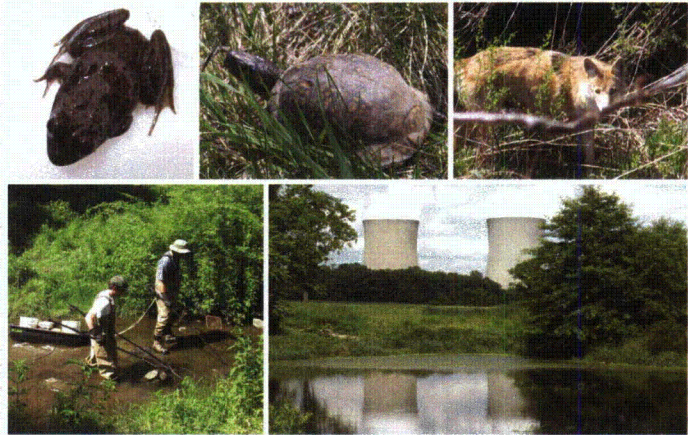


Final

A Field Survey of Plant Communities at the
Proposed Bell Bend Nuclear Power Plant Site,
Luzerne County, Pennsylvania



Submitted to:
AREVA NP, Inc.
Marlborough, MA

Rev. 6
September 2011

A Field Survey of Plant Communities at the
Proposed Bell Bend Nuclear Power Plant
Site, Luzerne County, Pennsylvania

Revision 6

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September 2011

**A Field Survey of Plant Communities at the Proposed Bell Bend Nuclear
Power Plant Site, Luzerne County, Pennsylvania**

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Record of Revisions

Revision	Date	Pages/Sections Changed	Brief Description
000	September 2008	All	Initial release
001	July 2009	Title Page	Title
001		Table 1	Deleted stiff goldenrod (<i>Solidago rigida</i>)
002	July 2010	Title Page	Title
002		Page 2	Introduction-survey area
002		Page 3	Methods-updated to reflect additional 2010 field survey for Plot Plan Change
002		Page 3	Site Description-revised to reflect Plot Plan Change
002		Table 1	Added new plant species
002		Figure 1	Revised site boundary and added limit of disturbance to site location map
002		Figure 2	Revised site boundary, added field survey boundary to aerial photograph, and moved location of BBNPP to reflect Plot Plan Change
002		Figure 3	Added new plant communities within revised site boundary associated with Plot Plan Change
003	August 2010	Page 2	Modified text in regard to additional field surveys
003		Page 3	Included additional description of sampling methodology
003		Page 7	Modified text in regard to invasive species and added mile-a-minute weed
004	October 2010	Figures	All Figures were revised to include the modified BBNPP Project Boundary and Figure 3 was revised to include changes to wetland boundaries
004		References	AREVA 2010 reference updated to include most recent revision of document
005	November 2010	Figure 3	Revised wetland boundaries to reflect the wetland boundaries that had been determined prior to the 2 nd JD walk-through
005		Table 1	Modified title to reflect name change to BBNPP Project Boundary
005		Page 6	Revised stream name to conform with response to RAI AE 2.3-1
005		Pages 2 and 6	Modified text to reflect project boundary name change
006	September 2011	Title page	Updated submission date and revision number

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Revision	Date	Pages/Sections Changed	Brief Description
006		TOC	Updated page numbers
006		Page 3	Updated text to indicate additional field surveys during July 2011
006		Page 4	Revised text to include July 2011 sampling period and revised the potential area of disturbance
006		Page 9	Updated text to include most recent information regarding agency correspondence
006		Figures	Revised BBNPP Project Boundary per changes related to disposal of excess cut material and updated data layers to correspond with revised BBNPP Project Boundary
006		Table 1	Revised to include additional species and added footnote
006		Appendix B	Updated to include letter from PDCNR and submission date of USFWS letter
006		References	Added reference for PDCNR 2010 letter and updated AREVA reference to 2011 revision 7.

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INTRODUCTION

Bell Bend Nuclear Power Plant (BBNPP) is proposed to be sited adjacent to the Susquehanna Steam Electric Station in Salem Township, Luzerne County, Pennsylvania (Figure 1). Normandeau Associates, Inc. was contracted by AREVA NP, Inc. to map the terrestrial plant communities within and adjacent to potential areas of disturbance within the BBNPP Project Boundary (herein referred to as the BBNPP Site). Potential areas of disturbance are illustrated in Figure 1. The actual field survey area that bounds potential areas of disturbance is displayed in Figure 2.

Field studies of new parcels were performed in 2011 to supplement the ecological survey data previously obtained and reported in the prior revision of this report. This revision includes the new data as well as previously reported information.

Personnel

This survey was coordinated by Project Manager Paul Harmon and Principal Ecologist Robert Blye. Field work was accomplished by Normandeau biologists Elizabeth Garlo, Jayme Schaeffer, Chris Roche and Keith Maurice. Dr. James Montgomery of Ecology III, Inc. also participated in the field work and provided technical assistance. Keith Maurice prepared the report.

METHODS

Mapping of terrestrial plant communities was initiated by a review of relevant literature and readily available natural resources mapping in order to anticipate the distribution of plant communities across the site. References consulted included the Natural Resources Conservation Service Luzerne County Soil Survey, National Wetlands Inventory mapping, aerial photography and

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information on plant species of special concern.

