

Bell Bend NPP Roost Tree Study Report



Photo 6. Forest Area 13 – This live shagbark hickory was considered a roost tree with high potential as it was greater than 16 inches dbh and had a large percentage of exfoliating bark.



Photo 7. Forest Area 13 – Close-up of shagbark hickory with a high potential for use as a roost tree and with exfoliating bark visible.

Appendix D

Calculation Sheet for Indiana Bat Habitat Compensation

**CALCULATION SHEET FOR
INDIANA BAT HABITAT COMPENSATION
(revised 5/17/12)**

USFWS Project # 2009-0501 Date August 27, 2012
 Project Name: PPL Bell Bend Nuclear Power Plant
 Project Location (township and county): Salem Township, Luzerne County, PA
 Project Type: Nuclear Plant license DEP permit # NA
 Hibernaculum and/or Maternity Colony Affected: Glen Lyon, Dogtown Mines, Penn Wind 9

Table 1. Calculation of Compensation Acres

IMPACT TYPE	IMPACT ACRES	MULTIPLIER ¹	COMPENSATION ACRES
Summer Habitat Loss²			
Known maternity habitat	0	1.5	
Known non-maternity habitat	0	1.0	
Potential habitat ³	0	0.5	
Swarming Habitat Loss⁴			
P2 or P3	0	1.5	
P4	363	1.0	363
Overlapping Habitat Loss⁵			
Known maternity and swarming habitat occur together: choose highest multiplier from above (maternity or swarming) for the impact, and add 1.0 to the multiplier	0		

¹ Multiplier provides for a PARTIAL offset of habitat impacts and assumes permanent habitat protection will occur in accordance with the *Indiana Bat Mitigation Guidance for Pennsylvania*. A substantially higher multiplier would be needed to fully offset habitat impacts.

² Loss of known summer habitat assumes such loss will occur when bats are NOT present (i.e., between October 15 and March 31).

³ For coal mining projects having forest impacts ≥ 40 acres, applicants can either conduct mist-net surveys in accordance with the Service's survey guidelines OR assume presence of Indiana bats. When assuming presence, a seasonal restriction will apply, along with a 0.5:1 compensation ratio for forest impacts. Non-coal projects are evaluated on a case-by-case basis.

⁴ Swarming habitat is suitable habitat in the vicinity of an Indiana bat hibernaculum (generally 10-20 miles). Loss of swarming habitat assumes such loss will occur when bats are NOT present (i.e., between November 15 and March 31).

⁵ Loss of summer and swarming habitat assumes such loss will occur when bats are NOT present (i.e., between October 15 and March 31).

Table 2. Calculation of Deposit when using the Indiana Bat Conservation Fund

Location of Impact (County)	Compensation Acres (from Table 1)	Cost/Acre ⁶	IBCF Deposit ⁷
Adams		TBD	
Armstrong/Butler		\$2,060	
Beaver/Lawrence		\$2,320	
Bedford		TBD	
Berks		TBD	
Blair		TBD	
Centre		TBD	
Fayette		\$1,519	
Greene		\$1,223	
Huntingdon		TBD	
Luzerne	363	\$3,716	\$1,348,908
Mifflin		TBD	
Pike		\$8,100	
Somerset		\$2,247	
Washington		\$2,760	
York		TBD	
Other areas (not listed above)		TBD	

NOTE: Deposits to the IBCF are due prior to permit issuance. Provide documentation of the deposit to the USFWS and the permitting agency (*e.g.*, PA DEP). An escrow account has been set up at the following institution to receive IBCF deposits.⁸

First Commonwealth Bank – Trust Division
 Attn: Brenda Alabran
 614 Philadelphia Street
 P.O. Box 698
 Indiana, Pennsylvania 15701
 724-463-6580 (phone)

Designate the deposit for: Indiana Bat Conservation Fund (Acct #710621004)

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 USFWS USE ONLY

Recovery Focus Area to be credited: _____

⁶ Cost/acre subject to change, based on a periodic re-evaluation of land comparable values by the Pennsylvania Game Commission. Cost per acre reflects land cost per acre, plus 20% for expenses associated with land acquisition (*e.g.*, comparable values search, title search, transfer taxes, land survey, recording fees, *etc.*).

