



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

3817 Luker Road  
Cortland, NY 13045

June 3, 2009

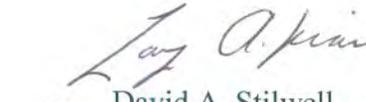
Colonel Kenneth H. Riddle  
Armor, Garrison Commander  
Department of the Army  
U.S. Army Installation Management Command  
Headquarters, United States Army Garrison, Fort Drum  
10000 10<sup>th</sup> Mountain Division Drive  
Fort Drum, NY 13602

Dear Colonel Riddle:

This is in regards to the activities conducted at the Fort Drum Military Installation (Fort Drum) located in the Towns of Antwerp, Champion, LeRay, Philadelphia, and Wilna, Jefferson County, and the Town of Diane, Lewis County, New York, and their effects on the Federally-listed endangered Indiana bat (*Myotis sodalis*). As you are aware, in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*), the U.S. Fish and Wildlife Service (Service) completed consultation with the U.S. Army Garrison Fort Drum (Army) for activities proposed on Fort Drum (2009-2011) and issued a biological opinion on March 24, 2009. On April 9, 2009, we received a request from your staff to revise one of the terms and conditions (#17). We agreed with the recommendation and have enclosed a revised opinion to reflect this. In addition, we found some minor typographical errors which we fixed in this version.

Should you have any questions, please contact Ms. Robyn Niver of this office at (607) 753-9334.

Sincerely,

  
David A. Stilwell  
Field Supervisor

Enclosure

cc: NYSDEC, Watertown, NY (A. Ross)  
NYSDEC, Albany, NY (P. Nye/A. Hicks)  
Army, Fort Drum, NY (J. Corriveau)  
COE, New York, NY (J. Connell)  
FWS, Hadley, MA (G. Smith)

# **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**

**Originally Submitted to the Army  
March 24, 2009**

**Revised June 1, 2009**

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## INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) based on our review of the U.S. Army Garrison at Fort Drum's (Army) proposed activities (2009-2011) on the Fort Drum Military Installation (Fort Drum) located in the Towns of Antwerp, Champion, LeRay, Philadelphia, and Wilna, Jefferson County, and the Town of Diane, Lewis County, New York, and their effects on the Indiana bat (*Myotis sodalis*) in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The Army's December 1, 2008, request for formal consultation was received on December 5, 2008, along with the Fort Drum, New York, Biological Assessment for the Indiana Bat (*Myotis sodalis*) 2009-2011 (U.S. Forest Service and U.S. Army 2008). The U.S. Forest Service (USFS) was contracted by the Army to assist with the development of the Biological Assessment (BA). The Service requested additional information during a January 15, 2009, conference call with the Army and USFS and received a revised BA (U.S. Forest Service and U.S. Army 2009) on February 5, 2009.

Many activities that occur on Fort Drum also involve actions by other Federal agencies, such as the U.S. Army Corps of Engineers (Corps) engineering and construction, Corps Section 404 of the Clean Water Act permitting, and U.S. Air Force training. Other branches of the Armed Services or Federal agencies may also periodically conduct training on Fort Drum. In a letter dated August 23, 2006, Mr. James Corriveau, of the Army, stated that the Army will be the lead Federal agency for all projects on Fort Drum. Pursuant to that agreement under 50 CFR § 402.07, the Army is taking the consultation lead for this project. Other Federal agencies may contribute to a project that will result in adverse effects to a listed species. Any actions these other agencies are responsible for will be addressed in the Reasonable and Prudent Measures section. The Service intends to provide a copy of this BO to the Corps; the Army can provide copies to the other agencies to demonstrate that the Army has fulfilled its obligations to consult with the Service.

This BO is based on information provided in the BA, numerous meetings, telephone conversations, and electronic mail exchanges among the Service, Army, and others. A complete administrative record of this consultation is on file at the Service's Cortland, New York, Field Office.

## CONSULTATION HISTORY

For several years prior to 2004, the Army sent letters to the Service requesting annual updates on potential listed species occurrences at Fort Drum. Each time the Service responded that "except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under our jurisdiction are known to exist in the project impact area."

On **May 24, 2004**, the Service sent a letter to the Army stating that we were learning more about the Indiana bat's summer activities in New York and we let the Army know that Indiana bats may occur on Fort Drum.

On **December 10, 2004**, the Service received a letter from the Army requesting an annual update of potential listed species occurrences.

On **February 22, 2005**, the Service responded by informing the Army that the Indiana bat may be present.

On **April 25, 2006**, the Service received a letter from the Army recognizing its obligation to consult with the Service under Section 7(a)(2) of the Endangered Species Act of 1973 to ensure actions would not jeopardize the Indiana bat.

On **June 27, 2006**, the Service attended a tour of Fort Drum and provided general ESA and Indiana bat technical assistance.

On **July 20, 2006**, the Service received a letter from the Army that they will assume presence of the Indiana bat on Fort Drum and conduct tree removals between September 30 through April 15. The Army also stated that funding would be pursued to analyze data from past bat acoustical surveys and to conduct a mist-net survey in FY07.

In late August the Service received an **August 23, 2006**, letter from the Army confirming presence of the Indiana bat on the installation as a result of off-site, independent mist-netting efforts and subsequent radio-tracking on Fort Drum of at least four Indiana bats. This letter also confirmed that the U.S. Army Garrison at Fort Drum was the lead agency for all activities occurring on Fort Drum pursuant to Section 7 of the ESA.

Between **February 20, 2007 - October 2008**, the Army informally consulted with the Service on approximately 52 actions.

On **August 15, 2007**, the Service and Army met to discuss the development of a biological assessment for multiple activities on Fort Drum.

Between **August 2007 and February 2008**, the Service, Army, and USFS had multiple conference calls and electronic mail communications regarding the BA.

On **March 11, 2008**, the Service received a letter from the Army that established a 2200+ acre (891 ha) Bat Conservation Area mostly in the undeveloped portion of the Cantonment Area with a small portion in Training Areas 3A and 4A.

On **May 2, 2008**, the Service and Army met at Fort Drum to discuss development of the BA.

In **mid-June 2008**, the Service received a draft of the BA.

On **July 15, 2008**, the Service and Army met at Fort Drum to discuss the draft BA.

On **July 21, 2008**, the Service provided written comments to the Army on the draft BA.

Between **July and December 2008**, the Service, Army, and USFS had multiple conference calls and electronic mail communications regarding the BA.

On **December 5, 2008**, the Service received the final BA (dated November 2008) and a request from the Army to expedite consultation.

On **December 22, 2008**, the Army called the Service to discuss their needs for expediting consultation and requested a final BO by the third week in March 2009.

On **January 15, 2009**, the Service initiated a call with the USFS and Army to provide comments on and request clarification of sections of the BA.

On **February 5, 2009**, the Service received a revised BA (dated January 2009).

On **March 16, 2009**, the Service provided the Army with draft Reasonable and Prudent Measures and Terms and Conditions as well as requests for clarification of information in the BA.

On **March 17, 2009**, the Service and Army held a call to discuss March 16, 2009, items.

On **March 24, 2009**, the Service issued the final BO.

On **April 9, 2009**, the Service received a request to revise Term and Condition #17.

## **BIOLOGICAL OPINION**

### **DESCRIPTION OF THE PROPOSED ACTION**

As defined in the ESA Section 7 regulations (50 CFR 402.02), “action” means “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas.” The “action area” is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.” The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present Federal, State, or private activities, as well as the cumulative effects of reasonably certain future State or private activities within the action area.

This BO evaluates several categories of activities (construction; military training; forest management; vegetation management; prescribed burning; pesticide use; wildlife management/vertebrate pest control; and outdoor recreation) that are anticipated to occur on Fort Drum between 2009-2011. The Service is not implementing a tiered programmatic consultation approach as sufficient information was provided to analyze impacts for the majority of activities proposed over the next three years. However, we anticipate that some projects may not fit the description provided during this consultation and will require individual consultation. In addition, new information on Indiana bat use in the Training Area may trigger the need for

further consultation for certain activities. The Army and Service worked together to identify what would either trigger reinitiation of this consultation or a separate consultation.

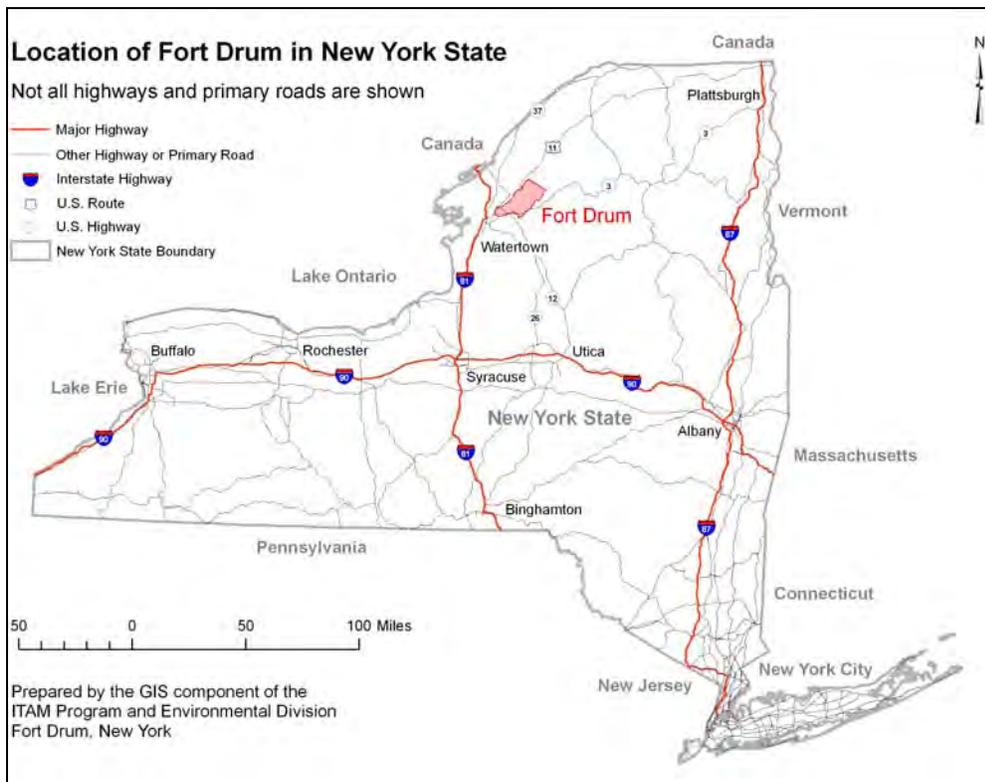
The following project background and area descriptions are summarized from the Army's Fort Drum, New York, BA for the Indiana Bat (*Myotis sodalis*) 2009-2011 (U.S. Forest Service and U.S. Army 2009); additional information can be found in the BA and is incorporated by reference.

## Project Description

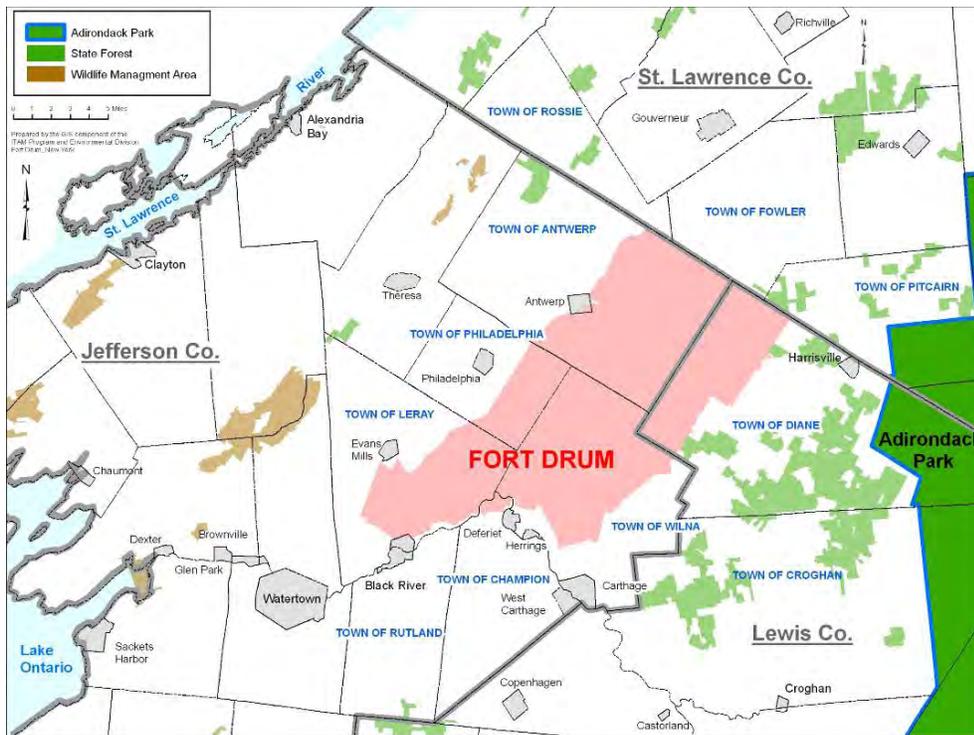
Fort Drum is the largest military installation in the northeastern United States. It is home of the 10<sup>th</sup> Mountain Division-Light Infantry and serves as the primary training facility for National Guard and Army Reserve units throughout the region.

Fort Drum officially encompasses 107,265 contiguous acres (43,408 ha) in northern New York State (approximate center: 44° 7' N 75° 35' W) (Figure 1). While the official acreage is 107,265 acres, according to the most recent Geographic Information System coverages, the total acreage is actually 109,024. The installation is 10 mi (16 km) wide and 20 mi (32 km) long.

Approximately 83% of Fort Drum is located in the Towns of Antwerp, Champion, LeRay, Philadelphia, and Wilna, Jefferson County, and the Town of Diane, Lewis County, New York (Figure 2).

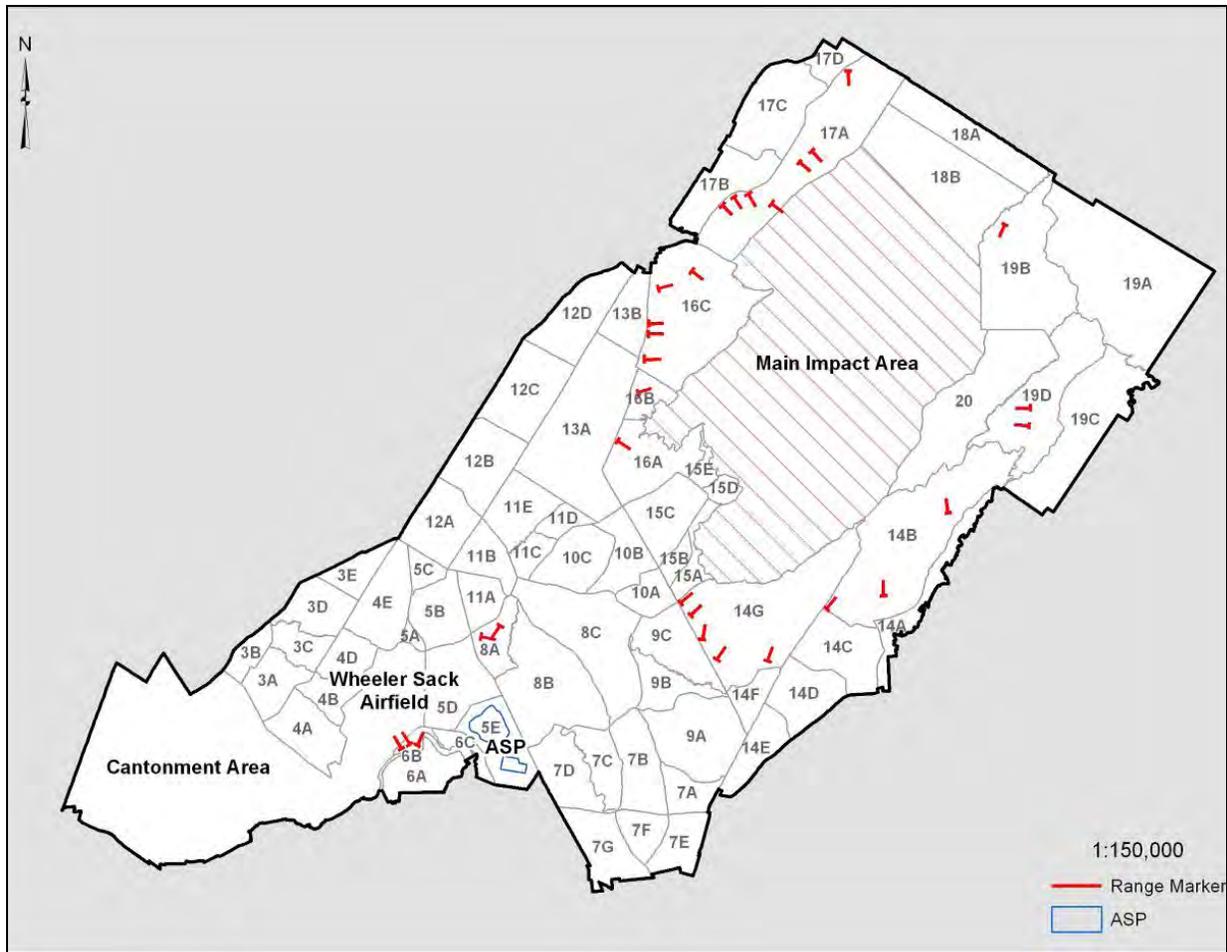


**Figure 1. Fort Drum location in New York.**



**Figure 2. Fort Drum Towns and Counties.**

Fort Drum is comprised of the Cantonment Area, Wheeler-Sack Army Airfield (WSAAF), and the Training Area (including ranges, maneuver area, and the Main Impact Area) (Figure 3). The Cantonment Area and the area surrounding WSAAF consist of administrative offices, housing, maintenance, and troop support facilities. The Cantonment Area (west of Route 26) and areas surrounding the WSAAF are in the southwestern part of the installation and the areas experiencing most of the current and future development. The Training Area is approximately 96,000 acres (38,850 ha) and where the majority of field training and firing of weapons occurs. The Training Area is divided into 18 numeric training areas (TAs) which is further subdivided into 70 alpha-numeric subtraining areas. The Main Impact Area covers 16,951 acres (6,860 ha). Due to the presence of dud and unexploded ammunition, the Main Impact Area is generally off-limits to all personnel. The 2,463 acres (997 ha) TA 20 was historically used as an impact area, but it has been surface-cleared of unexploded ordnance. Personnel are permitted in TA 20.



**Figure 3. Current map of Fort Drum, including Cantonment Area, Wheeler Sack Airfield, Ammunition Supply Point, Main Impact Area, and Range and Maneuver Areas.**

Forest comprises 74,514 acres (30,155 ha) or 68% of Fort Drum. Approximately 28,052 acres (11,352 ha) are deciduous or mixed-deciduous forest (> 6 in DBH), the remainder consists of conifers, early successional tree species, saplings, or is unknown. Unknown habitat of 16,178 acres (6,547 ha) includes areas that are unsafe to survey (e.g., Main Impact Area). Of the 74,514 acres (30,155 ha) of forests, 67,651 acres (27,377 ha) are classified as upland forests while 6,863 acres (2,777 ha) are wetland forests.

There are eight primary lakes and ponds totaling more than 400 acres (162 ha) of surface area on Fort Drum. Two ponds, Remington Pond and Conservation Pond, are impounded creeks created by dams. There are two rivers and approximately eight primary streams running through Fort Drum totaling approximately 91.9 mi (147.9 km). Minor streams and tributaries are widespread throughout the installation. Wetlands are prevalent throughout the installation and comprise approximately 20% of the land area on Fort Drum. Approximately 91% of all wetlands on Fort Drum are palustrine.

## Proposed Activities

In their BA, the Army outlined activities that may adversely or beneficially affect the Indiana bat. The Army included conservation measures to minimize potential adverse impacts of various activities as part of their project description. The Army also provided clarification on their determination of effects and proposed conservation measures for pesticide application (specifically aerial herbicide application) in a March 18, 2009, electronic mail. The Service has analyzed the effects of the proposed actions considering that the projects will be implemented as proposed (including all conservation measures). The Army also included a list of “beneficial actions” that they often implement during their actions to minimize environmental impacts. Because the Army was unclear as to how often these measures may be implemented, the Service did not take those efforts into account when analyzing impacts to the Indiana bat. The following BO addresses whether implementation of all activities are likely or not likely to jeopardize the continued existence of the Indiana bat.

The Army determined the following categories of activities (including implementation of conservation measures) may affect, but are not likely to adversely affect the Indiana bat:

- Military training (except smoke and obscurants)
- Mechanical vegetation management
- Prescribed fire
- Pesticide application
- Wildlife management/vertebrate pest control
- Outdoor recreation
- Pesticide application (except aerial application of herbicides)

The Service concurs with the Army’s determinations and projects in these categories meeting the descriptions provided in the BA (including the implementation of all described conservation measures) and March 18, 2009. This concurrence concludes consultation for these actions and no additional review is required. A summary of the activities and conservation measures are provided in Appendix A. If information becomes available indicating that any of these activities are likely to have an adverse effect on Indiana bats or conservation measures cannot be implemented, consultation for the category of activities or for individual projects will be necessary.

The Army determined the following certain activities within the following categories may adversely affect the Indiana bat:

- Construction
- Forest management
- Military training smoke and obscurants

These categories of activities will be discussed further below in addition to a list of general conservation measures that are not specific to any project category.

## *A. Construction*

Currently Fort Drum is in the midst of its third major construction period in its history. Between spring 2009 and December 2011, approximately 60 projects including 125 buildings and range facilities, and 900 residential homes are proposed for construction. Although construction will occur throughout Fort Drum, most of the projects are concentrated in the Cantonment Area and the area surrounding WSAAF.

Footprints for construction projects were estimated to represent the potential maximum area that may be impacted which includes structures plus stormwater management facilities, parking areas, landscaped yards, utilities, etc. While the Army attempted to define project footprints, the final location and size of footprints may shift during the next three years as a result of the design-build process. In design-build, the Army provides general conceptual and/or performance requirements to a contractual builder, who expands on the Army's general requirements, incorporates these ideas into a design, and subsequently constructs the project (Hanvey 2004). The overlapping of the engineering and construction phases means a final design is not established when construction begins, so often times footprints may need to shift as the project proceeds in order to address unknown issues. Although the design-build process was developed to streamline the construction process and to be more cost-effective, it creates challenges for environmental planning and compliance.

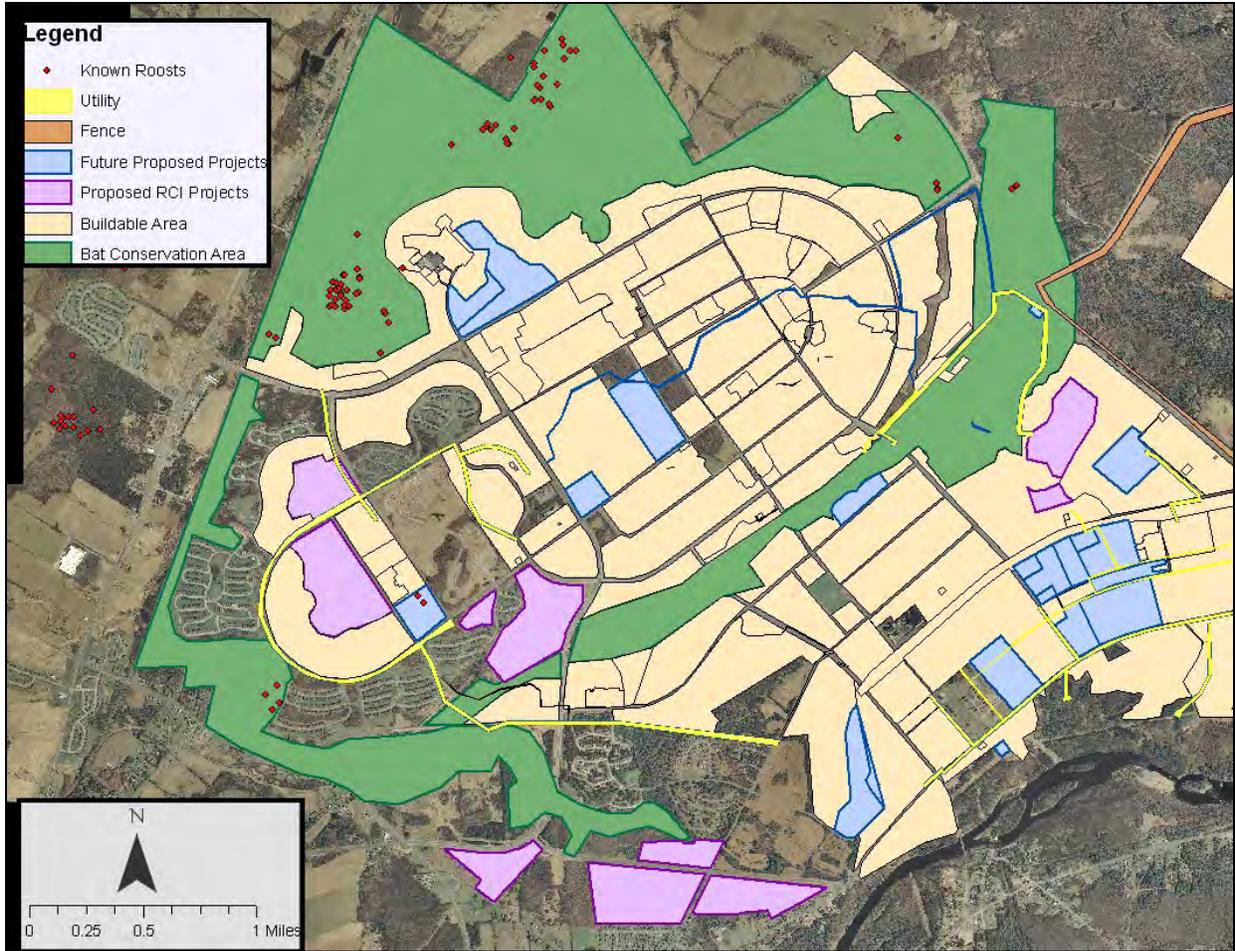
To determine the maximum amount of vegetation cover types that are likely to be cleared, construction footprints were overlain with vegetation information, and acreages of impacted habitat were determined for each project. These acreages were summed by each habitat type and the totals for all proposed projects were buffered by an additional 50 acres (20 ha) per vegetation type to adjust for potential project shifts to other areas with different vegetation types. Acreages for wetlands and water bodies were not buffered.

The Army's proposed construction activities can be coarsely divided into the Cantonment Area/WSAAF and Training Area and each category is discussed below.

### Cantonment Area and WSAAF Construction

The Cantonment Area and the surrounding area around WSAAF contain the majority of installation development. Construction proposed in the Cantonment Area includes a variety of projects such as barracks, headquarters and administrative buildings, vehicle maintenance facilities, residential housing, child development centers, and indoor firing ranges.

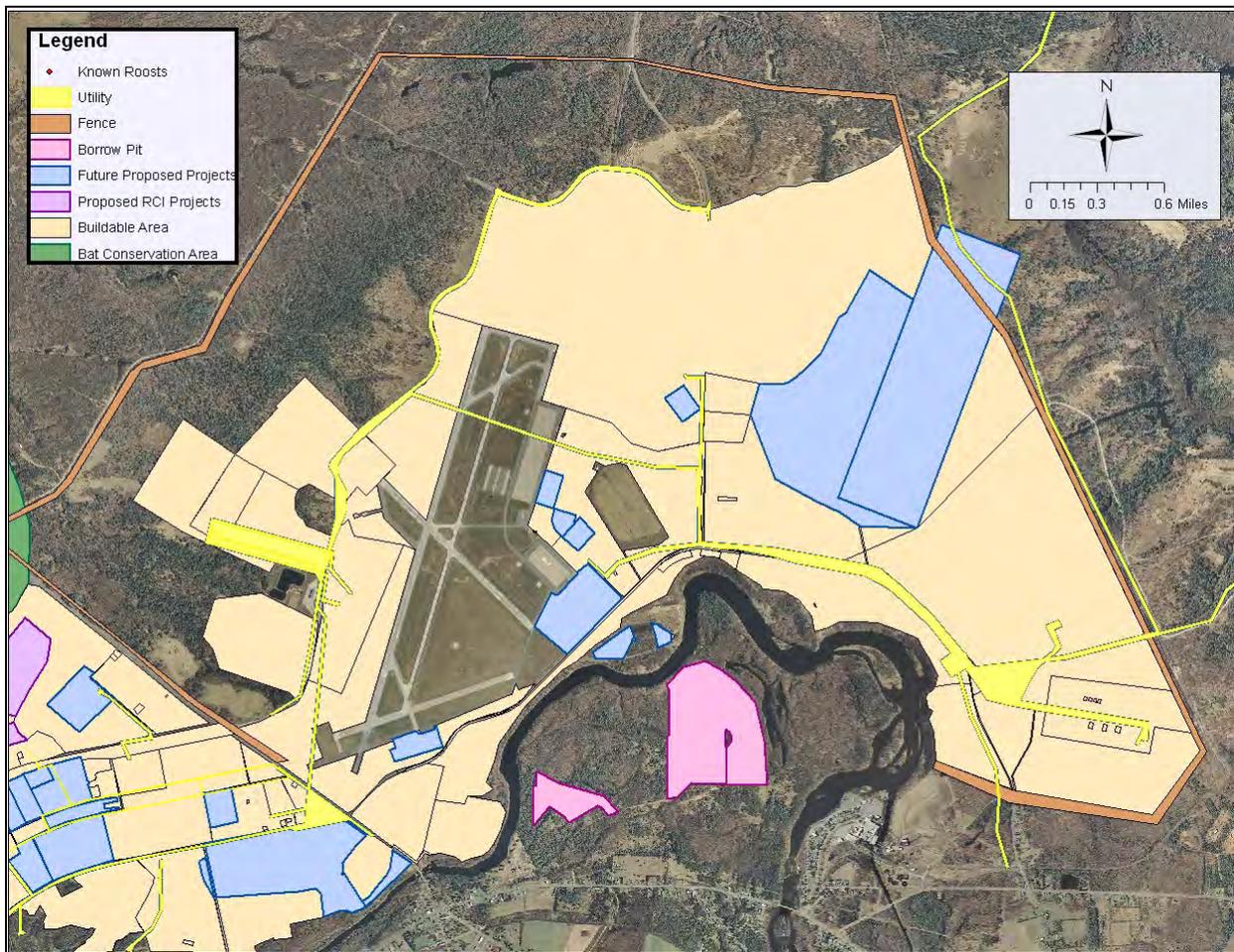
The Army anticipates constructing on up to approximately 2,483 acres (1,004 ha) of land in the Cantonment Area and in the surrounding areas around WSAAF between 2009–2011 (Figures 4 and 5, Table 1). When the total acres by vegetative cover type are buffered for the design-build process, the maximum acreage of permanent disturbance is approximately 2,880 acres.



