees around wetlands, it passively directs military activities (i.e. vehicle maneuvers) from these areas to more upland, drier sites. This leads to less military impacts to water quality and protects water sources for bats.

Conservation Measures for Land Conversion Activities

To minimize the risks of impacting Indiana and northern long-eared bats during land conversion activities, several conservation measures have been implemented.

1. Bat Conservation Area. Approximately 2,200 ac (890 ha) have been set aside for Indiana bats. This BCA will also provide the same protections to northern long-eared bats. Land conversion will not occur within the BCA without additional consultation with the USFWS.

2. Roost Tree Protection. No female roost trees, including roosts identified in the future, will be felled for the lifespan of the roost, unless there is a human health and safety concern. This includes roost trees in and outside of the BCA.

3. Roost Tree Avoidance. Land conversion activities will not occur within 0.75 mi (1.2 km) of known maternity roost trees located outside the BCA without further consultation with the USFWS. An exception to this requirement would be the forested areas at WSAAF. In order to meet federal regulations for air safety, some of these areas may be converted from forest to grassland for ease of maintenance. These areas were originally clearcut

in 2005 and contain trees primarily less than 4 in dbh. They have now regrown to heights that are once again becoming a safety concern. Some areas will be maintained as forest, but will be clearcut approximately every 5-10 years to keep them at the appropriate height (as described in Section 2.3). Other areas will be completely converted to grass.

4. No more than a total of 50 ac/year in each category (100 ac total for military training and wildlife habitat benefits) of land conversion will occur in forested areas with > 3 in dbh trees. This will help to ensure large areas within a contiguous area will not be removed, minimizing the potential to remove a large percentage of unknown roost trees.

5. Time of Year Restriction. A time of year restriction for clearing trees (> 3 in DBH) has been established to protect roosting bats during non-hibernation seasons. Felling of trees must take place between October 16 - April 15 while most Indiana or northern long-eared bats are not on Fort Drum.

6. No cutting of trees will occur within or along the bed or bank of streams protected under Article 15 of the New York State Environmental Conservation Law unless required to meet specific management goals and only after obtaining a permit from NYSDEC.

7. A minimum of 70 sq ft of residual basal area, all snags, and all live trees > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will be retained around all perennial streams and open waterbodies (2 ac or greater in size) on Fort Drum. A perennial stream is defined as having flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow. If land conversion treatments are needed that do not meet this conservation measure and that do not have a “no effect” determination, then individual consultation will be required with the USFWS. This buffer protects water quality and provides foraging habitat for Indiana and northern long-eared bats. Indiana bats are known to utilize riparian corridors that have suitable vegetative cover for foraging and for roosting in nearby trees (Jachowski et al. 2014a, Garner & Gardner 1992).

8. For annual reporting purposes, the proponent of the land conversion activities will provide shapefiles of converted areas and vegetative cover types pre- and post-conversion (within a scaled map to Fort Drum's Fish and Wildlife Management Program. This information will be used to describe the vegetative cover types and habitat modification on Fort Drum and will be reported annually to the USFWS.

Beneficial Actions for Land Conversion Activities

1. Typically, for all land conversion activities, a time of year restriction for clearing natural vegetation (i.e. shrubs, grasses and trees-excluding trees > 4 in DBH) will be established. Vegetation will not be removed between April 15 - August 1. This time of year restriction is primarily to minimize take of migratory birds and their young in accordance with the Migratory Bird Treaty Act. However, it can also benefit foraging bats, if they are using the area. If northern long-eared bats become a federally-listed species, this requirement will change to only include less than 3 in DBH trees. Those trees larger than 3 in DBH will be included in Conservation Measure # 5 in this section above

2. If soils are impacted by vegetation clearing, degraded areas will be repaired via actions that may include grading, compacting, seeding, and application of fertilizer, lime, and mulch. In the past, vegetation management activities typically have not disturbed soils to such an extent that repair work was necessary. This minimizes erosion run-off into waterways, and thus protects water quality and associated invertebrate abundance, including possible prey for bats.

Conservation Measures for Pesticide Application Activities

1. Only pesticides registered by the EPA and State of New York may be applied and only in accordance with their label.

2. Aerial applications will occur between the hours of sunrise and one hour before sunset. This will protect foraging bats in undiscovered foraging areas from direct exposure.

