

## Nottingham Serpentine Barrens NHA

PNHP Significance Rank: *Global*

### Site Description

This large Natural Heritage Area at the Pennsylvania / Maryland border contains a globally rare serpentine habitat in a mosaic of the characteristic serpentine barren plant communities, which include open gravel areas, grassy meadows, and conifer and deciduous dominated woodland habitats in various stages of natural succession. Nottingham Serpentine Barrens is one of several serpentine habitats that make up the State Line Serpentine Barrens, an ecologically unique system occurring in scattered, mostly small patches along this part of the PA/MD border. The serpentine habitats are often referred to as grasslands, and the scattered herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they also contain a good diversity of other plant species, many rare at the state and global levels. Nottingham Serpentine Barrens is currently known to support 38 animal species of concern, most of which are butterflies & moths that feed on the unique variety of plants present, 29 plant species of concern, and an additional six sensitive species of concern. The serpentine community itself is considered globally uncommon due to the limited occurrences of this habitat type around the world.






















































Juniper Hairstreak (*Callophrys gryneus*)

Andrew Strassman (PNHP)

Species or natural communities of concern that can be found in this NHA include the following:

Species or Natural Community Name	PNHP Rank <sup>1</sup>		PA Legal Status <sup>1</sup>	Last Seen	Quality <sup>2</sup>
	Global	State			
Summer Tanager ( <i>Piranga rubra</i> )			N (CA)	5/30/2004	E
Serpentine grassland			N (N)	2005	A
Serpentine pitch pine - oak forest			N (N)	2005	--
Common Roadside Skipper ( <i>Amblyscirtes vialis</i> )			N (N)	6/2/1995	E
Falcate Orangetip ( <i>Anthocharis midea</i> )			N (N)	5/14/1997	E
Dusted Skipper ( <i>Atrytonopsis hianna</i> )			N (N)	5/14/1997	C
Juniper Hairstreak ( <i>Callophrys gryneus</i> )			N (N)	5/14/1997	CD
Leonard's Skipper ( <i>Hesperia leonardus</i> )			N (N)	9/19/1996	E
Cobweb Skipper ( <i>Hesperia metea</i> )			N (N)	5/14/1997	B
Spiny Oakworm Moth ( <i>Anisota stigma</i> )			N (N)	7/16/2004	C
A Geometrid Moth ( <i>Apodrepanulatrix liberaria</i> )			N (N)	10/13/2001	CD
Dot-lined White Moth ( <i>Artace cribraria</i> )			N (N)	7/1/2000	E
Southern Pine Looper Moth ( <i>Caripeta aretaria</i> )			N (N)	8/26/2000	E
An Underwing Moth ( <i>Catocala umbrosa</i> )			N (N)	7/23/1998	C
Packard's Lichen Moth ( <i>Cisthene packardii</i> )			N (N)	8/27/2004	C
Lead-colored Lichen Moth ( <i>Cisthene plumbea</i> )			N (N)	8/27/2004	E
Regal Moth ( <i>Citheronia regalis</i> )			N (N)	7/16/2004	E
Pure Lichen Moth ( <i>Crambidia pura</i> )			N (N)	8/27/2004	E