**Figure 4. Proposed construction projects between 2009-2011 within the Cantonment Area on Fort Drum.**

**Table 1. Maximum acres of permanent impact by vegetation type for Cantonment/WSAAF and Training Area construction projects (2009-2011).**

| <b>Vegetation Type</b> | <b>Cantonment/<br/>WSAAF<br/>Construction</b> | <b>Buffer</b> | <b>Cantonment/<br/>WSAAF Total</b> | <b>Training<br/>Area<br/>Construction</b> | <b>Buffer</b> | <b>Training<br/>Area Total</b> | <b>Borrow Pits</b> | <b>Total</b> |
|------------------------|---|---------------|------------------------------------|---|---------------|--------------------------------|--------------------|--------------|
| Deciduous Forest       | 569   | 50            | 619                                | 1,399                                     | 50            | 1,449                          | 38                 | 2,106        |
| Mixed Forest           | 459   | 50            | 509                                | 545                                       | 50            | 595                            | 29                 | 1,133        |
| Conifer Forest         | 233   | 50            | 283                                | 122                                       | 50            | 172                            | 87                 | 542          |
| Shrublands             | 119   | 50            | 169                                | 382                                       | 50            | 432                            | 1                  | 602          |
| Water/Wetlands         | 8   | NA            | 8                                  | 209                                       | 50            | 259                            | 0                  | 267          |
| Grasslands             | 468   | 50            | 518                                | 741                                       | 50            | 791                            | 5                  | 1,314        |
| Landscaped<br>Yards    | 308   | 50            | 358                                | 57  | 50            | 107                            | 0                  | 465          |
| Sand Dunes/Flats       | 66  | 50            | 116                                | 0   | 0             | 0                              | 0                  | 116          |
| Disturbed              | 250   | 50            | 300                                | 25  | 50            | 75                             | 2                  | 377          |
| <b>Total</b>           | <b>2,480</b>                                  | <b>400</b>    | <b>2,880</b>                       | <b>3,480</b>                              | <b>400</b>    | <b>3,880</b>                   | <b>162</b>         | <b>6,922</b> |

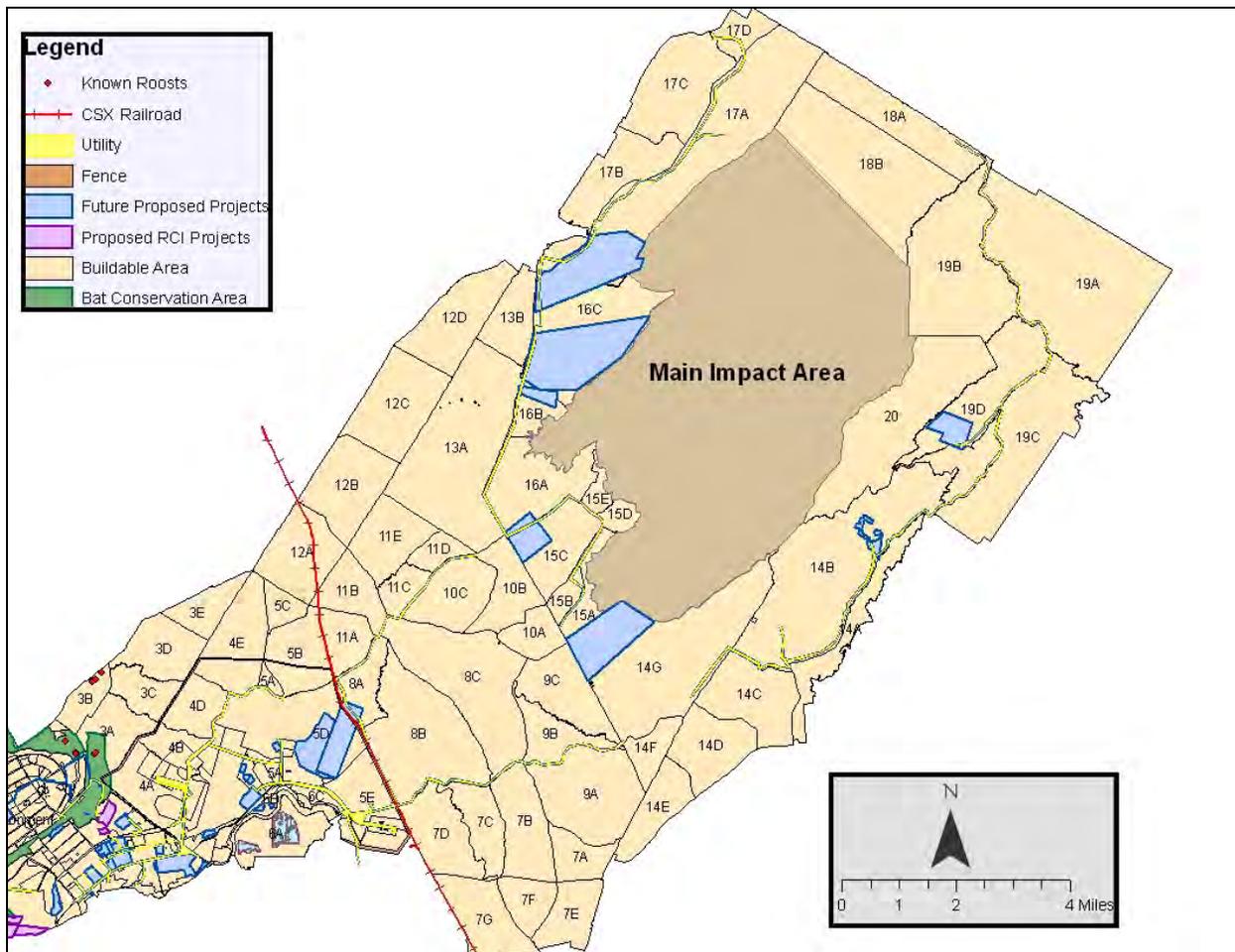


**Figure 5. Proposed construction projects between 2009-2011 around WSAAF on Fort Drum.**

### Training Area Construction

Construction of range facilities includes support and maintenance buildings, ranges for firing weapons including clearing for line of sight and target areas, airfields, and/or trail networks and bivouac sites (Figure 6). Unlike construction in the Cantonment Area, it is not always necessary to remove all vegetation to construct range facilities, however, these areas still have relatively high levels of disturbance. Although wetlands and surface waters may be encompassed within a range project footprint, extensive measures are undertaken to avoid, minimize, or mitigate wetland impacts.

Between 2009-2011, approximately 3,480 acres of permanent disturbance are anticipated. When total acres by vegetative cover type are buffered for the design-build process, the maximum acreage of permanent disturbance is approximately 3,880 acres.



**Figure 6. Proposed construction projects between 2009-2011 in the Training Area on Fort Drum.**

The majority of Training Area construction projects that involve tree clearing include conservation measures to conduct tree removal between October 1 and April 15. However, rapidly changing mission needs for small unit operations may warrant expedited construction of small projects. The Army needs to be able to be flexible and respond to changes in training needs. As a result of these small unforeseen training-related projects, the Army may need to clear trees in the Training Area between August 15-September 30. Based on previous years and projects, the Army anticipates that up to 5 projects may occur each year and that each project may need to harvest up to 5 acres (2.02 ha) of forested habitat (i.e. 25 forested acres (10 ha)/year). Although projects are subject to change, typical projects tend to be adjacent to existing trails or roads and are roughly 2 acres (0.8 ha) in size. In addition, projects are normally constructed on flat terrain.

To minimize the potential for impacts to pregnant and non-volant juvenile Indiana bats, the Army agreed to a conservation measure to avoid cutting trees between April 15 and August 15. An additional conservation measure restricts August 15-September 30 clearing to areas east of

the CSX railroad line running north and south through the southwestern part of the Training Area which is outside the area of the known maternity colony. In addition, as in all areas of Fort Drum, documented roosts (past or present) of female Indiana bats and an associated buffer of vegetation will not be cut without additional consultation with the Service.

As a means of gathering information on the likelihood of Indiana bats occurring in the Training Area and to assist with future evaluations of impacts of this type of activity, each project will be monitored via mist-netting and Anabat echolocation detection prior to tree clearing. Mist-netting will occur in locations most likely to capture Indiana bats in or near the project site between June-September. Mist-netting will follow Service mist-netting protocols for Indiana bats. There are no Service standards for monitoring Indiana bats using Anabat echolocation detectors, so the Army proposed the following guidelines:

- 1) A minimum of two Anabat detectors per acre will be deployed for at least two nights.
- 2) Recording will occur 30 minutes before sunrise until dawn.
- 3) Placement of detectors will occur within or immediately adjacent to the project site and in such a manner that it is most likely to record Indiana bat echolocation call sequences.
- 4) Detectors will not be deployed if the following weather conditions exist: precipitation; temperatures below 10°C; and/or strong winds.
- 5) Echolocation passes will be identified using a filter for Indiana bats, and the number of identified passes will be recorded.

Anabat and mist-netting results will be sent at the end of the year to the Service as part of the Army's annual report. Should any female Indiana bats be captured during mist-netting associated with these projects, the Service will require that radio transmitters be attached to those females and tracked for the life of the transmitter. As in all areas of Fort Drum, documented roosts (past or present) of female Indiana bats and an associated buffer of vegetation will not be cut without additional consultation with the Service.

### Demolition

Demolition is considered a "construction" activity for the purposes of this BO.

Many buildings on the installation were built in the 1940s and are scheduled to be demolished. Up to 80 buildings, including some outdated Residential Communities Initiative (RCI) housing, may need to be demolished between 2009-2011. The majority of buildings to be demolished will be 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 (*Myotis lucifugus*). If during the course of demolition, bats of any species are discovered, then all work must cease and the Army's Fish and Wildlife Management Program must be immediately contacted. If bats are identified as Indiana bats, then the Army's Fish and Wildlife Management Program will contact the Service to discuss the most appropriate measures that need to be taken to protect the Indiana bats.

## Borrow Pits

Eleven quarries/borrow pits in the Training Area and one in the Cantonment Area encompass approximately 188 acres (76 ha) and are used to provide sand and gravel for installation use, primarily for construction. Current borrow pit sites are disturbed sites with minimal vegetation. Up to 161 acres (65 ha) may be cleared to establish new borrow pits (Figure 5). Land clearing for borrow pits is considered another “construction” project for this BA. Refer to Table 1 for impacted vegetation types. No buffers were included in estimating vegetation cover types for borrow pits. The operation of borrow pits is considered to have no effect on Indiana bats because no additional vegetative cover will be lost and no other types of effects (e.g., noise, water quality impacts) are anticipated.

## Wetland Mitigation

Where impacts to wetlands are unavoidable and determined to be more than minimal, a plan to construct other wetlands or waters is incorporated into the wetlands permit application. The mitigation plan is developed in accordance with Corps Mitigation Guidelines (33 CFR Parts 325 and 332; 40 CFR Part 230). Only areas (both on- and off-post) that have no or minimal (e.g., a few isolated trees within a landscape of open grass or shrubland) tree removal will be recommended for mitigation areas. The exception to this would be restoring or creating forested wetlands. The Army has determined that wetland mitigation projects with no or minimal tree removal may affect, but are not likely to adversely affect, and may beneficially affect the Indiana bat. The Service concurs with the determination for mitigation sites with no removal of trees > 4 in DBH or winter removal of a few isolated trees > 4 in DBH.

## Conservation Measures for Construction Activities (from BA)

1. Bat Conservation Area. A 2,200+ acres (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.
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 bats. The size and shape of a buffer will be determined on a case by case basis by the Army’s Fish and Wildlife Management Program in consultation with the Service. 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 Indiana bats.
3. Time of Year Restriction for Tree Falling. A time of year restriction for clearing trees (> 4 in DBH) has been established to protect roosting Indiana bats during non-hibernation

seasons. For the majority of construction activities, felling of trees must take place between October 1 and April 15 while most Indiana bats are at the hibernaculum. This will greatly reduce the risk of accidentally harming Indiana 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. Tree felling that will occur during the non-hibernation season (August 15-September 30) and east of the CSX railroad line will be monitored for Indiana bats, which will help the Army identify potential Indiana bat areas for future consultations.

4. Flagging or signs will be used to demarcate forested 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, 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, the Army will evaluate the use of outdoor lighting and seek to minimize light pollution by angling lights downward or via other light minimization measures. In addition, structures surrounding the BCA will be retrofitted to reduce lighting impacts in this known area of Indiana bat use. High light levels may deter Indiana bats from areas as their nocturnal behavior may have evolved in response to predation risks (Speakman 1995). By angling the light away from potential foraging and roosting areas, the area would be darker thus providing Indiana bats more protection from predators.
7. Demolition. During demolition of buildings, if bats of any species are discovered, all work must cease and the Army's Fish and Wildlife Management Program must be immediately contacted. If the building has pre-existing known bat colonies, then the Army must be contacted before demolition is to occur. Refer to Section 2.7 of the BA for description of bat management. If during the course of demolition, bats of any species are discovered, then all work must cease and the Army's Fish and Wildlife Management Program must be immediately contacted. If bats are identified as Indiana bats, then the Army's Fish and Wildlife Management Program will contact the Service to discuss the most appropriate measures that need to be taken to protect the Indiana bats.
8. 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 Army'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 Service.
9. Water Quality (while this was described as a "beneficial action" – see below, this is actually required and, therefore, will always occur). All construction activities with ground disturbance greater than one acre or that meets another requirement of the New York State Department of Environmental Conservation (NYSDEC), are required to

follow standards in New York State Pollutant Discharge Elimination System: Stormwater General Permit for Stormwater 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 stormwater pollution prevention plan (SWPPP), which details all erosion and sediment control practices and, when necessary, post-construction stormwater management practices. Practices mentioned within the SWPPP will be in accordance with the New York State Stormwater Management 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.

#### Beneficial Actions for Construction Activities

In addition to the conservation measures that will always be followed above, the Army considers the following activities as optional and will attempt to implement whenever possible to further minimize impacts.

1. **Time of Year Restriction for Land Clearing.** For all construction activities requiring the removal of natural vegetation, a time of year restriction for clearing vegetation (i.e. shrubs, trees < 4 in DBH) has been established between April 15-August 1. This time of year restriction has been in place since 2003 in order to minimize take of migratory birds and their young in accordance with the Migratory Bird Treaty Act. All attempts are made to avoid land clearing during this time period, but due to unforeseen shifts or changes in projects, it may be necessary to remove non-forested vegetation during this time.
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.** The Army 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.

## Triggers for additional consultation with the Service for Construction Activities

While standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16, the following illustrates specific examples of foreseeable events that would likely trigger reinitiation:

### *Cantonment/WSAAF Construction*

Tree removal is proposed between April 16-October 1 or any other above-listed conservation measure cannot be implemented.

Projects exceed estimated acreage of impact of any given vegetative cover type (except disturbed, grasslands, sand dunes/flats, or landscaped yard) as described in the BA and above.

### *Training Area Construction*

Projects exceed total estimated acreage of impact or estimated acreage of impact of any given vegetative cover type (except disturbed, grasslands, sand dunes/flats, or landscaped yard) or any other above-listed conservation measure cannot be implemented.

Tree removal is proposed between April 16-August 15.

Tree removal is proposed between August 15-October 1 AND projects are west of the CSX railroad line or within the range of the known maternity colony.

Tree removal is proposed between August 15-October 1 AND project exceeds 5 ac (2.02 ha) per site or if the cumulative acreage exceeds 25 forested ac (10 ha) per year.

### *Demolition*

Bats are identified as Indiana bats during demolition of buildings.

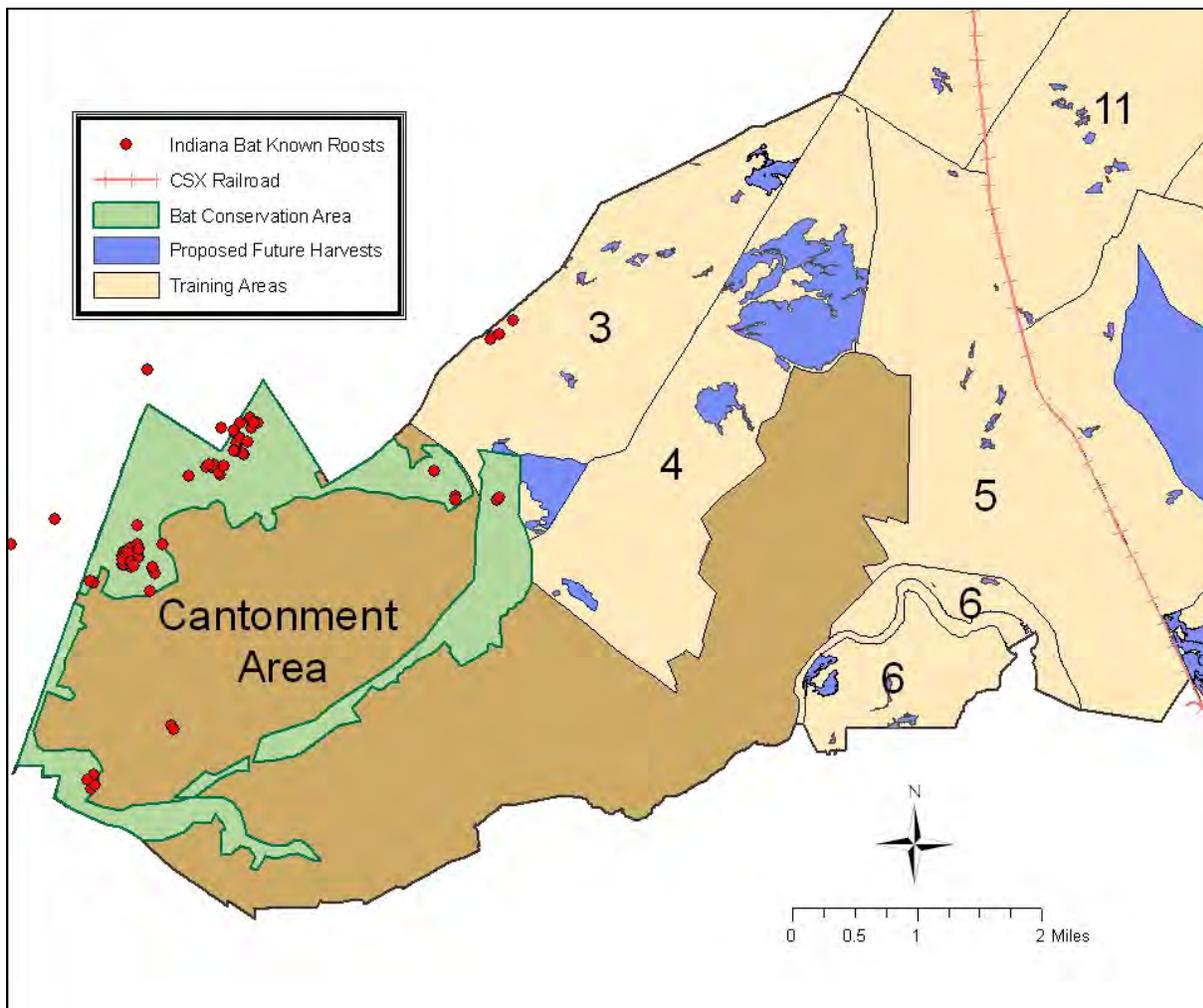
## ***B. Forest Management***

The Army's Forest Management Program (Directorate of Public Works-Environmental Division) has primary responsibility for managing forestland on Fort Drum. Current and future forestry actions are geared for sustainable ecosystem management while enhancing military training opportunities, maintaining forest health, benefiting wildlife habitat, and protecting water quality.

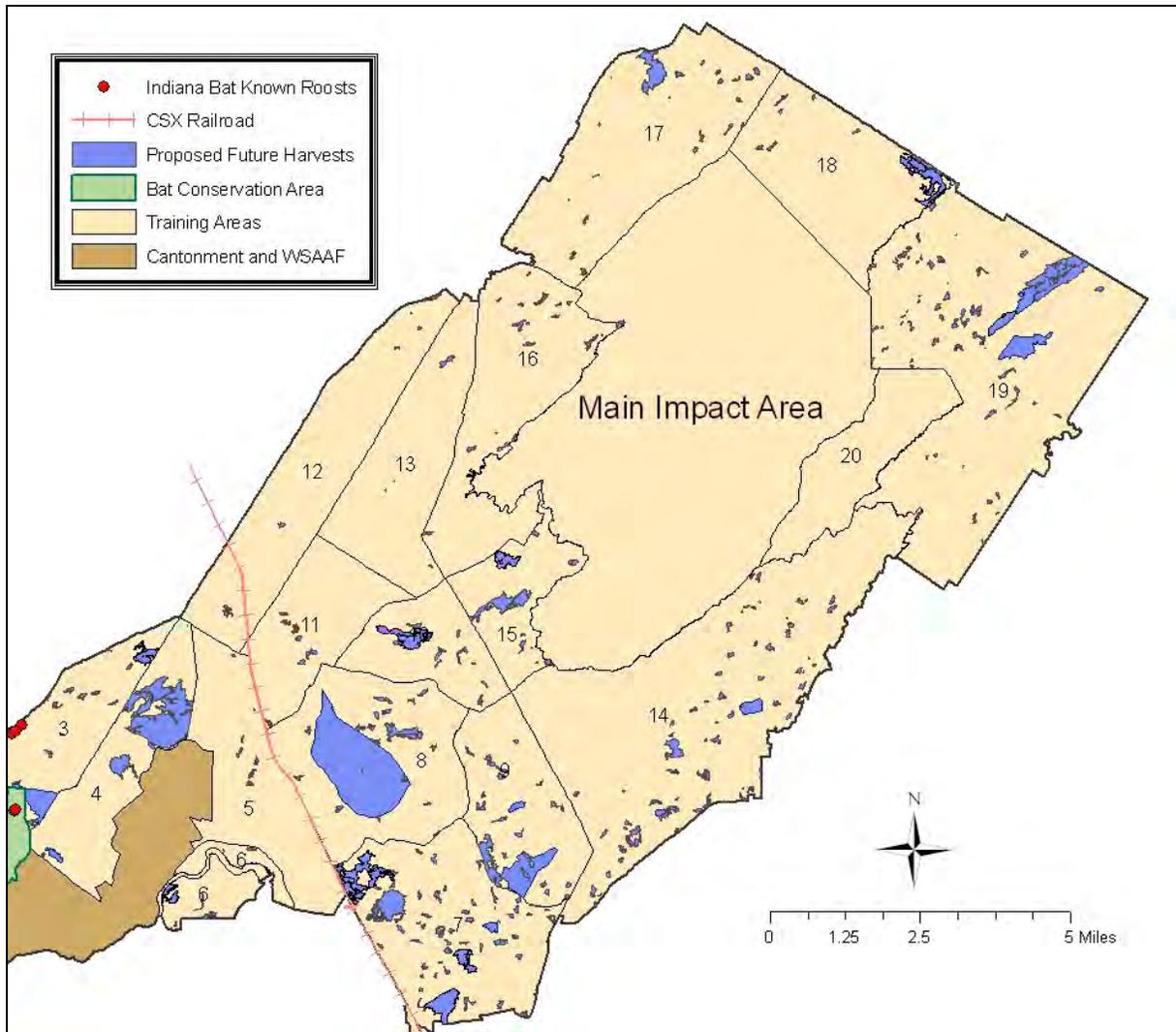
There are approximately 74,515 acres (30,155 ha) of forestland on Fort Drum. Approximately 47,259 acres (19,125 ha) are available for commercial and non-commercial forest management activities, while 27,256 acres (11,030 ha) are located in the Main Impact Area or in active range safety fans. Trees are not typically commercially harvested in these areas due to metal contamination and safety concerns.

In the next three years, up to 4,900 acres (1,982 ha) of forests may be harvested from the Training Area. This acreage is based on an annual maximum allowable cut of 1,627 acres (658 ha) calculated by the Army's Forest Management Program to maintain sustainable forest.

The current forest management plan is to manage approximately 3,500 acres (1,416 ha) in the next three years (Figures 7 and 8; Table 2). However, due to shifting priorities associated with supporting the military mission, these acreages may change in size, location, and species composition. The total amount actually harvested in a given year is also variable because commercial timber harvest contracts allow contractors two years to complete the harvest. Therefore, although rare, there may be instances where no harvesting occurs in one year, while up to 3,300 acres (1,335 ha) could occur in another. For the purposes of the BA and this BO, analysis was based on the maximum allowable cut (i.e. 4,900 acres (1,982 ha) total for the three years).



**Figure 7. Proposed timber harvests (2009-2011) within the range of the known Indiana bat maternity colony. Exact size and location of harvests are subject to change due to shifts in military priorities.**



**Figure 8. Proposed timber harvests (2009-2011) located east of the CSX railroad tracks. Exact size and location of harvests are subject to change due to shifts in military priorities.**

**Table 2. Maximum acreage of forests that are anticipated to be harvested between 2009-2011.**

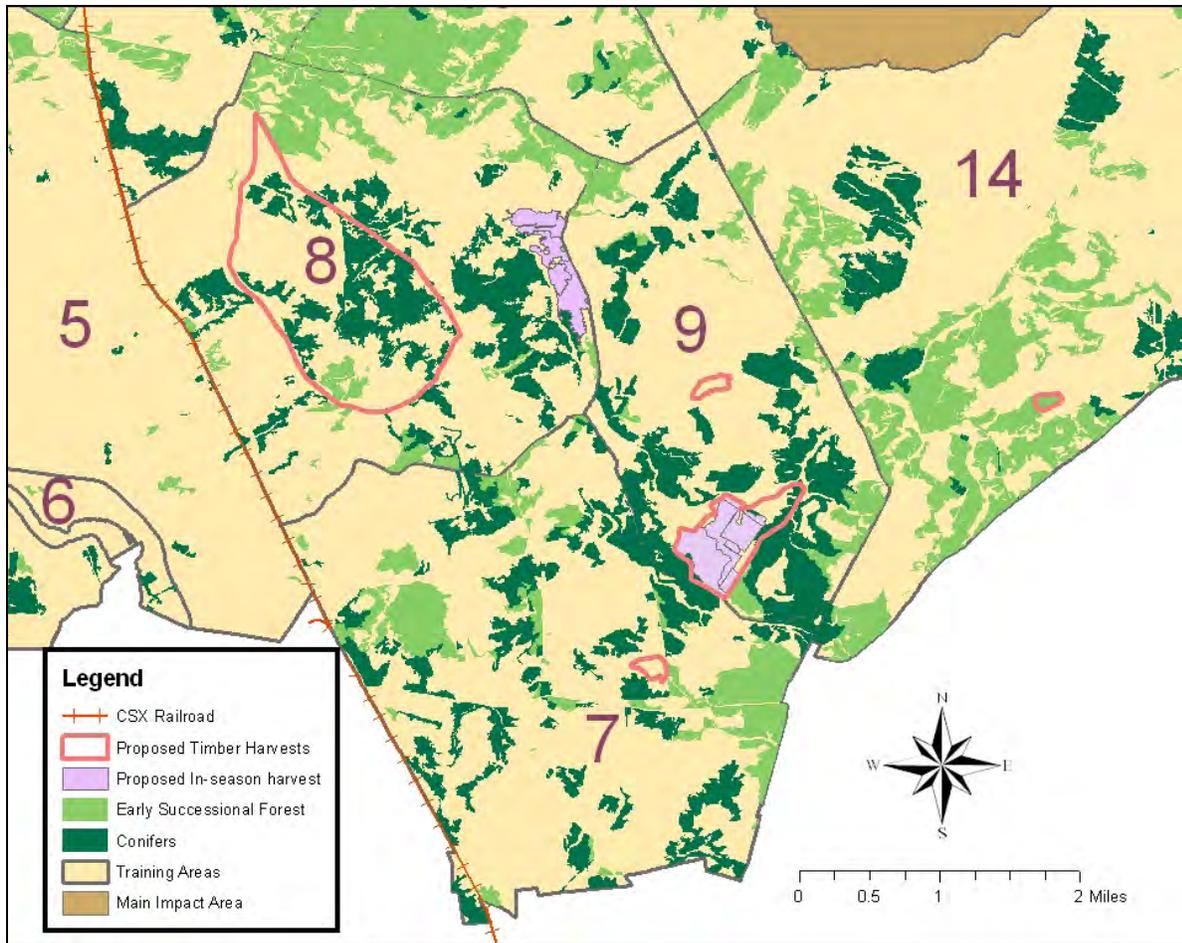
| Forest Type | Acreage |
|-------------|---------|
| Conifer     | 715     |
| Deciduous   | 1655    |
| Mixed       | 1060    |
| Unknown     | 1470    |
| Total       | 4900    |

In addition to timber harvesting, up to 300 acres (121 ha) of vegetation < 4 in DBH will be cleared between August 1-April 15 to support tree regeneration and to control unwanted vegetation between. Site preparation involves measures to prepare a site for replanting with desirable species and may include burning, herbicide, disking, or soil scarification. Site preparation will occur the year following a timber harvest but within the same footprint.

Forest management on Fort Drum utilizes both even-aged (e.g., clearcutting or shelterwood) and uneven-aged (single tree 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. Historically, even-aged methods have been utilized 70% of the time.

The majority of forestry actions will occur between October 1-April 15 when most Indiana bats are not present on Fort Drum. However, the Forest Management Program proposes to harvest up to 500 acres (202 ha) (total between 2009-2011) of early successional and/or conifer forests (Figure 9) between August 15 and September 30 in order to minimize soil disturbance, erosion, and water quality impacts. The 500 acres are included in the total maximum acreage (4,900) of harvest. Proposed potential harvest areas are east of the CSX railroad tracks on the following soil types: clay, clay loam, loamy sand, silt loam, and silty clay. Forest stands targeted for late summer clearing are predominantly aspen, birch, or conifers – none of which are considered typical bat roosting trees or habitat. The average patch size that may be harvested is estimated at 50 acres per site and the maximum patch size will not exceed 200 acres per site. Refer to Figure 9 for proposed locations of in-season harvests; however, any area east of the CSX railroad tracks that meet the aforementioned criteria may be harvested in-season not to exceed 500 acres total in three years. These sites are harvested for the benefit of military training which is dictated by the ever-changing mission, so exact locations and harvest scenarios are not known at this time.

To minimize impacts to pregnant females and non-volant juveniles, the Army agreed to a conservation measure that avoids tree clearing between April 15 and August 15. In addition, the potential use of these areas by Indiana bats will be monitored using mist-nets and Anabat echolocation detectors (see Training Area Construction section above). Anabat and mist-netting results will be sent at the end of the year to the Service as part of the Army's annual report. Should any female Indiana bats be captured during mist-netting associated with these projects, the Service will require that radio transmitters be attached to those females and tracked for the life of the transmitter. As in all areas of Fort Drum, documented roosts (past or present) of female Indiana bats and an associated buffer of vegetation will not be cut without additional consultation with the Service.



**Figure 9. Proposed locations for harvesting between August 15-September 30 that is comprised of early successional forest and/or conifer forests east of the CSX railroad tracks. Additional projects similar to these may occur elsewhere east of the CSX railroad tracks.**

Conservation Measures for Forest Management Activities (from BA)

1. Bat Conservation Area (BCA). Approximately 2,200 acres (890 ha) have been set aside for Indiana 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 Service 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. 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 Service. 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 and live trees > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will be retained. Currently, all known Indiana bat roost trees are within the BCA or in Training Area 3. No timber harvests are planned to occur in the Cantonment Area in the next three years. Further consultation will be needed with the Service for timber harvests that do not follow this conservation measure.

4. Time of Year Restriction. A time of year restriction for clearing trees (> 4 in DBH) has been established to protect roosting bats during non-hibernation seasons. Felling of trees must take place between October 1 and April 15 while most Indiana bats are at the hibernaculum with the exception of 500 acres (202 ha) of early successional forests or conifer forests east of the CSX railroad tracks which may be harvested between August 15-September 30. This will reduce the risk of accidentally harming Indiana bats that may potentially be present in trees scheduled to be removed. Specifically, the known maternity colony and its associated non-volant young will be protected from this disturbance.
5. For timber harvests that may occur in August and September, all snags will be left standing and an adequate amount of live residual trees will be left around each snag to minimize the effects of windthrow. In addition, live trees that are > 16 in DBH that have noticeable cracks, crevices, or exfoliating bark will not be felled and also have adequate amounts of live residual trees surrounding it to minimize windthrow. This conservation measure seeks to reduce the risk of felling a tree with roosting Indiana bats.
6. Snag Retention. Indiana bats select areas that have high snag densities for establishment of maternity colonies, so snag retention will benefit roosting Indiana 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 unless the treatment is a salvage harvest or clearcut. Snags should be distributed and retained throughout the landscape. At a minimum, contractors are required to leave a minimum of three snags > 9 in DBH every five acres for all silvicultural treatments. Two snags must be “hard” (i.e. a snag expected to stand for a number of years and more than likely has exfoliating bark) and one snag must be “soft” (i.e. a snag that may or may not have exfoliating bark and has the potential to fall within a couple of years).
7. No cutting of trees will occur within or along the bed or bank of streams protected under Article 15 of the NYS Environmental Conservation Law unless required to meet specific management goals and only after obtaining a permit from the 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 acres 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 Service. This buffer is intended to protect water quality and provide foraging habitat for Indiana bats.

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 (i.e. clearcut, selective thinning of 50% of aspen under 4 in DBH, etc.) to the Army’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 Service.

