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Critical Resources of Bald Mountain Section Lehigh Gorge State Park

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Submitted to the Western Pennsylvania Conservancy and the Pennsylvania Department of Conservation and Natural Resources, Bureau of State Parks, Harrisburg, PA
Preparation of this report was funded by the Western Pennsylvania Conservancy through a grant from DCNR Bureau of State Parks.

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Abstract
The 1539-acre Bald Mountain Section was added to Lehigh Gorge State Park in 2011. It is a forested ridge which buffers the scenic Lehigh River Gorge and affords spectacular views. The tract also includes a pond and associated wetland community created by a dam on Indian Run, a tributary of the Lehigh.

Dry oak - heath forest covers the ridge with the exception of the lower slope on the northeast end which supports a hemlock - white pine forest. Over browsing by deer has eliminated the shrub layer and/or created a distinct browse line in much of the site. Wildflower diversity has also been affected.

Non-native, invasive species are limited to the vicinity of the former farmstead at the entrance from Lehigh Gorge Drive. A small colony of common reed (*Phragmites australis*) which has become established in the wetland above the pond should be targeted for removal.

Existing woods roads provide good access for hiking including several vistas of the Lehigh Gorge. We recommend a continuation of low intensity use with vehicle access restricted to hunters during deer season. Other than exploring a possible link to the Penn Haven Planes, we do not recommend creation of new trails.

A decision to remove the dam on Indian Run should be based on safety concerns. In terms of impact on the vegetation, the wetland plant communities would decline and the adjacent hemlock – white pine forest type would expand down slope. The exposed pond bed would likely be colonized by invasive species such as common reed (*Phragmites australis*) and reed canary grass (*Phalaris arundinacea*).

Disciplines
Botany

Comments
Submitted to the Western Pennsylvania Conservancy and the Pennsylvania Department of Conservation and Natural Resources, Bureau of State Parks, Harrisburg, PA

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Final Report

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June 2013

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Cover: View of the upper end of the impoundment on Indian Creek

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We appreciate the assistance we received from David Madl and his staff at Hickory Run/Lehigh Gorge/Nescopeck State Parks Complex from the initial orientation to the site to answers to our questions along the way.

Executive Summary and Key Recommendations

The 1539-acre Bald Mountain Section was added to Lehigh Gorge State Park in 2011. It is a forested ridge which buffers the scenic Lehigh River Gorge and affords spectacular views. The tract also includes a pond and associated wetland community created by a dam on Indian Run, a tributary of the Lehigh.

Dry oak - heath forest covers the ridge with the exception of the lower slope on the northeast end which supports a hemlock - white pine forest. Over browsing by deer has eliminated the shrub layer and/or created a distinct browse line in much of the site. Wildflower diversity has also been affected.

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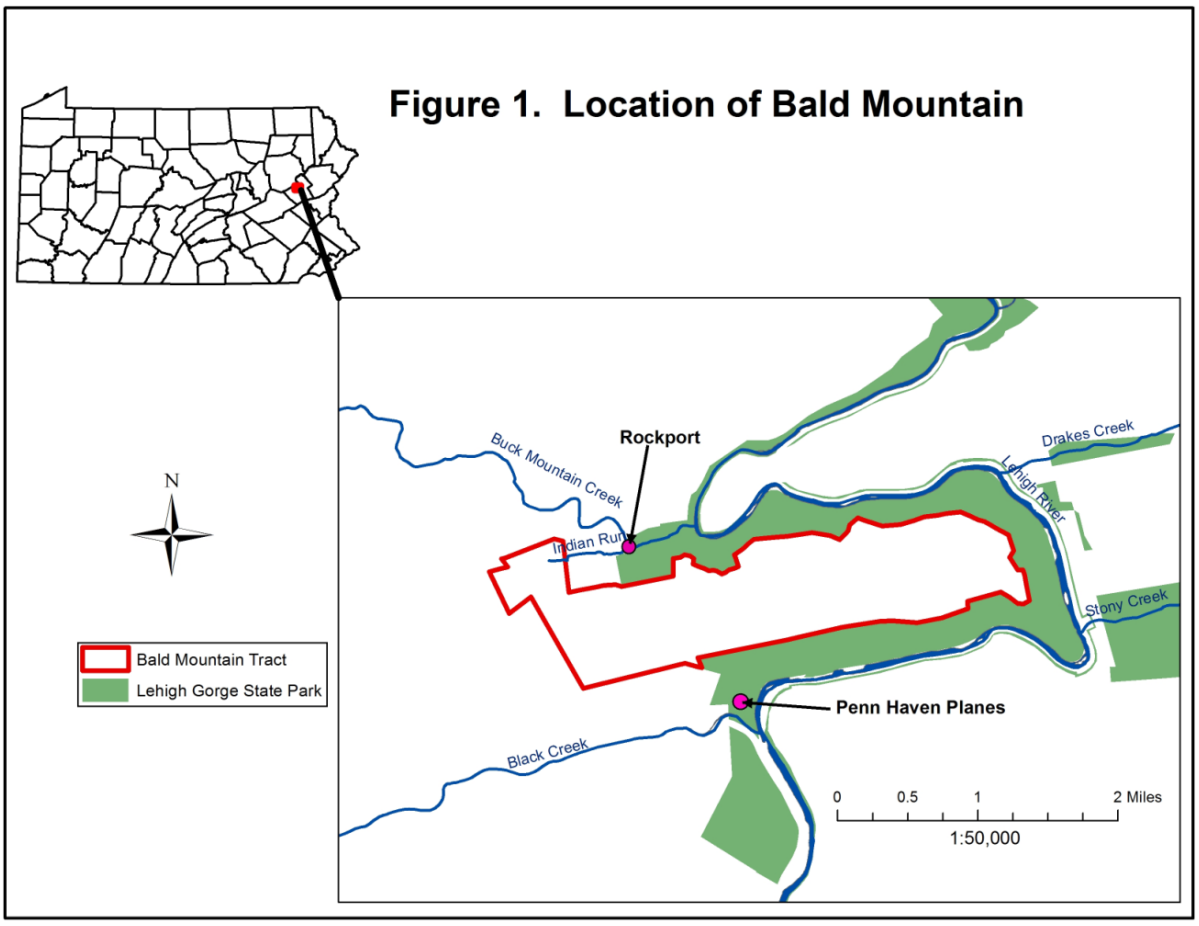
I. Introduction