Species or Natural Community Name		PNHP Rank <sup>1</sup>		PA Legal	Last	Quality <sup>2</sup>
		Global	State	Status <sup>1</sup>	Seen	
A Noctuid Moth ( <i>Elaphria cornutinis</i> )		G5	SU	N (N)	7/16/2004	E
Broad-lined Erastria Moth ( <i>Erastria coloraria</i> )		G3G4	S1	N (N)	6/22/2002	CD
Barrens Buckmoth ( <i>Hemileuca maia</i> )		G5	S1S2	N (N)	5/14/1997	C
Joyful Holomelina Moth ( <i>Holomelina laeta</i> )		G4	S1S2	N (N)	8/27/2004	C
Esther Moth ( <i>Hypagyrtis esther</i> )		G5	S2S3	N (N)	8/8/1996	C
A Wave Moth ( <i>Idaea violacearia</i> )		G4	S1	N (N)	10/13/2001	B
Black-waved Flannel Moth ( <i>Lagoa crispata</i> )		G5	S1	N (N)	6/12/2004	C
An Owlet Moth ( <i>Macrochilo hypocritalis</i> )		G4	SU	N (N)	7/23/1998	E
Footpath Sallow Moth ( <i>Metaxaglaea semitaria</i> )		G5	S2	N (N)	9/30/2000	E
A Borer Moth ( <i>Papaipema marginidens</i> )		G4	SU	N (N)	9/13/1996	E
A Noctuid Moth ( <i>Parahypenodes quadralis</i> )		G4	SU	N (N)	8/31/1998	E
A Noctuid Moth ( <i>Renia</i> sp. 1 nr. <i>discoloralis</i> )		G4	S1?	N (N)	8/26/2000	C
A Noctuid Moth ( <i>Richia acclivis</i> )		G4G5	S1S2	N (N)	8/26/2000	E
A Noctuid Moth ( <i>Sutyna privata teltowa</i> )		G5T4	S1	N (N)	9/15/2001	C
Tolype Moth ( <i>Tolype notialis</i> )		G4G5	S1	N (N)	7/16/2004	C
Southern Variable Dart Moth ( <i>Xestia elimata</i> )		G5	S2S3	N (N)	8/27/2004	C
A Zale Moth ( <i>Zale curema</i> )		G3G4	S1	N (N)	5/14/1997	C
Oblique Zale Moth ( <i>Zale obliqua</i> )		G5	S1	N (N)	7/2/1998	C
A Noctuid Moth ( <i>Zale squamularis</i> )		G4	S2S3	N (N)	7/16/2004	C
A Zale Moth ( <i>Zale submediana</i> )		G4	S2	N (N)	5/14/1997	C
Pine Barrens Zanclognatha ( <i>Zanclognatha martha</i> )		G4	S1S2	N (N)	8/27/2004	C
Blue Corporal ( <i>Ladona deplanata</i> )		G5	S1	N (N)	5/7/2008	E
Small White-snakeroot ( <i>Ageratina aromatica</i> )		G5	S3	N (PR)	9/25/2008	B
Arrow-feathered Three-awn ( <i>Aristida purpurascens</i> )		G5	S2	PT (PT)	10/15/2008	B
Mead's Sedge ( <i>Carex meadii</i> )		G4G5	S1	TU (PE)	8/26/1997	BC
Richardson's Sedge ( <i>Carex richardsonii</i> )		G5	S1	N (PE)	5/3/2005	BC
Field Chickweed ( <i>Cerastium velutinum</i> var. <i>velutinum</i> )		G5T4?	S3	N (SP)	5/4/2011	E
Fringe-tree ( <i>Chionanthus virginicus</i> )		G5	S3	N (PT)	10/15/2008	BC
Horrible Thistle ( <i>Cirsium horridulum</i> )		G5	S1	PE (PE)	6/3/2007	D
Field Dodder ( <i>Cuscuta pentagona</i> )		G5	S2	N (PT)	10/9/2008	C
Tufted Hairgrass ( <i>Deschampsia cespitosa</i> )		G5	S3	N (PT)	6/2/2010	B
Serpentine Panic-grass ( <i>Dichantherium annulum</i> )		GNR	S2	TU (PT)	9/25/2008	B
Heller's Witchgrass ( <i>Dichantherium oligosanthes</i> )		G5	S3	N (PT)	9/25/2008	BC
A Eupatorium ( <i>Eupatorium rotundifolium</i> )		G5	S3	TU (TU)	10/9/2008	B
Cluster Fescue ( <i>Festuca paradoxa</i> )		G5	S1	PE (PE)	7/10/2007	D
Annual Fimbray ( <i>Fimbristylis annua</i> )		G5	S2	PT (PT)	10/15/2008	A
St Andrew's-cross ( <i>Hypericum stragulum</i> )		G4	S2	N (PT)	7/30/2008	B
American Holly ( <i>Ilex opaca</i> )		G5	S2	PT (PT)	9/21/1996	B
Sandplain Wild Flax ( <i>Linum intercursum</i> )		G4	S1	PE (PE)	8/10/1997	AB
Stagger-bush ( <i>Lyonia mariana</i> )		G5	S1	PE (PE)	6/16/1993	D
Umbrella Magnolia ( <i>Magnolia tripetala</i> )		G5	S2	PT (PR)	8/15/1990	C
Plain Ragwort ( <i>Packera anonyma</i> )		G5	S2	PR (PR)	9/25/2008	B