3. Aerial application of pesticides in the BCA will not occur without further consultation with the USFWS.

4. Other pesticide application within the BCA will be limited to 50 ac per year (no more than 25 ac in a contiguous block) for tow behind power blowers and 25 ac per year for spot/ground application.

5. Tow behind power blowers will not be utilized until after August 15 in all forested areas to allow pups to reach volancy and exit an area if disturbed by this activity. Deviations from this conservation measure will require further consultation with the USFWS.

6. Whenever possible, herbicides that have low toxicity to mammals will be utilized with the tow behind power blowers. Herbicides that may be somewhat toxic to mammals will be mixed and applied at a rate that should minimize any potential exposure concerns.

7. Application of pesticides from ground mounted vehicles (i.e., ATVs, tractors) that spray chemicals directly onto the ground and do not result in broad dispersal will be conducted at least 100 ft (30 m) from known roost trees (including roosts identified in the future) and 250 ft (76 m) from known primary roosts.

8. Application of pesticides that result in broad dispersal (e.g., tow behind power blowers) will be conducted at least 250 ft (76 m) away from known roost trees (including roosts identified in the future) and 500 ft (152 m) from known primary roosts. Pesticides will not be applied between sunrise and one hour before sunset. Location-specific applications (i.e. hatchet or stem injections of trees, individual application to specific plants) may be used within 500 ft (30-76 m) of known roosts. This measure minimizes the risk of exposure to bats and potential effects from pesticides.

9. Pesticides applied from tow behind power blowers will use appropriate nozzles and drift control additives, and will be applied using low pressure to reduce drift and potential swirling motion from the blower. All efforts will be made to only spray 10 feet from ground level or below.

10. Pesticides will not be applied outdoors when the wind speed exceeds 8 mi/hr for all applications except power mist blowers. Pesticides applied via power mist blower will only be applied with wind speeds <5 mi/hr. This is to reduce the risk of pesticide drift, which could impact water quality or non-target areas. Care will be taken to make sure that any spray drift is kept away from non-target areas and individuals. Additionally, aerial application will utilize helicopters and employ large droplet technology through special nozzles on drop tubes to ensure the herbicide stays on target.

11. If a bat colony is found roosting in a building, then insecticides will be used sparingly and no foggers will be used. This will minimize impacts to roosting Indiana bats if they are found within a building. Currently, only one colony of bats has been located on Fort Drum. The LeRay Mansion houses several hundred little brown bats according to a survey conducted in 2007. No Indiana bats were identified in the survey.

12. For each pesticide application, Pest Control will report the total amount of PAI used for each pesticide, the size of the treated area (within a scaled map), and the vegetative cover types that were treated to Fort Drum's Fish and Wildlife Management Program for annual reporting purposes to the USFWS. For pesticides applied indoors or immediately along the exterior of the building, only the PAI needs to be reported—no map is required or vegetation types need to be reported.

Conservation Measures for Wildlife Management/Vertebrate Pest Control Activities

1. No Lethal Control. No lethal control methods are permitted for bats unless there is a suspected human health risk for exposure to rabies or other disease. If individual bats are in buildings and there is no evidence of maternity use, then all efforts will be made to safely capture and release individual bats. Or, the bats will be excluded by establishing one-way valves over the roost's exit (if feasible).

2. Time of Year Restriction for Exclusion. The exclusion will only be done during times of the year when pups are not present or when they are volant (i.e., August - early May). The time of year restriction will minimize the risk of separating mothers from non-volant young, so it will prevent potential pup mortality during exclusion activities. Sealing cracks and crevices in buildings will also be done during the late fall or early spring. This is based on the assumption that no bats hibernate in buildings on Fort Drum, which is a valid assumption given the narrow temperature requirements necessary for hibernating bats and the heating of buildings (Tuttle & Kennedy 2002) and the fact that no bats have been found hibernating in buildings to date. Sealing cracks and crevices prevents bats from entering a building and reduces human/bat conflicts.

3. Adhesive Trap Restrictions. No adhesive traps used for rodents or insects will be placed in such a manner that they could capture bats—glue traps will not be placed in any crawl space or attic compartment within buildings or in areas where bats are known to occur.