Location

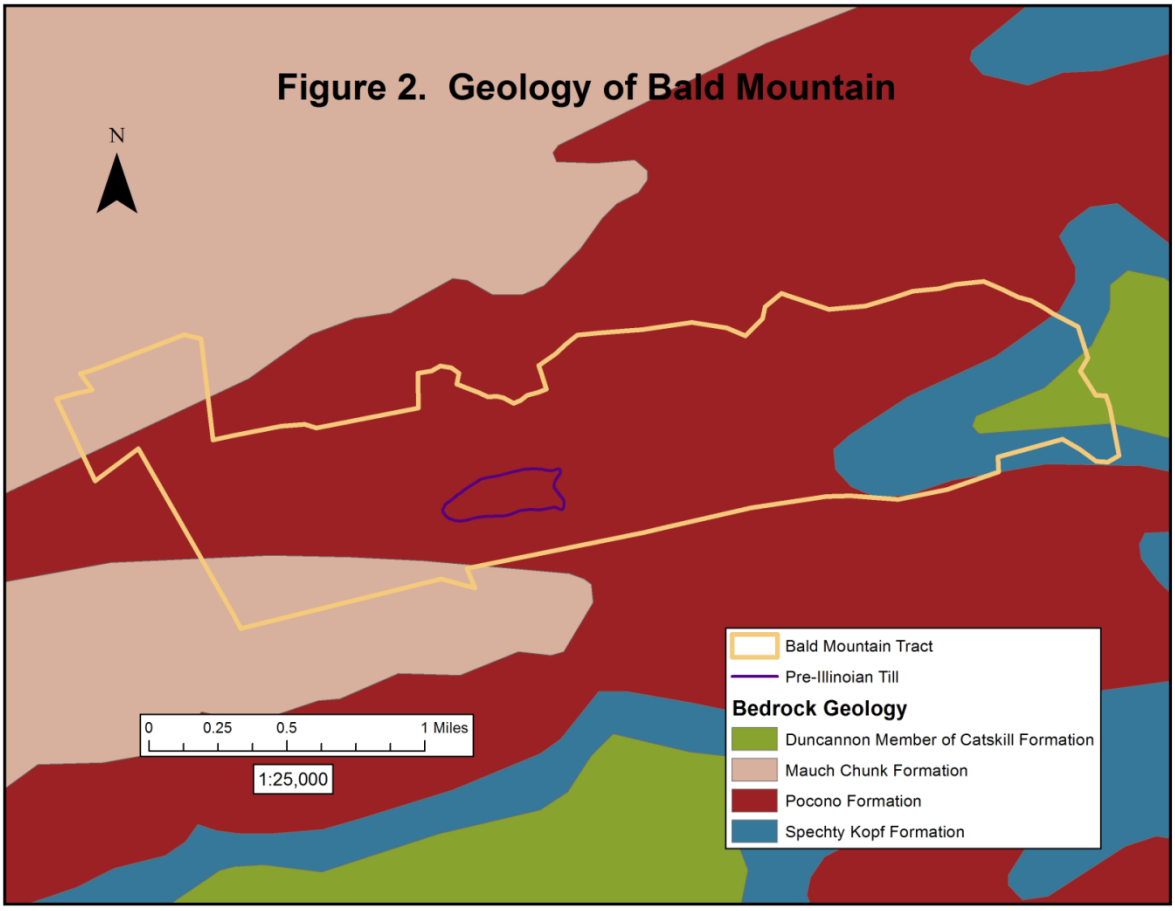
The Bald Mountain Section of Lehigh Gorge State Park is located in the Ridge and Valley Physiographic Province of northeastern Pennsylvania. This 1539-acre tract on the west side of the Lehigh River in Carbon County extends from the village of Rockport to a point approximately 2 km west of the Penn Haven Planes (Figure 1). Bald Mountain consists of a ridge oriented southwest to northeast with the highest elevation 488.6 m above mean sea level. The low point, along Indian Run, a tributary stream on the north side of the ridge, is approximately 335.3 m above mean sea level.

Bald Mountain Section is contiguous with the main area of Lehigh Gorge State Park with the exception of a small area at the western end (Figure 1).



Geology and Soils

Geology **-** Bald Mountain Section of Lehigh Gorge State Park is underlain by four geological formations (Figure 2). Mississippian age Pocono Formation sandstone forms the southwest to northeast trending ridge through the center of the site. Shale of the Mauch Chunk Formation, also of Mississippian age, is present at lower elevations in the northwestern and southwestern corners. Parallel bands of Mississippian Spechty Kopf sandstone and sandstone of the Duncannon member of the Catskill Formation of Devonian age are exposed at the eastern end of the site (Bureau of Topographic and Geologic Survey 2001). Bald Mountain is south of the Wisconsinan glacial boundary, but within the area of earlier pre-Illinoian till (Braun 2004). A small patch of lag (pre-Illinoian till) is located in a shallow basin on the ridge top (Figure 2).



Soils **–** Soils of the upper slopes and ridge top are of the DeKalb and Drifton soil series. Both are stony to very stony loams derived from acidic gray sandstone of the Pocono Formation. Dekalb soils are well-drained but Drifton very stony loam includes some area of poor drainage that create scattered, seasonally wet depressions (USDA 1962). The upper slopes and ridge top areas are characterized by oak-dominated forest with a dense shrub layer of blueberry, black huckleberry, dangleberry, sheep laurel, and mountain laurel.

On the northwestern end of the ridge, mid to lower slopes are characterized by Hazelton very stony loam. Hazelton soils are deep and well-drained; they formed from pre-Wisconsinan glacial till which included highly weathered sandstone, siltstone, and shale (USDA 1962). This soil type supports extensive stands of hemlock and white pine.

Holly silt loam characterizes the valley of Indian Run. Holly soils, formed by fine textured alluvial deposits, are poorly to very poorly drained and frequently flooded (USDA 1962). At the Bald Mountain tract they underlie the pond, bog, and stream valley on the north side of the ridge.

The hay/mowed fields are underlain by Leck Kill channery silt loam and Laidig gravelly loam (USDA 1962). Both are moderately deep, well-drained soils suitable for agriculture. They developed on colluvium at the base of Bald Mountain.

Hydrology

This site is entirely within the Lehigh River drainage. Indian Run, which flows into the Lehigh River at Rockport, parallels the base of the ridge on the north. It is dammed to form a shallow pond and associated bog. The eastern end of the tract drains directly to the Lehigh River which makes a dramatic curve to the east, then south, and finally west as it wraps around Bald Mountain. Several small intermittent drainages emanate from the ridge and flow north to Indian Run or east or south to the Lehigh (Figure 1).

Land Use History

The earliest exploitation of the natural resources of the Lehigh Gorge was the harvesting of timber. John James Audubon described a visit to a lumber camp near Rockport in 1829:

> *"Trees, one after another, were, and are yet, constantly heard falling during the days; and in calm nights, the greedy mills told the sad tale that in a century the noble forests around should exist no more. Many mills were erected, many dams raised, in defiance of the impetuous Lehigh. One full third of the trees have already been culled, turned into boards, and floated as far as Philadelphia." (Audubon 1897).*

Lehigh Tannery, one of the largest in the state was located along the Lehigh River approximately 8 km north of Bald Mountain. It operated from 1855 to 1875 and drew heavily on the abundant hemlock forests of the gorge to supply the bark used in tanning leather.

A load of hemlock bark on its way to the tannery, image courtesy of David S. Fry.

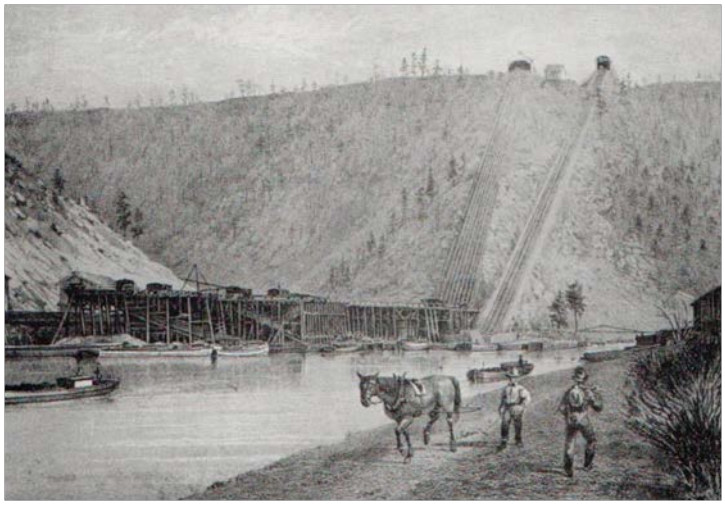
When coal was discovered at Summit Hill in 1791 it stimulated schemes to move the coal to markets. An ingenious gravity railroad system was built to transport the coal from the mines to Penn

Haven Junction and other sites along the Lehigh River. There it was lowered down inclined planes, loaded on barges, and floated down through the system of locks, dams, and canals that comprised the Upper Grand Section of the Lehigh Canal. The invention of the locomotive engine allowed railroads, which were already on the ascendency, to replace the canal system after it was destroyed in the flood of 1862.

Timber harvesting and fires started by sparks from locomotives denuded the slopes periodically.

Today the gorge and its forested slopes are protected as part of Lehigh Gorge State Park.