Field mapping within the survey area (Figure 2) took place during the period of July 2007 through August 2008, April to June 2010, and July 2011 in combination with wetlands delineation field studies. Wetlands and uplands plant communities were extensively surveyed and documented during these time periods.

Additional botanical field studies consisting of observational meander surveys were conducted during July and August 2008 to ensure that all plant communities onsite were thoroughly investigated and to inventory any plant species that weren't previously documented during the wetlands delineations. No new types of wetlands or uplands habitats were encountered during the April to June 2010 or July 2011 delineation field studies. Therefore, no additional botanical studies were conducted. Documentation of the plant communities included an inventory of common plant species and representative photographs.

Mapping of plant communities outside of the survey area was based upon existing natural resource mapping references, as noted above, and were not field verified.

SITE DESCRIPTION

Areas of disturbance associated with BBNPP include 687 acres (1.1 miles²) of property adjacent to SSES (Figure 1). The terrain is variable and ranges from steeply sloping hills in the west to the relatively level floodplain of the Susquehanna Riverlands in the east. Net topographic relief is approximately 400 feet.

Land uses consist largely of cropland in use for the production of corn and hay and fallow farmland including an abandoned orchard and deciduous forest. Prominent hydrologic features include the Susquehanna River, Walker Run, the North Branch Canal, several former farm ponds and a beaver pond. Man-made features consist of two active gravel quarries, several outlying SSES facilities and

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electric transmission line corridors, and two large soil stockpiles resulting from SSES construction in the 1970s. An aerial view of the site layout is presented in Figure 2.

RESULTS AND DISCUSSION

The Bell Bend Site encompasses large tracts of upland plant communities, wetland plant communities, agricultural land and developed properties including several former gravel quarries (Figure 3). Descriptions of the upland and wetland communities within the survey area are presented in the following sections.

Upland Plant Communities

Old Field/Former Agricultural

Old-field vegetation cover is composed of a variety of grasses and herbaceous plants. During 2007, old-field vegetation extended over much of the fallow farmland in the western section of the site. However, during 2008 some of this habitat was returned to agricultural use for the production of corn. Dominant old field species include daisy fleabane (*Erigeron annuus*), Canada thistle (*Cirsium arvense*), wrinkled goldenrod (*Solidago rugosa*), flat-top fragrant goldenrod (*Euthamia graminifolia*), Canada goldenrod (*Solidago canadensis*), giant foxtail grass (*Setaria faberi*), white heath aster (*Aster pilosus*), lamb's quarters (*Chenopodium album*), red clover (*Trifolium pretense*) and common ragweed (*Ambrosia artemisiifolia*).

Included with this habitat type in Figure 3 is an abandoned apple orchard several acres in size which is located in the vicinity of the proposed location for the power block.

A list of common plant species observed in the BBNPP site is presented in Table 1.

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Upland Scrub/Shrub

Upland shrub habitat occurs mostly along transmission line corridors and in several abandoned farm fields located around the site that are undergoing secondary succession. This community consists primarily of bush honeysuckle (*Lonicera tatarica*), multiflora rose (*Rosa multiflora*), Allegheny blackberry (*Rubus allegheniensis*), and Russian olive (*Elaeagnus angustifolia*).

Upland Deciduous Forest

Upland deciduous forest covers a large portion of the site to the west of Route 11. Common overstory species include northern red oak (*Quercus rubra*), white oak (*Quercus alba*), black cherry (*Prunus serotina*), white ash (*Fraxinus americana*), shagbark hickory (*Carya ovata*), bitternut hickory (*Carya cordiformis*), sweet birch (*Betula lenta*), black walnut (*Juglans nigra*), black locust (*Robinia pseudoacacia*), yellow poplar (*Liriodendron tulipifera*) and red maple (*Acer rubrum*).

Upland forest understories are composed predominantly of spicebush (*Lindera benzoin*), round-leaved greenbrier (*Smilax rotundifolia*), Virginia creeper (*Parthenocissus quinquefolia*) and saplings of overstory species. Groundcover species include may-apple (*Podophyllum peltatum*), garlic mustard (*Allaria petiolata*), hayscented fern (*Dennstedtia punctilobula*), tree clubmoss (*Lycopodium obscurum*), partridge berry (*Mitchella repens*), ground cedar (*Lycopodium tristachyum*) and stilt grass (*Eulalia viminea*).

Wetland Plant Communities

Palustrine Emergent Wetlands

Palustrine emergent wetlands are located throughout the site. A diverse group of

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herbaceous hydrophytic plants is present including soft rush (*Juncus effusus*), sedges (*Carex spp.*), arrow-leaf tearthumb (*Polygonum sagittatum*), common boneset (*Eupatorium perfoliatum*), giant goldenrod (*Solidago gigantea*), seedbox (*Ludwigia alternifolia*), nutsedges (*Cyperus spp.*), blue vervain (*Verbena hastata*), New York ironweed (*Vernonia noveboracensis*), swamp aster (*Aster puniceus*), cut-leaf coneflower (*Rudbeckia laciniata*), broad-leaved cattail (*Typha latifolia*), reed canary grass (*Phalaris arundinacea*) and purple loosestrife (*Lythrum salicaria*).

