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Enclosure 1

Indiana Bat Roost Tree Survey Study Plan

Indiana Bat (*Myotis sodalis*)  
Roost Tree Survey Study Plan  
Proposed Bell Bend NPP Site  
Luzerne County, Pennsylvania



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## BBNPP Roost Tree Survey Study Plan

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### INTRODUCTION

Normandeu Associates, Inc. (Normandeu) proposes to conduct a quantitative in-field survey for suitable Indiana bat (*Myotis sodalis*) roost trees within the forested areas proposed to be impacted by construction of the Bell Bend Nuclear Power Plant (BBNPP). The objective is to determine the density and quality of Indiana bat roosting habitat provided by these areas.

Neither the U.S. Fish and Wildlife Service (USFWS) nor the Pennsylvania Game Commission (PGC) has an official Indiana bat roost tree survey methodology. Therefore, our survey techniques will be based on this site-specific protocol. Each contiguous forest block proposed for clearing will be described with respect to species composition, age, structure and other measures used to judge habitat quality for Indiana bats as described under field measurements in the methodology section below. The habitat assessment will be based on density and quality of suitable roost trees and evaluation of forest stands.

### SITE DESCRIPTION

BBNPP is proposed to be sited adjacent to the Susquehanna Steam Electric Station (SSES) in Salem Township, Luzerne County, Pennsylvania. Potential areas of disturbance associated with BBNPP will extend across 703 acres (1.10 mile<sup>2</sup>) within the 1,991-acre (3.1 mile<sup>2</sup>) BBNPP Project Site (Figure 1). The site terrain is variable and ranges from steeply sloping hills in the north and west to the relatively level floodplain of the Susquehanna Riverlands in the east. The net topographic relief is approximately 560 feet. There are approximately 238 acres (228.45 upland versus 9.34 wetland) of forested habitat proposed to be impacted by construction of BBNPP that will be analyzed as part of this roost tree habitat evaluation.

### INDIANA BAT SUMMER HABITAT

The following section is provided as background information for our survey plan and was summarized from The U.S. Fish and Wildlife Service Draft Recovery Plan For The Indiana Bat (USFWS 2007).

#### Female Summer Roosts

Reproductive female Indiana bats migrate from the hibernacula to summer roosting habitat, and have shown strong site fidelity to their traditional summer roosting and foraging areas. They form maternity colonies after arriving at their summer range (late March to mid-May) and cluster in maternity roosts with suitable microclimates that facilitate roost temperatures favorable for prenatal and postnatal development. Maternity colonies most commonly consist of 60 to 100 adult females but may be larger, and may include females from more than one hibernaculum. Composition of the colony is fluid with females moving between as many as 10 to 20 different maternity roost trees. The majority of female bats use one to three primary maternity roost trees, while the rest of the trees are alternate or secondary maternity roosts that are intermittently used by small numbers of females throughout the summer, or on only a few days, or as temporary night roosts.

Maternity colonies may occupy maternity roost trees for a number of years; however all maternity roost trees are ephemeral and become unusable by losing important structural characteristics such as bark, falling to the ground or due to competition with other animals. The use of alternate maternity roost trees is thought to be a behavioral mechanism that enables bats to evaluate new trees for use as future primary maternity roosts.

Summer roosting habitat for non-reproductive female Indiana bats is less well known. They may remain close to their hibernaculum or migrate to summer habitat where they roost individually or in small numbers.

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Typically, non-reproductive females do not roost in colonies but may be present in the same trees as reproductive females.

### **Male Summer Roosts**

Summer roosting habitat for male Indiana bats also is not well known. Males are most commonly found in the vicinity of their hibernaculum but may also disperse throughout the summer range and roost individually or in small numbers.

### **Characteristics of Roost Trees**

Indiana bats roost under the exfoliating bark of trees and occasionally in longitudinal crevices within trees; however, they rarely use cavities created by rot or woodpeckers. For maternity roosts (primary and alternate), females prefer dead or nearly dead trees, or dead parts of living trees such as dead trunks of trees with multiple trunks. They are occasionally found on living trees with loose peeling bark; however, these trees are thought to be used primarily as alternate maternity roosts during exceptionally warm or wet weather. A wide variety of tree species are used for maternity roosts and use is primarily related to local availability of trees with suitable structure rather than a preference for a particular species. In addition, regional differences in maternity roost tree characteristics may result from influencing factors such as weather and altitude.