More recently, Bald Mountain Section was a private hunting preserve. It was subsequently acquired by a private individual who envisioned building a home and resort on the ridge top overlooking the Lehigh Gorge. After clearing a 2 km long swath along the ridge top, and cutting some trees to improve the view of the gorge, he abandoned his grandiose plans and in 2011 the tract was acquired by the State of Pennsylvania and added to Lehigh Gorge State Park.



The inclined planes at Penn Haven, note also the denuded hillsides. Image courtesy of David S. Fry.

Previous Studies of the Flora

The 2005 Natural Areas Inventory of Carbon County described an occurrence of ***Ridgetop Dwarf-tree Forest*** on Bald Mountain overlooking the Lehigh River. The area was described as having a xeric mixed oak overstory and thick shrub layer of blueberry, huckleberry and mountain laurel (The Nature Conservancy 2005).

An inventory of Lehigh Gorge State Park was completed by the authors in 2004 (Rhoads and Block 2004).

II. Inventory of Vascular Plant Diversity and Plant Communities

Methods
We spent four full days exploring Bald Mountain at various seasons. We drove all the internal roads several times and walked through all major sections of the site. We collected numerous herbarium specimens which have been deposited in the Morris Arboretum Herbarium (MOAR). Our extensive field notes, and aerial photography (PASDA 2012) were the basis for the classification and mapping of plant communities, no quantitative studies were conducted. Plant community nomenclature follows Fike (1999).

Plant Diversity
We have identified 229 species of plants on the site; 171 (75 percent) are native to Pennsylvania. The remainder are non-native species that have invaded disturbed portions of the site. See Appendix A for a complete list.

Endangered, Threatened, and Rare Plants
We did not find any plants tracked by the Pennsylvania Natural Heritage Program (PNHP) within the Bald Mountain Section of Lehigh Gorge State Park. A population of fly-poison (*Amianthium muscaetoxicum*), host for the larval stage of the rare fly poison bulb borer moth, is present in the area of lag (pre-Illinoian glacial till) on the ridge top. We estimate that the fly-poison population consists of more than 1000 plants; however, it is unknown whether the fly-poison bulb borer moth is present.

Plant Communities
Ten plant communities are represented in the Bald Mountain Section of Lehigh Gorge State Park (Table 1). Dry oak – heath forest covers more than 90 percent of the site.

Table 1. Plant Community Types of Bald Mountain Section

Plant Community type	***acres***
Conifer plantations	5.7
Dry oak - heath forest	1396.9
Dry oak - heath woodland	19.1
Hayfield/meadow	21.7
Hemlock - (white pine) forest	77.0
Hemlock - mixed hardwood palustrine woodland	6.6
Highbush blueberry - meadow-sweet wetland	0.9
Sphagnum - beaked rush peatland	0.9

Dry oak – heath forest – Dry oak – heath forest is the dominant forest type over most of Bald Mountain; it occurs over Pocono sandstone on the ridge top and upper slopes. Canopy trees include white oak (*Quercus alba*), scarlet oak (*Q. coccinea*), chestnut oak (*Q. montana*), red maple (*Acer rubrum*), blackgum (*Nyssa sylvatica*), black birch (*Betula lenta*), and occasional

pitch pine (*Pinus rigida*), Canada hemlock (*Tsuga canadensis*), and white pine (*Pinus strobus*). Widely scattered understory trees and tall shrubs include shadbush (*Amelanchier arborea*), sassafras (*Sassafras albidum*), American chestnut (*Castanea dentata*), and witch-hazel (*Hamamelis virginiana*).

Heavily browsed dry oak heath forest on the lower slope of the northeast end of Bald Mountain

The low shrub layer, which is very dense, consists of mountain laurel (*Kalmia latifolia*), sheep laurel (*K. angustifolia*), black huckleberry (*Gaylussacia baccata*), dangle-berry (*G. frondosa*), lowbush blueberry (*Vaccinium pallidum*), low sweet blueberry (*V. angustifolium*) and occasionally sweet-fern (*Comptonia peregrina*) in openings. Catbrier (*Smilax rotundifolia*) is also a frequent component. The low-growing subshrub, teaberry (*Gaultheria procumbens*), is abundant throughout.

Herbaceous species are few. Those represented include trailing arbutus (*Epigaea repens*), fly-poison (*Amianthium muscaetoxicum*), Indian cucumber-root (*Medeola virginiana*), poverty grass (*Danthonia spicata*), northern shorthusk (*Brachyelytrum aristosum*), southern shorthusk (*B. erecta)*, hay-scented fern (*Dennstaedtia punctilobula*), and Pennsylvania sedge (*Carex pensylvanica*).

A forest dominated by red maple (*Acer rubrum*) covers the lower slope on the northeast portion of Bald Mountain. Occasional red oak (*Quercus rubra*), white oak (*Quercus alba*), and black birch (*Betula lenta*) are also present.

According to Lidar imagery (PASDA 2012) the trees in this area are consistently taller than in other areas of the ridge. There is little or no understory. The shrub layer is represented by widely scattered clumps of rosebay (*Rhododendron maximum*), mountain laurel (*Kalmia latifolia*), and mountain holly (*Ilex montana*), all with a distinct browse line. Blueberry and huckleberry species are reduced to severely browsed patches only a few inches high. The only notable herbaceous plant is hayscented fern (*Dennstaedtia punctilobula*), which forms large patches. Our interpretation is that this forest is a variant on the dry oak heath forest in which deer have drastically reduced the diversity and cover in the shrub layer.

Hemlock – (white pine) forest – This forest type occurs on the lower slopes on the northwest side of the ridge at Bald Mountain and on the lower slope on the north side of Indian Run. Canada hemlock (*Tsuga canadensis*) is the dominant canopy species; additional tree species include yellow birch (*Betula alleghaniensis*), wild black cherry (*Prunus serotina*), blackgum (*Nyssa sylvatica*), red maple (*Acer rubrum*), and white pine (*Pinus strobus*). Shrubs include rosebay (*Rhododendron maximum*), mountain holly (*Ilex montana*), mountain laurel (*Kalmia latifolia*), and Japanese barberry (*Berberis thunbergii*) which is especially dense in the edge along the field.

Hemlock – white pine forest

Herbaceous species are sparse due in part to year-round shading by hemlock. In addition, many of the wildflowers are reduced to juvenile, non-flowering plants due to repeated grazing by deer. *S*pecies noted include blue bead-lily (*Clintonia borealis*), white wood aster (*Eurybia divaricata*), starflower (*Trientalis borealis*), Canada mayflower (*Maianthemum canadense*), partridgeberry (*Mitchella repens*), Indian pipe (*Monotropa uniflora*), wood aster (*Oclemena acuminata*), northern wood-sorrel (*Oxalis acetosella*) and painted trillium (*Trillium undulatum*). Hay-scented fern (*Dennstaedtia punctilobula*), New York fern (*Thelypteris noveboracensis*) and running-pine (*Diphasiastrum digitatum*) are also present.

Dry oak – heath woodland – This community includes the area identified in the Carbon County Natural Areas Inventory (TNC 2005) as ***Ridgetop Dwarf Tree Forest***. Trees species include sassafras (*Sassafras albidum*), red maple (*Acer rubrum*), scarlet oak (*Quercus coccinea*), and pitch pine (*Pinus rigida*). In addition scattered scrub oak (*Quercus ilicifolia*) is present.

The low shrub layer, which forms a dense matrix throughout, is a distinctive feature. It consists primarily of black huckleberry (*Gaylussacia baccata*), low sweet blueberry (*Vaccinium angustifolium*), and lowbush blueberry (*V. pallidum*), underlain by teaberry (*Gaultheria procumbens*). Catbrier (*Smilax rotundifolia*) is scattered throughout. Herbaceous species are very sparse.

Dry oak – heath woodland

This vegetation type is the result of repeated fires in the past which have resulted in the dense layer of

rhizomatous shrubs which recover quickly following fire. In addition oak regeneration has been inhibited due to overbrowsing by deer.