Palustrine Scrub/Shrub Wetlands

Several large palustrine scrub/shrub wetlands are located immediately southwest of SSES and hydrophytic shrubs are a common component of many wetlands across the BBNPP site. Spicebush is overwhelmingly the most abundant wetland-preferring shrub onsite. Other frequently occurring wetland shrubs are highbush blueberry (*Vaccinium corymbosum*), meadowsweet (*Spiraea latifolia*), alders (*Alnus spp.*), silky dogwood (*Cornus amomum*), arrow-wood (*Viburnum dentatum*) and grey dogwood (*Cornus racemosa*).

Palustrine Forested Wetlands

Palustrine forested wetlands are the principal wetland type in the BBNPP site, and large contiguous blocks of this habitat are associated with Walker Run and its eastern tributary (Unnamed Tributary No. 1). Trees commonly found in forested wetlands onsite include red maple (*Acer rubrum*), silver maple (*Acer saccharinum*) black gum (*Nyssa sylvatica*), pin oak (*Quercus palustris*) and river birch (*Betula nigra*). In addition, upland-preferring species such as white ash and yellow poplar are present on microsites scattered throughout some forested wetlands.

Wetland forest understories are comprised largely of spicebush, highbush

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blueberry, arrow-wood and winterberry (*Ilex verticellata*). Skunk cabbage (*Symplocarpus foetidus*) predominates in the groundcover along with sedges, jewelweed (*Impatiens capensis*), sensitive fern (*Onoclea sensibilis*), clearweed (*Pilea pumila*), cinnamon fern (*Osmunda cinnamomea*), stout woodreed grass (*Cinna arundinacea*), and swamp dewberry (*Rubus hispidus*).

INVASIVE PLANT SPECIES

Non-native invasive plants occur abundantly within particular upland and wetland habitats in the BBNPP site but were not dominant across the site as a whole. Invasive species in wetlands include reed canary grass, purple loosestrife, and common reed (*Phragmites australis*), which are herbaceous plants that commonly colonize emergent wetland habitat. Reed canary grass is a dominant species throughout much of the emergent wetlands onsite and forms monocultures in some areas. Purple loosestrife is moderately abundant and common reed is currently limited to a small area near the southeastern corner. These species will likely colonize additional emergent wetland habitats over time.

Invasive species in uplands include mile-a-minute (*Polygonum perfoliatum*), garlic mustard, stilt grass, multiflora rose and bush honeysuckle. Garlic mustard and stilt grass are herbaceous plants that are very common in the groundcover of upland forests. Multiflora rose and bush honeysuckle are shrubs that occur in dense concentrations in successional old-field habitat and along forest edges. Mile-a-minute was common in the vicinity of the intake structure.

SPECIES OF SPECIAL CONCERN

Information concerning the presence of threatened, endangered, and other special concern plants within a 0.5-mile radius of an area encompassing the site, PPL-owned lands to the north and the Susquehanna Riverlands was requested

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via correspondence submitted 21 December 2007 to the U. S. Fish and Wildlife Service (USFWS) and Pennsylvania Department of Conservation and Natural Resources (PDCNR). USFWS jurisdiction includes flora designated as listed, proposed or candidate under the Federal Endangered Species Act. PDCNR has jurisdiction over flora and natural communities considered to be rare in Pennsylvania. Neither agency reported any known occurrences of plants designated as threatened, endangered or of special concern within the search area (USFWS 2008 and PDCNR 2008). No threatened, endangered or other special concern plants were observed during Normandeau's field surveys. Requests for updated information concerning species of special concern were submitted by PPL Bell Bend LLC to USFWS and PDCNR on 20 September 2010. A response was received from PDCNR on 1 November 2010 which indicated that no plant species designated as threatened, endangered, or special concern occur within the search area (PDCNR 2010). A response to the 2010 letter from the USFWS is anticipated and the letter will be incorporated into Appendix B and summarized in this section upon receipt.

REFERENCES

AREVA, 2011. Wetlands Delineation and Exceptional Value Wetlands Analysis Report for the Proposed Bell Bend Nuclear Power Plant Site, Luzerne County, Pennsylvania, Rev. 7. AREVA NP, Inc., Marlborough, Massachusetts.

Gleason, H.A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. The New York Botanical Garden. Bronx, New York.

Harlow, William M. 1957. Trees of the Eastern and Central United States and Canada. Dover Publications, Inc., New York, New York.

A Field Survey of Plant Communities at the Proposed Bell Bend Nuclear Power Plant Site, Luzerne County, Pennsylvania

Holmgren, N.H. 1998. Illustrated Companion to Gleason and Cronquist Manual. The New York Botanical Garden. Bronx, New York.

Newcomb, Lawrence. 1977. Newcomb's Wildflower Guide. Little, Brown and Company. Boston, Massachusetts.

Pennsylvania Department of Conservation and Natural Resources. 2005. PAMAP Program 2005 Color Orthophotos of Luzerne County, Pennsylvania. Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey, Harrisburg, Pennsylvania.

Pennsylvania Department of Conservation and Natural Resources. 2008. Letter from Rebecca H. Bowden to George Wrobel (CEG GNA Engineering), Re: Environmental Review of Bell Bend Nuclear Power Plant Site, Berwick, Luzerne County, Pennsylvania, Dated: March 24, 2008.

Pennsylvania Department of Conservation and Natural Resources. 2010. Letter from Richard Shockey to Terry Harpster, Re: Bell Bend Nuclear Power Plant, Salem Township, Luzerne County, Pennsylvania, Dated: November 1, 2010.