Maternity roost trees are typically found in areas with high solar exposure such as openings within a forest, in a fence line, or along a wooded edge. Female Indiana bats may use structurally suitable trees in more interior sections of forest as maternity roosts during exceptionally warm or wet weather. Sizes of maternity roost trees vary, although larger diameter trees are preferred and may provide thermal advantages as well as more roosting spaces. The average range wide diameter of primary maternity roost trees is 18-inches. However, average diameters of primary and alternate maternity roost trees in several Midwestern states ranged from 16-inches to 24-inches, and an alternate maternity roost tree in Pennsylvania had a diameter of only 11-inches. The minimum height of maternity roost trees is typically greater than 10-feet, although the absolute height of maternity roost trees is thought to be less important than height and position relative to surrounding trees, which can affect the amount of solar exposure received by a tree.

Male Indiana bats are more flexible in their preferred summer roosting habitat. They roost in the same types of structurally suitable trees as females but not necessarily in areas with high solar exposure. In addition, male bats are more likely to roost in living trees and trees that are smaller since the average range wide diameter of male roost trees is 13-inches.

Based upon the research presented in USFWS 2007, female Indiana bat maternity roost trees (primary and alternate) are typically 11 inches in diameter at breast height (dbh) or greater, 10 feet in height or greater, dead with exfoliating, peeling or loose bark, and/or crevices. Primary roosts are situated in areas with high solar exposure and receive direct sunlight for more than half the day. Alternate roost trees may have a lower level of solar exposure. Trees with less than 10% live canopy will be considered dead to be consistent with USFWS "Forest Management Practices for Conserving Indiana Bats".

Male Indiana bat roost trees will encompass live and dead trees that have exfoliating, peeling or loose bark, and/or crevices with a 5 inch or greater dbh, regardless of their solar exposure. The 5-inch dbh criterion is used for consistency with USFWS guidance regarding tree cutting within the range of the Indiana bat during its summer roosting period, which is currently followed on adjacent SSES properties.

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### **SURVEY METHODOLOGY**

Proposed forest clearing on the BBNPP site may result in the loss of potential Indiana bat foraging and roosting habitat, as well as changes to the thermal regime of the remaining forest habitat. Normandeau proposes to conduct a survey of contiguous forest blocks proposed for clearing at the BBNPP site to determine the distribution, density and quality of Indiana bat roost trees (Figure 2). Our survey is intended to estimate the quality of roosting habitat in the forest proposed for clearing, and is not intended to inventory all potential roost trees present at the BBNPP site. Normandeau will survey both the edges and interiors of these forest habitats for the presence and quality of roost trees as defined above.

Mist-net surveys have not documented summer/maternity colony use of the site, although mist-netting effort was lower than recommended. Roosting and foraging by bats in the fall is the primary focus because three Indiana bat hibernacula occur near the BBNPP site. In addition, summer roosting by male Indiana bats is likely. Therefore, the roost tree assessment will focus on roosting habitat for Indiana bats during their active season (spring, summer, and fall).

#### **Forest Edges**

Normandeau biologists will inspect the onsite edges of all forested areas proposed for clearing and evaluate all potential roost trees within a distance of 50-feet of the forest edge. The 50-foot margin has been used in published scientific studies and represents a conservative boundary for identifying potential roost trees along a forest edge that are likely to receive increased solar radiation relative to trees located in more interior sections of a forest. The positions of potential roost trees will be located using a Global Positioning System (GPS) with a sub-meter level of accuracy. A single GPS location will be taken at the center of clumps or otherwise closely associated groups of suitable roost trees. Field measurements of roost tree characteristics as described below will be recorded in digital or hardcopy format.