Hemlock – mixed hardwood palustrine woodland – The upper reaches of Indian Run flow through a palustrine woodland where hemlock (*Tsuga canadensis*) is the most abundant tree. White pine (*Pinus strobus*) is also present. Rosebay (*Rhododendron maximum*) dominates the shrub layer; black chokeberry (*Photinia melanocarpa*) is also present.

Hemlock – mixed hardwood palustrine woodland

Herbaceous species include cinnamon fern (*Osmunda cinnamomea*), interrupted fern (*O. claytoniana*), sensitive fern (*Onoclea sensibilis*), northern blue flag (*Iris versicolor*), false hellebore (*Veratrum viride*), marsh marigold (*Caltha palustris*), goldthread (*Coptis trifolia*), tearthumb (*Persicaria sagittata*), and turtlehead (*Chelone glabra*).

Sedges, including *Carex bromoides, C. gynandra, C. lupulina, C. lurida, C. scabrata, C. stipata,* are also an important part of this community. Deer tongue grass (*Dichanthelium clandestinum*) is present throughout and a patch of the non-native, invasive common reed (*Phragmites australis*) has become established.

Highbush blueberry – meadow-sweet palustrine wetland – At the upper end of the pond is a hummocky low shrub-dominated area with numerous wet channels. Meadow-sweet (*Spiraea latifolia*) and hardhack (*S. tomentosa*) are the dominant plants. Additional shrubs present include highbush blueberry (*Vaccinium corymbosum*), winterberry holly (*Ilex verticillata*) and smooth alder (*Alnus serrulata*), all very heavily browsed.

Cinnamon fern in the bog at Bald Mountain

Associated herbaceous species include soft rush (*Juncus effusus*), slender spike-rush (*Eleocharis tenuis*), wool-grass (*Scirpus cyperinus*), several sedges (*Carex bromoides, C. gynandra, C. lurida*), jewelweed (*Impatiens capensis*), clubspur orchid (*Platanthera clavellata*), ragged-fringed orchid (*Platanthera lacera*), common

blue violet (*Viola sororia*), blue marsh violet (*V. cucullata*) and sweet white violet (*V. macloskeyi*).

Sphagnum – beak-rush peatland – The boggy margin on the south side of the pond is dominated by sphagnum moss with cranberry (*Vaccinium macrocarpon*) and several sedges (*Carex canescens, C. echinata, C. folliculata, C. gynandra, C. leptalea*). Three-square (*Dulichium arundinaceum*), tawny cotton-grass (*Eriophorum virginicum*), and swamp dewberry (*Rubus hispidus*) are also prominent. Other species include dewdrop (*Dalibarda repens*), and marsh fern (*Thelypteris palustris*). Fingers of sphagnum extend into the forest along the larger drainages that emanate from the adjacent slope.

Anthropogenic Areas

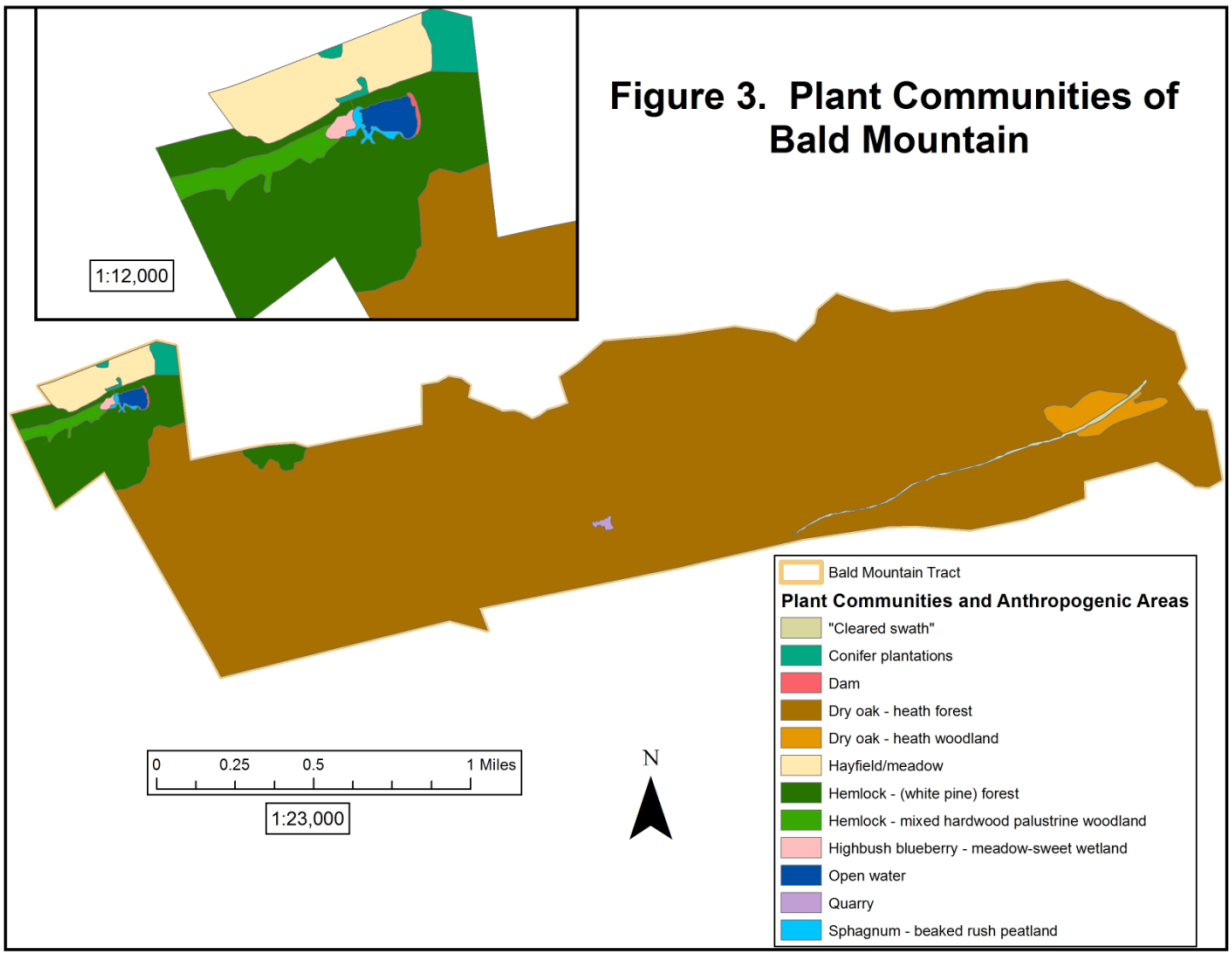
Farmstead –Remnants of domestic plantings that persist in the vicinity of the parking lot and entrance road above and immediately below the gate serve as a reminder that a home was located on the property. The earthen dam that forms the pond is also the site of numerous non-native plants. See discussion of invasive non-native plants below.

Hayfield/meadow – The former farm fields along Lehigh Gorge Drive have been planted in warm season (C4) grasses including switch grass (*Panicum virgatum*) and little bluestem (*Schizachyrium scoparium*). Other grasses present include orchard grass (*Dactylis glomerata*), sweet vernal grass (*Anthoxanthum odoratum*), velvetgrass (*Holcus lanatus*), and meadow fescue (*Schedonorus pratensis*). Forbs noted included milkweed (*Asclepias syriaca*), dogbane (*Apocynum cannabinum*), several goldenrods (*Solidago rugosa* and *Euthamia graminifolia*), ox-eye daisy (*Leucanthemum vulgare*), a mint (*Mentha* sp.) and several sedges (*Carex cristatella* and *C. swanii*). Canada thistle (*Cirsium arvense*) and bull thistle (*Cirsium vulgare*), which are state designated noxious weeds, are also present.

Conifer plantations – Plantings of conifers occur at two locations. A 5.8 acre plantation of white pine (*Pinus strobus*) is located at the corner of Lehigh Gorge Road and Rockport Road. A smaller stand of white pine with a few Japanese larch (*Larix kaempferi*) is located on the lower slope east of the access road.