#### Beneficial Actions for Forest Management Activities (from BA)

In addition to the conservation measures that will always be followed above, the Army considers the following activities as optional and will attempt to implement whenever possible to further minimize impacts.

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 acres (4 ha) or larger with open water and shorelines greater than 30 m apart, 20 suitable trees will be left for every 50 acres (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 acres in size removed from the stand) will be provided with the goal of providing foraging opportunities for Indiana bats.

#### Triggers for additional consultation with the Service for Forest Management Activities

While standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16, the following illustrates specific examples of foreseeable events that would likely trigger reinitiation:

More than 4,900 acres (1,982 ha) proposed to be cut over the next three years.

More than 500 acres proposed for removal between August 15 and October 1.

Tree removal is proposed between August 15-October 1 AND female Indiana bats are tracked to the forest patch for roosting or foraging in 2009, 2010, or 2011.

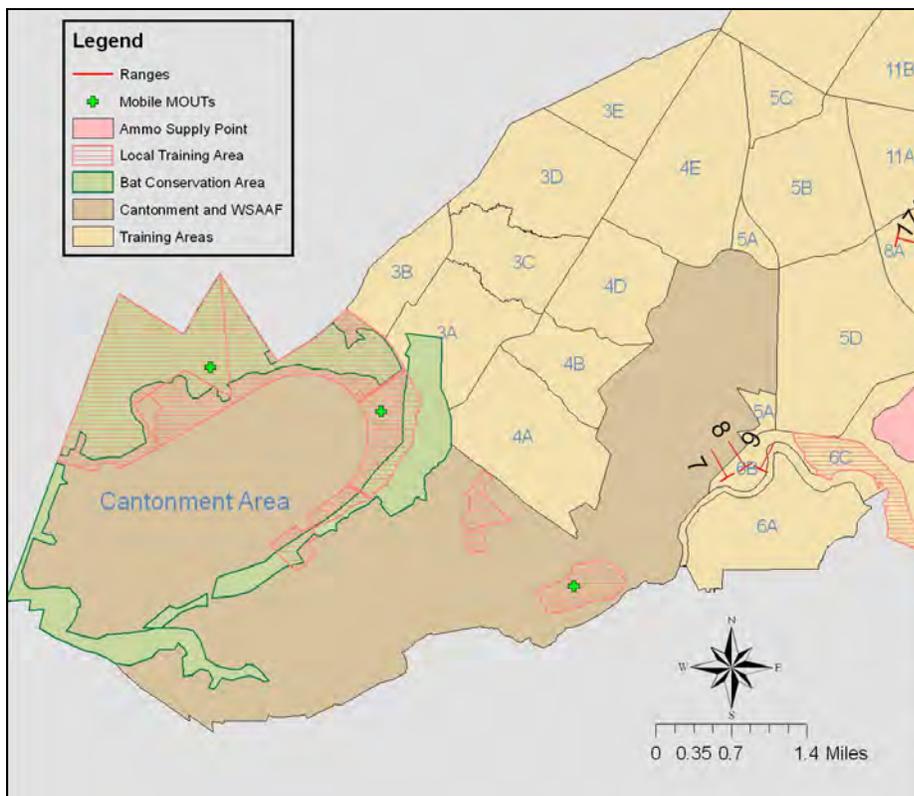
#### ***C. Military training smoke and obscurants***

For the purposes of the BA and this BO, military training activities are generally divided into eight categories: sustainment operations, engineering operations, air operations, water operations, field training operations, live munitions training, demolition, and smokes/obscurants. All of these activities occur in the Training Area; some of these activities occur in the Local Training Area within the Cantonment Area (see below for more information). The only type of training activity the Army determined had the potential to result in any adverse impacts to Indiana bats was the use of smokes/obscurants. All other military training activities and any associated conservation measures are discussed in Appendix A.

## Local Training Areas Activities

Local Training Areas (LTA) are located primarily within the Cantonment Area (Figure 10). The two largest LTAs are within the boundaries of the BCA. LTAs provide units with an area near their barracks and administrative buildings where low intensity training can be conducted. Unlike the Training Area where all activities are coordinated through Range Control, utilization of the LTAs is not centrally managed, but activities are regulated by *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas* (FD Reg 350-6).

Examples of military training typically conducted in LTAs include field exercises, air operations in approved landing and pickup zones (i.e. open fields), and/or foot and wheeled maneuvers. Only blank ammunition with the use of the Multiple Integrated Laser Engagement System (similar to laser tag) is authorized for use in the LTAs. Petroleum, oil, and lubricant (POL) operations and the use of CS gas (i.e. tear gas), live ammunition, and explosives are prohibited in LTAs in accordance with FD Reg 350-6. Colored smoke may be used at three mobile Military Operations Urban Terrain structures (MOUTs) (smaller and semi-portable MOUTs for urban warfare training) in the LTAs, however, no other smoke or obscurants are permitted within LTAs that are within the boundaries of the BCA. The three mobile MOUTs are located in open fields. Two MOUTs are approximately 400 m from known maternity roosts. Concertina wire is permitted within the LTAs, but booby traps and barbed wire are prohibited. Training may include the construction of temporary structures only. Physical training, road marching, and use of rappel towers may also occur throughout the Cantonment Area and the LTAs.



**Figure 10. Local Training Areas on Fort Drum.**

## Smoke/Obscurants

Smoke/obscurants are used to conceal military movements and are used throughout the Training Area primarily during the day. Although uncommon, smoke/obscurants may be deployed at night. Smoke/obscurants are generated via smoke grenades, smoke pots, and smoke generators (M56 and M58), and are deployed through munitions. Smoke/obscurant material may consist of white phosphorous (WP), terephthalic acid (TPA), fog oil, and/or graphite flakes.

WP is used for signaling, screening, and incendiary purposes, and is usually dispersed by explosive munitions. WP is used only 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. White phosphorous ignites when it is exposed to air and may cause burns. Smoke typically lasts up to 15 minutes.

TPA is used in floating or ground smoke pots, and in smoke grenades. 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 training may occur on approximately 30,000 acres (12,140 ha) on Fort Drum. However, smoke training would be rotated regularly among multiple areas to minimize impacts to any one area of the installation. The only smoke/obscurant permitted in the BCA is colored smoke. This may be used at three mobile MOUTs located in open fields.

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. Potentially up to 200 days of training could be conducted using fog oil/graphite 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; approximately 37,800 pounds of graphite per year may be used on Fort Drum to generate graphite smoke.

The Army has proposed one primary conservation measure to minimize potential adverse effects to Indiana bats from smoke/obscurants.

### Conservation Measures for Smoke/Obscurants (from BA)

1. In the Training Area, smoke and obscurants must be used > 100 m from known Indiana bat maternity roost areas (including roosts identified in the future) between April 16-September 30; the use of smoke and obscurants must be rotated among training areas to minimize impacts to any one area. The 100 m buffer serves to minimize the effects of smoke and obscurants by providing distance between the roost and the densest amount of smoke/obscurants. Training missions will be aware of maternity roost trees

via the Record of Environmental Consideration (REC) process (See Appendix C of BA) and will be directed to avoid these areas. By minimizing the concentration of smoke around maternity roosts, it will reduce the risk of Indiana bats (including pups) from abandoning roosts. The rotation of smoke/obscurants between areas reduces impacts to any one area, thus minimizes the Indiana bats' risk to chronic exposure.

No 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*. The one exception is the use of colored smoke at three mobile MOUTs within the LTAs (1 mobile MOUT is in an open area of the BCA and 1 is in an open area near the BCA). Only infrequent use of colored smoke is expected to be used in around the mobile MOUTs. **With the exception of the colored smoke used at the mobile MOUTS, no other smoke or obscurant may be used in the BCA.** Currently, all known maternity roosts are found within the BCA or within a 1,000 m from the installation boundary.

#### Triggers for additional consultation with the Service for Smoke/Obscurants

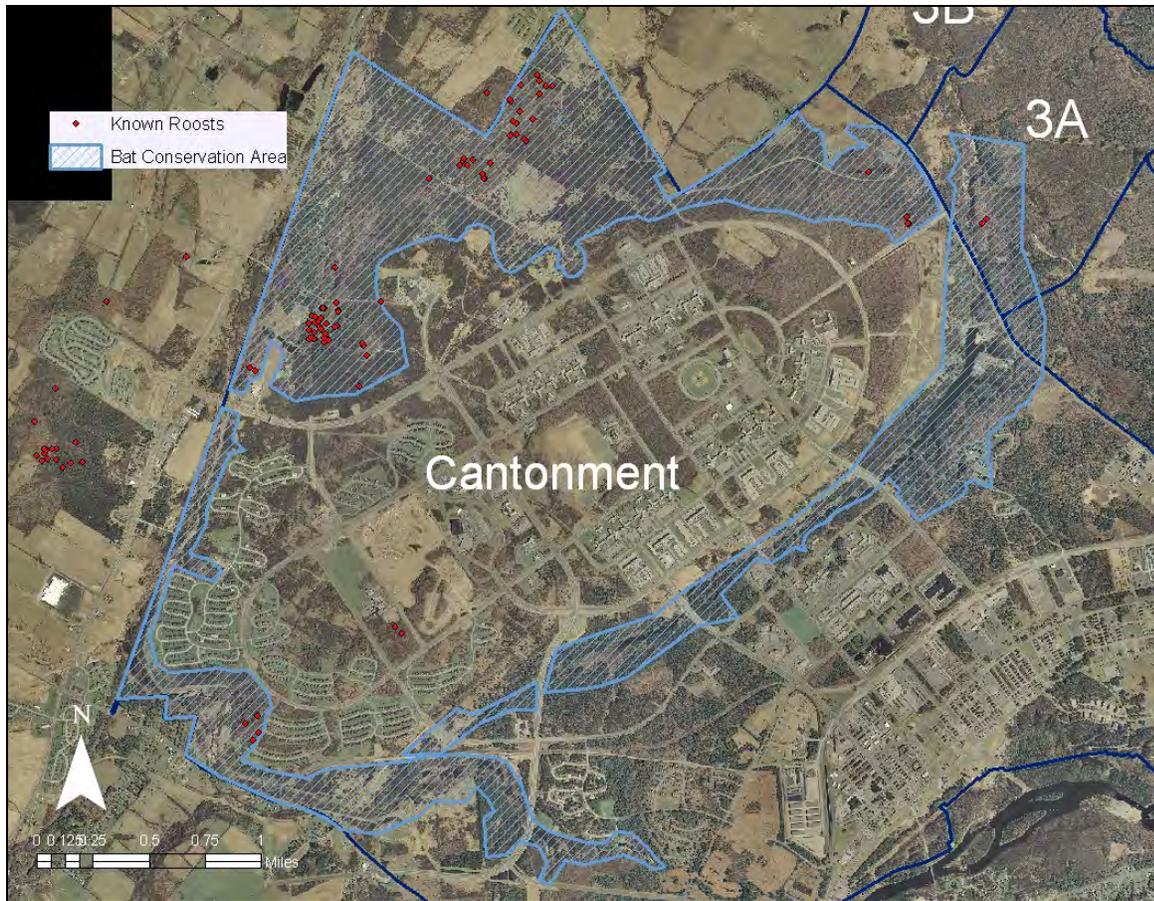
Proposed actions do not meet general project description provided in BA or conservation measures cannot be followed (standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16).

#### ***D. Non-project Specific Conservation Measures***

Section 3 of the BA provides a full description of these measures and are summarized here.

#### Bat Conservation Area

A 2,202 acres (891 ha) BCA has been established on Fort Drum for the benefit of Indiana bats (Figure 11). The majority of the BCA occurs in undeveloped portions of the Cantonment Area (2,051 acres (830 ha)) and follows Pleasant Creek northward into Training Areas 4A and 3A (151 acres (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 (Environmental Solutions and Innovations, Inc. 2008a, 2008b) and past acoustical surveys. The BCA contains all but six known roosts on Fort Drum.



**Figure 11. Bat Conservation Area.**

The Army’s intention for 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 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 8 acres (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 the Construction Activities section of the BO. Construction activities conservation measures will be conducted. 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.

Although currently not expected to occur within the next three years, the potential exists for the Installation Restoration Program to remove trees in order to access contaminated groundwater sites in response to a contamination episode. Individual consultation will occur with the Service and trees would only be removed during the October 1-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 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 bats.

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 LTAs. No live fire is allowed, however, weapons that fire the equivalent of 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.

With the exception of colored smoke used at the three identified mobile MOUTs, smoke and obscurants will not be used within 100 m of forested areas or within 1000 m of Fort Drum's boundary between April 16-September 30 to minimize impacts to roosting Indiana bats.

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

Spraying of herbicides will continue to be conducted along the perimeter fence and utility line corridors to manage vegetation. Pesticide use conservation measures will be conducted.

5. **Recreation.** Most of the BCA is currently used for recreational purposes. The primary recreational use is Physical Training 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 > 4 in DBH must be removed, only the minimum required will be removed during the October 1-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 using pesticides, biocontrol, and physical removal, as well as surveys, inventories, and

research. 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.

### Monitoring & Research

A funding request has been submitted to conduct a habitat survey in the Cantonment Area of known Indiana bat roosting areas starting in 2009. This information may be used in the future to develop a predictive model of potential bat habitat on Fort Drum as well as develop a forest bat management plan. Mist-netting is also planned in the Training Area in 2009. The USFS study initiated in 2008 is planned to continue in 2009.

### Outreach Efforts

The Army has participated in and facilitated several outreach efforts including publishing articles in local outlets, cooperating with local media, and participating in community and school events.

Future plans consist of including relevant information pertaining to Indiana 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 the Indiana bat on Fort Drum and will be made available on the Fish & Wildlife Management Program web site. Efforts are underway to create a poster to integrate the Indiana bat with 10<sup>th</sup> Mountain Division Soldiers under the common theme of “We Own the Night” similar to the successful U.S. Marine Corps “We’re Saving A Few Good Species” posters.

### Army Compatible Use Buffer Program

The Army Compatible Use Buffer (ACUB) Program was created to establish buffer areas around Army installations to limit effects of encroachment and maximize land inside the installation that can be used to support the mission. The ACUB Program can also be used to meet environmental regulatory requirements for endangered species conservation and off-post wetland mitigation which would 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 wildlife habitats.

Under the authority provided in Section 2811, National Defense Authorization Act of 2003 (codified at 10 United States Code Sec. 2684a), the Army received approval August 2007 to work with non-government organizations and/or other government agencies to develop an ACUB program. The ACUB program is one of the responsibilities of Plans Analysis and Integration Office. Natural resource professionals will assist in a supporting role whenever called upon. Potential ACUB partners at Fort Drum include Ducks Unlimited Great Lakes/Atlantic Regional Office, Thousand Islands Land Trust, Tug Hill Tomorrow Land Trust, Jefferson County Agricultural Development Corporation, New York State Office of Parks, Recreation & Historic Preservation, NYSDEC, and the Service.

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 Service has identified areas to target for the protection of known or potential Indiana bat habitat. It is anticipated that up to 1,300 acres (526 ha) of land along Fort Drum's border with Evans Mills, LeRay, and Philadelphia will be incorporated into the program over the next several years.

### **Action Area**

The action area is defined as all areas to be affected directly or indirectly by the Federal action(s) and not merely the immediate area involved in the action(s). The Service generally agrees with the action areas described in the BA and provides additional rationale below.

Two action areas were defined that encompassed roosting and foraging needs of Indiana bats throughout the year: Spring/Summer and Fall/Winter.

#### *Spring/Summer*

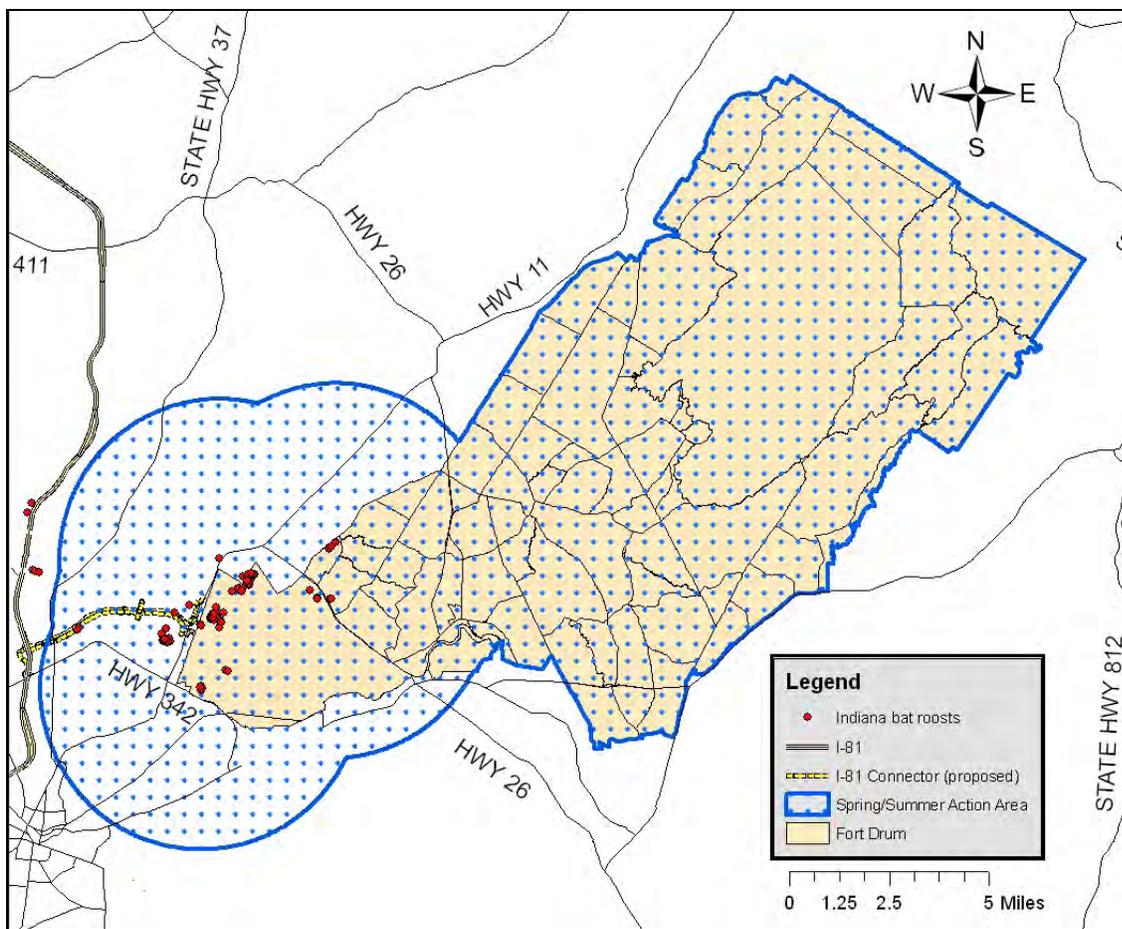
Indiana bats are known to occur within Fort Drum. In 2007, surveys conducted by Army contractors resulted in the capture of 1,380 bats, of which 18 were Indiana bats (11 adult females, 2 adult males, 3 juvenile females, 2 juvenile males) (Environmental Solutions and Innovations, Inc. 2008a). Seventeen Indiana bats were captured in the Cantonment Area and one in Training Area 4. 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 (unpublished data). Previous radio telemetry projects also identified Indiana bat activity on Fort Drum (Environmental Solutions and Innovations, Inc. 2006). Two known Indiana bat hibernacula (Glen Park Cave and Glen Park Commercial Cave) are within 6.5 miles of the proposed project. Glen Park Commercial Cave contains only a handful of Indiana bats (Hicks and Newman 2007), therefore, we will focus the remainder of this BO on the Glen Park Cave wintering population. In 2005, the NYSDEC and Service successfully tracked 26 of 32 radio-tagged Indiana bats from Glen Park Cave to their spring roost sites, all of which remained within 20 miles of their hibernaculum (Hicks et al. 2006). Similar studies on 7 occasions of all other primary hibernacula (Jamesville, Barton Hill, Williams Lake complex) in New York State have shown Indiana bats traveling no more than 40-50 miles from their hibernacula to spring/summer roost sites. The next closest hibernaculum to the project area is Jamesville Quarry Cave, located approximately 69 miles away. Therefore, we anticipate that all Indiana bats captured during the mist-netting activities on Fort Drum winter at Glen Park Cave. Additional information can be found in the **Environmental Baseline** section.

Sparks et al. (2005a) summarized results of previous studies and reported linear distances between roosts and foraging areas for females from 0.5 to 8.4 km (0.3 to 5.2 mi), although most distances were less than half the maximum distance. Butchkoski and Hassinger (2002) reported

maximum distances between Indiana bat roosts and foraging areas of 4.5 km (2.8 mi). Distances between capture sites and roost sites during studies associated with the proposed project ranged from 0.8-4 miles (0.13-6.44 km) with a mean of  $2.09 \pm 1.39$  miles. The Service routinely considers Indiana bats using roost trees within 2.5 miles from each other as part of the same colony, unless there is sufficient information to demonstrate otherwise.

To determine the potential summer action area for the one known and one assumed maternity colonies in the vicinity of the proposed project, we considered the distances between all documented roosts on Fort Drum and roosts from other studies, any documented foraging information, distances between capture sites and roost trees, and distances previously documented in the literature. The Spring/Summer action area included the whole of Fort Drum and a 4 mile radius around known maternity roosts (Figure 12). Indiana bats in the action area flew up to 4 miles between roosting and foraging areas during the Fort Drum Connector study (Gress Engineers, Inc. and FMSM Engineers, Inc. 2007).

There is a total of approximately 153,946 acres of land in the summer action area, of which approximately 60,757 acres (39.5%) are forested.



**Figure 12. Spring/Summer action area.**

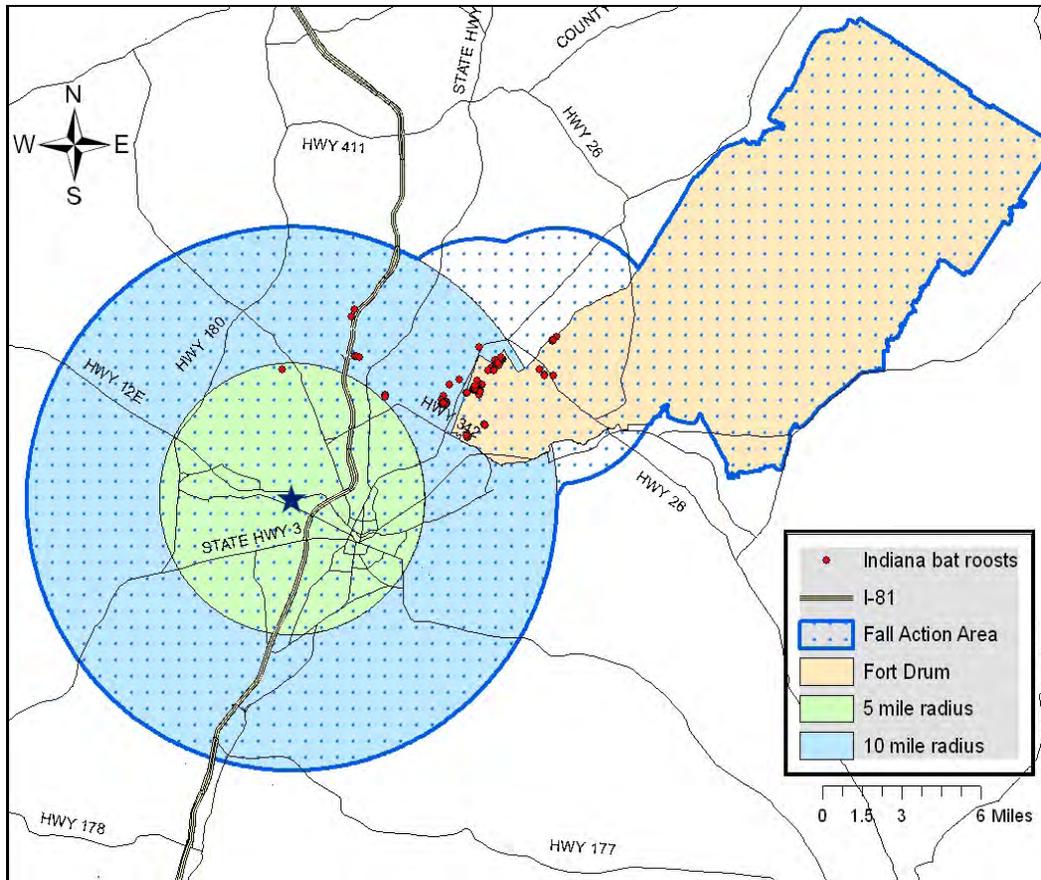
### *Fall/Winter*

The Fall/Winter action area consists of all of Fort Drum and extends to a known Indiana bat hibernaculum (Figure 13). This action area includes Fort Drum, a 4-mile radius around known maternity roosts, and a 10-mile radius around the Glen Park hibernaculum (6.5 miles west of Fort Drum). This area will most likely be used by Indiana bats during fall swarm.

During September-October 2007, three Indiana bats in Jefferson County, New York, were documented traveling or remaining up to 9.5 miles from their hibernaculum during fall foraging or swarming activities (Environmental Solutions and Innovations, Inc. 2008a). See **Environmental Baseline** for more information.

The total winter action area is 319,383 acres. The total forested habitat within the winter action area is 87,950 acres or 27.5% of the landscape.

In addition, effects to female members of the Glen Park Cave hibernating population may affect the maternity colonies to which they belong. For example, if females enter hibernation with reduced body fat due to reduced foraging success in the fall, some of those females would not be anticipated to survive the winter to make it back to their maternity colonies. We have information on approximately 10 maternity colonies known to use Glen Park Cave as their hibernacula. The action area could extend to these maternity colonies and their habitat, although the effects may be indeterminable. We believe there is only a low probability of minor impacts to Indiana bats during fall swarming/foraging and no further review of this potential larger action area is warranted because the anticipated effects will occur to Indiana bats during the spring and summer in a smaller geographic area. In addition, some members of the identified maternity colonies could originate from hibernacula other than the Glen Park Cave; however, we have no information to suggest that this is the case.



**Figure 13. Fall/Winter action area with a 5-mile and a 10-mile buffer around the Glen Park hibernaculum.**

The fall/winter action area encompasses the spring/summer action area and, therefore, is the total action area.

## STATUS OF THE SPECIES

### Species Description

The Indiana bat is a medium-sized bat in the genus *Myotis*. Its forearm length is 1 3/8-1 5/8 in, and the head and body length ranges from 1 5/8-1 7/8 in. This species closely resembles the little brown bat and the northern long-eared bat (*M. septentrionalis*). The Indiana Bat Draft Recovery Plan (Service 2007) provides a comprehensive summary of the description of the species and is incorporated by reference.

### Listing Status

The Indiana bat is a temperate, insectivorous, migratory bat that hibernates in caves and mines in the winter and summers in wooded areas. The Indiana bat was officially listed as an endangered species on March 11, 1967 (Federal Register 32[48]:4001), under the Endangered Species

Preservation Act of October 15, 1966 (80 Stat. 926; 16 U.S.C. 668aa[c]). The ESA extended full protection to the species.

### **Critical Habitat**

Critical habitat was designated for the species on September 24, 1976 (41 FR 14914). Thirteen hibernacula, including 11 caves and two mines in six states, were listed as critical habitat:

Illinois - Blackball Mine (LaSalle Co.);  
Indiana - Big Wyandotte Cave (Crawford Co.), Ray's Cave (Greene Co.);  
Kentucky - Bat Cave (Carter Co.), Coach Cave (Edmonson Co.);  
Missouri - Cave 021 (Crawford Co.), Caves 009 and 017 (Franklin Co.), Pilot Knob Mine (Iron Co.), Bat Cave (Shannon Co.), Cave 029 (Washington Co.);  
Tennessee - White Oak Blowhole Cave (Blount Co.); and  
West Virginia - Hellhole Cave (Pendleton Co.).

### **Recovery Plan Status**

The Service has published a recovery plan (Service 1983) which outlines recovery actions. Briefly, the objectives of the plan are to: (1) protect hibernacula; (2) maintain, protect, and restore summer maternity habitat; and (3) monitor population trends through winter censuses. An agency draft of a revised plan was published in 1999, but this was never finalized. A revised draft recovery plan was published in 2007 (Service 2007) (Appendix B). The Recovery Priority of the Indiana Bat is 8, which means that the species has a moderate degree of threat and high recovery potential.

### **Life History**

The average life span of the Indiana bat is 5 to 10 years, but banded individuals have been documented living as long as 14 and 15 years (Humphrey and Cope 1977). Female survivorship in an Indiana population was 76% for ages 1 to 6 years and 66% for ages 6 to 10 years. Male survivorship was 70% for ages 1 to 6 years and 36% for ages 6 to 10 years (Humphrey and Cope 1977).

The Indiana bat is a migratory bat, hibernating in caves and mines in the winter (typically October through April) and migrating to summer habitat. Although some Indiana bat bachelor colonies have been observed (Hall 1962, Carter et al. 2001), males and non-reproductive females typically do not roost in colonies and may stay close to their hibernaculum (Whitaker and Brack 2002) or migrate long distances to their summer habitat (Kurta and Rice 2002). Reproductive females may migrate up to 357 miles (Winhold and Kurta 2006) to form maternity colonies to bear and raise their young. However, much shorter movements have been observed in New York. Both males and females return to hibernacula in late summer or early fall to mate and enter hibernation. The Indiana Bat Draft Recovery Plan (Service 2007) provides a comprehensive summary of Indiana bat life history and is incorporated by reference.

## Food Habits

The Indiana bat feeds primarily on aquatic and terrestrial insects. Diet varies seasonally and variations exist among different ages, sexes, and reproductive status (Service 1999). Numerous foraging habitat studies have been completed for the Indiana bat. These studies found that Indiana bats forage in closed to semi-open forested habitats and forest edges located in floodplains, riparian areas, lowlands, and uplands. Forested habitats are very important for foraging bats, but old fields and agricultural areas seem to also be somewhat important habitats in studies completed in Indiana (Service 2007). At a study site near the Indianapolis International Airport, Sparks et al. (2005b) found Indiana bats spending nearly 51% of their time foraging over agricultural fields with movements focused on a riparian corridor. Indiana bats, using open habitats for foraging at other sites, are probably utilizing forest-field edges and crowns of large scattered trees within the open canopy habitats.

## Habitat Requirements

In this section we provide summaries of habitat requirements for Indiana bats. The Indiana Bat Draft Recovery Plan (Service 2007) and BA provide more comprehensive summaries and are incorporated by reference.

During winter, Indiana bats are restricted to suitable underground habitats known as hibernacula. The majority of hibernacula consist of limestone caves, especially in karst areas of east central United States, but abandoned underground mines, railroad tunnels, and even hydroelectric dams can provide winter habitat throughout the species' range (Service 2007). In New York, the largest and most rapidly growing populations of Indiana bats occur in abandoned underground mines (Hicks and Novak 2002). Hibernacula with stable and/or growing populations of Indiana bats have stable low temperatures that allow the bats to maintain a low metabolic rate and conserve fat reserves through the winter.

Spring emergence occurs when outside temperatures have increased and insects (forage) are more abundant (Richter et al. 1993). In New York, spring emergence studies have consistently shown that Indiana bats emerge once evening temperatures remain higher than 50°F after April 15 (A. Hicks, pers. comm.). Some bats may remain in close proximity to the cave 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).

Indiana bats exhibit strong site fidelity to their traditional summer colony areas and foraging habitat, that is, they return to the same summer range annually to bear their young (Kurta et al. 2002, Service 1999). Traditional summer sites that maintain a variety of suitable roosts are essential to the reproductive success of local populations. 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 this effort places additional stress 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.