Pennsylvania Natural Heritage Program. 2006. A Natural Areas Inventory Luzerne County, Pennsylvania. Western Pennsylvania Conservancy, Middletown, Pennsylvania.

Peterson, Roger Tory and Margaret McKeany. 1986. A Field Guide to Wildflowers, Northeastern/Northcentral North America. Houghton Mifflin Company. Boston, Massachusetts.

Petrides, George A. 1986. Trees and Shrubs. Houghton Mifflin Company.

**A Field Survey of Plant Communities at the Proposed Bell Bend Nuclear
Power Plant Site, Luzerne County, Pennsylvania**

Boston, Massachusetts.

Rhodes, A. and W. McKinley, Jr. 1993. The Vascular Flora of Pennsylvania:
Annotated Checklist and Atlas. American Philosophical Society.
Philadelphia, Pennsylvania.

Strausbaugh, P. D. and Earl Core. 1977. Flora of West Virginia, Second Edition,
Seneca Books, Inc., Grantsville, West Virginia.

U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetland Delineation
Manual. Technical Report Y-87-1, U.S. Army Engineer Experiment
Station, Vicksburg, Mississippi.

U.S. Army Corps of Engineers (USACE). 2009. Draft Interim Regional
Supplement to the Corps of Engineers Wetland Delineation Manual:
Eastern Mountains and Piedmont Region. Technical Report ERDC/EL TR-
09-19. U.S. Army Engineer Research and Development Center,
Vicksburg, Mississippi.

U.S. Fish and Wildlife Service. 2008. Letter from David Densmore to Rod Krich
(Unistar Nuclear), Re: USFWS Project #2008-518, Federally Listed
Endangered and Threatened Species for the Bell Bend Nuclear Power
Plant Site, Berwick, Luzerne County, Pennsylvania, Dated: January 18,
2008.

U.S. Fish and Wildlife Service. 2011. Response letter to be referenced when
available.

Table 1. Common plants identified within the BBNPP Project Boundary.

Scientific Name^{1,2}	Common Name
<u>Trees and Saplings</u>	
<i>Acer saccharinum</i>	silver maple
<i>Acer rubrum</i>	red maple
<i>Ailanthus altissima</i>	tree-of-heaven
<i>Betula alleghaniensis</i>	yellow birch
<i>Betula lenta</i>	sweet birch
<i>Betula nigra</i>	river birch
<i>Betula populifolia</i>	gray birch
<i>Carya cordiformis</i>	bitternut hickory
<i>Carya ovata</i>	shagbark hickory
<i>Carya tomentosa</i>	mockernut hickory
<i>Celtis occidentalis</i>	hackberry
<i>Cornus florida</i>	flowering dogwood
<i>Fagus grandifolia</i>	American beech
<i>Fraxinus americana</i>	white ash
<i>Fraxinus pennsylvanica</i>	green ash
<i>Juglans nigra</i>	black walnut
<i>Juniperus virginiana</i>	eastern red cedar
<i>Liriodendron tulipifera</i>	yellow poplar
<i>Malus</i> spp.	apples
<i>Nyssa sylvatica</i>	black gum
<i>Pinus resinosa</i>	red pine
<i>Pinus strobus</i>	eastern white pine
<i>Pinus sylvestris</i>	Scots pine
<i>Platanus occidentalis</i>	American sycamore
<i>Populus deltoides</i>	eastern cottonwood
<i>Populus tremuloides</i>	quaking aspen
<i>Prunus serotina</i>	black cherry
<i>Quercus alba</i>	white oak
<i>Quercus bicolor</i>	swamp white oak
<i>Quercus palustris</i>	pin oak
<i>Quercus rubra</i>	northern red oak
<i>Quercus velutina</i>	black oak
<i>Robinia pseudoacacia</i>	black locust
<i>Sassafras albidum</i>	sassafras
<i>Tilia americana</i>	American basswood
<i>Tsuga canadensis</i>	eastern hemlock
<i>Ulmus rubra</i>	slippery elm
<u>Woody Vines</u>	
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Parthenocissus quinquefolia</i>	Virginia creeper
<i>Rubus flagellaris</i>	northern dewberry
<i>Smilax glauca</i>	cat greenbrier

Table 1. (Continued)

Scientific Name ^{1,2}	Common Name
<u>Woody Vines</u>	
<i>Smilax rotundifolia</i>	common greenbrier
<i>Toxicodendron radicans</i>	poison ivy
<i>Vitis labrusca</i>	fox grape
<u>Shrubs</u>	
<i>Alnus</i> spp.	alders
<i>Alnus serrulata</i>	Smooth alder
<i>Cornus amomum</i>	silky dogwood
<i>Cornus racemosa</i>	swamp dogwood
<i>Elaeagnus angustifolia</i>	Russian olive
<i>Hamamelis virginianus</i>	American witch-hazel
<i>Ilex verticillata</i>	winterberry
<i>Kalmia latifolia</i>	mountain laurel
<i>Ligustrum obtusifolium</i>	privet
<i>Lindera benzoin</i>	northern spicebush
<i>Lonicera tatarica</i>	tartarian honeysuckle
<i>Rhus typhina</i>	staghorn sumac
<i>Rosa multiflora</i>	multiflora rose
<i>Rubus allegheniensis</i>	Allegheny blackberry
<i>Rubus occidentalis</i>	black raspberry
<i>Sambucus canadensis</i>	American elder
<i>Salix discolor</i>	pussy willow
<i>Salix nigra</i>	black willow
<i>Spirea latifolia</i>	broad-leaf meadow-sweet
<i>Vaccinium corymbosum</i>	highbush blueberry
<i>Viburnum cassinoides</i>	withe-rod
<i>Viburnum dentatum</i>	arrow-wood
<i>Viburnum prunifolium</i>	black-haw
<u>Herbs</u>	
<i>Achillea millefolium</i>	common yarrow
<i>Artemisia vulgaris</i>	mugwort
<i>Acorus calamus</i>	sweetflag
<i>Agropyron repens</i>	quack grass
<i>Agrostis gigantea</i>	redtop grass
<i>Alisma subcordatum</i>	subcordate water-plantain
<i>Alliaria petiolata</i>	garlic mustard
<i>Allium vineale</i>	field garlic
<i>Ambrosia artemisiifolia</i>	common ragweed
<i>Anthoxanthum odoratum</i>	sweet vernal grass