Quarry – A small area on the ridge top was used to quarry material for onsite road construction. This highly disturbed site contains little vegetation but is the only area where we saw winged sumac (*Rhus copallina*), sweet-fern (*Comptonia peregrina*), arrow-leaved violet (*Viola sagittata*), and whorled loosestrife (*Lysimachia quadrifolia*).

Cleared swath – A former owner cleared a 2 km long swath along the ridge top. Trees were bulldozed, uprooted, and pushed aside, but no further work appears to have been done. Herbaceous species including grasses, sedges, and goldenrods have colonized the exposed soil.



Invasive, Nonnative Species

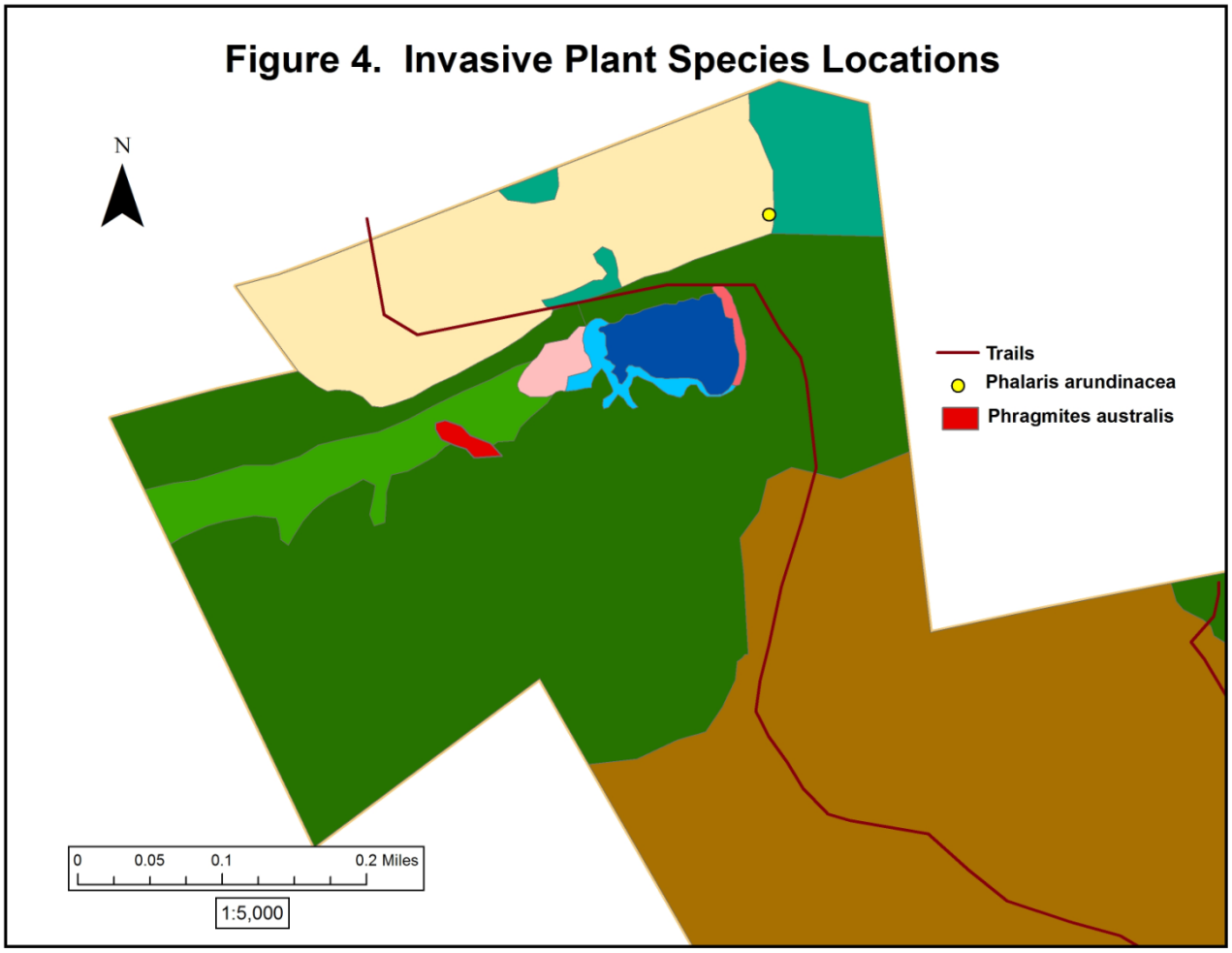
Most of this site is essentially free of invasive, non-native plants. Those that are present are concentrated in the vicinity of the former homestead and the hay/mowed fields. Remnants of domestic landscaping include a massive infestation of common periwinkle (*Vinca minor*) on the slope between the entrance road and the pond as well as large patches of orange daylily (*Hemerocallis fulva*). Garlic mustard (*Alliaria petiolata*) and dame's rocket (*Hesperis matronalis*) are also established in this area.

Disturbance associated with maintenance of the dam has also introduced non-native species such as Morrow's honeysuckle (*Lonicera morrowii*), Japanese barberry (*Berberis thunbergii*), coltsfoot (*Tussilago farfara*), Canada thistle (*Cirsium arvense*), ox-eye daisy (*Leucanthemum vulgare*), and yarrow (*Achillea millefolium*).

Occasional plants of Morrow's honeysuckle (*Lonicera morrowii*) and multiflora rose (*Rosa multiflora*) are present along the stream above the pond and the edges of the hayfields. Japanese barberry is well established in the forest edge adjacent to the hayfield west of the entrance road.

Japanese stiltgrass (*Microstegium vimineum*) has crept in to wetlands along base of slope in a few spots.

In addition there is a significant colony of common reed (*Phragmites australis*) in the wetland above the pond (Figure 4) and a small colony of reed canary grass (*Phalaris arundinacea*) at the lower corner of the hayfield east of the entrance road. These occurrences should be high priorities for removal.



III. Conclusions and Recommendations

Endangered, threatened and rare plants and plant communities
This site does not contain plants or plant community types that are tracked by the Pennsylvania Natural Heritage Program.

An area identified in the Carbon County Natural Areas Inventory (TNC 2005) as Ridgetop Dwarf Tree Forest is, in our estimation, the result of repeated fires in the past which resulted in the dense layer of ericaceous shrubs, plus inhibition of oak regeneration due to overbrowsing by deer. See discussion of dry oak – heath woodland above.

A shallow basin on the ridge top, which contains a remnant of pre-Illinoian glacial till (Figure 2) (Braun 2004), supports a sizeable population of fly-poison (*Amianthium muscaetoxicum*), the plant that is the host for the fly-poison borer moth. This insect was unknown to science when it was first discovered at Hickory Run State Park in 1984 (NatureServe 2013). Known as *Papaipema* sp. 1, it is locally common within the Pocono region, but is not known outside of Pennsylvania (NatureServe 2013). It is ranked S2 (imperiled) at the state level. Trapping should be conducted to determine whether the moth is present at Bald Mountain.

Fly-poison in bloom at Bald Mountain June 12, 2013

On our June 11, 2013 visit to Bald Mountain we heard and saw periodical cicadas. They were active in the southwestern corner of the site and on adjacent lands.