Summering Indiana bats (males and females) roost in trees in riparian, bottomland, and upland forests. Roost trees generally have exfoliating bark which allows the bat to roost between the bark and bole of the tree. Cavities and crevices in trees also may be used for roosting. A variety of tree species are used for roosts including, but not limited to, silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*), shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), eastern cottonwood (*Populus deltoides*), northern red oak (*Quercus rubra*), post oak (*Quercus stellata*), white oak (*Quercus alba*), shingle oak (*Quercus imbricaria*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), and sassafras (*Sassafras albidum*) (Rommé et al. 1995). Structure is probably more important than the species in determining if a tree is a suitable roost site; tree species which develop loose, exfoliating bark as they age and die are likely to provide roost sites. Male bats disperse throughout the range and roost individually or in small groups. In contrast, reproductive females form larger groups, referred to as maternity colonies in which they raise their offspring. Non-reproductive females may roost individually or in small groups, but occasionally are found roosting with reproductive females. While Indiana bats primarily roost in trees, some colonies have been found in artificial roost sites. Only four maternity colonies have been found in buildings; in comparison, more than 400 roost trees have been documented for female Indiana bats (Service 2007).

Indiana bat roost trees have been described as either primary or alternate depending on the number of bats in a colony consistently occupying the roost site. In Missouri, Callahan (1993) defined primary roost trees as those with exit counts of more than 30 bats on more than one occasion; however, this number may not be applicable to small-to-moderate sized maternity colonies. Kurta (2005) summarized summer habitat information from 11 states and found most exit counts at primary roosts are at least 20-100 adults with a typical maximum of 60-70 adults in a primary roost at any given time. Primary roost trees are almost always located in either open canopy sites or in the portion of a tree used by bats that is above the canopy cover of the adjacent trees (Callahan et al. 1997, Kurta et al. 2002). Alternate roost trees can occur in either open or closed canopy habitats. Maternity colonies use a minimum of 8-25 trees per season (Callahan et al. 1997, Kurta et al. 2002). On the average, Indiana bats typically switch roosts every two to three days with reproductive condition of the female, roost type, weather conditions, and time of year affecting switching behavior (Kurta et al. 2002, Kurta 2005).

Exposure of trees to sunlight and location relative to other trees are important to suitability. Cool temperatures can delay development of fetal and juvenile young and selection of maternity roost sites may be critical to reproductive success. Dead trees with southeast and south-southwest exposures allow warming solar radiation. Some living trees may provide a thermal advantage during cold periods (Service 1999). Maternity colonies use multiple roosts in both dead and living trees that are grouped. Extent and configuration of a use area is probably determined by availability of suitable roost sites. Distances between roosts can be a few meters to a few kilometers. Reasons for frequent roost switching may be a response to weather changes, changing needs of females in different reproductive conditions, or an attempt by the bats to maintain social contacts or knowledge of alternate roost sites (Barclay and Kurta 2007).

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 usually surrounded by open canopy and are warmed by solar radiation. Alternate roosts may be used when temperatures are above normal or during precipitation. Shagbark hickories are good alternate roosts because they are cooler during periods of high heat and tight bark shields the bats from rain (Service 1999). Weather has been found to influence bat behavior and habitat use (Humphrey et al. 1977).

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 mile (1 km) wide. In addition, data collected from a residential development in northern New York showed use of linear features (i.e. hedgerows and tree-lined fence rows) by Indiana bats (Environmental Solutions and Innovations, Inc. 2006). Apparently suitable (but distant) forest patches may not be available to Indiana bats unless they are connected by a wooded corridor, however, we do not know the maximum size of an opening Indiana bats may cross.

### **Status and Distribution**

Because the vast majority of Indiana bats form dense aggregations or “clusters” on the ceilings of a relatively small number of hibernacula (i.e. caves and mines) each winter, conducting standardized surveys of the hibernating bats is the most feasible and efficient means of estimating and tracking population and distribution trends across the species’ range. Collectively, winter hibernacula surveys provide the Service with the best representation of the overall population status and relative distribution that is available.

For several reasons, interpretation of the census data must be made with some caution. First, winter survey data have traditionally been subdivided by state due to the nature of the data collection. As described below, each state does not represent a discrete population center. Nevertheless, the range-wide population status of the Indiana bat has been organized by state thus far. Second, as will be further discussed, available information specific to the “reproductive unit” (i.e. maternity colony) of the Indiana bat is limited. While winter distribution of the Indiana bat is well documented, relatively little is known as to the size, location, and number of maternity colonies for the Indiana bat. As described below, it is estimated that the locations of more than 90% of the estimated maternity colonies remain unknown.

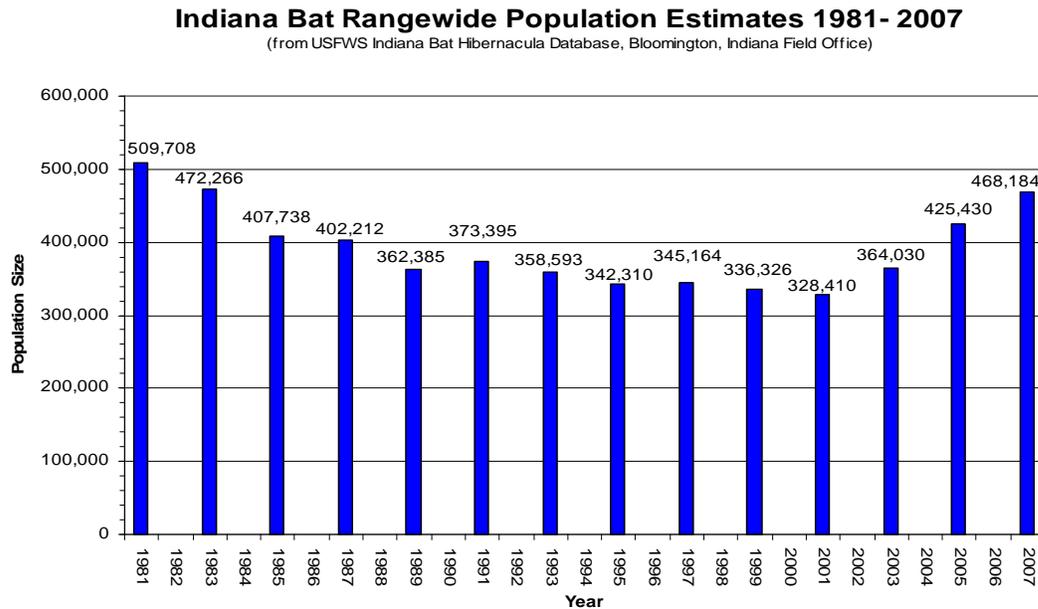
Additionally, the relationship between wintering populations and summering populations is not clearly understood. For example, while it is known that individuals of a particular maternity colony typically come from one to many different hibernacula, the source (hibernacula) of most, if any, of the individuals in a maternity colony is not known.

There is limited information on the historic distribution of Indiana bats. However, paleontological evidence suggests that prehistoric abundance of Indiana bats may have exceeded our current population estimates, as well as historic estimates, by an order of magnitude (Service

2007). A summary of prehistoric and historic distribution and abundance can be found in the Indiana Bat Draft Recovery Plan (Service 2007).

### Current Abundance

The Service compiled winter hibernacula survey information from 2006 and 2007 to develop the most recent range-wide population estimate of 468,184 Indiana bats. Winter counts ranged from 509,708 in 1981 down to 328,410 in 2001 and back up to 468,184 in 2007 (Figure 14). Additional information on short- and long-term trends can be found in the Indiana Bat Draft Recovery Plan (Service 2007).



**Figure 14. Indiana bat range-wide populations estimates 1981-2007 (Service 2008).**

### Categorization of Hibernacula

In the Indiana Bat Draft Recovery Plan (Service 2007), Indiana bat hibernacula are assigned priority numbers primarily on the basis of winter population sizes and to protect essential hibernation sites across the species’ range.

**Priority 1 (P1):** Essential to recovery and long-term conservation of Indiana bat, Priority 1 hibernacula typically have (1) a current and/or historically observed winter population  $\geq 10,000$  Indiana bats and (2) currently have suitable and stable microclimates (e.g., they are not considered “ecological traps” as defined below). Priority 1 hibernacula are further divided into one of two subcategories, “A” or “B,” depending on their recent population sizes. Priority 1A (P1A) hibernacula are those that have held 5,000 or more Indiana bats during one or more winter surveys conducted during the past 10 years. In contrast, Priority 1B (P1B) hibernacula are those that have sheltered  $\geq 10,000$  Indiana bats at some point in their past, but have consistently contained fewer than 5,000 bats over the past 10 years.

**Priority 2 (P2):** Contributes to recovery and long-term conservation of Indiana bat. Priority 2 hibernacula have a current or observed historic population of 1,000 or greater, but fewer than 10,000 and an appropriate microclimate.

**Priority 3 (P3):** Contribute less to recovery and long-term conservation of Indiana bat. Priority 3 hibernacula have current or observed historic populations of 50-1,000 bats.

**Priority 4 (P4):** Least important to recovery and long-term conservation of Indiana bat. Priority 4 hibernacula typically have current or observed historic populations of fewer than 50 bats.

**High Potential (HP):** A special designation given to P2, P3, or P4 hibernacula that are deemed capable of supporting 10,000 or more Indiana bats in the future if (1) an appropriate microclimate is restored (or created in the case of some mines) and/or (2) the site is protected from disturbance. These sites typically have no recorded direct observations of significant numbers of Indiana bat (i.e. at least none that can be readily confirmed; they differ from a P1B site in this respect). Instead most “high-potential” hibernacula have one or more forms of indirect evidence indicating previous use by large numbers of *Myotis* and/or Indiana bat (e.g., anecdotal historic accounts and/or paleontological evidence such as bones, mummified remains, ceiling staining, etc.). As of October 2006, two caves had been designated as having HP – Mammoth Cave in Kentucky and Rocky Hollow Cave in Virginia.

**Ecological Trap (ET):** A hibernaculum having a history of repeated flooding or severe freezing events that have resulted in the mortality of most hibernating Indiana bat. Hibernacula with other environmental conditions that pose a severe and/or imminent threat to the majority of hibernating bats may also be designated as “ecological traps” by the Service (e.g., threat of catastrophic collapse). As of October 2006, three caves had been preliminarily designated as ETs – Bat Cave (Shannon Co.) in Missouri (freezing), Hailes Cave in New York (flooding), and Clyfty Cave in Indiana (flooding). These preliminary designations were made based on the recommendations of Indiana bat experts familiar with these caves and on the history of Indiana bat mortality in these caves. The designations will be reevaluated when procedures for evaluation and designation of hibernacula as ETs are developed.

### Current Winter Distribution

The following is a summary from the Indiana Bat Draft Recovery Plan and unpublished data (Service 2007, Service 2008 unpublished data); additional information from the Plan is incorporated by reference. As of October 2008, the Service has winter records of extant winter populations (i.e. positive winter occurrence since 1995) of the Indiana bat at approximately 281 different hibernacula located in 19 states (Figure 15). Likewise, based on the 2005 winter surveys, there were a total of 23 Priority 1 hibernacula in seven states – Illinois (n=1), Indiana (n=7), Kentucky (n=5), Missouri (n=6), New York (n=2), Tennessee (n =1), and West Virginia (n=1). A total of 53 Priority 2 hibernacula are known from the aforementioned states, as well as Arkansas, Ohio, Pennsylvania, and Virginia. A total of 150 Priority 3 hibernacula have been reported in 16 states. A total of 213 Priority 4 hibernacula have been reported in 23 states.

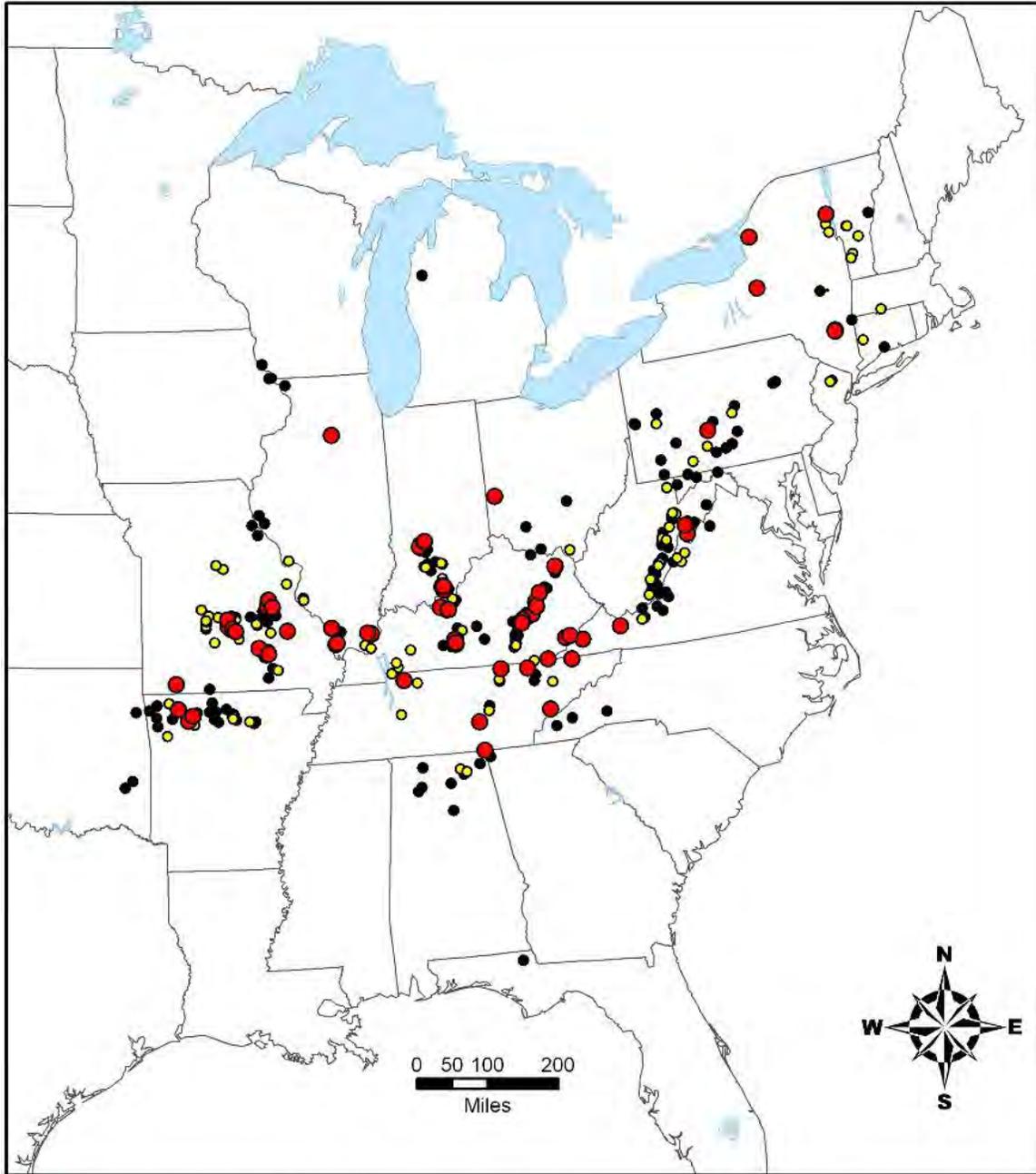
Winter surveys in 2006-2007 found hibernating Indiana bats dispersed across 15 states. However, over 90% of the estimated range-wide population hibernated in five states – Indiana (46.4%), Missouri (12.6%), Kentucky (13.4%), Illinois (10.5%), and New York (10.3%) (Table 3, Service 2008).

### Current Winter Population Groups

The following summary is from the Indiana Bat Draft Recovery Plan (Service 2007). M.J. Vonhof and G.F. McCracken's statistical analysis of genetic samples (mtDNA extracted from wing membrane punches) collected from hibernating Indiana bats from widely dispersed hibernacula suggested that genetic variance among samples was best explained by dividing sampled hibernacula (n=13) into four separately defined population groups, as follows:

- Midwest, included sampled populations in AR, MO, IN, KY, OH, Cumberland Gap, Saltpeter Cave in southwestern VA, and Jamesville Quarry Cave in Onondaga Co., NY,
- Appalachia, included White Oak Blowhole Cave in east TN, and Hellhole Cave in WV,
- Northeast 1 (NE1), included Barton Hill Mine and Glen Park Caves in northern NY (Essex and Jefferson Counties, respectively), and
- Northeast 2 (NE2), included Walter Williams Preserve Mine in Ulster Co., NY (Service 2007).

For more information on wintering bat distribution, abundance, and potential genetic variation, see the Indiana Bat Draft Recovery Plan (Service 2007).



- Priority 1 & 2 IBat Hibernacula Sites (to be surveyed in 2009)
- Priority 3 (may or may not be surveyed in 2009)
- Priority 4 (many will not be surveyed in 2009)

Figure 15. Distribution of known Indiana bat hibernacula and their current priority status (Service 2007). Source: Andrew King, Service, Bloomington, Indiana.

**Table 3. 2007 Range-wide population estimate for the Indiana bat.**



**U.S. Fish & Wildlife Service**

**Revised\* 2007 Range-wide Population Estimate for the Indiana Bat, *Myotis sodalis***

Estimates are based on winter surveys conducted at all known Priority 1 and 2 hibernacula throughout the species' range. Additional data from Priority 3 and 4 hibernacula have also been included when available.

| Service Region           | State         | 2001           | 2003           | 2005           | 2007           | % Change from 2005 | % of 2007 Total |
|--------------------------|---------------|----------------|----------------|----------------|----------------|--------------------|-----------------|
| Region 2                 | Oklahoma      | 0              | 5              | 2              | 0              | -100.0%            | 0.0%            |
| Region 3                 | Indiana       | 173,111        | 183,337        | 206,610        | 238,009        | 15.2%              | 50.8%           |
|                          | Missouri      | 18,999         | 17,722         | 16,102         | 15,895         | -1.3%              | 3.4%            |
|                          | Illinois      | 21,677         | 43,646         | 55,166         | 54,095         | -1.9%              | 11.6%           |
|                          | Ohio          | 9,817          | 9,831          | 9,769          | 7,629          | -21.9%             | 1.6%            |
|                          | Michigan      | 20             | 20             | 20             | 20             | 0.0%               | 0.0%            |
|                          | <b>Total</b>  |                | <b>223,624</b> | <b>254,556</b> | <b>287,667</b> | <b>315,648</b>     | <b>9.7%</b>     |
| Region 4                 | Kentucky      | 51,053         | 49,544         | 65,611         | 71,250         | 8.6%               | 15.2%           |
|                          | Tennessee     | 9,564          | 9,802          | 12,074         | 8,906          | -26.2%             | 1.9%            |
|                          | Arkansas      | 2,475          | 2,228          | 2,067          | 1,829          | -11.5%             | 0.4%            |
|                          | Alabama       | 173            | 265            | 296            | 258            | -12.8%             | 0.1%            |
|                          | <b>Total</b>  |                | <b>63,265</b>  | <b>61,839</b>  | <b>80,048</b>  | <b>82,243</b>      | <b>2.7%</b>     |
| Region 5                 | New York      | 29,671         | 32,981         | 41,727         | 52,803         | 26.5%              | 11.3%           |
|                          | Pennsylvania  | 702            | 931            | 835            | 1,038          | 24.3%              | 0.2%            |
|                          | West Virginia | 9,714          | 11,444         | 13,417         | 14,745         | 9.9%               | 3.1%            |
|                          | Virginia      | 969            | 1,158          | 769            | 723            | -6.0%              | 0.2%            |
|                          | New Jersey    | 335            | 644            | 652            | 659            | 1.1%               | 0.1%            |
|                          | Vermont       | 246            | 472            | 313            | 325            | 3.8%               | 0.1%            |
|                          | <b>Total</b>  |                | <b>41,637</b>  | <b>47,630</b>  | <b>57,713</b>  | <b>70,293</b>      | <b>21.8%</b>    |
| <b>Range-wide Total:</b> |               | <b>328,526</b> | <b>364,030</b> | <b>425,430</b> | <b>468,184</b> |                    | <b>100.0%</b>   |

|                        |        |        |        |
|------------------------|--------|--------|--------|
| 2-yr. Net Increase of: | 35,504 | 61,400 | 42,754 |
| % Increase of:         | 10.8%  | 16.9%  | 10.0%  |

\* Missouri's 2001 - 2007 estimates had previously assumed 50,550 Indiana bats in Pilot Knob Mine (PKM) based on external fall capture rates at the mine's primary entrance, but a February 2008 internal survey of this mine documented a total population of 1,678 Indiana bats (Elliott and Kennedy 2008, unpublished technical report; available at [http://www.utexas.edu/tmm/sponsored\\_sites/biospeleology/pdf/index.htm](http://www.utexas.edu/tmm/sponsored_sites/biospeleology/pdf/index.htm)). The Service considers this new data to more closely estimate the true population within the mine and adjusted the MO estimates accordingly. Some other, smaller adjustments were made based upon the discovery of new hibernacula in Kentucky and New York in 2008 (i.e. we assumed the same number of Indiana bats that were found at these new sites in 2008 were also present in 2007).

Compiled by Andy King, U.S. Fish and Wildlife Service, Bloomington, Indiana, Ecological Services Field Office from data gathered from bat biologists throughout the species' range. (andrew\_king@fws.gov)

## Current Summer Distribution

Summer distribution of the Indiana bat occurs throughout a wider geographic area than its winter distribution. Most summer occurrences are from the upper Midwest including southern Iowa, northern Missouri, much of Illinois and Indiana, southern Michigan, Wisconsin, western Ohio, and Kentucky. Recently, many summer maternity colonies have been found in the northeastern states of Pennsylvania, Vermont, New Jersey, New York, West Virginia, and Maryland. Maternity colonies extend south as far as northern Arkansas, southeastern Tennessee, and southwestern North Carolina (Britzke et al. 2003, Service 2007). Non-reproductive summer records for the Indiana bat have also been documented in eastern Oklahoma, northern Mississippi, Alabama, and Georgia.

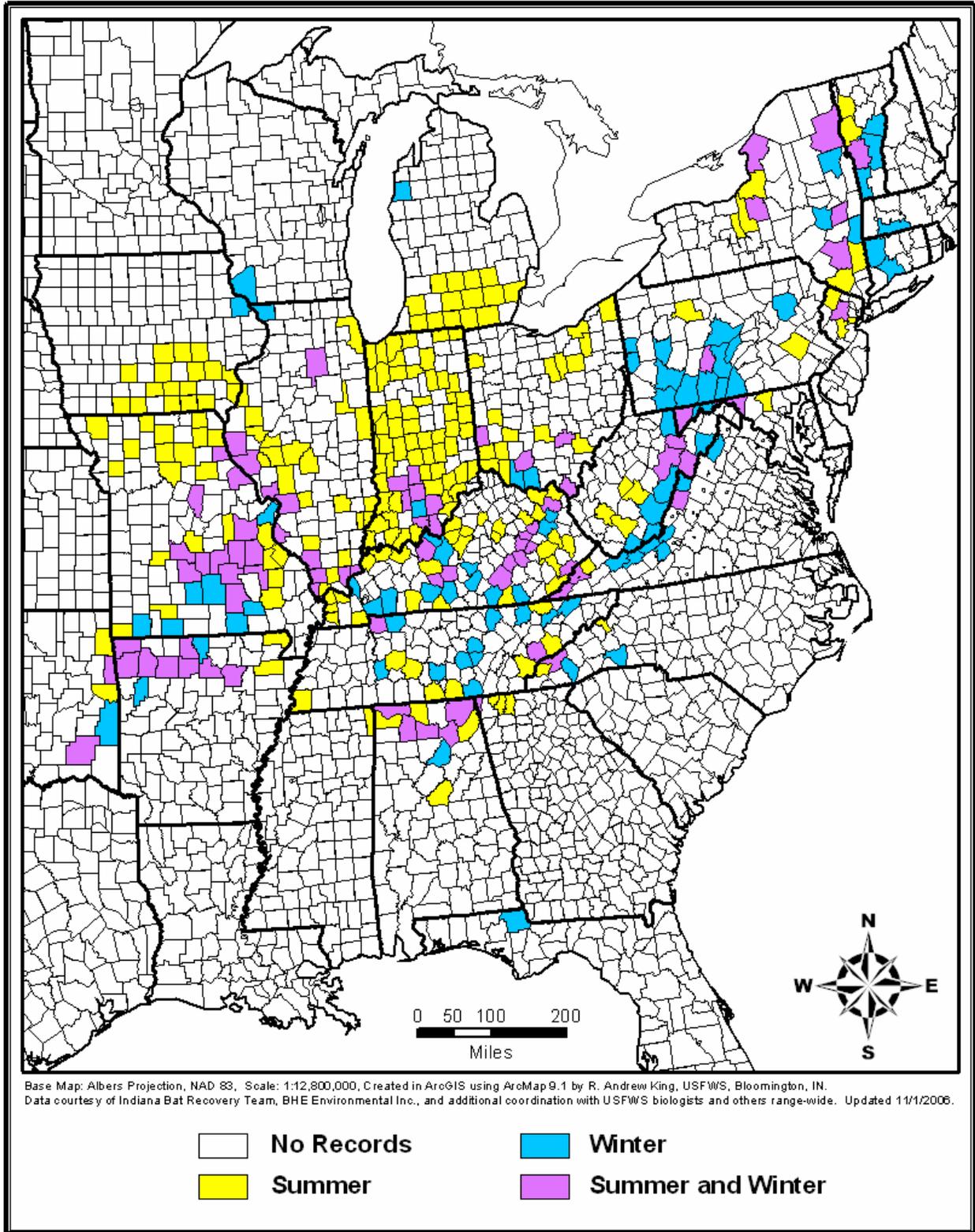
### *Maternity Colonies*

The first Indiana bat maternity colony was not discovered until 1971 in east-central Indiana (Cope et al. 1974). As of publication of the Indiana Bat Draft Recovery Plan (Service 2007), we have records of 269 maternity colonies in 16 states that are considered locally extant. Of the 269 colonies, 54% (n=146) have been found, mostly during mist-netting surveys, within the past 10 years (i.e. since 1997). This number is an underestimate as additional colonies were discovered in New York and probably found elsewhere in 2007. Because maternity colonies are widely dispersed during the summer and difficult to locate, it is presumed that all the combined summer survey efforts have found only a fraction of the maternity colonies based on the range-wide population estimates derived from winter hibernacula surveys.

In New York, there are approximately 35 documented maternity colonies across the landscape in 8 counties – Cayuga, Dutchess, Essex, Jefferson, Onondaga, Orange, Oswego, and Ulster. Many of these colonies have been located by tracking females as they emerge from hibernation to their spring roosting areas using radio telemetry. Each documented roost tree was recorded using a Global Positioning System handheld unit. Many of the radio transmitter batteries lasted into “summer” season (after May 15, or approximately 30 days) documenting the use of these sites by potential colonies. Many sites had large exit counts in spring either before or after May 15 and many sites were documented as colonies by subsequent mist-netting and radio telemetry efforts.

### *Adult Males*

Male Indiana bats are found throughout the range of the species, but in summer are most common in areas near hibernacula (Gardner and Cook 2002) (Figure 16).



**Figure 16. Distribution of counties with known summer and winter records of the Indiana bat as of publication of the Indiana Bat Draft Recovery Plan (Service 2007).**

## Reasons for Listing/Threats

From 1965-2001, there was an overall decline in Indiana bat populations, with winter habitat modifications having been linked to changes in populations at some of the most important hibernacula (Service 2007). Most of these modifications were human-induced for either commercialization of the cave, control of cave access, or for mining. Improper gating and other structures have rendered many historical hibernacula unavailable to Indiana bats. Other documented threats involving hibernacula include human disturbance, vandalism, indiscriminate collecting, handling, and/or banding of hibernating bats, flooding of caves for reservoirs, and destruction by limestone quarries. Natural alterations of hibernacula can include flooding, entrance and passage collapse, and blocked sinkholes which can all alter the temperature regime within the cave and even prevent entry by bats. Natural and human-induced changes to hibernacula can alter the climate required by Indiana bats which adversely affects the population.

Summer habitat modification is also suspected to have contributed to the decline of bat populations, however, it is difficult to quantify how forest management or disturbance may affect Indiana bats. Forests used by foraging and roosting Indiana bats during spring, summer, and autumn have changed dramatically from pre-settlement conditions. Forests have been fragmented in areas, fire has been suppressed, and much of the vegetation in flatlands (i.e. prairie) has been converted for agricultural purposes (Service 1999). Summer habitat can include small woodlots connected by hedgerows or extensive forests. The removal of such habitats is occurring rapidly in some portions of the Indiana bat's range due to urban development, mining, and other infrastructure, including roadways and utility corridors.

In addition, chemical contamination while bats are outside of hibernacula has been suggested as a cause for the decline of Indiana bats (Service 1999). The effect of acute or chronic toxicity on population declines is still unknown. However, additional research should improve our knowledge of the effects of chemical contaminants on bats. More recently, climate change has been suggested as a cause of population shift from southern to northern hibernacula (Clawson 2002). Collisions with man-made objects (e.g., wind turbines, communication towers, and vehicles) are also a potential risk for Indiana bats.

## New Threats

White-nose syndrome (WNS) is a malady of unknown origin that is killing cave-dwelling bats in unprecedented numbers in the northeastern U.S. This affliction was first documented at four sites in eastern New York in the winter of 2006-07, but photographic evidence emerged subsequently of apparently affected bats at an additional site, Howe's Cave, collected the previous winter in February 2006. Overall mortality rates (primarily of little brown bats) have ranged from 81% to over 97% at the 4 study sites where we have collected 2 years (2007 and 2008) of data thus far (Hicks et al. 2008). While little brown bats appear to be the most affected of the 6 species of cave-wintering bats in the Northeast, Indiana bats have been greatly impacted by WNS. It is important to note, however, that most of these species do not form large clusters in the winter, as little brown bats and Indiana bats do, and so they are not easily counted; therefore, we have poor baseline estimates for other species at most sites by which to compare post-WNS abundance estimates. The apparent loss of all 685 Indiana bats in Hailes Cave, and

all but 124 of 13,014 Indiana bats in the Williams Preserve Mine in New York, was documented in the first winter WNS was observed at each site (Hicks et al. 2008). However, counts of Indiana bats at other WNS-affected New York hibernacula (e.g., Barton Hill Mine and Williams Preserve Mine) have apparently been unchanged through spring 2008 (Hicks et al. 2008).

The most obvious symptom of WNS is the presence of a white fungus on the face, wing, or tail membranes of many, but not all affected animals. Behavioral changes are also indicative of WNS affliction, characterized by a general shift of animals from traditional winter roosts to colder areas, or to roosts unusually close to hibernacula entrances. Affected bats are generally unresponsive to human activity in the hibernaculum, and may even fail to arouse from torpor when handled. Bats at affected sites are regularly observed flying across the mid-winter landscape, and, on occasion, carcasses of little brown bats by the hundreds to thousands have been found outside affected hibernacula with more found inside. Affected animals appear to be dying as a result of depleted fat reserves, and mortalities are first apparent months before bats would be expected to emerge from hibernation.

As of February 28, 2009, at least 58 sites in seven states (Connecticut, Massachusetts, New Jersey, New York, Pennsylvania, Vermont, and West Virginia) appear to be affected by WNS, and suspicious fungal growth has been observed in hibernacula in two additional states (New Hampshire and Virginia). The affected hibernacula are located in 27 different counties across the seven states, with a distribution that mainly extends along the Appalachian Mountain range (Figure 17). Significant bat mortality (> 50% of known population) has been observed at several of these locations, especially in the northernmost regions. The annual distribution of WNS appears to be expanding rapidly from the initially affected hibernacula in western Albany/eastern Schoharie Counties, New York. The initial five sites where WNS was found in 2006 and 2007 were all within 15 km of a point that has come to be defined as the “epicenter.” By April 2008, all of the hibernacula surveyed within 130 km of the epicenter were affected by WNS, and the farthest extent of the affliction reached approximately 200 km to a site near Watertown, New York. Thus far in 2009, affected sites have been discovered as far as approximately 650 km from the epicenter and 500 km from the closest known affected site from 2008 (Sullivan County, New York). There is no evidence of any resistance to the problem among survivors. If current trends for spread and mortality at affected sites continue, and there is currently no indication that they will not, WNS threatens to drastically reduce the abundance of many species of hibernating bats in much of North America in what may only be a matter of years.