Beneficial Actions for Wildlife Management/Vertebrate Pest Control Activities

1. Bat Houses. Two large bat structures have been successfully installed and utilized near LeRay Mansion. Additional bat houses may be erected throughout the Installation to provide alternate roosting opportunities for bats.

2. Systematic Planning & Exclusion. Any future exclusion of colonies of bats (such as the LeRay Mansion colony) will only be done through a systematic process. Exit counts will be performed to determine approximate numbers of bats utilizing the structure and alternate roosting structures with enough capacity for the colony will be provided in the area (when practicable) prior to any exclusions or sealing of exit holes. The exclusion will only be done during times of the year when pups are not present or when they are volant (i.e. August - early May) to avoid potentially trapping and killing any non-volant pups.

Conservation Measures for Outdoor Recreation Activities

1. Skeet Range. Skeet shooting at the current skeet range is located adjacent to the BCA and fires over a known fall, summer, and assumed spring foraging location of Indiana bats. From April 15 - October 15, the skeet range's hours of operation will be no earlier than 30 minutes after sunrise and no later than 1 hour before sunset. This measure will prevent the accidental shooting of an Indiana bat during the non-hibernation seasons.

Appendix P. Outdoor Lighting Minimization Measures.

Purpose

The purpose of the Fort Drum Outdoor Lighting Guidelines is to regulate outdoor lighting in order to reduce or prevent light pollution. This means to the extent reasonably possible the reduction or prevention of glare and light trespass, the conservation of energy, and promotion of safety and security. These Guidelines will ensure appropriate outdoor lighting in compliance with the Endangered Species Act and in accordance with the Fort Drum's Army Strategic Plan for Sustainability.

Definitions

a. Fixture Height: height of the fixture shall be the vertical distance from the ground directly below the centerline of the fixture to the lowest direct light emitting part of the fixture.

b. Foot-candles: a unit of illumination of a surface that is equal to one lumen per square foot. For the purposes of these regulations, foot-candles shall be measured at a height of 3 ft. above finished grade.

c. Fully Shielded Light: light fixtures shielded or constructed so that no light rays are directly emitted by the installed fixture at angles above the horizontal plane as certified by a photometric test report. The fixture must also be properly installed to effectively down direct light in order to conform with the definition.

d. Light Trespass: the shining of light produced by a light fixture beyond the boundaries of the property on which it is located.

e. Lumen: the unit of luminous flux, the total amount of light falling uniformly on or passing through an area of 1 square foot, each of which is 1 foot from a 1-candela source, yielding an illuminance of 1 foot candle at that distance (the output of lamps and bulbs is customarily measured in lumens, a common 100 watt incandescent light bulb, for example, having an output less than 1,800 lumens).

f. Point Light Source: the exact place from which illumination is produced (i.e., a light bulb filament or discharge capsule).

g. Sag-lens or Drop-lens: A clear or prismatic refracting lens that extends below the lowest opaque portion of a light fixture.

Applicability

All outdoor lighting fixtures installed, retro-fitted, or replaced on Fort Drum property shall comply with these regulations. These regulations do not apply to interior lighting.

Exemptions

The following are exempt from the provisions of these guidelines:

a. Traffic control signals and devices.

b. Temporary emergency lighting (i.e., fire, police, repair workers).

c. Moving vehicle lights.

d. Navigation lights (i.e., airports, heliports, radio/television towers).

e. Seasonal decorations with individual lights in place no longer than 60 days.

f. Lighting for flags. Efforts should be made in these areas to minimize sky glow and light trespass whenever feasible.

g. Sports field outdoor lighting (i.e. ball fields, football, soccer, ice rink, etc.). Sports outdoor lighting is to be turned off when a sporting event is not occurring.

h. Other special situations for temporary or periodic events (i.e. fairs, festivals, carnivals, night-time construction).

i. Security lights of any wattage that are controlled by a motion-sensor switch and which do not remain on longer than 10 minutes after activation.

j. Access points, Army Supply points, or other high security areas subject to AR 190-11 or TM-8-583-2. Efforts should be made in these areas to minimize sky glow and light trespass whenever feasible.

Additional exemptions may be provided after coordination with Fort Drum's Fish and Wildlife Management Program.