⁷ Multiply the number of Compensation Acres by the Cost/Acre to determine the amount to be submitted to the Indiana Bat Conservation Fund.

⁸ If you choose to set up an escrow account at another institution, do so in coordination with the Pennsylvania Game Commission.

Appendix E

Resource Management Plan for Reforestation, Natural Succession and Habitat Conservation Lands

APPENDIX E

RESOURCE MANAGEMENT PLAN FOR REFORESTATION, NATURAL SUCCESSION AND HABITAT CONSERVATION LANDS

1. Purpose

This plan addresses the resource management actions that would be undertaken in the event that the alternative mitigation plan consisting of reforestation, natural succession, and habitat conservation is implemented by PPL.

2. Reforestation Specifications

Reforestation will involve planting select species of trees on designated land within the BBNPP Project Boundary that has been cleared during construction of BBNPP and/or on adjacent PPL-owned land that is not currently forested and is suitable for forest habitat. Approximately 58 acres (24 ha) are proposed for reforestation within or adjacent to the BBNPP Project Boundary (see Figure 7 in BEMP). Included in the 58 acres (24 ha) are approximately 10 acres (4 ha) on which forested wetland creation will occur as part of restoration of Walker Run. Once implemented, reforestation is expected to provide forested migration corridors along the north-south oriented riparian corridors associated with the Susquehanna River and Walker Run and potential Indiana bat foraging and roosting habitat of varying stages of succession.

Reforestation efforts will be planned and carried-out in consultation with the USFWS and PDCNR Bureau of Forestry. Additional sources of technical information that may be used in reforesting disturbed lands include the Forest Reclamation Advisories published by the Appalachian Regional Reforestation Initiative (USDOJ, 2010). Site preparation and replanting will be based on a site specific planting plan developed based on guidance provided in the June 1, 2010 meeting with the USFWS and the USDOJ's Range-wide Indiana Bat Protection and Enhancement Plan Guidelines (USDOJ, 2009). The proposed specifications are listed below:

- 1) Saplings, groundcover and other vegetation will be planted in conformance with detailed specifications prepared by an experienced forester or restoration professional. Saplings will also be planted in a non-uniform pattern that resembles natural tree distribution within a forest. The following specific USFWS requirements for replanting will be adopted:
 - a. A minimum of six different species from the "Tree Species List for Indiana Bat Protection and Enhancement Plans" will be selected (species selection should be determined by site-specific characteristics such as soil moisture, sun exposure, etc. and seedling availability) (USDOJ, 2009).
 - b. A minimum of four species identified as "exfoliating bark species" will be planted and equal at least 40 per cent, or 160 live woody stems, of a minimum of 400 live woody stems per acre. Tree species should be planted at approximately equal rates. The

- remaining 60% of the minimum stems per acre may come from any of the tree categories in the species list with no more than 20% of the total consisting of one tree species.
- c. Black locust (*Robinia pseudoacacia*) will comprise no more than 50 stems per acre.
 - d. Herbaceous ground cover will be native to the ecosystem, compatible with tree planting, non-invasive, slow-growing, and beneficial to wildlife.
- 3) Low compaction grading techniques will be used to increase the survival rate of planted trees.
 - 4) Saplings will be protected from browsing by white-tailed deer (*Odocoileus virginianus*) and other wildlife using methods such as tree tubes or deer fencing (Curtis et al, 2001; Vercauteren et al., 2006).
 - 5) Plantings may be done in stages over multiple consecutive growing seasons. PPL will contract ahead of time with local and regional nurseries (contract growing) to ensure that an adequate supply of the required species will be available for planting and, where feasible, enable locally adapted trees to be used as the seed source.