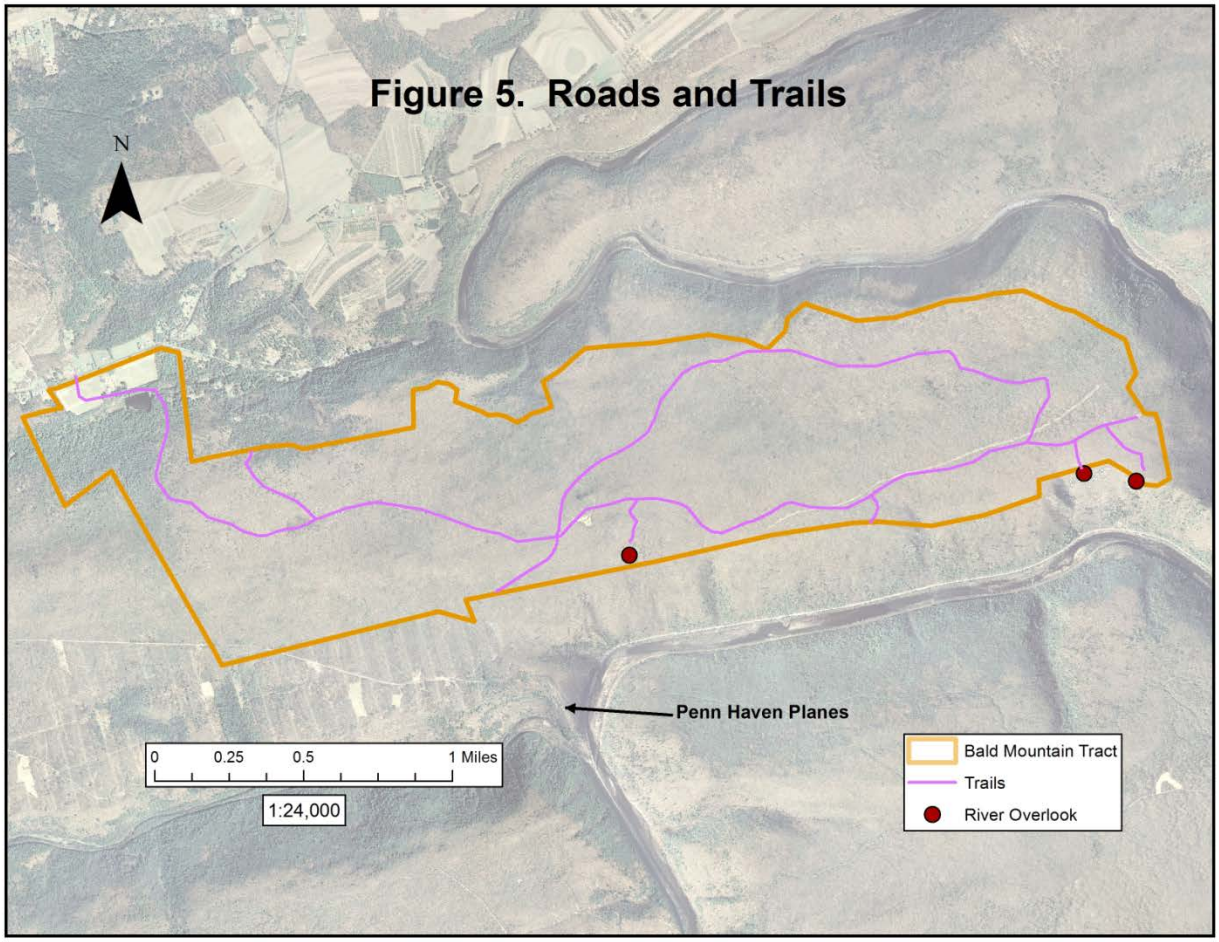
Invasive species
Non-native, invasive plants are restricted to the farmstead area and a few scattered sites along Indian Run. A patch of common reed (*Phragmites australis*) in the palustrine woodland at the upper end of the pond (Figure 4) should definitely be targeted for removal as soon as possible to prevent further spread. Reed canary-grass (*Phalaris arundinacea*) which has become established in the southeastern corner of the meadow along the entrance road, should be eradicated before it spreads to more of the site.

Impact of Deer
The lack of a forest understory and the browse line visible on mountain laurel (*Kalmia latifolia*), mountain holly (*Ilex montana*) and rosebay (*Rhododendron maximum*) throughout the Bald Mountain section indicates that over-browsing by deer is severe. The lack of herbaceous diversity in some areas is also attributable to too many deer. We recommend that the Bald

Mountain section be open for hunting and that hunters be permitted to drive the interior roads to facilitate access during hunting season.

Trails and Access

The Bald Mountain Section of Lehigh Gorge State Park is accessed via a woods road that crosses Indian Run below the dam, ascends the slope to the ridge and extends along the top. At the



eastern end the road makes a broad loop that descend the north slope part way before circling back to rejoin the ridge line access. There are three side trails, also woods roads, which provide access to points where the Lehigh Gorge can be viewed (Figure 5).

With the possible exception of a link to the Penn Haven Planes (see discussion below), we do not recommend construction of additional trails. A proposed rim trail would be very difficult to execute due to the frequent deposits of boulder colluvium along the upper slope facing the gorge. Nor do we recommend access by automobile beyond the current gate, except for hunters as discussed above.

An existing trail/woods road that extends down the south side of Bald Mountain to the old gravity railroad grade comes within 530 m of the top of the Penn Haven Planes (Figure 5). A connecting trail would need to be longer to avoid private lands and accommodate the grade by following contours, but is worth exploring.

View of the Lehigh River Gorge from Bald Mountain

Dam Removal

The possibility of removing the dam on Indian Run has been discussed. Restoring natural flow in the stream would definitely affect the plant communities mapped and described above as *sphagnum – beak-rush wetland* and *highbush blueberry – meadow-sweet palustrine wetland.* In time the adjacent *Hemlock – (white pine) forest* would expand down slope as the water level dropped.

No endangered, threatened or rare plants or plant communities would be affected by drawing down the pond; however, overall species diversity of the site would decline. In addition, the exposed pond bed would likely be colonized by invasive species such as common reed (*Phragmites australis*) and reed canary grass (*Phalaris arundinacea*).

Animal species that would likely be affected include waterfowl and reptiles and amphibians. We documented the presence of a wood turtle (*Glyptemys insculpta)* in the wetland above the pond. Wood turtle is classified as G3, S3S4 (PNHP 2013).

Wood turtle photographed at Bald Mountain Section May 4, 2012

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Appendix A. Plant List for Bald Mountain Section, Lehigh Gorge State Park

	family	*Common name*	*Native*	*Wetlands*
Ferns and fern allies				
Athyrium filix-femina var. *angustum*	Polypodiaceae	Lady fern	N	FAC
Dennstaedtia punctilobula	Polypodiaceae	Hay-scented fern	N	N
Diphasiastrum digitatum	Lycopodiaceae	Deep-rooted running-pine	N	FACU-
Dryopteris carthusiana	Polypodiaceae	Spinulose wood fern	N	FAC+
Dryopteris cristata	Polypodiaceae	Crested shield fern	N	FACW+
Equisetum arvense	Equisetaceae	Field horsetail	N	FAC
Lycopodium clavatum	Lycopodiaceae	Common clubmoss	N	FAC
Lycopodium hickeyi	Lycopodiaceae	Hickey's ground-pine	N	N
Lycopodium obscurum	Lycopodiaceae	Flat-branched ground-pine	N	FACU
Onoclea sensibilis	Polypodiaceae	Sensitive fern	N	FACW
Osmunda cinnamomea	Osmundaceae	Cinnamon fern	N	FACW
Osmunda claytoniana	Osmundaceae	Interrupted fern	N	FAC
Polypodium virginianum	Polypodiaceae	Common polypody	N	N
Thelypteris noveboracensis	Polypodiaceae	New York fern	N	FAC
Thelypteris palustris	Polypodiaceae	Marsh fern	N	FACW+
Grasses, rushes, and sedges				
Agrostis capillaris	Poaceae	Rhode Island bent	I	N
Anthoxanthum odoratum	Poaceae	Sweet vernal grass	I	FACU
Brachyelytrum aristosum	Poaceae	Northern shorthusk	N	N
Brachyelytrum erectum	Poaceae	Southern shorthusk	N	N
Bromus arvensis	Poaceae	Field chess	I	N
Carex amphibola	Cyperaceae	Sedge	N	FAC
Carex bromoides	Cyperaceae	Sedge	N	FACW
Carex canescens var. *disjuncta*	Cyperaceae	Sedge	N	OBL
Carex cristatella	Cyperaceae	Sedge	N	FACW
Carex debilis var. *rudgei*	Cyperaceae	Sedge	N	FAC
Carex echinata var. *echinata*	Cyperaceae	Prickly sedge	N	OBL
Carex folliculata	Cyperaceae	Sedge	N	OBL
Carex gracillima	Cyperaceae	Sedge	N	FACU
Carex gynandra	Cyperaceae	Sedge	N	OBL
Carex intumescens	Cyperaceae	Sedge	N	FACW+
Carex leptalea	Cyperaceae	Sedge	N	OBL
Carex lupulina	Cyperaceae	Sedge	N	OBL
Carex lurida	Cyperaceae	Sedge	N	OBL
Carex pensylvanica	Cyperaceae	Sedge	N	N
Carex scabrata	Cyperaceae	Sedge	N	OBL
Carex scoparia	Cyperaceae	Broom sedge	N	FACW
Carex stipata var. *stipata*	Cyperaceae	Sedge	N	N
Carex swanii	Cyperaceae	Sedge	N	FAcu
Carex tonsa var. *tonsa*	Cyperaceae	Sedge	N	N
Carex trisperma	Cyperaceae	Sedge	N	OBL
Carex umbellata	Cyperaceae	Sedge	N	N
Carex vulpinoidea	Cyperaceae	Sedge	N	OBL
Dactylis glomerata	Poaceae	Orchard grass	I	FACU