Table 1. (Continued)

Scientific Name ^{1,2}	Common Name
<u>Herbs</u>	
<i>Apocynum cannabinum</i>	clasping leaf dogbane
<i>Asclepias incarnata</i>	swamp milkweed
<i>Asclepias syriaca</i>	common milkweed
<i>Aster pilosus</i>	white heath aster
<i>Aster puniceus</i>	swamp aster
<i>Aster simplex</i>	panicked aster
<i>Barbarea vulgaris</i>	winter-ress
<i>Bidens</i> spp.	beggar-ticks
<i>Boehmeria cylindrica</i>	false nettle
<i>Bromus inermis</i>	smooth brome grass
<i>Carex</i> spp.	sedges
<i>Carex lurida</i>	shallow sedge
<i>Carex stricta</i>	uptight sedge
<i>Chenopodium album</i>	lamb's quarters
<i>Cicuta bulbifera</i>	water hemlock
<i>Cinna arundinacea</i>	stout wood-reedgrass
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium vulgare</i>	bull thistle
<i>Claytonia virginica</i>	spring beauty
<i>Conyza canadensis</i>	horseweed
<i>Coronilla varia</i>	crown-vetch
<i>Cyperus</i> spp.	nutsedges
<i>Dactylis glomerata</i>	orchard grass
<i>Dennstaedtia punctilobula</i>	hayscented fern
<i>Dichanthelium clandestinum</i>	deer-tongue grass
<i>Dipsacus sylvestris</i>	teasel
<i>Digitaria sanguinalis</i>	crabgrass
<i>Dryopteris spinulosa</i>	spinulose wood fern
<i>Eleocharis</i> spp.	spikerushes
<i>Erechtites hieracifolia</i>	American burn
<i>Erigeron annuus</i>	daisy fleabane
<i>Erigeron philadelphicus</i>	Philadelphia fleabane
<i>Erythronium americanum</i>	dogtooth violet
<i>Eulalia viminea</i>	Nepal microstegium
<i>Eupatoriadelphus</i> spp.	Joe-Pye-weed
<i>Eupatorium perfoliatum</i>	common boneset
<i>Euthamia graminifolia</i>	flat-top fragrant goldenrod
<i>Fragaria virginianum</i>	Virginia strawberry
<i>Galium mollugo</i>	wild madder
<i>Geum canadense</i>	white avens
<i>Glyceria striata</i>	fowl manna grass
<i>Hesperis matronalis</i>	dames rocket

Table 1. (Continued)