Identifying the cause of WNS is a critical concern if we have any hope of addressing the problem. As formulated by the participants of the WNS planning meeting held June 9-11, 2008, in Albany, New York, there are at least four feasible hypotheses for the emergence and spread of WNS in bats in the northeastern United States:

**Hypothesis 1:** Bats are starving to death due to a change in body condition caused by either:

(Hypothesis 1a.) Inadequate quantity/quality of fats stored prior to hibernation

(Hypothesis 1b.) Early depletion of fat stores

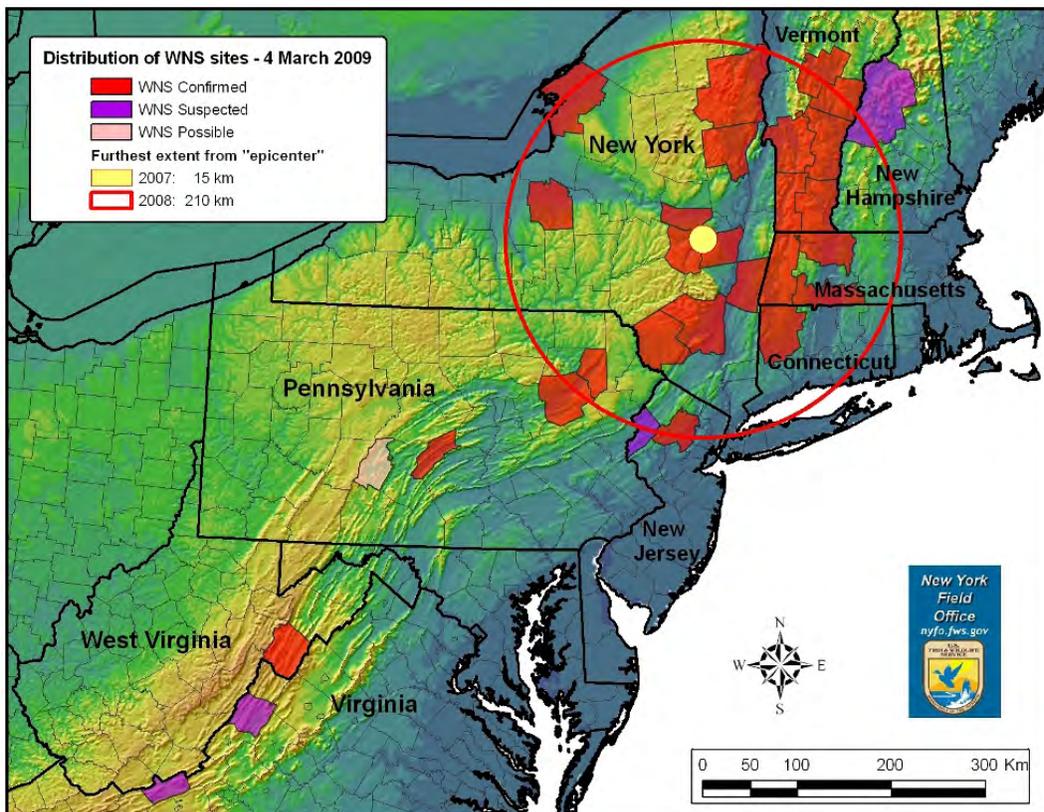
(Hypothesis 1c.) Water imbalance

This hypothesis addresses the identification of symptoms of the problem, but does not address the causative agent directly.

**Hypothesis 2:** The mortality seen in WNS bats is directly due to a pathogen (i.e. fungus, virus, bacteria, or parasite). While the pattern of emergence and spread of WNS is suggestive of an emergent infectious disease, there is no proof as yet of a single causative pathogen.

**Hypothesis 3:** The mortality associated with WNS is directly or indirectly caused by environmental contaminants (for example, pesticide residues or mercury, which in low levels could be altering behavior or physiology). Evidence to date does NOT support the idea that currently present contaminants are directly lethal to bats, however, contaminant exposure may result in sub-lethal impacts to bats. While there is no proof as of yet, the pattern of emergence and spread of WNS does not suggest a contaminant is the most likely cause.

**Hypothesis 4:** WNS is caused by the synergistic effects of multiple causal influences. In this scenario, things such as contaminants, altered patterns of fat deposition or utilization, and a potential pathogen all interact to cause the starvation and death seen in WNS bats.



**Figure 17.** Distribution of counties affected by White-nose syndrome (WNS) through March 4, 2009. The solid red circle (210 km) represents the farthest extent of WNS in 2008 from the epicenter (the geographic center of the 5 sites known to be affected in 2006 and 2007).

It has not yet been demonstrated how, or if, WNS is transmitted. However, the temporal presentation of WNS among bats in a single New York cave in 2006 to numerous sites in 8 contiguous northeastern states by 2009 suggests that WNS is spread from bat-to-bat, or from bat-to-hibernacula, through direct contact. Further, current data suggest that a newly identified fungus (*Geomyces* sp.) is responsible, at least in part, for the impacts and mortality associated with WNS (Blehert et al. 2009). This vector of transmission is consistent with the rate of spread observed from 2006 through 2008, based on assumptions from available tracking data for local bat movements and from knowledge of inter- and intraspecific bat contact at summer and fall roosting and staging sites. While the growth characteristics of the fungus associated with WNS have raised questions about the likelihood for bats to carry viable fungal material for the duration of summer, and thus about their potential to spread a fungal infection at summer maternity colonies (D. Blehert, USGS, pers. comm.), current thought is still that bats are likely the primary vector for the spread of WNS. However, an equally plausible mode of transport for the causative agent(s) for WNS is by anthropogenic sources. Fungal spores, and/or other microscopic organisms, can easily become attached to skin, hair, clothing, and equipment with which they come in contact, and it is possible that such elements could remain viable for weeks or months after leaving a subterranean environment. Hard evidence that people are, or have been, responsible for transporting WNS to naïve hibernacula is currently not available. However, the occasionally discontinuous nature of the spread of WNS, especially to the most recently discovered sites in West Virginia and Virginia, does suggest that something other than bat-to-bat transmission may be responsible. Another piece of supporting evidence for anthropogenic spread is the coincidental observation that many of the recently affected sites are also popular destinations for recreational users of caves and mines. In fact, the site where WNS was first documented photographically, Howe's Cave, is itself directly connected to one of the most visited commercial cave systems in the northeastern U.S. Therefore, although currently anecdotal, there is evidence to suggest that the spread of WNS may be multifactorial, and so precaution must be exercised to reduce any and all activities that may contribute to the continued transport of potential causative agents of WNS.

Another outstanding question regarding the effects of WNS is if susceptibility varies by species within and among caves or if observed symptoms are expressed differentially by species. For example, the NYSDEC has reported that symptoms of WNS may manifest differently between Indiana bats and little brown bats, even within the same site. It is also unclear how long symptoms take to manifest after exposure to the causative agent(s). In January 2009, an affected juvenile little brown bat was collected at a site in Pennsylvania, indicating that the developmental period for WNS may be less than six months, but this observation is still unsubstantiated (G. Turner, Pennsylvania Game Commission, pers. comm.). Captive inoculation trials currently underway at the National Wildlife Health Center will hopefully provide clues into the transmissibility of the *Geomyces* fungus associated with WNS, as well as the period of time it takes for bats to exhibit signs of WNS after exposure (D. Blehert, USGS, pers. comm.). Finally, it is unclear what the long-term effects (e.g., geographic spread, mortality within affected sites) to the Indiana bats will be.

As of February 28, 2009, all known Indiana bat hibernacula in New York, except for a recently-discovered site (P3 or P4) in Orange County (Bull Mine), have been documented with WNS. In addition, all known Indiana bat hibernacula in Vermont and New Jersey and two sites

in Pennsylvania are likewise affected with WNS. Surveys of the majority of remaining Indiana bat hibernacula are ongoing; we have yet to hear of any additional Indiana bat sites with signs of WNS.

New York's Indiana bat population estimates from the last four surveys periods were: 2001 – 29,671; 2003 – 32,981; 2005 – 41,727; and 2007 – 52,803 bats; this steady increase was consistent with trends range-wide. The average increase between surveys during this time range was 21% (every two years). In sharp contrast, surveys conducted at New York's hibernacula during early 2008 (post-WNS) estimated the population at 37,141 Indiana bats (a drop of 15,662 bats), which is a 30% decrease from the previous year's estimate. We presume the observed decline in the New York population was a direct result of WNS-related mortality. In fact, the decline probably should be considered a conservative estimate of the mortality associated with WNS because: 1) surveys were conducted prior to the end of hibernation, and mortality associated with WNS continued throughout the hibernation period, and 2) there is evidence from the Northeast that some WNS-affected bats continued to die throughout the summer. From a broader perspective, the loss of 15,662 Indiana bats from WNS in 2008 represented a loss of approximately 3.3% of the revised 2007 total population for the species.

Impacts to Indiana bats are inconsistent between affected hibernacula. Biologists with NYSDEC conducted photographic surveys of all New York State Indiana bat hibernacula in March 2008, to compare with the 2006-2007 counts. While still in draft form at present, there are some notable discrepancies in the population trends evident between different affected sites. For example, Indiana bat numbers and roosting locations appeared normal at both Barton Hill and Williams Hotel in 2008 (Service unpublished data), however, at Glen Park Cave, the "K-cluster" of Indiana bats appeared to be where expected at the end of March 2008, but preliminary analyses indicate that there were approximately 600-800 fewer individuals that season compared to the total estimate, 1,932 Indiana bats, from 2006-2007. This difference represents a drop in abundance of 30-40%. A more drastic decline (100%) was observed at Hailes Cave, where Indiana bats had been documented during every survey since 1981. In 2004-2005, 685 Indiana bats were observed at the site, but no Indiana bats (living or dead) were found at Hailes Cave during surveys in 2007, 2008, or 2009 (Hicks and Newman 2007, A. Hicks, NYSDEC, pers. comm.). Hailes Cave has been classified as an ecological trap hibernaculum in the Indiana Bat Draft Recovery Plan (Service 2007) due to the history of occasional flooding and freezing events at this site, however, the total and persistent loss of all Indiana bats at this site is unprecedented. Lastly, late winter counts in Williams Preserve and Williams Lake are down by 92-99% when compared to 2006-2007 mid-winter surveys. In 2006-2007, there were approximately 13,014 and 1,003 Indiana bats in the Williams Preserve and Williams Lake, respectively. In April 2008, counts were closer to 124 and 80 Indiana bats (Hicks et al. 2008). Because the surveys were conducted late in the season, and no carcasses were found at these sites, it was hoped the missing Indiana bats had moved to new hibernacula or had emerged prior to the survey. Count data collected during the 2009 survey at this site, conducted in February, did not support this alternate hypothesis, however, and Indiana bat abundance was slightly lower than recorded in April 2008 (A. Hicks, NYSDEC, pers. comm.).

In summary, WNS has now been documented or suspected in nine states, and the degree of impact to bats varies greatly by site and species. Based on observations of continued

mass-mortality at several sites, we anticipate the loss of Indiana bats to continue in the Northeast/mid-Atlantic regions. In addition, we anticipate that WNS will continue to radiate out to new sites, however the potential for climate, or some other environmental factor, to influence the spread of WNS, or the severity of its impact on affected bats, is unknown. Observations and winter count data from surveys in 2009 will reveal the severity of the spread of WNS since 2008 and hopefully provide valuable insight into the mechanisms behind the transmission or transportation of WNS between hibernacula. Population-level impacts to Indiana bats will not be known until the data from the 2009 surveys can be tallied, at which point the status of the species will be evaluated. Given the evidence to date, however, it is abundantly clear that WNS presents a significant threat to the species.

### Previous Incidental Take Authorizations

All previously issued Service BO's involving the Indiana bat have been non-jeopardy. These formal consultations have involved a variety of action agencies including: (a) the USFS for activities implemented under various Land and Resource Management Plans on National Forests in the eastern United States, (b) the Federal Highway Administration (FHWA) for various transportation projects, (c) the Corps for various water-related projects, and (d) the Department of Defense for operations at several military installations. Additionally, an incidental take permit has been issued under Section 10 of the ESA to an Interagency Taskforce for expansion and related development at the Indianapolis Airport in conjunction with the implementation of a Habitat Conservation Plan (i.e. Six Points Road Interchange HCP). A table of previous consultations can be found at <http://www.fws.gov/midwest/endangered/mammals/inba/inbaBOs.html>.

It is important to note that in many of these consultations, survey information was lacking. As Federal agencies are not required to conduct surveys, often the Service relied on a host of valid factors in helping the Federal agency determine whether Indiana bats were likely to be present. To ensure the Federal agency and Service met the mandate of the Section 7(a)(2), if the best available information suggested that Indiana bats may be present, the assumption was often made that one or more maternity colonies occurred within the action area. Although this approach, we believe, fully accords with the intent of the Congress in writing the ESA, it likely resulted in an over-estimate of the number of individuals or colonies that may have been impacted by Federal actions.

Take has primarily been authorized in the form of harm through habitat loss because of the difficulty of detecting and quantifying take of Indiana bats. This is due to the bat's small body size, widely dispersed individuals under loose bark or in tree cracks/crevices, and unknown spatial extent and density of much of their summer roosting population range. For some incidental take statements, take has also been extrapolated to include an estimated number of individual Indiana bats.

Previous habitat impacts have been both temporary (e.g., USFS timber management) and permanent (e.g., FHWA road alignments). Some of these projects were certain to impact known Indiana bat habitat. To minimize the effects of projects, the action agencies agreed to implement various conservation measures including seasonal tree clearing restrictions, protection of roost

trees, minimization of project footprints and retention of adequate roosting and/or foraging habitat to sustain the maternity colony into the future, and permanent protection or restoration of off-site habitat to provide future roosting and foraging habitat opportunities.

With the exception of three (Fort Knox, Great Smoky Mountains National Park, and Laxare East and Black Contour Coal Mining projects), none of the BO's and associated incidental take statements anticipated the loss of a maternity colony. Required monitoring for three formal consultations (Camp Atterbury, Newport Military Installation, and Indianapolis Airport) has confirmed that the affected colonies persisted through the life of the project and continue to exist today. We recognize that given the philopatric nature of Indiana bats and the long lifespan, the full extent of the anticipated impacts may not yet have occurred. Nonetheless, these monitoring results, and the lack of data to suggest otherwise, indicate that the conservation measures to avoid and minimize the impacts of Federal projects appear to be effective. Only with long-term monitoring will we definitely be able to determine the true effectiveness of our conservation measures.

There has been one previous project with incidental take authorization for the Indiana bat in the State of New York, the Fort Drum Connector highway project, located partially within the Action Area of Fort Drum. The BO was issued on June 27, 2008, and authorized harm of a small percentage of Indiana bats known to winter in the Glen Park Cave and who travel, roost, forage, and swarm within the action area and a small percentage of Indiana bats associated with three maternity colonies that are traveling, roosting, and foraging within the action area as a result of the removal of 36 acres of forest and 4,181 linear feet (1,274 m) of hedgerows, and the degradation of remaining forest patches (~102 acres) directly along the project corridor. This impact is anticipated in the first spring/summer after tree removal has occurred (spring 2010) and foraging patterns/range may be shifted. Alternative foraging areas are available in the action area and likely used (little foraging data are available) and limited impacts are anticipated in subsequent years. In addition, after several years, plantings will provide additional commuting corridors and foraging opportunities for Indiana bats. We also anticipated mortality of a small number (< 10) of Indiana bats throughout the life of road operation.

Overall, there has been limited incidental take authorization for the Indiana bat in the proposed Northeast Recovery Unit.

Overall, we believe the take exempted to date via Section 7 consultations has resulted in short-term effects to Indiana bats. As many of these consultations necessarily made assumptions about Indiana bat presence, we are confident that the number of maternity colonies actually exposed to the environmental impacts of the Federal actions is far less than anticipated. Furthermore, although not definitive, monitoring of several maternity colonies pre- and post-project implementation preliminarily suggests that our standard conservation measures, when employed in concert, appear to be effective in minimizing adverse effects on the affected Indiana bats, including maternity colonies. However, we now consider WNS losses in our evaluations.

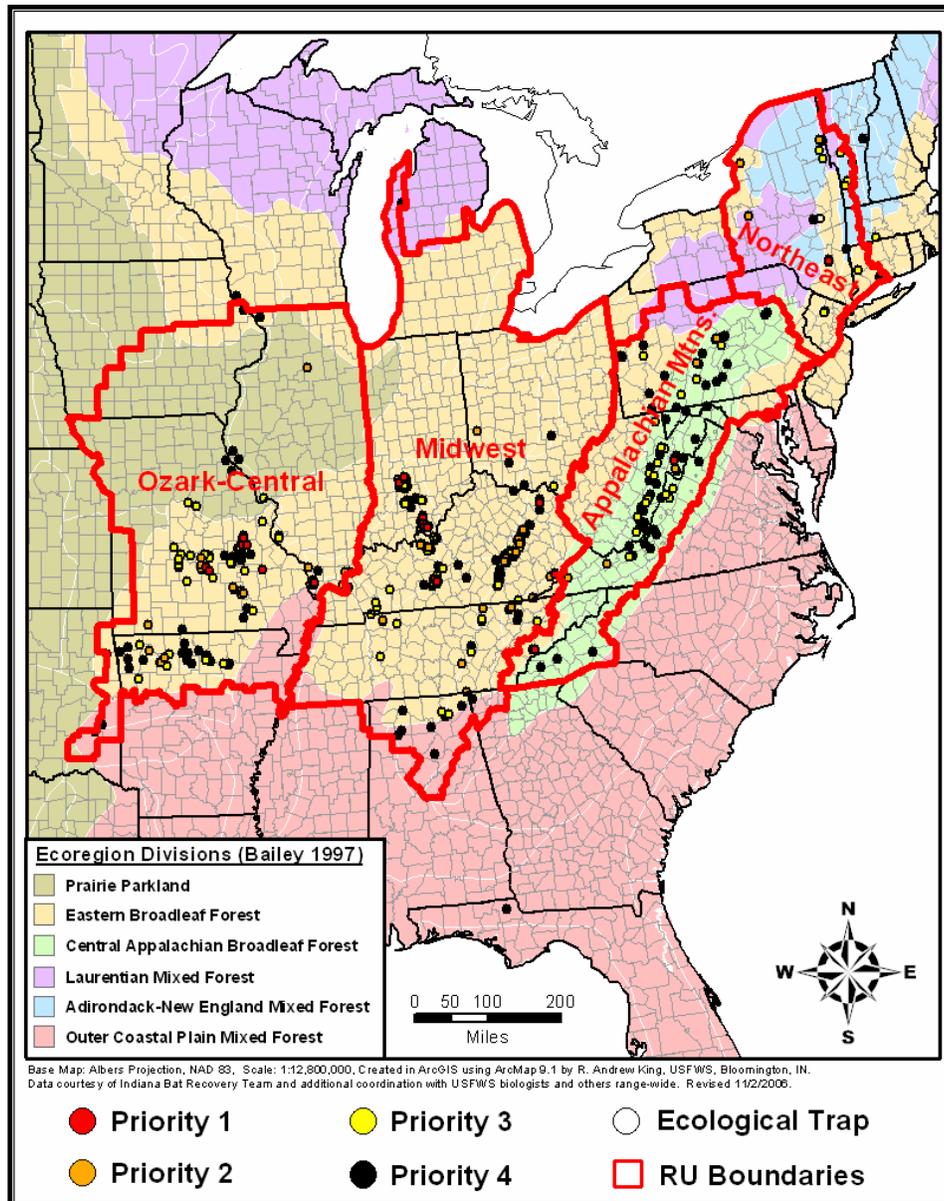
## Species Recovery

The existing recovery program for the Indiana bat focuses on protection of hibernacula (Service 1983). The proposed recovery program for this species has four broad components:

1) range-wide population monitoring at the hibernacula with improvements in census techniques; 2) conservation and management of habitat (hibernacula, swarming, and to a degree, summer); 3) further research into the requirements of and threats to the species; and 4) public education and outreach (Service 2007). This recovery program continues to have a primary focus on protection of hibernacula, but also increases the focus on summer habitat and proposes use of Recovery Units. It is important to note that WNS was not a current threat at the time of the release of the 2007 Recovery Plan and is now the primary threat being addressed by the Service.

### *Recovery Units*

The Service's proposed delineation of Recovery Units relied on a combination of preliminary evidence of population discreteness and genetic differentiation, differences in population trends, and broad-level differences in macrohabitats and land use. When Recovery Unit delimitations suggested by these factors were geographically close to state boundaries, the Recovery Unit borders were shifted to match the state boundaries in order to facilitate future conservation and management. The Indiana Bat Draft Recovery Plan proposes four Recovery Units for the species: Ozark-Central, Midwest, Appalachian Mountains, and Northeast (Figure 18) (Service 2007).



**Figure 18. Proposed Indiana bat Recovery Units (Service 2007).**

### Range-wide Trend

The overall population distribution has not changed, however, the abundance of Indiana bats in the northeast has declined significantly and the threat to the species from WNS remains at a high level. Recovery efforts are primarily focused on the WNS investigation at this time. When we consider the positive trends observed over the last several range-wide hibernacula counts (prior to WNS) along with the newly gathered information on WNS, we have concerns about the status of the species. As of the fall of 2008, the Service considers the 1-year trend (2007 to 2008) (annual required reporting metric) to be declining. We are likely observing a leveling off of a

previous positive trend and this appears to be the beginning of an overall negative trend of the status of the species.

### **Analysis of the Species/Critical Habitat Likely to be Affected**

The Service has reviewed the BA and supporting information for the proposed 2009-2011 activities on Fort Drum. The BA evaluated the potential and likely effects of a variety of actions on the Indiana bat. There are no other Federally-listed or proposed species known or likely to occur within the action area.

The Service concurs with the Army's determination that some of the actions proposed between 2009-2011 may adversely affect the Indiana bat due to the loss or alteration of roosting and foraging habitat and potential impacts to individuals from tree clearing and smoke/obscurants. Critical habitat has been designated for the Indiana bat, but none of those critical habitat areas occur within the project area. Therefore, the proposed project is not likely to adversely modify critical habitat for the species.

### **ENVIRONMENTAL BASELINE**

Under Section 7(a)(2) of the ESA, when considering the "effects of the action" on Federally-listed species, the Service is required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all Federal, State, or private actions and other activities in the action area (50 CFR 402.02), including Federal actions in the area that have already undergone Section 7 consultation, and the impacts of State or private actions that are contemporaneous with the consultation in process. As such, the environmental baseline is "an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including critical habitat), and ecosystem, within the action area (Service and National Marine Fisheries Service [NMFS] 1998, page 4-22)." The environmental baseline is, therefore, a "snapshot" of the species' health at a given point in time, but it does not include the effects of the proposed action.

### **Status of the Species in New York**

In New York, winter counts range from 22 Indiana bats in 1981 (Hailes Cave only) to 52,803 in 2006-2007. In that 25-year span, new sites or new sections of sites were discovered and added to the surveys. In addition, in 2004-2005, the survey methodology in New York of taking photographs and counting bats back at the office was modified with enhanced digital photography imaging. As stated above, the primary threat to Indiana bats in New York at this time is WNS. We are currently in the midst of our Indiana bat biennial surveys and do not have final count information for winter 2008-2009.

### **Status of the Species within the Action Area**

The identified action area includes the roosting and foraging habitat used by one known and one additional potential maternity colony. In addition, the action area is used in the fall, and likely

the spring, by Indiana bats that hibernate in the nearby Glen Park Cave. Therefore, the status of the documented maternity colony, assumptions regarding the potential maternity colony, and the status of the nearby hibernating population are examined below.

### ***Winter Hibernation***

The Glen Park Cave is located approximately 6.5 miles west of Fort Drum and is the hibernaculum for approximately 1,932 Indiana bats. The cave is privately owned. The NYSDEC monitors Indiana bat use of the cave by conducting mid-winter counts of the bats every two years. The number of Indiana bats observed in the cave between 1997 and 2007 ranges from approximately 1,704-3,129 bats.

Glen Park Cave is documented as a WNS-affected site and it visually appears that the K-cluster of Indiana bats is smaller than in previous winters. However, we have not observed any dead Indiana bats or Indiana bats with significant fungal growth at this site to date. Actual counts from digital photographs have not been completed to provide an accurate estimate of the number of bats. It is unclear what the long-term impacts of WNS may be on Indiana bats at this site, in the northeast, or range-wide. See **Status of the Species** Section for additional information.

### ***Spring/Summer***

The following is a summary of spring emergence and mist-netting field work conducted in and around the Action Area.

#### ***NYSDEC/Service Spring Emergence Study***

In April 2005, 32 Indiana bats (30 females and 2 males) were captured at Glen Park Cave prior to spring emergence and fitted with radio transmitters. Twenty-four females and two males were successfully tracked to at least one roost tree, and most were tracked for the life of the transmitters (3-4 weeks) all of which remained within 20 miles of their hibernaculum. Eight maternity colonies (conservative estimate) were identified during this project, although none on Fort Drum. Three of these were subsequently verified by additional mist-netting and radio-tracking studies (see below).

#### ***Eagle Ridge***

During the summer (August 8-13) of 2006, four Indiana bats (three adult males and one post-lactating female) were captured during mist-netting associated with a residential housing project (Eagle Ridge) in the Town of LeRay, Jefferson County (Environmental Solutions and Innovations, Inc. 2006). Each bat was tracked for a minimum of six days after capture and eighteen day-roosts were located. Two of these roosted on Fort Drum and all four foraged in and around the Cantonment Area. The roosts were approximately 2.2 miles east of the proposed project (currently under construction).

### *Fort Drum Connector*

A total of seven mist-net sites (MS) were surveyed for the Indiana bat within and adjacent to the proposed FHWA/New York State Department of Transportation Fort Drum Connector project corridor from July 10-18, 2007. Additional project detail can be found in the Service's 2008 BO for the project (Service 2008) or the project BA (Gress Engineers, Inc. and FMSM Engineers, Inc. 2007). Five reproductive female Indiana bats were captured during mist-net surveys. Four were captured in canopy-covered golf cart trails at mist-net sites MS-1 and MS-3 at the Highland Meadows Golf Course. The remaining Indiana bat was captured along a narrow hedgerow dominated by sugar maple and bitternut hickory at MS-6. Radio-transmitters were attached to five adult female Indiana bats from July 10-18, 2007, so roost sites could be located. The five Indiana bats captured during this survey were tracked to 12 different diurnal roost trees located in six different areas. For the purpose of this BO, area names are used as descriptors for roost trees including the Golf Course, Bonny Road, Knowlesville, Perch Lake, Fort Drum, and Anable. The distance between capture sites and roost sites, used by five Indiana bats captured during this survey, ranged from 0.08 to 4.00 miles (0.13 to 6.44 km).

Emergence counts were conducted at each tree to determine the number of bats occupying the roost on a given day. With the exception of five roost trees – one at Highland Meadows Golf Course (GC-2), one at Anable Avenue, and the roost trees on Fort Drum (FD-1, FD-2, and FD-3) – biologists conducted three emergence counts on every roost tree documented during this survey. Emergence counts at roost trees ranged from 74 bats at the Bonny Road tree (BR-1) to zero bats at Highland Meadows Golf Course (GC-1 and GC-2), Knowlesville (K-1), and Perch Lake (PL-1). Emergence count efforts at the Bonny Road tree (BR-1) produced counts of 74, 66, and 10 individuals on July 15<sup>th</sup>, 16<sup>th</sup>, and 22<sup>nd</sup>, respectively. This tree was also used by an Indiana bat tracked during a separate study in 2007 and we assume there is a maternity colony (Perch Lake WMA South maternity colony) associated with roosts in this area.

The roost tree (PL-1) near Perch Lake accounted for the second highest number of bats with 45, 28, and 19 individuals on July 16<sup>th</sup>, 21<sup>st</sup>, and 26<sup>th</sup>, respectively. Emergence counts at one of the Knowlesville trees (K-1) resulted in 32, 22, and 21 individuals on July 12<sup>th</sup>, 14<sup>th</sup>, and 16<sup>th</sup>, respectively. Two other trees at Knowlesville, K-2 and K-3, were used by 14 and 10 bats, respectively. The Knowlesville trees are in very close proximity (< 0.75 mile) to previous roosts documented during the 2005 NYSDEC spring emergence study (Perch Lake maternity colony); the Perch Lake and Knowlesville roosts are within 2.5 miles of each other. This reconfirms the presence of at least one maternity colony in this area.

The three trees (GC-1, GC-2, and A-1) located adjacent to the Fort Drum Connector Route were all used by only one or two bats during emergence counts, which indicates their status as alternate roosts. The A-1 roost is within 1 mile of the Fort Drum roosts, within 2.5 miles of multiple roosts on the installation, and within 0.75 mile of multiple roosts documented during netting and tracking of 4 Indiana bats associated with a residential housing project (see above). Two bats tracked during this project spent all or most of their time on the military installation. Therefore, we conclude there is at least 1 maternity colony (Fort Drum maternity colony) in this area.

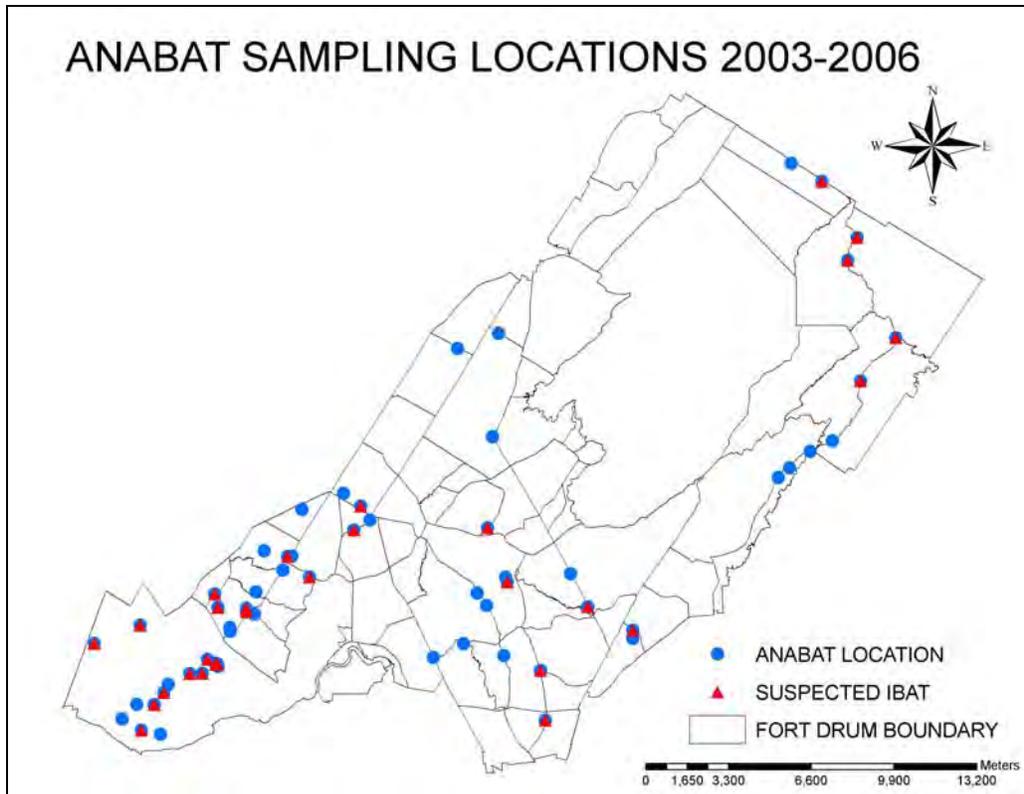
## *Fort Drum*

The following information is summarized from the BA which is incorporated by reference.

The Army surveyed for Indiana bats at eight sites during a two-week period in July 1999 (BHE Environmental, Inc. 1999). The 1999 survey did not result in the capture of Indiana bats, however, the survey was limited in scope and was only conducted in the Training Area.

Acoustical surveys using Anabat echolocation detectors have been conducted annually since 2003, but the data were not analyzed until 2006. Anabat detectors provided support for the possible presence of Indiana bats throughout the installation (Figure 19) and identified areas of general bat activity throughout the installation. Service standards for positively confirming the presence of Indiana bats is currently restricted to mist-net protocols, however acoustic surveys have an accuracy rate of 93-100% for identifying Indiana bats (Britzke et al. 2002).