Danthonia compressa	Poaceae	Northern oatgrass	N	FACU-
Danthonia spicata	Poaceae	Poverty-grass	N	N
Dichanthelium acuminatum	Poaceae	Panic grass	N	FAC
Dichanthelium clandestinum	Poaceae	Deer-tongue grass	N	FAC+
Dichanthelium depauperatum	Poaceae	Poverty panic grass	N	N
Dichanthelium dichotomum	Poaceae	Panic grass	N	FAC
Dulichium arundinaceum	Cyperaceae	Three-way sedge	N	OBL
Eriophorum virginicum	Cyperaceae	Tawny cotton-grass	N	OBL
Glyceria canadensis	Poaceae	Rattlesnake mannagrass	N	OBL
Glyceria melicaria	Poaceae	Slender mannagrass	N	OBL
Glyceria striata	Poaceae	Fowl mannagrass	N	OBL
Holcus lanatus	Poaceae	Velvetgrass	I	FACU
Juncus effusus	Juncaceae	Soft rush	N	FACW+
Juncus tenuis	Juncaceae	Path rush	N	FAC-
Leersia oryzoides	Poaceae	Rice cutgrass	N	OBL
Luzula multiflora	Juncaceae	Field woodrush	N	FACU
Microstegium vimineum	Poaceae	Stiltgrass	I	FAC
Panicum virgatum	Poaceae	Switchgrass	N	FAC
Phalaris arundinacea	Poaceae	Reed canary-grass	I	FACW
Phleum pratense	Poaceae	Timothy	I	FACU
Phragmites australis ssp. *australis*	Poaceae	Common reed	I	FACW
Phlalaris arundinacea	Poaceae	Reed canary-grass	I	FACW
Poa alsodes	Poaceae	Woodland bluegrass	N	FACW-
Poa annua	Poaceae	Annual bluegrass	I	FACU
Schedonorus pratensis	Poaceae	Meadow fescue	I	FACU-
Schizachyrium scoparium var. *scoparium*	Poaceae	Little bluestem	N	FACU
Scirpus cyperinus	Cyperaceae	Wool-grass	N	FACW+
Scirpus georgianus	Cyperaceae	Bulrush	N	OBL
Aquatic plants				
Myriophyllum humile	Haloragaceae	Water-milfoil	N	OBL
Potamogeton epihydrus	Potamogetonaceae	Ribbonleaf pondweed	N	OBL
Brasenia schreberi	Cabombaceae	Purple wen-dock	N	OBL
Callitriche heterophylla	Plantaginaceae	Water-starwort	N	OBL
Sparganium americanum	Sparganiaceae	Bur-reed	N	OBL
Wildflowers				
Achillea millefolium	Asteraceae	Common yarrow	I	FACU
Agrimonia striata	Rosaceae	Roadside agrimony	N	FACU-
Alliaria petiolata	Brassicaceae	Garlic-mustard	I	FACU-
Amianthium muscaetoxicum	Melanthiaceae	Fly-poison	N	FAC
Apocynum cannabinum	Apocynaceae	Dogbane	N	FACU
Arctium minus	Asteraceae	Common burdock	I	FACU-
Arisaema triphyllum ssp. *triphyllum*	Araceae	Jack-in-the-pulpit	N	FACW-
Asclepias syriaca	Apocynaceae	Common milkweed	N	FACU-
Barbarea verna	Brassicaceae	Early wintercress	I	N
Caltha palustris	Ranunculaceae	Marsh-marigold	N	OBL
Cardamine pensylvanica	Brassicaceae	Pennsylvania bittercress	N	OBL

Cerastium fontanum ssp. *triviale*	Caryophyllaceae	Common mouse-ear chickweed	I	FACU-
Chelone glabra	Plantaginaceae	Turtlehead	N	OBL
Circaea canadensis	Onagraceae	Enchanter's-nightshade	N	FACU
Cirsium arvense	Asteraceae	Canada thistle	I	FACU
Cirsium vulgare	Asteraceae	Bull thistle	I	FACU-
Clinopodium vulgare	Lamiaceae	Wild basil	I	N
Clintonia borealis	Liliaceae	Blue bead-lily	N	FAC
Conyza canadensis	Asteraceae	Horseweed	N	UPL
Coptis trifolia	Ranunculaceae	Goldthread	N	FACW
Cuscuta gronovii var. *gronovii*	Convolvulaceae	Common dodder	N	N
Dalibarda repens	Rosaceae	Dewdrop	N	FAC
Daucus carota	Apiaceae	Queen Anne's-lace	I	N
Epigaea repens	Ericaceae	Trailing-arbutus	N	N
Euthamia graminifolia	Asteraceae	Grass-leaved goldenrod	N	FAC
Fallopia cilinodis	Polygonaceae	Fringed bindweed	N	N
Galium tinctorium	Rubiaceae	Bedstraw	N	OBL
Gaultheria procumbens	Ericaceae	Teaberry	N	FACU
Hesperis matronalis	Brassicaceae	Dame's-rocket	I	N
Hieracium caespitosum	Asteraceae	King-devil	I	N
Houstonia caerulea	Rubiaceae	Bluets	N	FACU
Hydrocotyle americana	Araliaceae	Marsh pennywort	N	OBL
Hypericum mutilum	Hypericaceae	Dwarf St. John's-wort	N	FACW
Hypericum perforatum	Hypericaceae	St. John's-wort	I	N
Impatiens capensis	Balsaminaceae	Jewelweed	N	FACW
Iris versicolor	Iridaceae	Northern blue flag	N	OBL
Lactuca canadensis	Asteraceae	Wild lettuce	N	FACU-
Lepidium campestre	Brassicaceae	Fieldcress	I	N
Leucanthemum vulgare	Asteraceae	Ox-eye daisy	I	N
Lilium canadense	Liliaceae	Canada lily	N	FAC+
Linaria vulgaris	Plantaginaceae	Butter-and-eggs	I	N
Lycopus virginicus	Lamiaceae	Bugleweed	N	OBL
Lysimachia quadrifolia	Myrsinaceae	Whorled loosestrife	N	FACU-
Maianthemum canadense	Ruscaceae	Canada mayflower	N	FAC-
Matricaria discoidea	Asteraceae	Pineapple-weed	I	FACU
Medeola virginiana	Liliaceae	Indian cucumber-root	N	N
Melilotus alba	Fabaceae	White sweet-clover	I	FACU
Monotropa uniflora	Ericaceae	Indian-pipe	N	FACU-
Myosotis laxa	Boraginaceae	Wild forget-me-not	N	OBL
Myosotis scorpioides	Boraginaceae	Forget-me-not	I	OBL
Myosotis sylvatica	Boraginaceae	Garden forget-me-not	I	UPL
Oclemena acuminata	Asteraceae	Wood aster	N	N
Oenothera perennis	Onagraceae	Dundrops	N	FAC-
Oxalis acetosella	Oxalidaceae	Northern wood-sorrel	N	FAC-
Oxalis stricta	Oxalidaceae	Common yellow wood-sorrel	N	UPL
Persicaria sagittata	Polygonaceae	Tearthumb	N	OBL
Plantago lanceolata	Plantaginaceae	English plantain	I	UPL
Plantago rugelii	Plantaginacerae	Broad-leaved plantain	N	FACU
Platanthera clavellata	Orchidaceae	Clubspur orchid	N	FACW+
Platanthera lacera	Orchidaceae	Ragged fringed-orchid	N	FACW