3 Monitoring and Management of Reforested Lands

A monitoring and management plan will be implemented for fifteen years after planting to ensure effectiveness of mitigation, presence of appropriate vegetation and documentation of use by native wildlife (vertebrate and invertebrate species). Monitoring will occur on an annual basis for the first five years and then once every five years for a maximum of fifteen years from planting. Monitoring will be conducted by a biologist to ensure that reforestation is occurring in a manner consistent with the intended purpose (optimal habitat for Indiana bat). Annual reports with photo documentation will be submitted to the USFWS with the first annual report to be used as the baseline for evaluation of future success. These annual reports will include:

- Survival rates of planted vegetation,
- Identity and quantity of colonization by native vegetation for overall survival and percent native ground cover over time,
- Plant species diversity,
- Assessment of damage to saplings by deer or other wildlife, and
- Identity and quantity of invasive plant species.

The vegetation monitored will be sampled for species frequency and percent cover. Plantings will be considered successful if survival is at least 80% (350 stems/acre) during each monitoring event and maintained for fifteen years. Volunteer woody stems will be included in the survival counts if species, age and condition are similar to planted stems. Species diversity must consist

of a minimum of nine species in each planting area with individual species consisting of no more than 20% of 350 stems. A minimum of 20% of surviving seedlings should consist of species known to be used by Indiana bat as roost trees. Should success metrics not be attained, then supplemental plantings shall occur to achieve these metrics.

If deer or other pests are determined to be the cause of loss of native saplings, shrubs or herbaceous ground cover, then additional protective measures such as tree tubes, fencing or organic pesticides must be undertaken.

If invasive plant species become established, then efforts to remove or control these species must be undertaken. The inspector will make recommendations to PPL on species-specific control methods for known problem plants identified in these areas. Removal and control methods will consist of hand or mechanical removal and/or use of organic herbicides only.

Following the initial fifteen year monitoring period the reforested lands will be managed in accordance with the requirements of Section 5 of this plan.

4. Monitoring and Management of Natural Succession Lands

Natural succession will be allowed to occur on agricultural lands within the BBNPP Project Boundary as well as adjacent PPL-owned properties on the eastern side of the Susquehanna River (see Figure 7 in the BEMP). Approximately 137 acres (55 ha) are proposed for natural succession within or adjacent to the BBNPP Project Boundary. Natural succession is expected to supplement reforestation by protecting forested migration corridors along the north-south oriented riparian corridors associated with the Susquehanna River and Walker Run and potential Indiana bat foraging and roosting habitat of varying stages of succession.

As with reforestation lands, a monitoring and management plan will be implemented for fifteen years after natural succession is allowed to occur to ensure effectiveness of mitigation, presence of appropriate vegetation and documentation of use by native wildlife (vertebrate and invertebrate species). Monitoring will occur on an annual basis for the first five years and then once every five years for a maximum of fifteen years from planting. Monitoring will be conducted by a biologist to ensure that natural succession is occurring in a manner consistent with the intended purpose (optimal habitat for Indiana bat). Annual reports with photo documentation will be submitted to the USFWS with the first annual report to be used as the baseline for future success. These annual reports will include:

- Identity and quantity of colonization by native vegetation for overall density of native ground cover over time,
- Plant species diversity,
- Assessment of damage to saplings by deer or other wildlife, and
- Rate and quantity of invasive plant species.

The vegetation monitored will be sampled for species identity and percent cover during each monitoring event and maintained for fifteen years. Natural succession will be considered successful if species identity and percent cover are representative of native vegetation viable as Indiana bat habitat. Species diversity must consist of a minimum of nine species known to be used by Indiana bat as roost trees in each natural succession area. Should success metrics not be attained, then supplemental plantings shall occur to achieve these metrics.

If deer or other pests are determined to be the cause of loss of native saplings, shrubs or herbaceous ground cover, then additional protective measures such as tree tubes, fencing or organic pesticides shall be undertaken.

If invasive plant species become established, then efforts to remove or control these species must be undertaken. The inspector will make recommendations to PPL on species-specific control methods for known problem plants identified in these areas. Removal and control methods will consist of hand or mechanical removal and/or use of organic herbicides only.

Following the initial fifteen year monitoring period the reforested lands will be managed in accordance with the requirements of Section 5 of this plan.