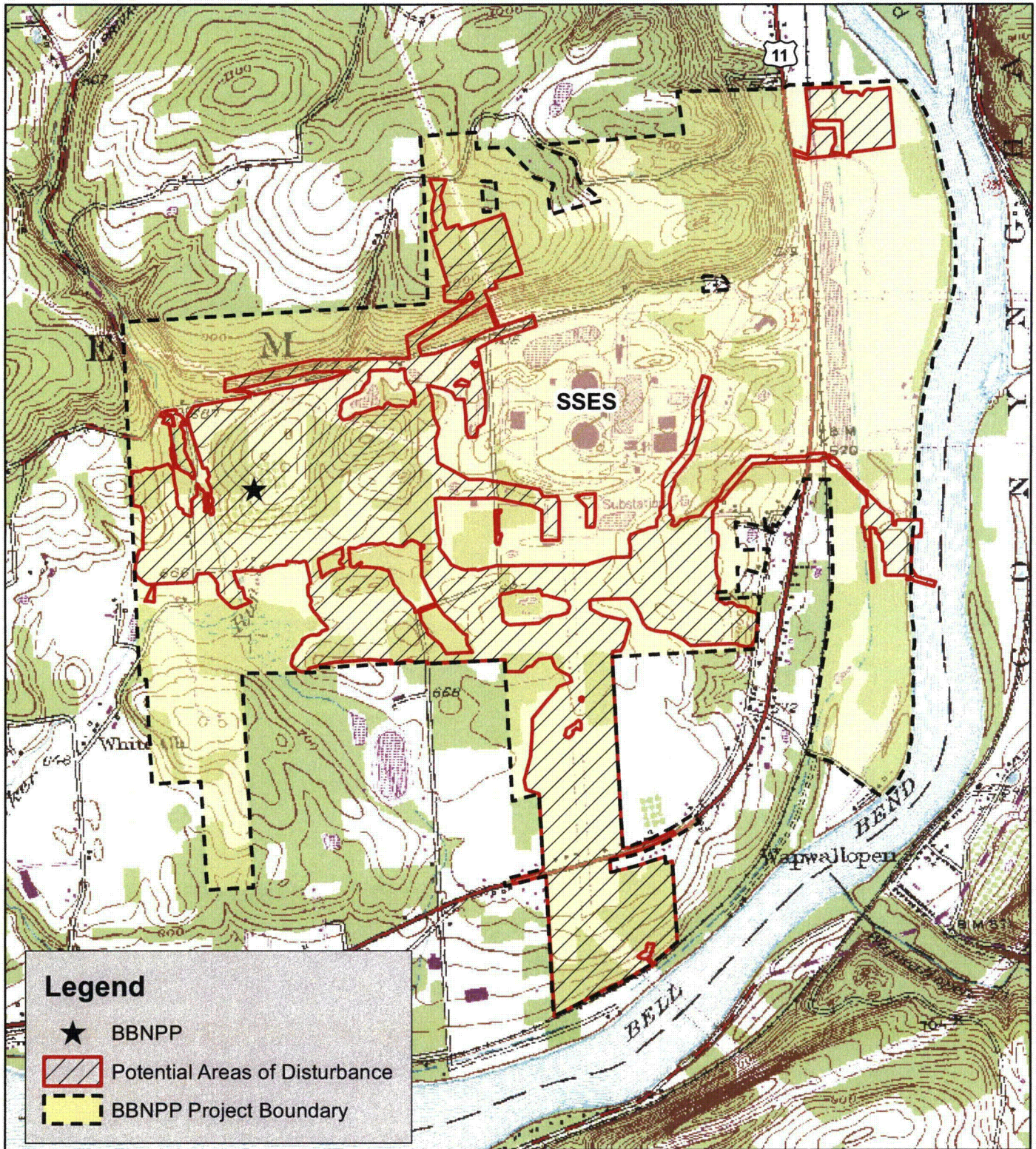
Scientific Name ^{1,2}	Common Name
Herbs	
<i>Holcus lanatus</i>	common velvet grass
<i>Hypericum perforatum</i>	St. John's wort
<i>Impatiens capensis</i>	jewelweed
<i>Juncus effusus</i>	soft rush
<i>Juncus tenuis</i>	path rush
<i>Lamium purpureum</i>	purple dead nettle
<i>Leersia oryzoides</i>	rice cutgrass
<i>Lemna</i> spp.	duckweeds
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Lilium canadense</i>	Canada lily
<i>Lonicera tatarica</i>	Tatarian honeysuckle
<i>Lotus corniculatus</i>	birds-foot trefoil
<i>Ludwigia alternifolia</i>	seedbox
<i>Ludwigia palustris</i>	marsh seedbox
<i>Lycopodium obscurum</i>	tree clubmoss
<i>Lycopodium tristachyum</i>	ground cedar
<i>Lycopus</i> spp.	bugleweeds
<i>Lysimachia ciliata</i>	fringed loosestrife
<i>Lysimachia nummularia</i>	moneywort
<i>Lythrum salicaria</i>	purple loosestrife
<i>Maianthemum canadense</i>	false lily-of-the-valley
<i>Mentha</i> spp.	mints
<i>Mitchella repens</i>	partridge-berry
<i>Oenothera biennis</i>	common evening-primrose
<i>Onoclea sensibilis</i>	sensitive fern
<i>Osmunda cinnamomea</i>	cinnamon fern
<i>Oxalis</i> spp.	wood-sorrels
<i>Panicum dichotomiflorum</i>	fall panic grass
<i>Phalaris arundinacea</i>	Reed canary grass
<i>Phleum pretense</i>	timothy grass
<i>Phragmites australis</i>	common reed
<i>Phytolacca americana</i>	common pokeweed
<i>Plantago lanceolata</i>	English plantain
<i>Plantago major</i>	common plantain
<i>Pilea pumila</i>	Clearweed
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Poa trivialis</i>	rough bluegrass
<i>Podophyllum peltatum</i>	may-apple
<i>Polygonum arifolium</i>	halberd-leaf tearthumb
<i>Polygonum cespitosum</i>	cespitose knotweed
<i>Polygonum hydropiperoides</i>	swamp smartweed
<i>Polygonum pennsylvanicum</i>	Pennsylvania smartweed
<i>Polygonum perfoliatum</i>	mile-a-minute
<i>Polygonum sagittatum</i>	arrow-leaved tearthumb

Table 1. (Continued)