Echolocation call sequences collected on Fort Drum were analyzed by the USFS Northern Research Station using very conservative filters, which are more likely to reject call sequences as Indiana bats if certain parameters are not met. In order to be even more conservative in identifying an area that may have Indiana bats, only sites with more than 10 Indiana bat echolocation passes were considered in Figure 19. Further acoustical surveys will be conducted to collect information about foraging bats on Fort Drum and to target other areas for future mist-net survey efforts.

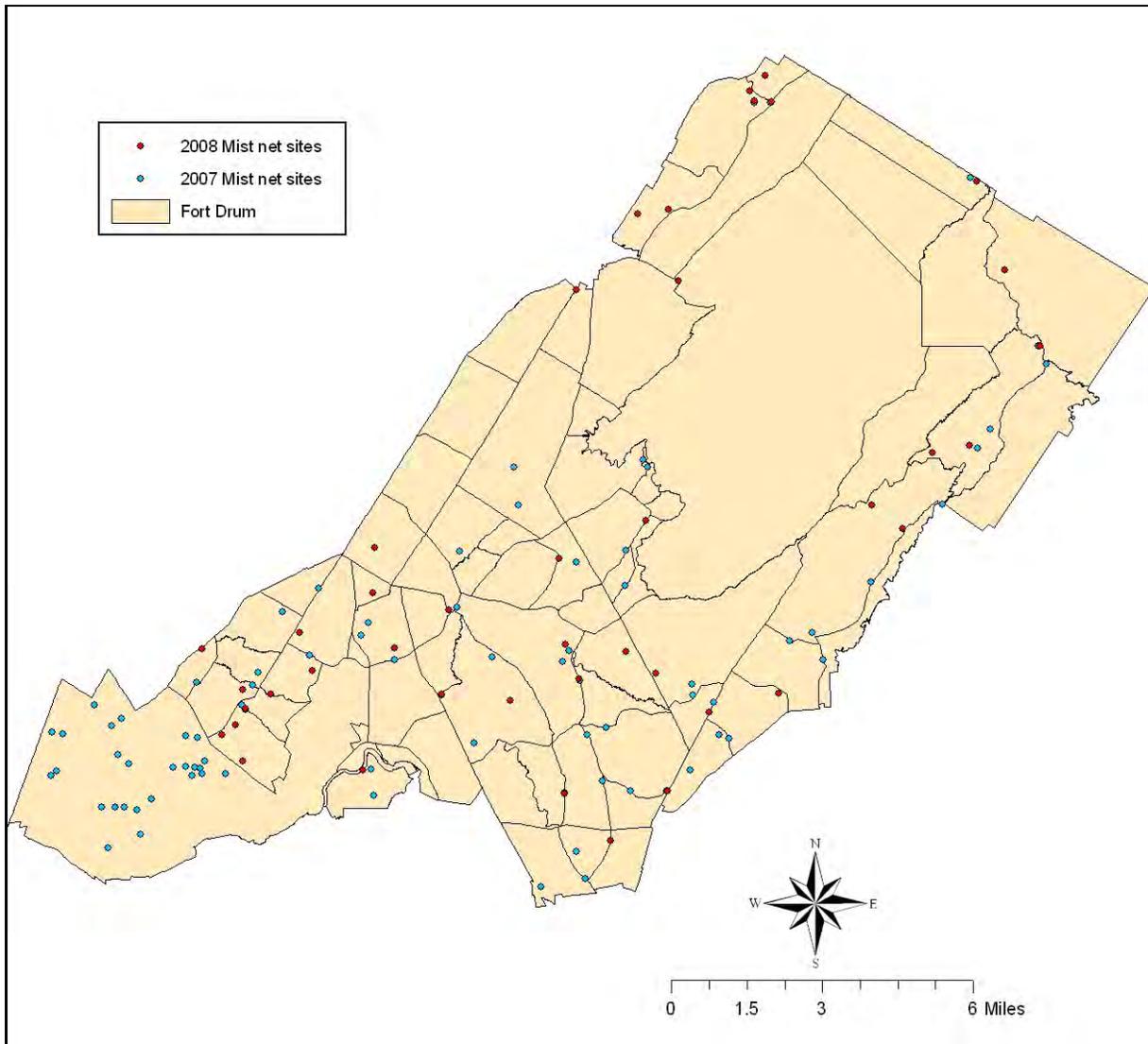


**Figure 19. Locations of Anabat surveys (blue circles) and locations where > 10 call sequences were determined (red triangle) from 2003-2006.**

In 2007 and 2008, summer mist-net surveys began on Fort Drum to record bat species presence, to assess the summer status of Indiana bats, and to locate maternity colonies on the installation (Environmental Solutions and Innovations, Inc. 2008a). One hundred twenty-two net sites were surveyed between June 2-August 15, 2007 (81 sites) and June 19-July 25, 2008 (41 sites) following Service mist-netting guidelines (Figure 20). Given Fort Drum's size and amount of forests accessible for surveys, it is estimated that 384 net sites (i.e. 262 additional net sites) need to be surveyed in order to sufficiently confirm the presence or probable absence of Indiana bats throughout the installation. The total number of net sites was determined by calculating the area of forested land available for commercial and non-commercial forestry (47,259 acres (19,125 ha)) and dividing it by 123 acres (49 ha) in accordance with Service mist-netting guidelines (1 net site/123 acres). Future mist-net surveys are planned on Fort Drum for 2009 and 2010.

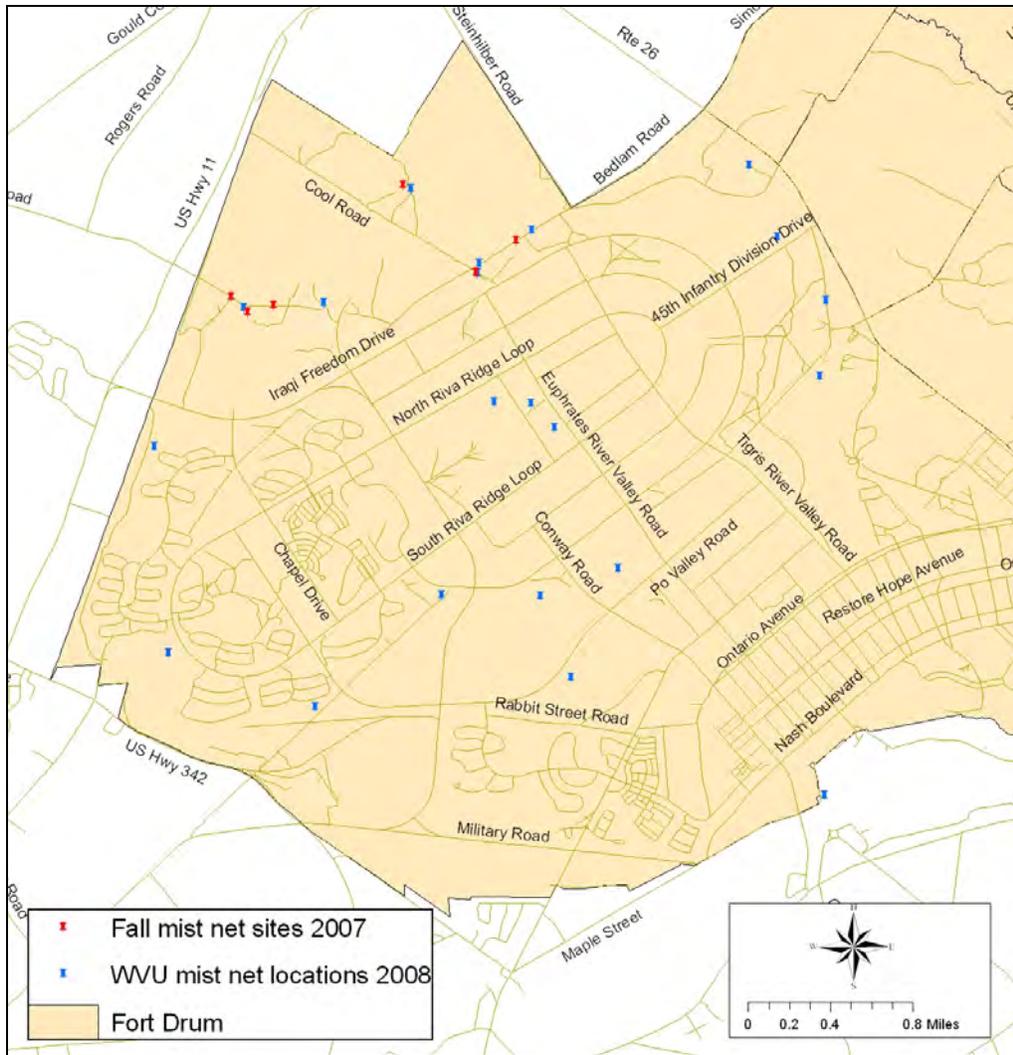
In the summer of 2007, 1,380 bats were captured, of which 18 were Indiana bats (11 adult females, 2 adult males, 3 juvenile females, 2 juvenile males) (Environmental Solutions and Innovations, Inc. 2008a). Seventeen Indiana bats were captured in the Cantonment Area and one in Training Area 4. Ten of 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. Emergence counts of roost trees ranged from 1-44 bats.

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 (unpublished data). Both were radio-tagged and tracked to roosts. Emergence counts ranged from 1 to 6.



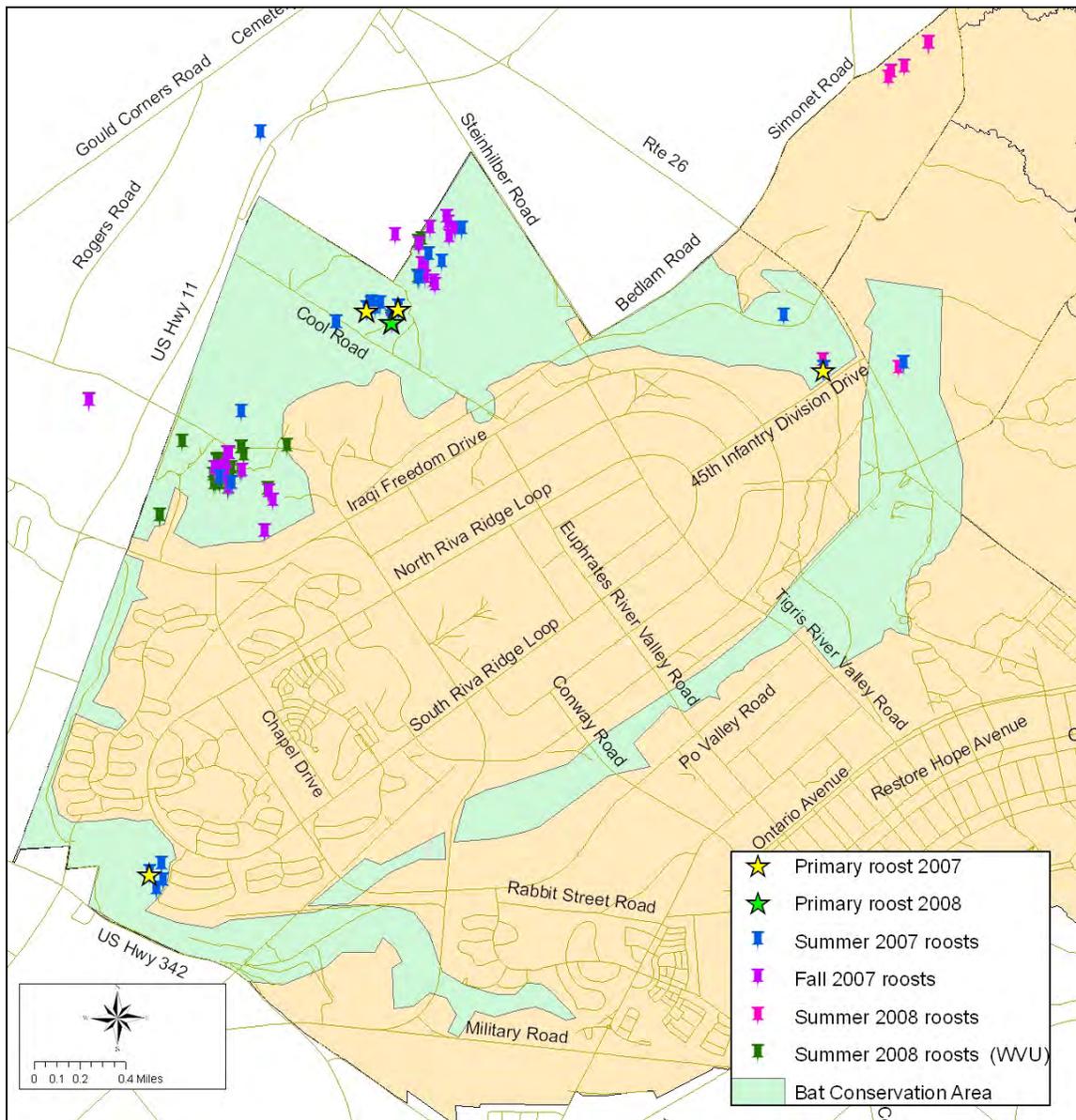
**Figure 20. Locations of mist-net surveys 2007 and 2008.**

In 2008, a more extensive project was initiated with the USFS and West Virginia University (WVU) to capture and intensively radio-track Indiana bats in the Cantonment Area to determine foraging areas and roost locations. Mist-netting was opportunistically selected (Figure 21). Between May 13 to the beginning of October in 2008, 10 Indiana bats (5 adult females, 2 adult males, 1 juvenile male, and 1 juvenile female) were captured and 9 were radio-tagged and tracked. Emergence counts ranged from 1 to 64. The project is planned to continue in 2009.



**Figure 21. Mist-net locations opportunistically placed in fall 2007 and summer 2008 for foraging and movement studies.**

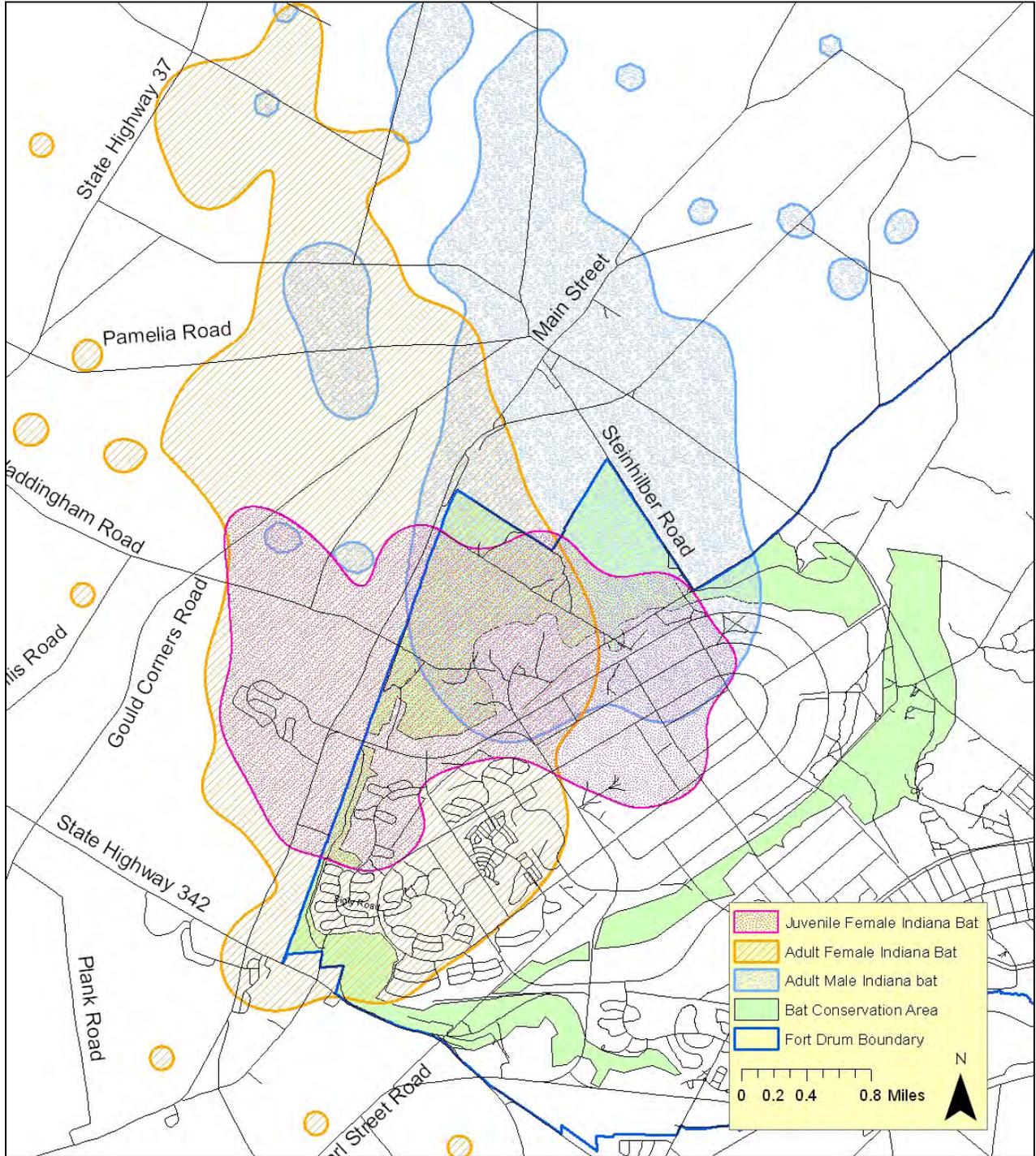
Roosts found to date on Fort Drum include 2 in 2006, 24 in summer, 29 in fall of 2007, and 50 in 2008, however, a few of these roosts were used in more than one year (C. Dobony, pers. comm.). Roost locations from the summer and fall 2007 and summer 2008 studies on Fort Drum were concentrated in the Cantonment Area, TA 3 and on private lands just off-post (Figure 22). Indiana bats associated with these roosts are assumed to be part of one maternity colony. In 2008, Indiana bats demonstrated site fidelity by returning to several of the same areas previously identified in 2007. Specifically, two Indiana bats were tracked in 2008 to the same roost trees that were utilized in 2007 (unpublished data). The largest exit count from one roost tree (primary) was 64 Indiana bats. In addition to this roost tree, several other alternate roost trees were identified during survey efforts and there are likely more than the 63 Indiana bats in the colony. The Army has assumed that between 75-100 Indiana bats are present within this known maternity colony.



**Figure 22. Known Indiana bat roost locations from 2007 and 2008 monitoring efforts on Fort Drum.**

Indiana bat foraging has been confirmed in the Cantonment Area and off-post from radio-telemetry studies (Environmental Solutions and Innovations, Inc. 2008b, unpublished data), and it is assumed that Indiana bats forage within Training Areas 3 and 4 since they have been captured and/or found to roost in these locations. During the fall 2007 study, three Indiana bats foraged over the northern portion of the Cantonment Area as well as in off-post areas to the north and east of the installation (Figure 23). Pasture/hay, deciduous forests, and palustrine forested wetlands were the most commonly used habitat types accounting for 68% of habitat used by the tagged Indiana bats. The home range size (fixed kernel) of the Indiana bats varied

from 1,267-5,295 acres (513-2,143 ha) with a mean range of 4,720 ac (1,910 ha) (Environmental Solutions and Innovations, Inc. 2008b).



**Figure 23. Fall home range for three foraging Indiana bats captured on Fort Drum (Environmental Solutions and Innovations, Inc. 2008b).**

Research studying Indiana bats' temporal and spatial use of Fort Drum is currently being conducted by the USFS and WVU. Data from this study is still being analyzed, but preliminary data suggests foraging areas similar to ones identified in the fall 2007 study.

In addition to the one documented maternity colony, an undiscovered maternity colony is assumed to be present on Fort Drum based on: 1) the ample amount of suitable roosting habitat available; 2) proximity to the Glen Park hibernaculum; 3) the size of Fort Drum; 4) the size of and distance to the known maternity colony; 5) echolocation passes identified as potential Indiana bat call sequences found throughout the installation; and 6) insufficient mist-net survey efforts to rule out probable absence. Based on the known maternity colony on Fort Drum, the undiscovered maternity is estimated to be of similar size with up to 100 Indiana bats. For the purposes of this BO, it is assumed that two maternity colonies with up to 100 Indiana bats in each are present on Fort Drum.

We do not anticipate that the unknown maternity colony frequently uses the Main Impact Area for either roosting or foraging given the routine noise and fire from live fire. In addition, we would have no way to ever document the level of use or any incidental take in that area. For the remainder of this BO, we do not discuss the potential use or potential for effects to Indiana bats in the Main Impact Area.

#### Summary

In summary, a minimum of 10 maternity colonies (conservative estimate) have been documented in Jefferson County (eight initially during the 2005 spring emergence study and two by a combination of other netting and telemetry work). One of these colonies is located in the Summer Action Area and another colony is assumed to be present in the Action Area.

The ten documented maternity colonies are listed below.

| Colony Number | Colony Name                          | Projects Verifying   |
|---------------|--------------------------------------|--|
| 1.            | Conklin/Black Creek Maternity Colony | NYSDEC 2005, Horse Creek 2007  |
| 2.            | Morris Track Maternity Colony        | NYSDEC 2005, Horse Creek 2006-2007   |
| 3.            | Mitchell Maternity Colony            | NYSDEC 2005  |
| 4.            | Perch Lake Maternity Colony          | NYSDEC 2005, Fort Drum Connector 2007                                      |
| 5.            | Cady Road Maternity Colony           | NYSDEC 2005  |
| 6.            | Fralic Maternity Colony              | NYSDEC 2005  |
| 7.            | Minkler Maternity Colony             | NYSDEC 2005  |
| 8.            | Holmdale Maternity Colony            | NYSDEC 2005  |
| 9.            | Perch Lake WMA South                 | Fort Drum Connector 2007, Horse Creek 2007                                 |
| 10.           | Fort Drum                            | Eagle Ridge 2006, Fort Drum Connector 2007, Fort Drum 2007, Fort Drum 2008 |

### ***Non-reproductive Females and Males***

Some male Indiana bats likely remain in and around Glen Park Cave during the summer. Non-reproductive females and males are less colonial than either reproductively active females or juveniles. Although there is little information available, male Indiana bats in the action area appear to have similar roosting preferences as females.

### ***Fall Swarming***

Because of Fort Drum's proximity to a Priority II 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 (Service 2007).

A fall study in 2007 observed the presence of roosting and foraging Indiana bats ( $n=3$ ) in the Cantonment Area as late as October 12 (Environmental Solutions and Innovations, Inc. 2008b). Roosts that were located in the fall were approximately 7.7-9.5 mi (12.4-15 km) from the Glen Park hibernaculum. One tagged Indiana bat (juvenile female) was present on Fort Drum until October 10 when it flew to the Glen Park hibernaculum. The other two bats were also present on Fort Drum after October 1, but the transmitter either fell off or its battery died before it could be determined when the bats left Fort Drum for the hibernaculum. In total, 29 roost trees (2 partially dead, 2 live, and 25 dead trees) were located within the Cantonment Area of Fort Drum during the autumn survey. Fourteen new roosts were located after October 1. In 2008, 11 new roost trees were identified in the Cantonment Area after August 15 (unpublished data). In addition, two juvenile Indiana bats (1 male, 1 female) were tracked in 2008 and were observed foraging and roosting on Fort Drum after October 1. Habitat use during the fall swarming period

probably varies somewhat from year to year due to weather conditions, prey availability, and the proximity and quality of available roosts.

### **Factors Affecting the Species' Environment within the Action Area**

In order to ensure the consideration of all potential direct, indirect, and cumulative effects of the proposed action on the Indiana bat, the Army and Service determined that the action area under consideration includes Fort Drum and any Indiana bat habitat within 4 miles of roost trees (summer action area), and Indiana bat habitat within approximately ten miles of Glen Park Cave (winter action area). Additional description of the action area is provided in the **Action Area** section above.

Numerous land use activities that affect the Indiana bat and that likely occur within the action area include hunting and other outdoor recreation, agriculture, timber harvest, and residential and commercial development associated with expansions at Fort Drum. Many of these are private actions, but many involve Corps permits for impacts to waters of the United States. The Service is unaware of any quantifiable information relating to the extent of private timber harvests within the action area. The Service is engaged with the Town of LeRay in developing a Town master plan and is actively involved with reviewing most, if not all, development projects within the Town (regardless of other Federal [e.g., Corps] involvement). We 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.

In addition to land activities, WNS has the potential to affect Indiana bats in the action area. As stated in the **Status of the Species** section, WNS has been documented at Glen Park Cave. At this point, we have no way of knowing whether significant WNS-associated mortality at Glen Park Cave may occur over time. However, based on our current understanding of WNS, as discussed in the **Status of the Species** section, we cannot say that the status of the species has significantly changed. Additional analyses of 2008-2009 surveys will shed light into the potential short-term impacts of WNS on Indiana bats at Glen Park.

### **EFFECTS OF THE ACTION**

"Effects of the action" refers to the direct and indirect effects of an action on listed species or critical habitat, together with the effects of other activities interrelated and interdependent with that action which will be added to the environmental baseline. The ESA defines indirect effects as those caused by the proposed action and that are later in time, but are still reasonably certain to occur (50 CFR §402.02). Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

There are activities within three categories proposed on Fort Drum between 2009 and 2011 that may result in adverse effects to Indiana bats: construction, forest management, and military training smoke and obscurants.

This section includes an analysis of the direct and indirect effects of the proposed actions on the species and/or critical habitat and its interrelated and interdependent activities. While analyzing direct and indirect effects of the proposed action, the Service considered the following factors:

Proximity of the action: As stated in the environmental baseline, at least one maternity colony is known and one maternity colony is assumed to occur in the action area. While at least 52 roosts have been located to date, it is unlikely that all roost trees have been discovered. In addition, there is a high probability that not all Indiana bats within a maternity colony have been counted to date, as multiple trees are used by a colony and varying numbers of bats use many of these trees in a given night. Therefore, it is likely that additional females utilize the habitat within these home ranges and that other primary and secondary roost trees are present with these home ranges.

One Indiana bat hibernaculum (Glen Park Cave) is located within the fall/winter action area. No designated critical habitat for the Indiana bat is located within the action area.

Suitable roosting, foraging, and potential maternity habitats for the Indiana bat occur within and adjacent to the project area. These habitats likely support spring staging and migration, summer roosting, maternity, fall migration, and/or fall swarming periods of Indiana bats within the project area.

Distribution: In-season forest management and smoke/obscurants may have direct effects on the species. Indirect effects on the species may also occur throughout all or some of the remainder of the action area defined previously due to loss or alteration of roosting and foraging habitat, alterations to individual bat behavior patterns, and modifications of population dynamics in the action area.

Timing: Removal or destruction of habitat during the spring staging and migration, summer roosting, maternity, fall migration, and/or fall swarming periods of the Indiana bat would cause the removal of habitat during a time that the species actively need and/or use the habitat. However, direct effects from tree removal will be minimized as the majority of tree removal activities will occur while bats are in hibernation (October 1-April 15). However, limited in-season clearing and other activities are proposed during the active period of Indiana bats.

Nature of the effect: It is likely that the proposed project will have a variety of effects on individual Indiana bats and the associated maternity colonies. In particular, the proposed project activities are expected to result in: a) permanent loss of occupied and/or potential foraging and roosting habitat through removal of that habitat (e.g., removal of roost trees and foraging habitat); b) alteration of habitat (primarily in a positive manner); c) alteration and/or modification of normal Indiana bat behaviors (e.g., reproduction effects, foraging effects, and sheltering behaviors); and d) potential mortality associated with limited in-season tree removal and smoke/obscurants. Additional details are discussed below.

Duration: Actions on Fort Drum have a variety of durations. Some actions result in permanent loss of Indiana bat habitat while others result in temporary (short- or long-term) alterations of habitat (e.g., forest management) that may ultimately be beneficial to the species.

Disturbance frequency: Disturbance is continuous on Fort Drum. Some activities will result in one-time disturbances (e.g., construction of a building) and other activities are ongoing (e.g., military training). However, these disturbances have been occurring for years and presumably Indiana bats have become accustomed to most activities on Fort Drum.

Disturbance intensity: Up to 3,781 acres of forest will be permanently disturbed (construction) and 4,900 acres altered (forest management). However, Fort Drum currently has approximately 74,514 acres of forested land and is permanently protecting 2,202 acres (primarily forest) in the BCA.

Disturbance severity: The species' resiliency to natural and anthropogenic disturbances on some level has been demonstrated through monitoring (see **Previous Incidental Take Authorizations** and **Status of the Species** in the **Action Area** sections above). While the proposed project will result in some incidental take of Indiana bats, previous studies suggest that most bats should adjust to construction activities and limited habitat removal.

## **Analyses of Effects of the Action**

### ***A. Construction***

#### Direct Effects to Roosting/Foraging Bats

##### *Construction Noise*

Increased noise created by construction equipment within the project area could disturb bats day roosting in nearby forests during spring, summer, and fall. This potential disturbance would be localized and short-term for a given project. The novelty of these noises and their relative volume levels will likely dictate the range of responses from individuals or colonies of bats. At low noise levels (or farther distances), bats initially may be startled and have increased respiration/heart rates, but they would likely habituate to the low background noise levels. At closer range and louder noise levels (particularly if accompanied by physical vibrations from heavy machinery and crashing of falling trees), many bats would probably be startled to the point of fleeing from their day-time roosts and in a few cases may experience increased predation risk. Because the noise levels in construction areas will likely continue for more than a single day, the bats roosting within or close to these areas are likely to shift their focal roosting areas farther away or may temporarily abandon these roosting areas completely. However, the alteration of the forest patches through tree-clearing during the prior winter may alter roosting behaviors prior to spring and summer construction activities. Gardner et al. (1991) suggested that noise and exhaust emissions from machinery could possibly disturb colonies of roosting bats, but such disturbances would have to be severe to cause roost abandonment. Callahan (1993) noted that the likely cause of the bats in his study area abandoning a primary roost tree was disturbance from a bulldozer clearing brush adjacent to the tree. No auditory data and/or the effects from noise are available for the Indiana bat. However, a similar species, the little brown bat, is sensitive to sound between 10 kilohertz (kHz) and 130 kHz, with greatest hearing sensitivity between 35 and 40 kHz (Grinnell 1963). Based on analysis in Montgomery Watson and 3D/I

(1998), operation of heavy equipment (bulldozers and earthmovers) at Fort Leonard Wood, Missouri, generated sound frequencies between 25 and 20,000 Hz with peak frequencies less than 125 Hz. For the purpose of this BO, we assume that construction equipment used will generate sound in a similar frequency range. While bats may hear sounds generated by construction equipment and vehicles at Fort Drum, peak sound energy from vehicles is likely to be well below frequencies audible to bats.

There are many examples of Indiana bats tolerating noise. During studies for the Fort Drum Connector, a primary Indiana bat roost tree containing as many as 45 bats on July 16, 2007, was found along Interstate 81 (I-81). This maternity colony was apparently not affected by noise created by vehicles traveling north and south on I-81. In addition, during spring emergence studies, we have documented roost trees 195 and 207 meters of I-81, 113 meters of I-481, and 65 meters of I-84. Bats roosting in these situations may have become habituated to the noise, as bats on Fort Drum likely have as well. Indiana bats roosted within 500 meters of active construction sites on Fort Drum in 2008 (C. Dobony, pers. communication). When taking this information under consideration, we concur with the Army's determination that noise may affect but is not likely to adversely affect the Indiana bat.

#### *Construction Dust*

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 fall when Indiana bats are roosting in adjacent forested habitats and possibly foraging throughout the project corridor. Any potential effects from dust would be very local within and immediately adjacent to any given project. It is very unlikely that dust created from construction would drift underneath the bark where an Indiana bat is roosting.

Dust is known to coat adjacent vegetation, thus possibly temporarily reducing insect production locally along a narrow band. However, Indiana bats from the known maternity colony primarily forage in the BCA and off-post, and Indiana bats from the potential maternity colony have ample other foraging areas within the Training Area. Therefore, we concur with the Army's determination that dust may affect but is not likely to adversely affect the Indiana bat.