5 Management Guidelines for Habitat Conservation Lands

Habitat conservation is being proposed in conjunction with reforestation and natural succession to further mitigate for the loss of habitat on site, since it may take many years for forested areas that have been cleared to provide habitat characteristics supporting Indiana bat life cycle requirements.

PPL has identified 386 acres (156 ha) of currently forested land within the BBNPP Project Boundary and adjacent PPL-owned lands that are similar to the habitat that is being lost and suitable for habitat conservation (Figure 7 in BEMP). Approximately 122 acres (49 ha) of existing forest is proposed for habitat conservation within the defined 1,500-foot (457-meter) corridor along Walker Run, and 264 acres (107 ha) within the defined 1,500-foot (457-meter) corridor along the Susquehanna River. Following completion of an initial fifteen year monitoring period for reforested and natural succession lands, these lands will also be subject to the habitat conservation practices as outlined below.

Commencing with the initiation of construction activities based on the construction phasing schedule (Appendix B), PPL proposes to implement passive habitat management practices on all lands (existing forested lands) proposed for habitat conservation following suggested USFWS forest management guidelines. The implementation of these guidelines is intended to result in the establishment of optimal habitat and consider the Indiana bat's needs for foraging and roosting habitat to survive and successfully reproduce.

The following forest management plan guidelines will be followed to conserve and enhance Indiana bat habitat within the forest conservation areas proposed in this mitigation plan:

1. Commercial timber harvesting shall not be permitted. Tree harvesting may be conducted to preserve or improve habitat in case of pest infestation or disease.
2. Tree cutting shall not occur between April 1 and November 15 except to protect human health and safety or comply with the FERC Standards of Transmission Reliability. This corresponds to the Indiana bat reproductive and spring/fall emergence and swarming seasons. Individual trees which represent a potential safety risk may be removed in accordance with the PPL Danger Tree Removal Policy (see Section 6.1 in the BEMP).
3. No timber stand improvement activities shall be permitted within 100 feet of perennial streams or 50 feet of intermittent or ephemeral streams to provide riparian buffer zone protection.
4. Selective thinning may be undertaken to decrease canopy cover in densely stocked forested stands, but at least 60% of the canopy closure shall be retained.
5. All snags will be retained, except where they pose a safety hazard due to their location near a building, yard, road, or power line ROW. Trees with less than 10% live canopy shall be considered snags.
6. The following species of trees in each forest stand will be identified, and protected, to enhance Indiana bat habitat. These trees have been identified as having relatively high value as potential Indiana bat roost trees:

○ shagbark hickory (<i>Carya ovata</i>) ○ mockernut hickory (<i>Carya tomentosa</i>) ○ other hickories (<i>Carya</i> spp.) ○ sugar maple (<i>Acer saccharum</i>) ○ green ash (<i>Fraxinus pennsylvanica</i>) ○ eastern cottonwood (<i>Populus deltoides</i>) ○ scarlet oak (<i>Quercus coccinea</i>) ○ white oak (<i>Quercus alba</i>) ○ slippery elm (<i>Ulmus rubra</i>) ○ black locust (<i>Robinia pseudoacacia</i>)	○ bitternut hickory (<i>Carya cordiformis</i>) ○ pignut hickory (<i>Carya glabra</i>) ○ silver maple (<i>Acer saccharinum</i>) ○ red maple (<i>Acer rubrum</i>) ○ white ash (<i>Fraxinus americana</i>) ○ northern red oak (<i>Quercus rubra</i>) ○ black oak (<i>Quercus velutina</i>) ○ chestnut oak (<i>Quercus prinus</i>) ○ American elm (<i>Ulmus americana</i>)
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This list is based on review of literature (Carter, 2003; Gardener, 1991; USDOl, 2009) and data on Indiana bat roosting requirements. Other species may be added as they are identified. Other tree species with exfoliating bark, crevices or cavities could also serve as potential roost trees.

7. PPL will ensure that all PPL personnel and contractors working in or near forest conservation areas are made aware of the limits and restrictions of these forest management guidelines.