Scientific Name^{1,2}	Common Name
<u>Herbs</u>	
<i>Polygonum virginianum</i>	Virginia knotweed
<i>Potentilla canadense</i>	dwarf cinquefoil
<i>Potentilla simplex</i>	old-field cinquefoil
<i>Prunella vulgaris</i>	heal-all
<i>Ranunculus acris</i>	common buttercup
<i>Rubus hispidus</i>	bristly blackberry
<i>Rudbeckia hirta</i>	black-eyed Susan
<i>Rudbeckia laciniata</i>	cut-leaf coneflower
<i>Rumex crispus</i>	curly dock
<i>Sagittaria latifolia</i>	broad-leaf arrow-head
<i>Saponaria officinalis</i>	bouncing-bet
<i>Schizachrium scoparium</i>	little bluestem
<i>Scirpus cyperinus</i>	wool-grass
<i>Scirpus</i> spp.	bulrushes
<i>Setaria faberi</i>	Japanese bristle grass
<i>Setaria glauca</i>	yellow bristle grass
<i>Smilacina racemosa</i>	feather false-Solomon's-seal
<i>Solanum carolinense</i>	Carolina nightshade
<i>Solidago canadensis</i>	Canada goldenrod
<i>Solidago gigantea</i>	giant goldenrod
<i>Solidago rugosa</i>	wrinkled goldenrod
<i>Sparganium</i> spp.	burreeds
<i>Symplocarpus foetidus</i>	skunk-cabbage
<i>Taraxacum officinale</i>	common dandelion
<i>Thelypteris noveboracensis</i>	New York fern
<i>Tridens flavus</i>	purple-top tridens
<i>Trifolium pratense</i>	red clover
<i>Typha latifolia</i>	broad-leaved cattail
<i>Urtica dioica</i>	stinging nettle
<i>Uvularia sessilifolia</i>	sessile-leaf bellwort
<i>Verbascum blattaria</i>	moth mullein
<i>Verbascum thapsus</i>	common mullein
<i>Verbena hastata</i>	blue vervain
<i>Vernonia noveboracensis</i>	New York ironweed

¹ Additional species observed only during the 2010 surveys are indicated in blue font.

² Additional species observed only during the 2011 surveys are indicated in red font.



Legend



- ★ BBNPP
-  Potential Areas of Disturbance
-  BBNPP Project Boundary

Figure 1.
Location of Proposed BBNPP



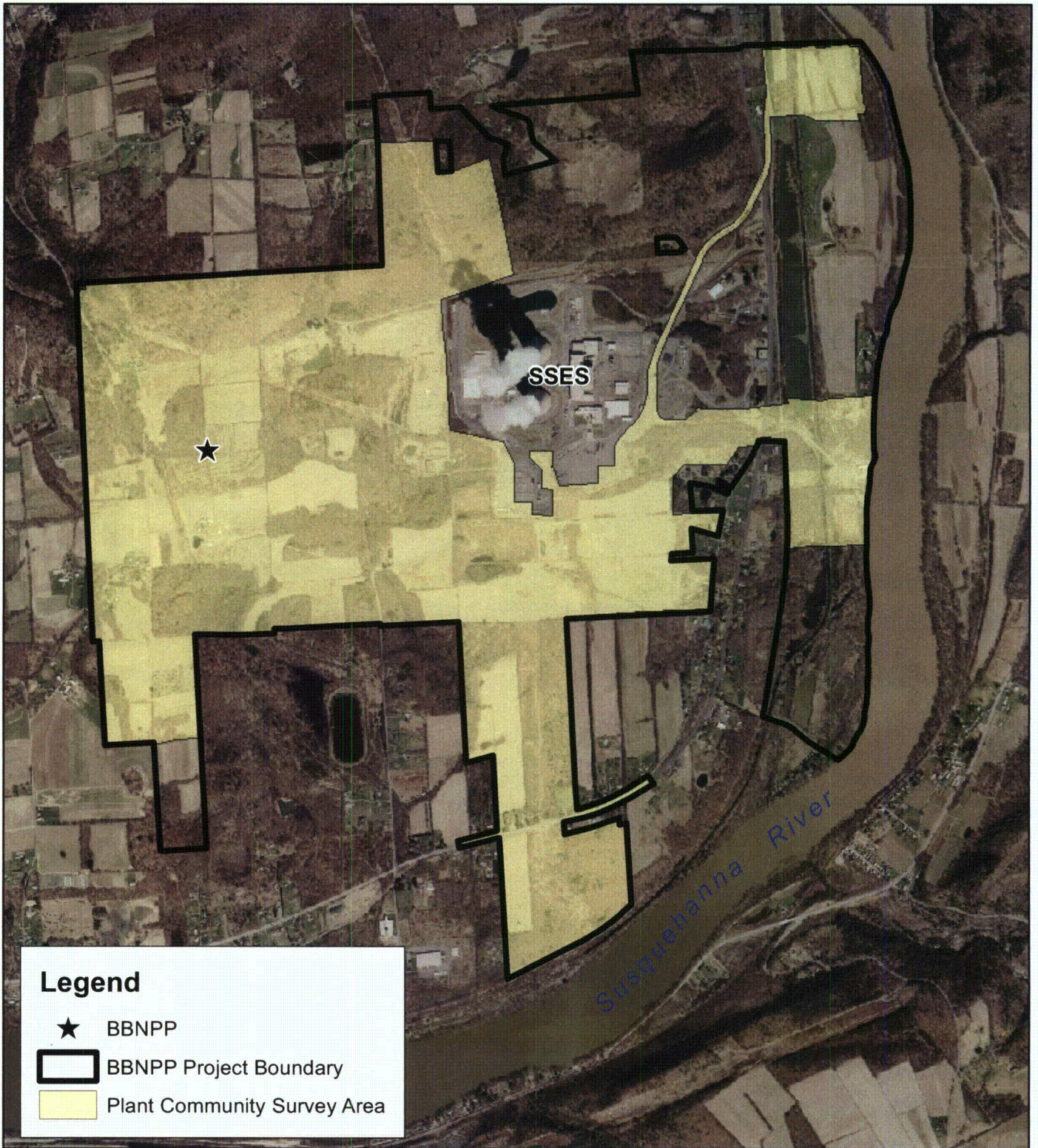
0.5 0.25 0 0.5 Miles



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date: 07/27/10
prepared by: s.sherman
project: 22474.000

rev. date: 10/12/10, 09/09/11
prepared for: b.lees
file name: Figure1.BBNPP_Site_USGS