#### **Forest Interiors**

Normandeau will survey all contiguous forest blocks of approximately 2 acres or greater (18 total) proposed for clearing for the quality and density of Indiana bat roosting habitat. Forest blocks will be surveyed at the rate of one 100-ft radius sample plot per 5 acres or fraction thereof. There are 10 forest blocks between 2 acres and 10 acres in size and some 8 forest blocks greater than 10 acres in size. Additional plots will be located within forest blocks to insure that our sampling is representative of all forest habitats present, particularly forested wetlands. Each forest block and will be evaluated for potential roost trees. We will also characterize the overall vegetation community according to species composition, age, structure and other measures of habitat quality for Indiana bats as described under field measurements below. The center of each interior forest plot will be located with a sub-meter level GPS and data will be recorded in digital or hardcopy format.

#### **Field Measurements**

All trees in surveyed areas will be evaluated for suitability as roosts. The following information will be recorded for each potential roost tree: 1) species, 2) dbh, 3) roost tree condition (live, dead, or partially dead), 4) type of roost structure(s) (bark, crevice, and/or cavity), 5) date, 6) surveyor, and 7) sampling location (GPS coordinates). Field measurements are explained in more detail below. All measurements are for roost trees only, except in the forest interior plots where species identification and dbh will also be measured for the purpose of general categorization of the forest cover in each block.

1) Species identification: All trees will be identified to species. Dead trees and snags that are too far decayed for identification will be designated as unknown.

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- 2) Diameter at breast height (dbh): The dbh of each roost tree be measured to the nearest inch using a Biltmore stick, diameter tape or similar measuring device. For the purpose of categorizing the general forest cover, the minimum, maximum and average dbh will be measured in a similar manner from representative sub-samples of the trees in each of the forest interior plots.
- 3) Roost Tree Condition: (Live, dead, or partially dead): Trees designated as live will be healthy in appearance and have more than 80% live canopy. Trees designated as dead will encompass snags and trees with less than 10% live canopy. Trees designated as partially dead will have 10-80% live canopy.
- 4) Type of roost structure: The type(s) of roost structure on the tree will be identified as bark (exfoliating or defoliating bark), crevice, or cavity.
- 5) Date: The date of the survey will be recorded as MMDDYYYY.
- 6) Surveyor: The name of the person who identified the tree to species, measured dbh and classified attributes 3-5 and 7 will be recorded. If more than one person contributes to the data, then a lead and assistants will be identified for each line of data.
- 7) Sampling location (GPS coordinates): The latitude and longitude of the base of each roost tree will be recorded using a sub-meter GPS. The datum and coordinate system will be chosen to coordinate with existing survey information for the BBNPP site.

### **Roost tree characterization**

Trees will be categorized as having a “high”, “moderate”, or “low” potential for serving as a roost tree for Indiana bats.

High – Live, dead, and partially dead trees that are  $\geq 16$ ” dbh and have roost structure.

Medium – Live, dead, and partially dead trees that are 9 to 15” dbh and have roost structure.

Low – Live, dead, and partially dead trees that are 5 to 8” dbh and have roost structure.

### **DATA ANALYSIS AND REPORT**

Normandeau will prepare a report that summarizes the study findings. Roost tree identity, dbh, attribute data and rank as described above will be tabulated and presented by forest block. Our report will include a written discussion of the on-site forest characteristics as they pertain to the quality of the roosting habitat, as well as tabular summaries of data for forest edges and interior forest plots, maps showing the locations of vegetation plots and potential roosting habitat, and representative photographs of forest edges, interior forest sample plots and suitable roost trees.

### **REFERENCES**

- Menzel, M.A., J. Menzel, T. Carter, W. Ford, J. Edwards. 2001. Review of the Forest Habitat Relationships of the Indiana bat (*Myotis sodalis*). U.S. Department of Agriculture Forest Service Northeastern Research Station General Technical Report NE-284. 21 pp.
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USFWS, 2007. 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.

USFWS, undated. Forest Management Practices for Conserving Indiana Bats. 2pp.