#### *Construction Lighting*

Night lighting is not anticipated, as night construction is unnecessary.

#### *Water Quality During Construction*

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 fall. Both grubbing and construction may cause erosion; however, required Best Management Practices incorporated into the SWPPP will

minimize erosion and subsequent sedimentation, thus reducing potential impacts on aquatic ecosystems.

However, it is still possible to have periods where erosion and sedimentation may cause short-term declines in aquatic insect populations in adjacent wetlands, ponds, and streams. Since potential impacts from sedimentation are expected to be localized, foraging Indiana bats will be able to relocate upstream or downstream to forage.

Construction activities may also impact up to 8 and 259 acres of wetlands/water in the Cantonment Area/Training Area, respectively. All of these aquatic systems may contribute to the local insect communities which may be consumed by Indiana bats, but most of them appear to provide only open canopy foraging opportunities. Forested wetlands may also provide potential spring, summer, and fall roosting and foraging habitat. Avoidance and minimization during project design will reduce impacts to wetlands to the greatest extent possible.

If Indiana bats forage within these wetland communities, it could result in short-term indirect effects on foraging behaviors. However, the Indiana bat is considered a selective, opportunistic forager and should be able to locate additional aquatic and/or terrestrial insects nearby since numerous wetlands will remain. Additionally, any wetland impacts from future construction activities will be compensated for whether on or off of Fort Drum.

The Service believes that water quality impacts will cause a reduction in prey base and drinking resources for the Indiana bat. However, we presume that the surrounding landscape will continue to provide an abundant prey base of both terrestrial and aquatic insects during project construction, operation, and maintenance. Therefore, any potential direct effects to Indiana bats from a reduction in water quality are anticipated to be insignificant.

### *Tree Removal*

Direct effects (e.g., harass, kill, injure) to Indiana bats from tree removal will be avoided for the most part by conducting those activities between October 1 and April 15. There is a potential for Indiana bats to continue to roost/forage on Fort Drum for a couple of weeks after October 1, as was observed in 2007, however, the bats are more dispersed (small numbers of bat roosting together and roost trees further and further apart) than in the summer and continuously change roost trees (Environmental Solutions and Innovations, Inc. 2008a). The likelihood that a few Indiana bats may be present in a tree after October 1 and the tree being cut for the proposed construction projects is low, however, we cannot completely discount this. If an Indiana bat is present and a tree is cut down, the bat may either stay in the tree and potentially be crushed or fly out during the day and be more susceptible to predation.

In addition, in order to facilitate small, unanticipated training-related projects, the Army may need to clear trees in the Training Area between August 15-September 30. It is expected that 5 projects with a maximum size of 5 acres (2.02 ha) may need to occur in this timeframe per year. No more than 25 forested acres (10 ha) per year would be cleared for a maximum total of up to 75 acres (30 ha) between 2009-2011. This total is included in the overall acreage for

construction projects. The 75 acres of forest represents approximately 0.01% of available forest on Fort Drum.

Projects in this category would only occur east of the CSX railroad line running north and south through the southwestern part of the Training Area. This area is outside the range of the known maternity colony, so no known direct impacts to this maternity colony are anticipated. However, the undiscovered maternity colony may be adversely affected by tree felling in August and September. During this time, Indiana bats are more likely to be dispersed throughout the forested habitat although multiple Indiana bats have known to continue to roost together during this time. Felling trees during August and September reduces the risk of felling a maternity roost tree with non-volant pups or a tree with a large cluster of individuals. Juvenile bats should be newly volant at this time. However, novice Indiana bats and some adult individuals may not be capable of quickly abandoning the roost which could result in injury or death to individuals. More experienced fliers are better able to quickly abandon a roost, however, this forced abandonment means Indiana bats will need to immediately find alternate roosts.

There are no currently documented roost trees in any of the proposed Training Area construction project areas, therefore no impacts to known roost trees will occur. In addition, any newly documented female roost trees (and a buffer around them) will not be cut without further consultation with the Service, therefore we provide no further analysis of effects associated with the loss of documented female roosts. Even with these conservation measures, it is virtually impossible to identify and protect all roost trees for a given maternity colony (as well as for non-reproductive females and males). Therefore, we believe that it is reasonable to assume that 1-2 occupied roost trees (with less than 10 bats in each) may be felled and lead to the death or injury of some proportion (but not all) of the bats. We assume that some bats would be startled by the noise and vibrations coming from a chainsaw and would successfully exit their roost trees prior to the tree being felled. Bats that remained in a roost tree and survived the initial felling would likely try to crawl and fly away from the immediate area, but being unaccustomed to flying during the daytime and likely injured or disoriented from the fall, would likely have a relatively high risk of predation from diurnal predators. Bats that successfully flee the disturbance uninjured would not be expected to return to that area and would likely shift their focal roosting and perhaps foraging area at least temporarily.

In summary, the only direct effects from loss of roosting habitat we anticipate are those associated with tree removal. Specifically, the clearing of trees between August 14-September 30 associated with small range construction projects (< 25 acres per year) may result in the felling of an estimated 1-2 undocumented occupied roost trees and lead to the death/injury of some of the bats using those trees. No documented female roosts will be cut without additional consultation.

#### Indirect Effects from Loss of Roosting Habitat

##### Cantonment Area

The primary effect of the construction within the Cantonment Area/WSAAF is the permanent disturbance of up to approximately 2,480 acres of land. As a reminder, these calculations

include buffers of all vegetative cover types to allow for flexibility in the design-build process and fewer acres are likely to actually be disturbed. Of this, approximately 1,411 acres are forested (including buffers) and conservatively may provide current or future roosting habitat. This represents 1.9% of currently forested land (74,514 acres) on Fort Drum, and 1.6% of currently forested land (87,950 acres) in the Action Area.

There are two known roost trees that will be removed during construction activities. However, these were small (4.7 and 7.9 in DBH) trees used by males in 2006. No known female roosts will be removed. That said, there are likely additional current or future male or female roosts that will be removed. Therefore, the loss of forest in this area may be considered as loss of potential roosting habitat for the known maternity colony. This will reduce the number of suitable roosts within the colony's current summer range. However, based on existing information, the major roosting areas will not be impacted by the proposed projects. All but four roosts (TA 3B) and the two male roosts mentioned above on Fort Drum will be permanently protected in the BCA. Female roosts throughout the installation will not be removed without consultation with the Service. Therefore, while potential roosting habitat may be lost in the Cantonment Area, the core roosting area for the known maternity colony has been identified and will be protected. Effects from the loss of roosting habitat should be minimal and short-term.

#### Training Area

The primary effect of the construction within the Training Area (borrow pits included in this calculation) is the permanent disturbance of up to approximately 4,042 acres of land. As a reminder, these calculations include buffers of all vegetative cover types to allow for flexibility in the design-build process and fewer acres are likely to actually be disturbed. Of this, approximately 2,370 acres are forested (including buffers) and conservatively may provide current or future roosting habitat. This represents 3.2% of currently forested land (74,514 acres) on Fort Drum, and 2.7% of currently forested land (87,950 acres) in the Action Area.

The only known roosts to date in the Training Areas are in TA 3B and there are no proposed construction projects in that Training Area. Given the current acoustic monitoring data, it seems likely that Indiana bats are using other sections of the Training Area for foraging; however, there is little information to confirm or reject whether they are currently using the Training Area for roosting. The loss of forest in the Training Area may be conservatively considered as loss of actual or potential roosting habitat which may reduce the number of suitable roosts within the assumed second colony's summer range. However, given the extensive amount of potential roosting habitat within the Training Area, Indiana bats should be able to find additional suitable roosts in close proximity to any cleared areas. Therefore, we would only anticipate short-term effects (first season returning to site after clearing) to Indiana bats from the loss of roosting habitat in the Training Area.

The Army will be contracting additional mist-netting activities in the Training Area in 2009. The Army has agreed that no cutting of any female roosts will occur without further consultation with the Service. Therefore, we are not authorizing any impacts to Indiana bats associated with the removal of documented female roosts in this BO and are only considering the loss of potential current/future roosting habitat in the Training Area as a potential impact.

## Summary

In summary, there is potential for indirect effects to Indiana bats associated with the loss of potential roosting habitat. The loss of up to 1,411 acres of forest in the Cantonment Area is unlikely to affect the assumed second maternity colony, however, it is within the likely home range of Indiana bats associated with the known maternity colony. We anticipate short-term (first season after clearing) effects to Indiana bats from forest removal in the cantonment area.

The loss of up to 2,370 acres of forest in the Training Area is unlikely to affect the known maternity colony (as the majority of documented roosting habitat is located in the BCA). However, the assumed second maternity colony may be impacted due to the removal of undocumented current roosts. Given the extensive availability of potential roosting habitat in the Training Area, we anticipate any impacts to Indiana bats associated with the second assumed colony to be short in duration (first season after tree clearing).

As discussed in the **Conservation Measures** section, the Army is permanently protecting 2,202 acres (primarily of forest habitat). While permanent protection of existing forest will not offset the maximum potential loss of 3,781 acres of forest (1,411 in Cantonment Area and 2,370 acres in the Training Area), it protects the majority of known roosting and foraging habitat for the maternity colony within the Cantonment Area. Given the intense development pressure observed both on- and off-post, we believe that permanent protection of existing forest is essential to maintain Indiana bats on the landscape.

### Indirect Effects from Loss of Foraging Habitat

#### Cantonment Area/WSAAF

The primary effect of the construction within the Cantonment Area/WSAAF is the permanent disturbance of up to approximately 2,483 acres of land. Excluding landscaped yards, sand dunes, and disturbed areas, approximately 2,106 acres of this may be conservatively considered current or future foraging habitat.

The primary documented foraging areas to date for the known maternity colony are located within the BCA and off-post. Given the currently fragmented and urbanized nature of the Cantonment Area outside the BCA, much of the land proposed for disturbance may not be used by the majority of Indiana bats on Fort Drum. However, Indiana bats have been captured and documented roosting and foraging in the Cantonment Area in close proximity to urban settings.

While Indiana bats using the affected forest patches for foraging have documented alternative foraging habitat available within the action area, some individual bats will likely have to shift or expand their foraging ranges into areas previously unused by them to make up for the loss of foraging habitat. Bats that only forage in the interior Cantonment Area sporadically will be familiar with other nearby foraging areas and should be able to quickly adjust their foraging habits by spending more time foraging in other parts of their existing home range. For bats that foraged more extensively within the interior Cantonment Area (and in particular areas proposed

for construction in 2009-2011), the effects may be more severe. The impact of shifting flight patterns and foraging areas on individual bats will vary. Recovery from the stress of hibernation and migration may be slower as a result of the added energy demands of searching for new foraging habitat, especially if the bats were affected by WNS the prior winter and have even further reduced fat stores. In addition, environmental factors, such as an unseasonably cool or wet spring, could limit the availability of prey while at the same time increase the energetic costs of thermoregulation. Pregnant females displaced from preferred foraging areas will have to expend additional energy to search for alternative foraging habitat, which would likely result in reduced reproductive success (failure to carry to full term or failure to raise pup through first summer) for some females. Females that do give birth may have pups with lower birth weights given the increased energy demands associated with longer flights, or their pups may experience delayed development. These longer flights would also be experienced by pups once they become volant which could affect the survival of these pups as they enter hibernation with potentially reduced fat reserves. Indiana bats may also experience higher rates of predation or competition when searching for new foraging areas.

Overall, the effect of the loss of foraging habitat on individual bats from the maternity colonies in the action area is anticipated to range from no effect to death. The effect on the colonies would then be reduced reproduction and loss of a small portion of the colony. These effects are anticipated to be relatively short-lived (1-2 years) as Indiana bats are anticipated to acclimate to the altered landscape.

#### Training Area

The primary effect of the construction within the Training Area (borrow pits included in this calculation) the permanent loss of up to approximately 4,042 acres of land. Excluding landscaped yards, sand dunes, and disturbed areas, approximately 3,858 acres of this may be conservatively considered current or future foraging habitat.

There is no current information on Indiana bat foraging within the Training Area except for acoustic monitoring suggesting presence of Indiana bats at several locations. Potential impacts to the unknown colony from Training Area construction would be similar as those described for the known colony from Cantonment Area construction above. However, there is far more alternative foraging habitat available to Indiana bats within the Training Area. Given the small pockets of construction compared to the extent of available foraging habitat, it may be difficult to discern any measurable impacts to Indiana bats that may occur in the Training Area.

In summary, we anticipate indirect effects to Indiana bats associated with the loss of foraging habitat.

The loss of up to 2,106 acres of potential foraging habitat in the cantonment area is unlikely to affect the assumed second maternity colony, however, it is within the likely home range of Indiana bats associated with the known maternity colony. We anticipate short-term (1-2 years) effects to Indiana bats from construction projects in the Training Area.

The loss of up to 3,858 acres of potential foraging habitat in the Training Area is unlikely to affect the known maternity colony as the majority of documented foraging habitat is located in the BCA. However, the assumed second maternity colony may be impacted from this disturbance. Given the extensive availability of potential foraging habitat in the Training Area, we anticipate any impacts to Indiana bats associated with the second assumed colony to be shorter in duration (first season after disturbance) than those associated with the known colony.

As discussed in the **Conservation Measures** section, the Army is permanently protecting 2,202 acres (primarily of forest habitat). While permanent protection of existing roosting and foraging habitat will not offset the maximum potential loss of 5,964 acres of foraging habitat (2,106 acres in the Cantonment Area and 3,858 acres in the Training Area), it protects the majority of known roosting and foraging habitat for the maternity colony within the Cantonment Area. Given the intense development pressure observed both on- and off-post, we believe that permanent protection of existing forest is essential to maintain Indiana bats on the landscape.

#### Indirect Effects from Loss of Travel Corridors

The proposed construction activities will cause the loss of most of the remaining interior forest patches of the Cantonment Area resulting in an even more urbanized environment. Many Indiana bats already appear to avoid much of the Cantonment Area, as discussed above. However, some Indiana bats are documented using non-BCA areas and many options for travel, roosting, and foraging will be lost outside the BCA.

The BCA includes habitat that surrounds the Cantonment Area and some interior forest patches will remain, so complete disconnection will not occur, but we anticipate increased commuting distances for Indiana bats that currently use forest patches on the north and south of the Cantonment Area. The effects of increasing travel distances for daily foraging bouts for some bats is compounded by the anticipated loss of foraging habitat (discussed above).

Given the extensive amount of potential habitat in the Training Area and dispersed construction projects, we do not anticipate impacts to Indiana bats from the loss or fragmentation of potential travel corridors.

#### Effects on Fall Swarming Habitat

The potential effects to fall swarming habitat are the same as those discussed above. Two male roosts as well as potential roost trees and foraging habitat will be lost. Indiana bats will be using the summer and winter action areas described above during fall swarming activities. Up to 5,964 acres of potential foraging habitat may be impacted out of a total of approximately 309,231 acres of potential foraging habitat (all cover types except disturbed) (1.9%) may be removed due to construction projects in the Cantonment and Training Areas. We do not currently understand how important or insignificant Fort Drum may be to Indiana bats during the fall swarming period. Limited tracking of Indiana bats during the fall on Fort Drum did show some use; however, a great deal of activity may be occurring closer to Glen Park or throughout the rest of the Action Area. We anticipate that any impacts associated with forest loss will be greatest immediately after Indiana bats return to Fort Drum the season after tree removal and do

not anticipate any impacts to Indiana bats during fall swarming from construction projects on Fort Drum.

### Effects on Wintering Bats

The project will result in no direct physical impacts to the Glen Park Cave or wintering bats. In addition, given the distance of the project to the cave, no indirect impacts to the cave from activities on Fort Drum are anticipated. In conclusion, we anticipate no direct or indirect effects to wintering Indiana bats.

### Indirect Effects from Changes in Habitat Quality

In addition to habitat loss, proposed actions may result in a decrease in the quality of remaining habitat in the action area. Factors that may lead to reduced habitat quality include habitat fragmentation, increased human disturbance (e.g., noise, lighting, dust), and water quality impacts. Direct effects are discussed above. Indirect effects associated with potential changes in habitat quality are discussed here.

#### *Habitat Fragmentation*

In this case, we believe the potential effects of habitat fragmentation are already addressed in the discussions of loss of foraging and roosting habitat and travel corridors above.

#### *Increased Noise*

The additional homes and supporting facilities for soldiers and staff will increase the ambient noise on Fort Drum, however, when considering the existing noise from traffic, construction, training, recreation, etc., on Fort Drum, we do not anticipate a significant change from current levels. Therefore, we consider indirect effects to Indiana bats from increased noise to be insignificant.

#### *Increased Lighting*

Additional artificial lighting is anticipated with the new construction projects in the Cantonment Area. More light may increase risk of predation by birds of prey (Speakman 1995). Projects adjacent to the BCA are anticipated to increase the amount of light pollution within the area of the known maternity colony. Foraging Indiana bats, including newly volant young, in this area may become more susceptible to predation. However, the Army is implementing light minimization measures on newly constructed buildings in and around the BCA, as well as retro-fitting existing lighting to help reduce these impacts. With these measures, light pollution may affect, but is not likely to adversely affect Indiana bats.

### *Water Quantity/Quality Changes*

With increased development and more impervious surfaces, the Army anticipates higher levels of sediment and pollution run-off within the Cantonment Area. On Fort Drum, the BCA encompasses portions of Pleasant and West Creeks which are buffered by natural habitats. Impacts to water quality will be reduced as vegetative buffers minimize sediment and pollution run-off into streams. In addition, standard erosion and sedimentation control measures will be used to minimize water quality impacts.

Temporary effects on water quality could occur during construction, which could reduce local insect populations. Given the very localized and temporary nature of any impacts and the availability of foraging habitat throughout the BCA, Training Area, and some off-post areas, we agree with the Army's conclusion that Indiana bats may be affected, but are not likely to be adversely affected by changes in water quality. In fact, the Army concluded that water quality may actually improve during future development due to new stormwater practices in place that did not exist during earlier construction.

Construction projects are anticipated to impact up to 267 acres (108 ha) of wetlands, mostly in the Training Area. Wetlands and riparian corridors provide important foraging habitat for Indiana bats, so loss of these habitats could result in short-term indirect effects on foraging behaviors, such as temporary reduction in insect prey. Indiana bats are considered selective, opportunistic foragers and should be able to locate additional aquatic and/or terrestrial insects nearby since numerous wetlands will remain throughout the 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 by the creation or restoration of wetlands elsewhere. Because there are ample water sources and wetlands throughout Fort Drum, we agree with the Army's conclusion that any potential indirect effects to Indiana bats from a temporary reduction in water availability will be insignificant.

### ***B. Forest Management***

#### Direct Effects to Roosting/Foraging Bats

##### *Noise, dust, lighting, water quality impacts*

The potential for direct effects to Indiana bats associated with these is similar (and likely less) than those associated with construction activities. For reasons similar to those stated above, the Service does not anticipate any direct effects to Indiana bats from noise, dust, lighting, or changes in water quality associated with forest management activities.

##### *Tree removal*

The majority of forestry actions will occur between October 1-April 15 when most Indiana bats are not present on Fort Drum. This time of year restriction will protect maternity colonies during the reproductive season. However, the Forest Management Program may need to harvest up to 500 acres (202 ha) total (between 2009-2011) of early successional and/or conifer forests

between August 15 and September 30 in order to minimize soil disturbance, erosion, and water quality impacts. Forest stands targeted for late summer clearing include predominantly aspen, birch, or conifers – none of which are considered typical bat roosting trees or habitat. The average patch size that may be harvested is estimated at 50 acres per site and the maximum patch size will not exceed 200 acres per site. These sites are harvested for the benefit of military training which is dictated by the ever-changing mission, so exact locations and harvest scenarios are not known at this time.

Projects in this category would only occur east of the CSX railroad line running north and south through the southwestern part of the Training Area. This area is outside the range of the known maternity colony, so no known direct impacts to this maternity colony are anticipated. However, the undiscovered maternity colony may be adversely affected by tree felling in August and September. During this time, Indiana bats are more likely to be dispersed throughout the forested habitat although multiple Indiana bats have known to continue to roost together during this time. Felling trees during August and September reduces the risk of felling a maternity roost tree with non-volant pups or a tree with a large cluster of individuals. Juvenile bats should be newly volant at this time. However, novice Indiana bats and some adult individuals may not be capable of quickly abandoning the roost which could result in injury or death to individuals. More experienced fliers are better able to abandon a roost quickly, however, this forced abandonment means Indiana bats will need to immediately find alternate roosts.

There are no currently documented roost trees in any of the 2009-2011 forest management units. In addition, any newly documented female roost trees (and a buffer around them) will not be cut without further consultation with the Service. Finally, the forest type associated with in-season clearing reduces the likelihood of Indiana bat presence. Even with these conservation measures, it is virtually impossible to identify and protect all roost trees for a given maternity colony (as well as for non-reproductive females and males). Therefore, we believe that it is reasonable to assume that 1-2 occupied roost trees (with less than 10 bats in each) may be felled and lead to the death or injury of some proportion (but not all) of the bats. We assume that some bats would be startled by the noise and vibrations coming from a chainsaw and would successfully exit their roost trees prior to the tree being felled. Bats that remained in a roost tree and survived the initial felling would likely try to crawl and fly away from the immediate area, but being unaccustomed to flying during the daytime and likely injured or disoriented from the fall, would likely have a relatively high risk of predation from diurnal predators. Bats that successfully flee the disturbance uninjured would not be expected to return to that area and would likely shift their focal roosting and perhaps foraging area at least temporarily.

In summary, the only direct effects from loss of roosting/foraging habitat we anticipate from forest management are those associated with tree removal. Specifically, the clearing of trees between August 14-September 30 associated with military training described above (< 500 acres total) may result in the felling of an estimated 1-2 undocumented occupied roost trees and lead to the death/injury of some of the bats using those trees.

### Alteration of Roosting/Foraging Habitat

Unlike construction activities, forest management activities will not result in permanent loss of roosting or foraging habitat. Instead, there will be alterations of habitat including shifts from forest to open areas, selective thinnings, uneven age management, etc. Forest management activities create a mosaic of habitat types throughout the Training Area and in the long term should be beneficial to Indiana bats. The primary differences between the forest management activities and construction are that foraging/roosting habitat may still remain depending on the type of harvest, foraging/roosting habitat may be enhanced over the short-term (increased edge and variety of vegetation types) or the long-term (change species composition and structure of forest patches). However, there may be short-term impacts to small numbers of Indiana bats associated with the known or unknown maternity colony from tree removal similar to impacts from construction projects (e.g., shift of roosting/foraging range, potential for increased competition).

### Habitat Fragmentation

Given the extensive amount of potential roosting and foraging habitat throughout the Training Area and the proposed forest management activities spread throughout that area, the likelihood of adverse impacts to Indiana bats from fragmentation is minimal. The forest management practices of the Army are anticipated to provide extensive edge habitat (with a wide variety of vegetation types) for Indiana bats to use as commuting and/or foraging habitat and no parts of Fort Drum are anticipated to become unavailable to Indiana bats due to habitat fragmentation. The bats should be able to fly over or around any newly created openings in the forest. Therefore, we do not anticipate any discernable effects to Indiana bats from habitat fragmentation associated with forest management activities.

### ***C. Military Training Smoke and Obscurants***

#### Direct Effects to Roosting/Foraging Bats

Guelta and Balbach (2005) found that fog oil smoke can penetrate tree cavities; while Indiana bats generally use cracks, crevices, and bark rather than cavities, we assume that smoke can also enter those spaces. We assume that other types of smoke can also reach roosting Indiana bats which may expose volant and non-volant individuals to potentially harmful chemicals via inhalation, ingestion, or through the skin. The smoke itself may force Indiana bats to abandon the roost, and smoke exposure can have harmful effects (acute or chronic, depending on exposure). The primary smoke and obscurants used on Fort Drum include white phosphorous, colored smoke, fog oil, and graphite smoke.

#### *White phosphorous*

White phosphorous (WP) ignites when it is exposed to the air and can result in severe burns if it comes into contact with the skin; it is highly toxic if ingested and can result in respiratory tract irritation if inhaled (National Research Council 1999a). Smoke typically lasts up to 15 minutes. Indiana bats exposed to WP smoke are anticipated to show signs of respiratory irritation; if

pregnant Indiana bats are exposed to WP in high concentrations over a period of time, it could result in lower fecundity and/or natal weights. See the BA for additional detailed information on WP studies. The Army's conservation measures restrict the use of smokes and obscurants within 100 m of known Indiana bat maternity roosts. However, more importantly, WP is only used on the ranges aimed towards the Main Impact Area with any effects of WP in the Main Impact Area. There are no known maternity colonies located within 6,500 m (~ 4 mi) of the ranges or Main Impact Area. Because of the distance between known roosts and WP training sites, it is unlikely WP smoke training will drift and result in adverse effects to known Indiana bats during the spring, summer, or fall. Thus, impacts are discountable.

The Army considered the potential for the undiscovered maternity colony to occur within the Main Impact Area and, therefore, the potential for adverse effects by WP smoke via inhalation, ingestion, or dermal absorption during the non-hibernation seasons. As stated above, the Service does not anticipate Indiana bat use of the Main Impact Area and if use did occur, we have no means of monitoring the use or potential adverse effects.

In conclusion, we do not anticipate any reasonably detectable adverse effects to Indiana bats from WP.

#### *Colored smoke*

Overall data on the toxicity of colored smoke are 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 smoke 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/marketing tool, it will not be broadly dispersed, which also minimizes the risk of smoke exposure to Indiana bats.

Based on recent past use, colored smoke has not been utilized around known Indiana bat areas on Fort Drum, however the potential exists that colored smoke may be deployed near known roosts at the three mobile MOUTs. In the BCA (where the majority of known roosts are located), smoke will not be used within 100 m of forested areas during the non-hibernation season or within 1000 m of the installation boundary except for colored smoke use at the three MOUTs (Figure 24). Subsequently, few locations remain within the BCA that would permit smoke use. The mobile MOUTs in the BCA are approximately 400 m from known maternity roosts. An Ecological Risk Assessment prepared by 3D/International, Inc. (1997b) for Fort Leonard Wood found that foraging and roosting Indiana bats within 30 m of deployed colored smoke grenades may inhale unsafe quantities of colored smoke, which could result in acute effects (minor respiratory inflammation) (3D/International, Inc. 1997b). They found that the concentration of smoke that could result in acute effects lasted approximately one minute.

However, no chronic effects to stationary (in this case hibernating) Indiana bats were observed. In addition, chronic effects to mobile (foraging) Indiana bats were considered unlikely as they are not anticipated to inhale a continuous concentration of smoke during a grenade release, be exposed to the maximum number of grenade releases at a given training area, or remain in a smoke cloud long enough to inhale quantifiable concentrations of smoke (3D/International, Inc. 1997b).

Colored smoke is not expected to be used in large quantities within the BCA and the area of deployment is approximately 400 m (much greater than 30 m zone of acute impact) from known maternity roosts. Because of the infrequency of use, the distance to known maternity colonies, and the smoke buffer around Fort Drum's perimeter, the Army determined that colored smoke may affect, but is not likely to adversely affect Indiana bats.

In conclusion, the Service agrees that the known maternity colony is unlikely to be adversely affected by colored smoke as we anticipate no acute or chronic effects to mobile (foraging) or stationary Indiana bats.

Given the narrow geographic area of impact (30 m), short duration of impact (< 1 minute), low severity of impact, and limited use as a signaling/marketing tool throughout the Training Area, we also do not anticipate impacts to the unknown maternity colony.

#### *Fog oil*

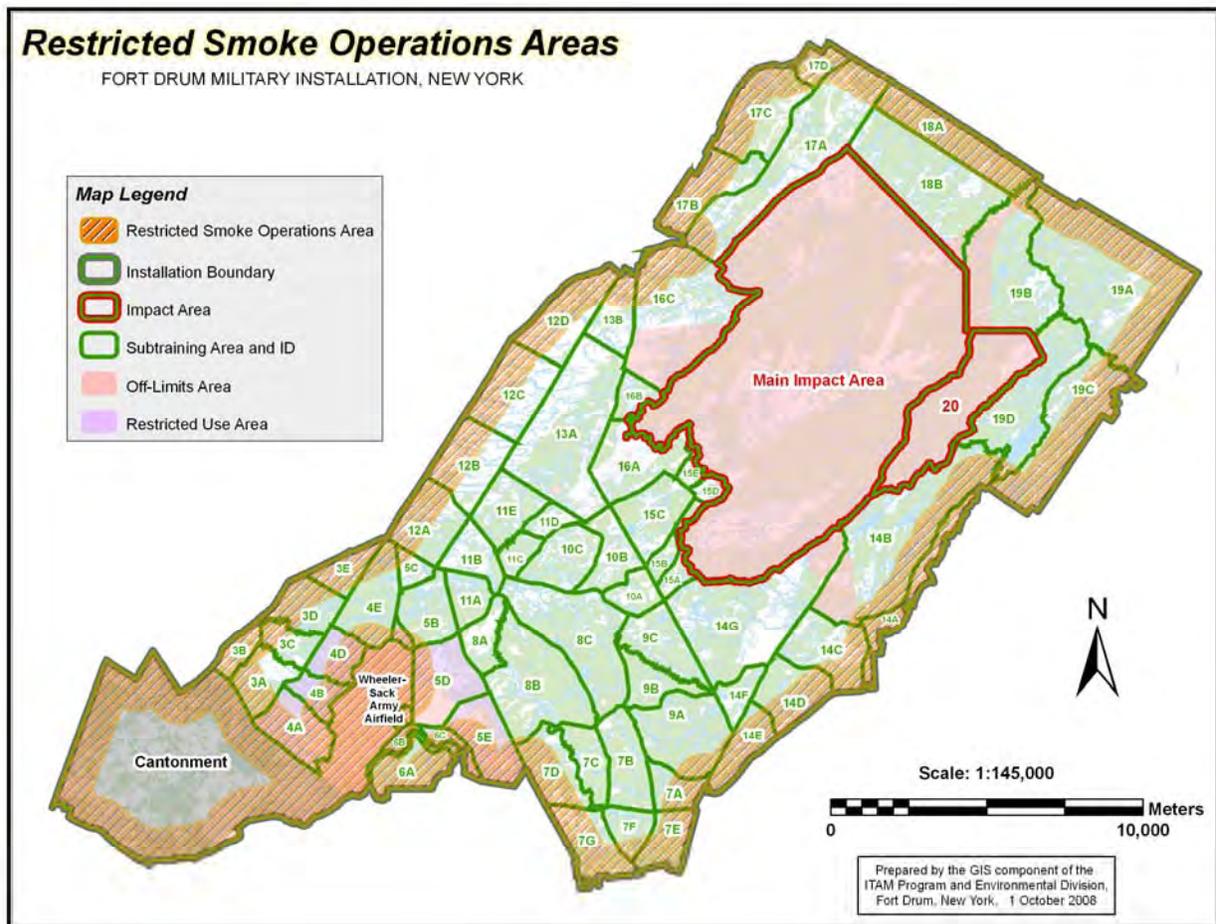
Fog oil exercises are primarily conducted during daylight hours while Indiana bats are roosting, however, the BA stated that there is potential for use of smoke at night. Fog oil has low potential for acute toxicity (dermal exposure) and may cause slight to moderate irritation after a single exposure to the skin (National Research Council 1997). However, 3D/International, Inc. (1997a) found that a single exposure to fog oil during either static or mobile training will not affect foraging or roosting Indiana bats. Prolonged and repeated exposure (inhalation) of fog oil may cause adverse pulmonary and systemic effects which could reduce fitness and fecundity of Indiana bats (3D/International Inc. 1997a). In a study conducted on Fort Leonard Wood, it was estimated that Indiana bats within 4,000 m of static smoke training and 7,000 m of mobile smoke training had the potential to inhale unsafe quantities of fog oil (3D/International Inc. 1997a). Indiana bats repeatedly foraging or roosting within 4,000 m of static fog oil smoke training and within 7,000 m of mobile smoke training will be exposed to unsafe concentrations of fog oil, and are likely to exhibit chronic inhalation effects. Fog oil is anticipated to be used frequently throughout the Training Areas of Fort Drum. The Army has proposed a conservation measure limiting smoke use within 100 m of known maternity roost trees to minimize Indiana bat exposure to high concentrations of fog oil; however, this appears insufficient to avoid all adverse effects. Fog oil may be used in Training Areas 3 and 4 where there are 6 known roost trees.