Potentilla recta	Rosaceae	Sulfur cinquefoil	I	N
Potentilla simplex	Rosaceae	Old-field cinquefoil	N	FACU-
Prunella vulgaris ssp. *vulgaris*	Lamiaceae	Heal-all	I	FACU+
Ranunculus acris	Ranunculaceae	Common meadow buttercup	I	FAC+
Ranunculus recurvatus	Ranunculaceae	Hooked crowfoot	N	FAC+
Rumex acetosella	Polygonaceae	Sheep sorrel	I	UPL
Rumex obtusifolius	Polygonaceae	Bitter dock	I	FACU-
Silene latifolia	Caryophyllaceae	White campion	I	N
Solidago rugosa var. *rugosa*	Asteraceae	Wrinkle-leaf goldenrod	N	FAC
Stellaria longifolia	Caryophyllaceae	Long-leaved stitchwort	N	FACW
Symphyotrichum puniceum	Asteraceae	Purple-stemmed aster	N	OBL
Symplocarpus foetidus	Araceae	Skunk cabbage	N	OBL
Taraxacum officinale	Asteraceae	Common dandelion	I	FACU-
Thalictrum pubescens	Ranunculaceae	Tall meadow-rue	N	FACW+
Triadenum virginicum	Hypericaceae	Marsh St. John's-wort	N	OBL
Trientalis borealis	Myrsinaceae	Star-flower	N	FAC
Trifolium campestre	Fabaceae	Low hop-clover	I	N
Trillium undulatum	Melanthiaceae	Painted trillium	N	FACU
Tussilago farfara	Asteraceae	Coltsfoot	I	FACU
Typha latifolia	Typhaceae	Common cat-tail	N	OBL
Urtica dioica ssp. dioica	Urticaceae	Great nettle	I	FACU
Veratrum viride	Melanthiaceae	False hellebore	N	FACW+
Verbascum thapsus	Scrophulariaceae	Common mullein	I	N
Veronica arvensis	Plantaginaceae	Corn speedwell	I	N
Veronica officinalis	Plantaginaceae	Common speedwell	I	FACU-
Vinca minor	Apocynaceae	Common periwinkle	I	N
Viola cucullata	Violaceae	Blue marsh violet	N	FACW+
Viola labradorica	Violaceae	American dog violet	N	FACW
Viola macloskeyi ssp. *pallens*	Violaceae	Sweet white violet	N	OBL
Viola sagittata var. sagittata	Violaceae	Arrow-leaved violet	N	FACW
Viola sororia	Violaceae	Common blue violet	N	FAC-
Trees, shrubs and woody vines				
Acer pensylvanicum	Sapindaceae	Moosewood	N	FACU
Acer platanoides	Sapindaceae	Norway maple	I	UPL
Acer rubrum	Sapindaceae	Red maple	N	FAC
Alnus incana ssp. *rugosa*	Betulaceae	Speckled alder	N	N
Amelanchier arborea	Rosaceae	Shadbush	N	FAC-
Berberis thunbergii	Berberidaceae	Japanese barberry	I	N
Betula alleghaniensis	Betulaceae	Yellow birch	N	FAC
Betula lenta	Betulaceae	Black birch	N	FACU
Castanea dentata	Fagaceae	American chestnut	N	N
Comptonia peregrina	Myricaceae	Sweet-fern	N	N
Diervilla lonicera	Caprifoliaceae	Bush-honeysuckle	N	N
Fagus grandifolia	Fagaceae	American beech	N	FACU
Fraxinus americana	Oleaceae	White ash	N	FACU
Gaylussacia baccata	Ericaceae	Black huckleberry	N	FACU
Gaylussacia frondosa	Ericaceae	Dangleberry	N	FAC
Hamamelis virginiana	Hamamelidaceae	Witch-hazel	N	FACU+
Ilex montana	Aquifoliaceae	Mountain holly	N	N

Ilex verticillata	Aquifoliaceae	Winterberry	N	FACW+
Kalmia angustifolia	Ericaceae	Sheep laurel	N	FAC
Kalmia latifolia	Ericaceae	Mountain laurel	N	FACU
Larix kaempferi	Pinaceae	Japanese larch	I	N
Liriodendron tulipifera	Magnoliaceae	Tuliptree	N	FACU
Lonicera morrowii	Caprifoliaceae	Morrow's honeysuckle	I	N
Malus pumila	Rosaceae	Apple	I	
Nyssa sylvatica	Nyssaceae	Sourgum	N	FAC
Photinia melanocarpa	Rosaceae	Black chokeberry	N	FAC
Picea abies	Pinaceae	Norway spruce	I	N
Pinus resinosa	Pinaceae	Norway pine	N	FACU
Pinus strobus	Pinaceae	Eastern white pine	N	FACU
Prunus serotina	Rosaceae	Wild black cherry	N	FACU
Quercus alba	Fagaceae	White oak	N	FACU
Quercus bicolor	Fagaceae	Swamp white oak	N	FACW+
Quercus coccinea	Fagaceae	Scarlet oak	N	N
Quercus ilicifolia	Fagaceae	Scrub oak	N	N
Quercus montana	Fagaceae	Chestnut oak	N	FACW
Quercus rubra	Fagaceae	Red oak	N	FACU-
Rhamnus frangula	Rhamnaceae	Alder buckthorn	I	N
Rhododendron maximum	Ericaceae	Rosebay	N	FAC
Rhus copallina var. *copallina*	Anacardiaceae	Shining sumac	N	N
Rhus typhina	Anacardiaceae	Staghorn sumac	N	N
Rosa multiflora	Rosaceae	Multiflora rose	I	FACU
Rubus enslenii	Rosaceae	Southern dewberry	N	N
Rubus hispidus	Rosaceae	Swamp dewberry	N	FACW
Rubus idaeus	Rosaceae	Red raspberry	N	FAC-
Salix sericea	Salicaceae	Silky willow	N	OBL
Sambucus canadensis	Adoxaceae	American elder	N	FACW-
Sassafras albidum	Lauraceae	Sassafras	N	FACU-
Smilax rotundifolia	Smilacaceae	Catbrier	N	FAC
Spiraea alba	Rosaceae	Meadow-sweet	N	FACW+
Spiraea tomentosa	Rosaceae	Hardhack	N	FACW-
Syringa vulgaris	Oleaceae	Common lilac	I	N
Thuja occidentalis	Cupressaceae	Arbor-vitae	I	FACW
Tsuga canadensis	Pinaceae	Canada hemlock	N	FACU
Vaccinium angustifolium	Ericaceae	Low sweet blueberry	N	FACU-
Vaccinium corymbosum	Ericaceae	Highbush blueberry	N	FACW-
Vaccinium macrocarpon	Ericaceae	Cranberry	N	OBL
Vaccinium pallidum	Ericaceae	Lowbush blueberry	N	N
Vitis aestivalis	Vitaceae	Summer grape	N	FACU