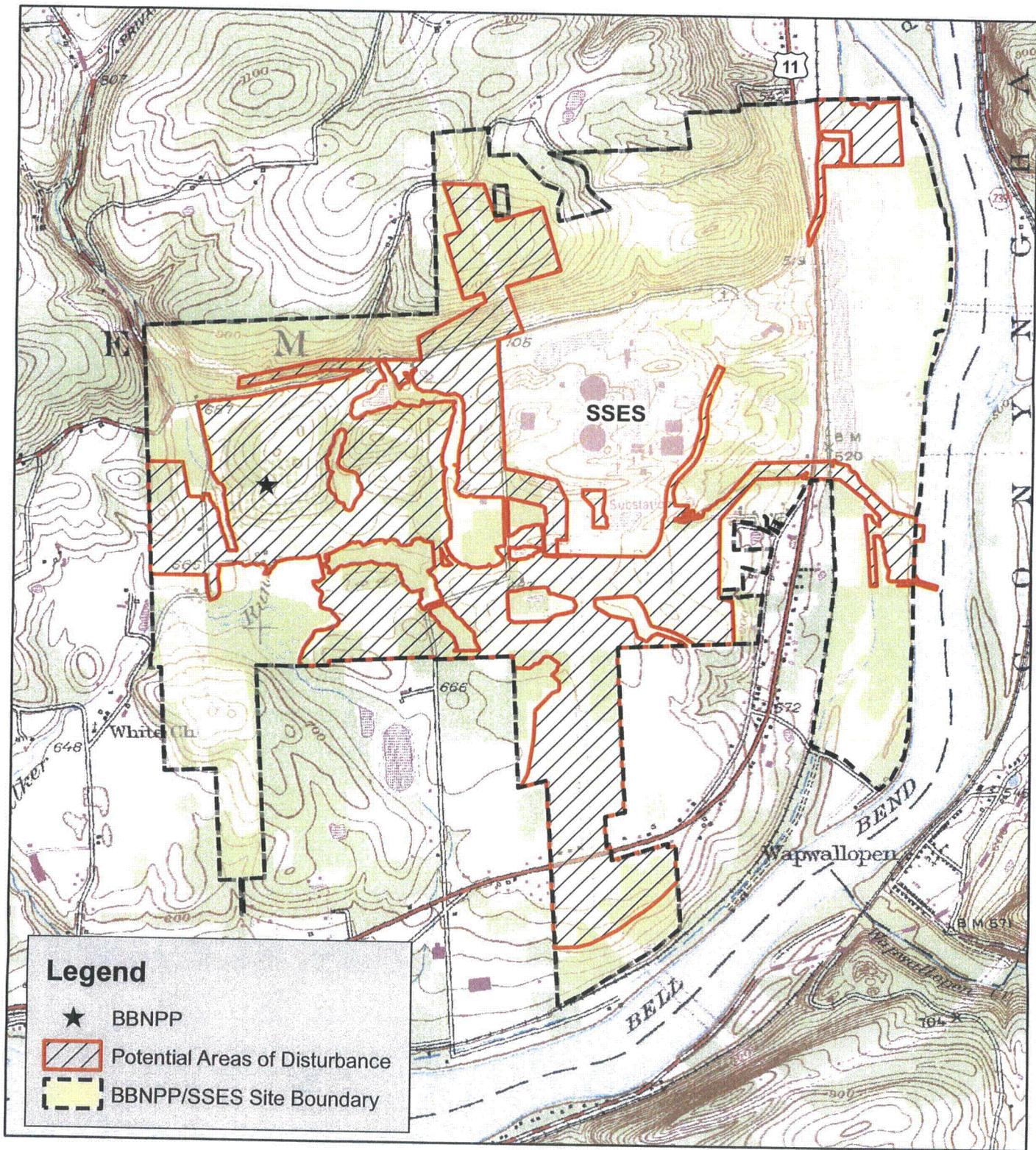


Figure 1.  
**Bell Bend NPP**  
**Site Location Map**



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date: 07/27/10  
 prepared by: s.sherman  
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rev. date:  
 prepared for: b.lees  
 file name: Figure1.BBNPP\_Site\_USGS