Fog oil can also be used throughout the rest of the Training Area which may adversely affect Indiana bats associated with the undiscovered maternity colony as well as non-reproductive females and/or males that may occur in the Training Area. All bats present within the zone of unsafe concentrations of fog oil inhalation may be affected. Direct effects may include respiratory distress which may lead to abandonment of roosts, lower birth weights in pups,

and/or reduced fecundity. Since we do not have adequate information on the assumed second maternity colony and effects could be significant, reinitiation with the Service will be necessary should roosting or foraging areas of this colony be found on Fort Drum.

*Graphite smoke*

Graphite smoke inhalation studies have shown to cause only mild respiratory tract inflammations in rats even at high graphite concentrations (100 mg/m<sup>3</sup>) (National Research Council 1999a). Repeated inhalation exposure also produced minimal effects in rats and all noted symptoms were reversible after two weeks. Dermal exposure to rabbits showed no signs of toxicity, including no skin irritation (National Research Council 1999a). Graphite was not acutely toxic when given orally to rats at 5 g/kg of body weight. Given the low toxicity to experimental animals, the Army determined that the use of graphite smoke may affect, but is not likely to adversely affect the known and undiscovered maternity colonies of Indiana bats.



**Figure 24. Buffer (1000 m) around Fort Drum where smoke operations are prohibited per Fort Drum Regulation 350-4 Range Regulation.**

## Summary

After reviewing the information on the various smokes/obscurants and considering the conservation measures proposed by the Army, we believe that any adverse effects associated with WP, colored smoke, or graphite smoke are insignificant or discountable. However, impacts from fog oil could not be discounted and we would anticipate detectable effects, but only to the assumed second maternity colony. Since we do not have adequate information on the assumed second maternity colony and effects could be significant, reinitiation with the Service will be necessary should roosting or foraging areas of this colony be found on Fort Drum. At that time, we may also revisit the potential for impacts associated with the use of WP, colored smoke, and graphite smoke.

### Indirect Effects

The Army does not anticipate any indirect effects to Indiana bats from the use of smoke/obscurants.

All visible fog oil in the air will dissipate within 5 minutes of termination of the smoking exercise (Getz et al. 1996). In a study at Fort McClellan, Alabama, 3D/International, Inc. (1996) found that fog oil did not bioaccumulate, bioconcentrate, or remain in the environment for any period of time. Fog oil is biodegraded by microorganisms and is soluble in water where it undergoes chemical degradation (3D/International, Inc. 1997a). Prey are unlikely to be affected by exposure to fog oil through aquatic pathways. We do not anticipate any indirect effects to Indiana bats from fog oil.

Prey species are also unlikely to be affected by exposure to terephthalic acid (TPA) in smoke through aquatic pathways (3D/International Inc. 1997a). 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. 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.

## **CUMULATIVE EFFECTS**

Cumulative effects include the combined effects of any future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation under Section 7 of the ESA.

As stated in the **Environmental Baseline** section, hunting and other outdoor recreation, agriculture, timber harvest, and residential and commercial development are reasonably certain to occur within the action area. Many of these are private actions, but many involve Corps

permits for impacts to waters of the United States or are activities conducted on Fort Drum and authorized by the Department of Army. The Service is unaware of any quantifiable information relating to the extent of private timber harvests within the action area. The Service is engaged with the Town of LeRay in developing a Town master plan and is actively involved with reviewing most, if not all, development projects within the Town (regardless of Federal involvement). We 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.

## CONCLUSION

After reviewing the current status of the Indiana bat, the environmental baseline for the action area, the effects of the proposed activities on Fort Drum (2009-2011), and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Indiana bat. Critical habitat for the Indiana bat has been designated at a number of locations throughout its range; however, this action does not affect any of those designated critical habitat areas and no destruction or adverse modification of that critical habitat is expected.

Because of our analysis, we do not believe that the proposed action "would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the Indiana bat by reducing the reproduction, numbers, or distribution of the Indiana bat (50 CFR 402)." For the proposed action to "reduce appreciably" the Indiana bat's survival and recovery, the proposed action would have to impede or stop the process by which the Indiana bat's ecosystems are restored and/or threats to Indiana bat are removed so that self-sustaining and self-regulating populations can be supported as persistent members of native biotic communities (Service and NMFS 1998, page 4-35). We do not believe the proposed project impedes or stops the survival and recovery process for the Indiana bat because:

The species' resiliency to some level of natural and anthropogenic disturbances has been demonstrated (See **Previous Incidental Take Authorizations**). We believe that the proposed actions on Fort Drum from 2009-2011, while potentially resulting in the incidental take of some individuals associated with one known and one assumed maternity colony, are not a significant threat to the species in the Northeast regional population (proposed Northeast Recovery Unit) or the species as a whole and, therefore, do not rise to the level of jeopardy. In fact, we find that many of the proposed actions of the Army, including the proposed conservation measures, are likely to result in benefits to the species. No component of the proposed action is expected to result in harm, harassment, or mortality at a level that would reduce appreciably the reproduction, numbers, or distribution of the Indiana bat. While we recognize that the status of the species is uncertain, we considered the environmental baseline, and the intensity, frequency, and duration of the project impacts, and found that the proposed project is unlikely to greatly decrease the reproduction, numbers, or distribution of the Indiana bat.

## **INCIDENTAL TAKE STATEMENT**

Section 9 of the ESA and Federal regulations under Section 4(d) of the ESA prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Army so that they become binding conditions of any funding, permits, and/or approvals, as appropriate, issued to any other Federal agencies or contractors on Fort Drum for the exemption in Section 7(o)(2) to apply. The Army has a continuing duty to regulate the activity covered by this incidental take statement. If the Army 1) fails to require Army personnel, other Federal agencies, or contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, authorization, or funding document; and/or 2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Army must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement (50 CFR §402.14(I)(3)).

### **AMOUNT OR EXTENT OF TAKE ANTICIPATED**

The Service anticipates incidental take of the Indiana bat will be difficult to detect for the following reasons:

1. The individuals are small and occupy summer habitats where they are difficult to find;
2. Indiana bats form small (i.e. 25-100 individuals), widely dispersed maternity colonies under loose bark or in the cavities of trees, and males and non-reproductive females may roost individually which makes finding the species or occupied habitats difficult;
3. Finding dead or injured specimens during or following project implementation is unlikely;
4. The extent and density of the species within its summer habitat in the action area is unknown; and
5. Most incidental take will be non-lethal and undetectable.

Because of the difficulty in determining a level of take based on the number of Indiana bats that will be adversely affected, the Service has decided that it is appropriate to base the level of authorized incidental take on the habitat acreage that will be affected by the proposed projects.

We anticipate harm of a small percentage of Indiana bats known to winter in the Glen Park Cave and who travel, roost, forage, and swarm within the action area and a small percentage of Indiana bats associated with one documented and one assumed maternity colony that are traveling, roosting, and foraging within the action area as a result of the permanent disturbance of up to 3,781 acres of forest (potential roosting/foraging habitat) and an additional 2,183 acres of potential foraging habitat (lands excluding landscaped yards, sand dunes, and disturbed areas). "Harm," as defined within the definition of "take" in the Act, means an act that actually kills or injures wildlife. Such acts may include significant habitat loss and/or alteration where the act actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. These impacts are anticipated in the first, and possibly second, spring/summer after tree removal has occurred and foraging patterns/range may be shifted. The primary foraging areas for the documented maternity colony will remain available in the action area and limited impacts are anticipated in subsequent years.

In addition, there may be similar short-term impacts associated with forest management activities, including up to 4,900 acres of forest harvest (potential roosting/foraging habitat). These activities are not anticipated to result to any impacts to the known maternity colony. However, we assume that a second colony occurs on Fort Drum and may be impacted. Forestry actions will not result in permanent loss of habitat for Indiana bats and foraging opportunities are expected to be enhanced in the long-term.

In addition, we anticipate injury or mortality of a small number (< 20) of Indiana bats associated with up to 75 acres and 500 acres of tree clearing between August 15 and October 1 for range construction and forest management projects, respectively.

## **EFFECT OF THE TAKE**

In the accompanying BO, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Indiana bat or destruction or adverse modification of critical habitat.

## **REASONABLE AND PRUDENT MEASURES**

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of the Indiana bat:

1. The Army will ensure that the described proposed project components, including all conservation measures, will occur as planned and documented in the BA and March 18, 2009, electronic mail.

2. The Army will conduct additional measures to accomplish intended conservation benefits as described in the BA. These measures are either in addition to or clarifications of those included as conservation measures.
3. The Army must monitor its activities associated with the proposed project to determine if the Terms and Conditions of this BO are being implemented adequately in order to ensure that take is minimized and provide an annual report of those activities to the Service.

## **TERMS AND CONDITIONS**

In order to be exempt from the prohibitions of Section 9 of the ESA, the Army (and other Federal agencies where denoted) must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The Army shall not remove any trees > 4 in DBH in the BCA except those associated with the Remington Park facilities construction, perimeter fence, and/or utilities maintenance, and hazard tree management described in the BA without additional consultation. This Term and Condition is associated with Reasonable and Prudent Measures 2.
2. The Army shall not construct any new trails in the BCA without additional consultation. This Term and Condition is associated with Reasonable and Prudent Measures 2.
3. The Army shall not use any smokes/obscurants other than limited colored smoke grenades in the BCA. This Term and Condition is associated with Reasonable and Prudent Measures 2.
4. The Army Environmental Division shall provide annual training to all project personnel that are directly or indirectly responsible for actions conducted on Fort Drum on the terms of this BO. This Term and Condition is associated with Reasonable and Prudent Measures 1-3.
5. The Army shall ensure that all appropriate/applicable conservation measures and Terms and Conditions are included in contracts for work conducted on Fort Drum. This Term and Condition is associated with Reasonable and Prudent Measures 1-3.
6. The Army shall ensure they maintain a valid NYSDEC permit for the handling of Indiana bats. This Term and Condition is associated with Reasonable and Prudent Measure 1-3.
7. Mist-netting sites in the Training Area in 2009-2011 shall first be focused in areas proposed for disturbance in 2009-2011. Females (of appropriate weight) captured during Training Area mist-netting activities shall receive radio transmitters and be tracked to roosting and foraging locations. The Army and/or contractor shall request access from landowners if the bats roost off-post. The Army Environmental Division shall coordinate

with the Service on any additional contract details for future surveys. This Term and Condition is associated with Reasonable and Prudent Measures 2 and 3.

8. Should any female Indiana bats be captured during mist-netting associated with in-season range construction or forest management projects, the Army shall attach radio transmitters to those females and track them for the life of the transmitter. Should any females roost in the area proposed for in-season clearing, see term and condition #10. The Term and Condition is associated with Reasonable and Prudent Measures 2 and 3.
9. The Army shall monitor the presence of the known Indiana bat maternity colony in 2009 by continuing the USFS study and in 2010 and 2011. The Army will coordinate with the Service on monitoring methods by February 15<sup>th</sup> of the survey year. This Term and Condition is associated with Reasonable and Prudent Measures 1-3.
10. The Army shall not cut/remove any current or future identified female roosts for any purpose (except emergency situations where life or property is imminently threatened) without additional consultation with the Service. 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 bats. The size and shape of a buffer will be determined on a case by case basis by the Army's Fish and Wildlife Management Program in consultation with the Service. 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 Indiana bats. This Term and Condition is associated with Reasonable and Prudent Measures 1-3.
11. The Service, NYSDEC, and their representatives shall have access to any on-post BCA for future Indiana bat monitoring. All access shall be coordinated with the Army's Environmental Division. This Term and Condition is associated with Reasonable and Prudent Measures 2 and 3.
12. The Army shall request access for the Service, NYSDEC, and their representatives when negotiating conservation easement language for off-post conservation lands (e.g., ACUB lands) for future Indiana bat monitoring. All access shall be coordinated with the Army's Environmental Division. This Term and Condition is associated with Reasonable and Prudent Measures 2 and 3.
13. The Army shall provide an annual report summarizing the activities described in this BO by February 15<sup>th</sup> of the following year. The report shall include a calculation of total acreages (by vegetative cover type) impacted by project category on an annual and running (for the 3 years) basis. The report shall also summarize whether any conservation recommendations were implemented. This Term and Condition is associated with Reasonable and Prudent Measures 1-3.
14. The Army shall provide the best available shapefiles of clearing limits (may precede final "as built" limits) for construction and forest management activities by February 15<sup>th</sup> of

the following year. This Term and Condition is associated with Reasonable and Prudent Measures 1-3.

15. The Army shall provide an annual report summarizing any Indiana bat field work (e.g., mist-netting, Anabat, and radio telemetry activities) by February 15<sup>th</sup> of the following year. This Term and Condition is associated with Reasonable and Prudent Measures 1-3.
16. The Army may request an extension, for the Service's consideration, to the time limitations in meeting the requirements outlined in all terms and conditions. An extension request shall be provided to the Service in writing within one year from the completion date of this BO and clearly identify the additional timeframe needed. This Term and Condition is associated with Reasonable and Prudent Measures 1-3.
17. The Army and any other Federal agency working on Fort Drum shall make all reasonable efforts to educate personnel to report any sick, injured, and/or dead bats (regardless of species) located on Fort Drum during construction, operations, maintenance, or monitoring activities immediately to the Army's Environmental Division. Due to the number of soldiers and other military and support personnel, it is not expected nor required to educate all personnel working on Fort Drum, but those most likely to come across bats during the course of normal working conditions. Environmental staff will subsequently report to the Service's New York Field Office (NYFO) (607-753-9334) and the NYSDEC, and/or New York State Health Department. No one, with the exception of trained Army Garrison staff or researchers contracted to conduct bat monitoring activities, should attempt to handle any live bat, regardless of its condition. If needed, NYFO and/or NYSDEC will assist in species determination for any dead or moribund bats. Any potential dead Indiana bats will be transported on ice to the NYFO or NYSDEC. If an Indiana bat is identified, NYFO will contact the appropriate Service law enforcement office. In addition, Fort Drum Environmental Division Staff will make all reasonable efforts to immediately report any dead suspected Indiana bats found outside Fort Drum but within the Action Area. In the extremely rare event that someone has been bitten by a bat, please keep the bat in a container and contact the Jefferson County Public Health Service at 315-786-3770.

In conclusion, up to **5,964 acres** of suitable roosting and foraging habitat for Indiana bats may be permanently lost (3,781 acres of forest and 2,183 acres of other habitat). An additional **4,900 acres** of forest may be altered. The Service believes that a **small number** of Indiana bats will also be killed or injured. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded (i.e. 3,781 acres, 4,900 acres, small number of bats), such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. The Army must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures and/or conservation measures.

## **CONSERVATION RECOMMENDATIONS**

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid the adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

The Service has identified the following actions that, if undertaken by the Army, would further the conservation and assist in the recovery of the Indiana bat.

1. Assist with WNS investigations (No Recovery Actions specific to WNS in draft Recovery Plan but Action 3.5.1 addresses disease threats). For example, Fort Drum could:
  - a. Monitor the status/health of the little brown bat colony at the LeRay mansion/bat houses;
  - b. Collect samples for ongoing or future studies;
  - c. Provide funding for off-post WNS research activities; and
  - d. Allow staff to participate in off-post research projects.
2. Pursue additional acquisition of parcels or easements to protect Indiana bat roosting, foraging, and commuting habitat through the ACUB program (Recovery Actions 2.1-Manage habitat on private lands, 2.2-Conserve and manage Indiana bats and their habitat on Federal lands, 2.4.2-Identify and conserve foraging habitat, water sources, and travel corridors).
3. Conduct research on smoke/obscurant impacts to the Indiana bat (No Recovery Actions specific to this in draft Recovery Plan). As stated in Shapiro and Hohmann (2005), additional work on short-term and long-term exposure models is necessary. Research on potential impacts to insect populations is also recommended.
4. Assist with Recovery Action 3.3 (and related subactions)- conduct research on the summer habitat requirements and distribution of Indiana bats.
5. Evaluate potential to correlate USFS foraging data with training activities to glean any information on Indiana bat response to night training exercises.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the conservation recommendations carried out.

## **REINITIATION NOTICE**

This concludes formal consultation on the actions outlined in the information presented with the December 1, 2008, requests for initiation of formal consultation. As written in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or

control over the action has been retained (or is authorized by law), and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals the agency action may affect listed species or critical habitat in a manner or to an extent not considered in this BO; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this BO; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. In addition, see the below example description of specific triggers for either reinitiation of this consultation or separate individual project consultation. Triggers for reinitiation for NLTAA categories of activities are in Appendix A.

#### Triggers for additional consultation with the Service for Construction Activities

Any changes in project description or effects not fully analyzed in BO, for example:

##### *Cantonment/WSAAF Construction*

Tree removal is proposed between April 16-October 1 or any other above-listed conservation measure cannot be implemented.

Projects exceed estimated acreage of impact of any given vegetative cover type (except disturbed, grasslands, sand dunes/flats, or landscaped yard) as described in the BA and above.

##### *Training Area Construction*

Projects exceed total estimated acreage of impact or estimated acreage of impact of any given vegetative cover type (except disturbed, grasslands, sand dunes/flats, or landscaped yard) or any other above-listed conservation measure cannot be implemented.

Tree removal is proposed between April 16-August 15.

Tree removal is proposed between August 15-October 1 AND projects are west of the CSX railroad line or within the range of the known maternity colony.

Tree removal is proposed between August 15-October 1 AND project exceeds 5 ac (2.02 ha) per site or if the cumulative acreage exceeds 25 forested ac (10 ha) per year.

##### *Demolition*

Bats are identified as Indiana bats during demolition of buildings.

#### Triggers for additional consultation with the Service for Forest Management Activities

Any changes in project description or effects not fully analyzed in BO, for example:

More than 4,900 acres (1,982 ha) proposed to be cut over the next three years.

More than 500 acres proposed for removal between August 15 and October 1.

Tree removal is proposed between August 15-October 1 AND female Indiana bats are tracked to the forest patch for roosting or foraging in 2009, 2010, or 2011.

## Triggers for additional consultation with the Service for Military Training Activities

Any changes in project description or effects not fully analyzed in BO, for example:

Reinitiation with the Service will be necessary should roosting or foraging areas of the second colony be found in areas proposed for fog oil use.

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## APPENDIX A

Summary of activities proposed on Fort Drum that are not likely to adversely affect the Indiana bat.

The Army determined the following categories of activities (including implementation of conservation measures) may affect, but are not likely to adversely affect the Indiana bat:

Military training (except smoke and obscurants)  
Mechanical vegetation management  
Prescribed fire  
Pesticide application  
Wildlife management/vertebrate pest control  
Outdoor recreation

### **A. Military Training (except smoke and obscurants)**

For the purposes of the BA, military training activities were generally divided into eight categories: sustainment operations, engineering operations, air operations, water operations, field training operations, live munitions training, demolition, and smokes/obscurants. All of these activities occur in the Training Area; some of these activities occur in the Local Training Area within the Cantonment Area.

See Section 2.2 in the BA for additional information.

### Conservation Measures

1. In the Training Area and LTAs, the cutting of trees and tree removal is prohibited without approval by the Army'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.
2. In the LTAs in accordance with *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas*, vehicular traffic is restricted to open grassy areas within easy access of the road. 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.
3. In the LTAs in accordance with *Fort Drum Regulation 350-6 Assignment and Operational Use of Local Training Areas*, Petroleum, Oils, and Lubricants operations are prohibited which minimizes the risk of accidental water/ground contamination.

4. The Army will abide by the Integrated Wildland Fire Management Plan (U.S. Army 2005) 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. This will protect Indiana bats from smoke exposure and from roost destruction. Burn bans are most likely implemented during the summer months when reproductive Indiana bats are present on Fort Drum.

#### Triggers for additional consultation

Proposed military training action does not meet general descriptions provided in BA or conservation measures cannot be followed (standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16).

#### **B. Mechanical Vegetation Management**

Vegetation management is conducted for a variety of purposes including, but not limited to:

- Grassland/shrubland management for military training including maneuver space, bivouac areas, drop zones, landing zones, firing points
- Line-of-sight clearance on ranges for firing weapons
- Minimizing/controlling vegetation growth along perimeter fences, utility corridors, roads, and trails
- Urban/suburban lawn care
- Grassland/shrubland management for wildlife habitat management
- Invasive species or undesired vegetation control
- Hazard tree removal

See Section 2.4 in the BA for additional information.

Hazard tree removal was the only activity under this category that the Army considered potential to result in adverse effects to Indiana bats. However, between the November 2008 and January 2009 additional conservation measures were added to the project description and no adverse effects are anticipated.

#### Conservation Measures

1. Time of Year Restriction for Tree Falling. A time of year restriction for clearing trees (> 4 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 1 and April 15 while most Indiana bats are at the hibernaculum. This will greatly reduce the risk of accidentally harming Indiana 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 #3 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. High Risk Hazard Trees. For hazard trees that are determined to be high or critical classified between April 16-September 30, the Army'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 Service 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 the Army's Fish and Wildlife Management Program for annual reporting requirements to the Service. Mowing of landscaped grass in the Cantonment Area does not need to be documented.

### Beneficial Actions

In addition to the conservation measures that will always be followed above, the Army considers the following activities as optional and will attempt to implement whenever possible to further minimize impacts.

1. Typically, clearing natural vegetation for maintenance purposes (e.g., not landscaped yards or open areas) is conducted between August 1-April 15 to minimize the impact to migratory birds.
2. Vegetation management for military readiness is conducted year-round although it is recommended that shrubs 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 Indiana bats.

### Triggers for additional consultation

While standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16, the following illustrates specific examples of foreseeable events that would likely trigger reinitiation:

Proposed vegetation management in Local Training Areas in the BCA.

Bats found during exit counts of hazard trees.

Vegetation management acreages greater or project description other than stated in the BA.

Conservation measures cannot be followed.

### **C. Prescribed Fire**

Prescribed fire is primarily used on Fort Drum to improve line-of-sight on ranges and observation points for direct and indirect firing, maintain grassland/open shrubland for open maneuver training, and to reduce fuel accumulation to minimize wildfire risk. Prescribed fires are not planned to be used for forest management activities in 2009-2011, nor is it anticipated to occur within forests. Due to seasonal precipitation patterns on Fort Drum, prescribed burning takes place during the spring dormant season (late April-early May).

Approximately 6,500 ac (2,630 ha) outside the Main Impact Area are expected to be burned during the next three years. The proposed sizes and locations of prescribed fires outside the Main Impact Area are unlikely to change in the next three years due to the complex procedural process associated with implementing prescribed burns. Of the total acreage, about 2,500 ac (1,012 ha) may be burned annually. The remaining acreage will be burned on a cycle of every 3-5 years in order to maintain their vegetative status as grasslands or semi-open shrublands.

Within the Main Impact Area, prescribed fires may be conducted in the north and south boxes (~5,420 ac (~2193 ha)) in order to facilitate military training activities. Human health and safety concerns restrict personnel from entering the Main Impact Area, so non-mechanical methods are the primary means for managing vegetation in that area. Although fire may be a tool used to manage vegetation in the Main Impact Area, prescribed burns will most likely be used infrequently due to variable moisture conditions within the targeted area.

See Section 2.5 in the BA for additional information.

### Conservation Measures

1. Development and Implementation of the Prescribed Fire Plan. Protocols are established within the prescribed fire work plans to closely control where, when, and how fires are

set. This helps to control where flames and smoke occur on the landscape. Because both flames and smoke could negatively impact Indiana bats, it is important to try and minimize potential impacts from both. Currently, no known maternity areas are known to exist within close proximity to any of the burn units, however, if new maternity roosts are discovered near proposed burn sites, then burn plans may be written to include additional provisions that protect maternity roosts by diverting smoke or flames from the roost, when possible.

2. **Wet Lines.** Wet lines will be established around forested areas to preclude fire from entering, to the maximum extent practicable.
3. **Time of Year Restriction.** No burning may occur from May 15-September 15 to prevent smoke and possible fires from penetrating forested areas where non-volant young bats may be present. Therefore, even if a prescribed fire enters a forested area, there should be no non-volant young present.
4. **Time of Day Restriction.** Whenever possible, all efforts will be made to have all flames extinguished and smoke generation minimized by sunset to reduce potential direct impacts to foraging Indiana bats.
5. **Record-keeping and Reporting.** For annual reporting purposes, all entities responsible for prescribed fire activities on Fort Drum will submit electronic shapefiles of prescribed fire limits to the Army's Fish and Wildlife Management Program. This information will be used to describe vegetative cover types and habitat modification on Fort Drum and reported annually to the Service.

#### Triggers for additional consultation

While standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16, the following illustrates specific examples of foreseeable events that would likely trigger reinitiation:

Proposed prescribed fire project does not meet descriptions provided in BA (e.g., conduct prescribed fire activities in a forested environment or more than 6,500 ac [2,630 ha] are proposed to be burned between 2009-2011) or conservation measures cannot be followed.

#### **D. Pesticide Application**

In this section, pesticides used on Fort Drum to control vegetation and invertebrates are assessed.

See Section 2.6 of the BA for additional information. Additional clarification and conservation measures were provided in a March 18, 2009, electronic mail (see below).

#### Conservation Measures

1. Only pesticides registered by the Environmental Protection Agency 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 1 hour before sunset. This will protect foraging bats in undiscovered foraging areas from direct exposure.
3. Aerial application of pesticides in the BCA is prohibited without further consultation with the Service.
4. Application of pesticides that result in broad dispersal (i.e. vehicle mounted spraying) will be conducted at least 100 ft (30 m) away from known roost trees (including roosts identified in the future) and 250 ft (76 m) from known primary roosts. Pesticides will be applied between sunrise and 1 hour before sunset. Location-specific applications (i.e. hatchet injections of trees, individual application to specific plants) may be used within 100-250 ft (30-76 m) of known roosts. This measure minimizes the risk of exposure to Indiana bats and potential effects from pesticides.
5. Pesticides will not be applied outdoors when the wind speed exceeds 5 mi (8 km) per hour. 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.
6. 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.
7. For each pesticide application, Pest Control will report the total amount of Pounds of Active Ingredient (PAI) used for each pesticide (i.e. Accord, Roundup, etc.), the size of the treated area (within a scaled map), and the vegetative cover types that were treated to the Army's Fish and Wildlife Management Program for annual reporting purposes to the Service. 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.

The January 2009 BA determination of may affect, likely to adversely affect was based on the possibility that herbicide would be applied to > 4 in DBH trees within the Main Impact Area. See below for the language for herbicide application for range facilities to control vegetation for line of site or invasive species - NOT IN MAIN IMPACT AREA:

1. Landcover within and around the larger herbicide units that will have aerial application will be primarily grassland/rangeland and shrublands, with small diameter hardwoods mixed throughout. Most of the forested areas within these herbicide units are < 4 in DBH, and of unsuitable size to be useful for Indiana bat roosting. Therefore the likelihood of applying herbicide directly to a roosting Indiana bat, as well as, removing roosting habitat, is discountable.

2. The potential to lose one or more primary roost trees is unlikely. The potential to adversely affect maternity colonies (or a significant amount of habitat suitable for maternity colonies) is discountable.
3. Areas where aerial herbicide will be applied will be delineated by painted boundaries on the ground. Suitable environmental conditions (low or no wind) will dictate when areas will be sprayed. Additionally, these areas will be sprayed by helicopter flying at altitudes that will provide good precision and accuracy in terms of where herbicide is applied. Therefore, it is expected that no herbicide will be sprayed outside these boundaries.
4. While some of these herbicide units may have potential foraging habitat, the units are not in one contiguous block, and large amounts of other more suitable foraging habitat can be readily found outside of the units.
5. While some wetland areas will be over-sprayed, the herbicide applied will be certified for use in aquatic areas.
6. There is a "no spray" requirement over NYSDEC Article 24 classified wetlands (plus a 100 foot buffer surrounding the wetland). There is a "no spray" requirement over any created wetland mitigation site.
7. Landcover within the ground application units that contain small diameter hardwoods ranging from < 4-8 in DBH will have no herbicide applied to the trees. The areas of shrubs and grasslands within and around these forested areas are the target areas, and no herbicide will be applied more than 8 feet above the ground in these areas.
8. Application to swallowwort will be to individual plants or plant clusters.

Given the project description and conservation measures, the Service does not anticipate any adverse impacts from pesticide application. We agree with the Army that all activities besides aerial application of herbicides may affect, but is not likely to adversely affect the Indiana bat. In addition, we find that aerial application for line of site projects including the March 18, 2009, conservation measures are similarly unlikely to result in adverse effects to Indiana bats. Finally, the Service does not anticipate any adverse effects to Indiana bats in the Main Impact Area. We find it unlikely that Indiana bats routinely use the Main Impact Area for roosting and if they were to use the area, there is no meaningful way to document use and/or adverse impacts. Therefore, we are not requesting any further consultation for projects in that area.

#### Triggers for additional consultation

Proposed pesticide application project does not meet descriptions provided in BA or conservation measures cannot be followed (standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16).

## **E. Wildlife Management/Vertebrate Pest Control**

There are several wildlife management/vertebrate pest control actions that occur on Fort Drum (e.g., wildlife surveys, fish stocking, etc.), but four have been identified to have some potential to impact Indiana bats: bat management, beaver management, Bird Air Strike Hazard management, and vertebrate pest control.

See Section 2.7 of the BA for additional information.

### Conservation Measures

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

In addition to the conservation measures that will always be followed above, the Army considers the following activities as optional and will attempt to implement whenever possible to further minimize impacts.

1. **Bat Houses.** One large bat structure has been successfully installed and utilized near LeRay Mansion. Bat houses may be erected nearby to provide alternate roosting opportunities for excluded 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.

#### Triggers for additional consultation

Proposed wildlife management project does not meet descriptions provided in BA or conservation measures cannot be followed (standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16).

### **F. Outdoor Recreation**

Various outdoor recreational activities occur on Fort Drum, both in the Training Area and the Cantonment Area. In general, activities in the Training Area and hunting and fishing on the entire installation are administered by the Army's Fish and Wildlife Management Program; activities in the Cantonment Area are administered by the Directorate of Morale, Welfare, and Recreation. Approximately 3,000 recreational permits are issued per year for hunting, fishing, trapping, wildlife viewing, and other recreational activities on Fort Drum (2,805 permits were issued in FY07). Recreation permits are required only to recreate in the Training Area or hunt and fish in the Cantonment Area.

The following recreational activities occur on Fort Drum: hunting; fishing; boating (including canoeing and kayaking); trapping; camping; target and skeet shooting; wildlife viewing and/or photography; harvesting berries, mushrooms, ramps/leeks, asparagus, and/or rhubarb; picnicking; hiking; geocaching; dog walking and training; cross country skiing; snowshoeing; biking; snowmobiling (only in Training Areas 7E, 7F, and 7G); ATV riding (only on designated recreational roads in Training Areas 7E, 7F, 7G); horseback riding; and paintball.

Only three recreational activities have been identified as having potential impacts to the Indiana bat: hunting, skeet shooting, and ATV use. The remaining activities are anticipated to have no known direct or indirect effects to Indiana bats.

See Section 2.8 of the BA for additional information.

#### Conservation Measures

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.

### Triggers for additional consultation

Proposed outdoor recreation project does not meet descriptions provided in BA or conservation measures cannot be followed (standard reinitiation criteria remain in effect pursuant to 50 CFR 402.16).

### **Literature Cited**

Tuttle, M., and J. Kennedy. 2002. Thermal requirements during hibernation. Pages 68-78 *in* A. Kurta, and J. Kennedy, editors. *The Indiana Bat: Biology and Management of an Endangered Species*. Bat Conservation International, Austin, TX.

U.S. Army. 2005. *Integrated Wildland Fire Management Plan*. Fort Drum Directorate of Emergency Services. Fort Drum, NY. 75pp.

## **APPENDIX B**

U.S. Fish and Wildlife Service. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp. - *Provided electronically.*