General Standards

All building exterior lighting and site lighting shall be at a minimum in accordance with these requirements and/or the most recent Fort Drum Utility Design Standards. A Professional Engineer must review any lighting plan in and ensure it is sound and meets minimization requirements. The following general standards shall apply to all outdoor lighting installed, retrofitted, or replaced on Fort Drum, which is not exempted above :

a. Outdoor lighting must be hooded, fully shielded (i.e. full cutoff fixtures), and/or aimed downward. Outdoor lighting used to illuminate parking spaces, driveways, maneuvering areas, or buildings shall conform to the definition for "fully shielded light fixtures" and be designed, arranged and screened so that the point light source shall not be visible from adjoining lots (i.e. woodlands) or streets.

b. The intensity of light within a site shall not exceed two (2) footcandles at any property line, edge of pavement, or road. There shall be no or minimal measureable light output behind the light pole.

c. The hood or shield must mask the direct horizontal surface of the light source. The light must be aimed to insure that the illumination is only pointing downward onto the ground surface, with no escaping light permitted to contribute to sky glow by shining upward into the sky.

d. Any bright light shining onto adjacent properties (i.e. woodlands) or streets which would result in a nuisance glare or a disabling glare shall not be permitted. Light trespass beyond property boundaries or above the horizontal plane shall be considered non-compliant.

e. Existing fixtures may be adapted to comply with these guidelines by adding a properly designed hood or shield, or by pointing any upward-mounted, shielded fixture downward onto the ground surface.

f. All outdoor lighting fixtures shall be designed, installed, located and maintained such that nuisance glare onto adjacent properties (i.e. woodlands) or streets shall be minimized and all direct illumination kept within the boundaries of a building's property.

g. Accent lighting shall be directed downward onto the building or object and not toward the sky or onto adjacent properties (i.e. woodlands). Direct light emissions shall not be visible above the roof line or beyond the building edge.

h. Spotlighting on landscaping and foliage shall be limited to 150 watts (2220 lumens output) and lighting is to be angled downwards. The lamp shall be fully shielded and not create disabling or nuisance glare.

i. No sag-lens or drop-lens are to be used.

j. LED light fixtures will be utilized to the maximum extent practicable. These fixtures shall be long life, coupled with high efficient drivers. LED lights shall incorporate measures to reduce blue-rich white light output. These measures will be coordinated with Fort Drum's electric shop and Natural Resources Branch prior to implementation, but could include things such as targeting wavelengths between 550-650 nm, and/or reducing the correlated color temperature of the fixture.

Appendix Q. Example Army Compatible Use Buffer Program "Agricultural Easement". Previously Provided to USFWS.

Appendix R. Additional Pesticides that may be used on Fort Drum

FY14 IMCOM PESTICIDE USE PROPOSAL		
Full Pesticide Trade Name from Label	**EPA Registration No.**	**Active Ingredients**
Prozap Insect Guard	5481-533-47000	Dichlorvos
Nuvan Prostrips	5481-553	Dichlorvos
Drax Ant Kil Gel (5%)	9444-131	Boric acid
EcoExempt Jet Wasp & Hornet Jet Aerosol	25B Exempt	2-Phenethyl Proprionate Rosemary
ECO EXEMPT B	25B Exempt	Plant Oils
ECO EXEMPT IC	25B Exempt	Plant Oils
Essenteria IC	25B Exempt	Rosemary Oil Geraniol Peppermint Oil
Essenteria IC3	25B Exempt	Rosemary Oil Geraniol Peppermint Oil Oil of Wintergreen White Mineral Oil Vanillin Polyglyceryl Oleate
Bedlam Insecticide	1021-1767	MGK-264 D-Phenothrin
Pyganic Dust ------- Evergreen Pyrethrum Dust	1021-1871	Pyrethrins
Lesco Three-Way	10404-43	Dicamba 2,4-D MCPP-p
Talpirid Mole Bait	12455-101	Bromethalin
Contrac All-Weather Blox	12455-79	Bromadiolone
Aquaneat	228-365	Glyphosate
Razor Pro	228-366	Glyphosate
Proclipse 65 WDG	228-434	Prodiamine
Polaris	228-570	Imazapyr
Mallet 2 F T&O	228-695	Imidacloprid
Arsenal AC	241-346	Imazapyr
Phantom Termiticide-Insecticide	241-392	Chlorfenapyr
Stalker	241-398	Imazapyr
Arsenal Powerline	241-431	Imazapyr
Altosid XR	2724-375	S-Methoprene
Starbar Quikstrike Fly Abatement Strip	2724-461	Nithiazine
Precor 2000 Plus	2724-490	MGK-264 PBO D-Phenothrin S-Methoprene Permethrin
Talstar EZ Granular	279-3168	Bifenthrin