Legend

- ★ BBNPP
- BBNPP Project Boundary
- Plant Community Survey Area

Note:
 Aerial Photography from PAMAP Program, PA DCNR,
 Bureau of Topographic and Geologic Survey, 2005

2,000 1,000 0 2,000 Feet



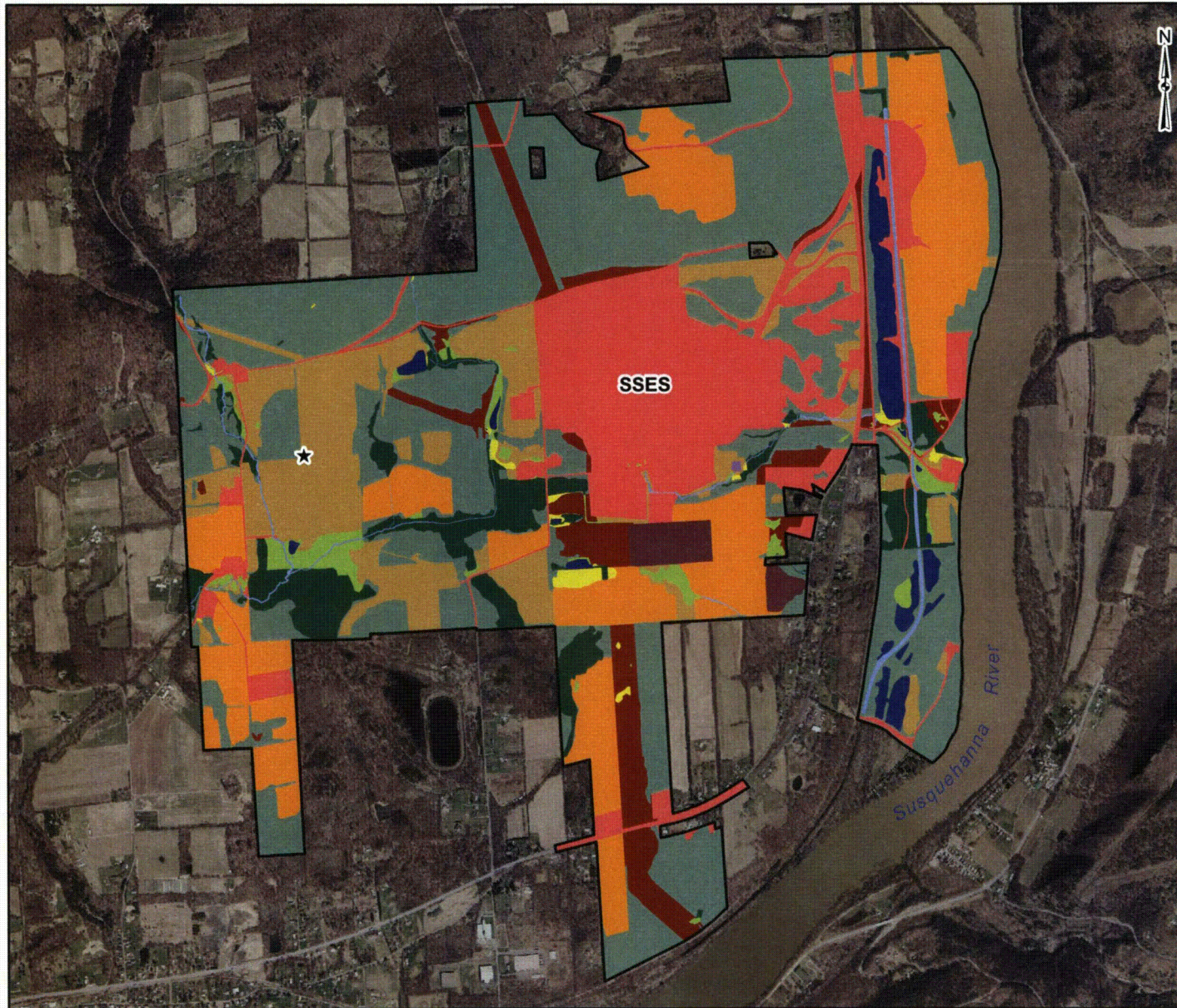
Figure 2.
Location of the
Plant Community Survey Area
within the BBNPP Project Boundary



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 file name: Figure2.BBNPP_Site_Aerial



Legend

- ★ BBNPP
- BBNPP Project Boundary

Plant Communities

- Upland Forest
- Upland Scrub/Shrub
- Old Field/Former Agricultural
- Agricultural
- Palustrine Forested Wetlands
- Palustrine Scrub/Shrub Wetlands
- Palustrine Emergent Wetlands
- Waterbodies
- Stormwater Detention Basin
- Stream
- Quarry
- Developed



Note:
 Areas outside the plant community survey area, as shown in Figure 2,
 are based on existing natural resource mapping and aerial photography
 and were not field verified by Normandeau Associates, Inc.

Figure 3.
 Bell Bend NPP
 Plant Communities Map