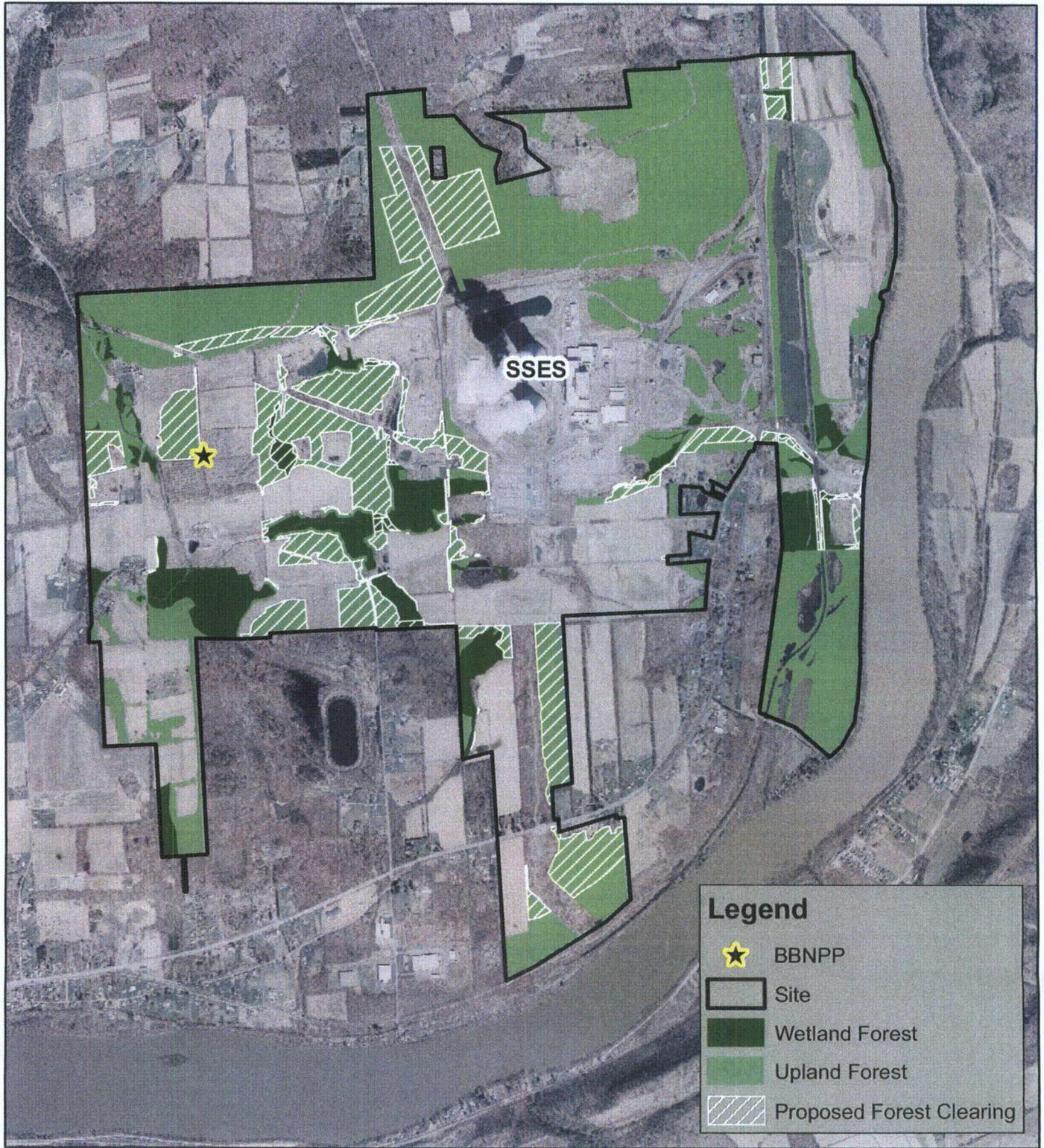


Figure 2.  
**BBNPP Proposed Forest Clearing**



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rev. date:  
 prepared for: k.maurice  
 file name: Figure2.Proposed Forest Clearing