Full Pesticide Trade Name from Label	EPA Registration No.	Active Ingredients
Talstar Professional	279-3206	Bifenthrin
Krenite	352-395	Fosamine
Escort XP	352-439	Metasulfuron-methyl
Oust XP	352-601	Sulfometuron methyl
Advion Cockroach Gel Bait	352-652	Indoxacarb
Advion Ant Bait Arena	352-664	Indoxacarb
Advion Ant Bait Gel	352-746	Indoxocarb
Method 50SG	352-787	aminocyclopyrachlor
Viewpoint	352-847	Imazapyr Aminocyclopyrachlor Metasulfuron
Sevin SL Carbaryl Insecticide	432-1227	Carbaryl
Maxforce Roach Killer Small Bait Stations	432-1251	Hydramethylnon
Maxforce Professional Insect Control Roach Killer Bait Gel	432-1254	Hydramethylnon
Maxforce FC Ant Bait Station	432-1256	Fipronil
Maxforce Carpenter Ant Bait Gel	432-1264	Fipronil
Tempo 20 WP	432-1302	Cyfluthrin
Criterion 75 WSP Insecticide	432-1318	Imidacloprid
Temprid SC Insecticide	432-1483	beta-Cyfluthrin Imidacloprid
Esplande	432-1516	Indaziflam
Delta Dust	432-772	Deltamethrin
Drione Dust	432-992	Piperonyl Butoxide Pyrethrins Silica Gell
PT 565 PLO XLO	499-290	MGK-264 Pipronyl Butoxide Pyrethrins
Cy-Kick CS	499-304	Cyfluthrin
Whitmire PT 515 Wasp Freeze Wasp & Hornet Killer	499-362	d-trans-Allethrin D-Phenothrin
PT Perma Dust	499-384	Boric Acid
Tri-Die Pressurized Silica + Pyrethrins Dust Formula 1	499-385	PBO Pyrethrins Silicon dioxide
Cy - Kick Crack & Crevice Pressureized Residual	499-470	Cyfluthrin
Pro Control Fogger	499-465	MGK-264 Piperonyl Butoxide Pyrethrins
Advance 360A Dual Choice Ant Bait Stations	499-496	Abamectin
QuikPRO	524-535	Diquat dibromide Glyphosate
Lesco Prosecuter Pro Non-Selective Herbicide	524-536-10404	Glyphosate
Roundup ProMax	524-579	Glyphosate
Pathfinder II	62719-176	Triclopyr
Rodeo	62719-324	Glyphosate

Full Pesticide Trade Name from Label	EPA Registration No.	Active Ingredients
Garlon 4 Ultra Specialty Herbicide	62719-40	Triclopyr
Recruit HD	62719-608	Noviflumuron
EcoPCO AR/X Multi-Purpose Insecticide	67425-15	2-Phenylethyl propionate Pyrethrins
Generation Mini Blocks	7173-218	Difethialone
First Strike Soft Bait	7173-258	Difethialone
Termidor NY	7969-210	Fipronil
Phantom Pressurized Insecticide	7969-285	Chlorfenapyr
OvoControl P	80224-1	Nicarbazin
Transport GHP	8033-96-279	Acetamiprid Bifenthrin
Andersons Turf Products Duocide Insect Control	9198-235	Carbaryl Bifenthrin
Renovate 3 (SLN NY-060001)	62719-37	triclopyr
Garlon 3A	62719-37	Triclopyr
Streamline	352-848	aminocyclopyrachlor/ Metsulfuron Methyl
Nufarm Polaris AC	228-570	Imazapyr

Appendix S. Description of National Environmental Policy Program REC Process

Can be provided upon request.