Species or Natural Community Name		PNHP Rank <sup>1</sup>		PA Legal Status <sup>1</sup>	Last Seen	Quality <sup>2</sup>
		Global	State			
Southern Red Oak ( <i>Quercus falcata</i> )		G5	S1	PE (PE)	10/15/2008	C
Sand Blackberry ( <i>Rubus cuneifolius</i> )		G5	S1	TU (PE)	6/3/2007	D
Few Flowered Nutrush ( <i>Scleria pauciflora</i> )		G5	S2	PT (PT)	9/21/1996	B
Narrow-leaved White-topped Aster ( <i>Sericocarpus linifolius</i> )		G5	S1	PE (PE)	7/21/1990	C
Spring Ladies'-tresses ( <i>Spiranthes vernalis</i> )		G5	S1	PE (PE)	7/23/1989	B
Prairie Dropseed ( <i>Sporobolus heterolepis</i> )		G5	S1	PE (PE)	9/25/2008	C
Wild Bean ( <i>Strophostyles umbellata</i> )		G5	S2	N (PE)	7/23/1996	E
Serpentine Aster ( <i>Symphyotrichum depauperatum</i> )		G2	S2	PT (PT)	9/25/2008	A
Bushy Aster ( <i>Symphyotrichum dumosum</i> )		G5	S1	TU (PE)	9/24/1996	D
Sensitive species of concern A <sup>3</sup>	<b>S</b>	---	---	---	5/14/1997	D
Sensitive species of concern B <sup>3</sup>	<b>S</b>	---	---	---	9/22/1996	D
Sensitive species of concern C <sup>3</sup>	<b>S</b>	---	---	---	5/20/2009	B
Sensitive species of concern D <sup>3</sup>	<b>S</b>	---	---	---	4/15/2013	B
Sensitive species of concern E <sup>3</sup>	<b>S</b>	---	---	---	6/13/2011	A
Sensitive species of concern F <sup>3</sup>	<b>S</b>	---	---	---	6/23/2007	E

<sup>1</sup>See the PNHP website (<http://www.naturalheritage.state.pa.us/RankStatusDef.aspx>) for an explanation of PNHP ranks and legal status. A legal status in parentheses is a status change recommended by the Pennsylvania Biological Survey.

<sup>2</sup>See NatureServe website (<http://www.natureserve.org/explorer/eorankguide.htm>) for an explanation of quality ranks.

<sup>3</sup>This species is not named by request of the jurisdictional agency responsible for its protection.

Many of the butterfly and moth species (Lepidoptera) documented at this location are limited in distribution in Pennsylvania to serpentine and other grassland habitats, which are often set in a matrix of open oak and pine woodlands. Conservation of these species requires protection of the habitat they use during all stages of their life cycles. Maintaining a mosaic of grassland, oak, and pine areas at serpentine barrens sites and the surrounding area will create a diverse and healthy habitat capable of supporting the rare Lepidoptera listed above. Creation of corridors between barrens sites could also encourage movement of species between sites and help create more secure populations. Pesticide application, especially for the control of gypsy moths, can have a devastating effect on populations of Lepidoptera species of concern and should not be used in this area.

Most of the plant species of concern found within this Natural Heritage Area are found primarily within the strongly serpentine influenced small herbaceous openings or within the adjacent thin woodlands. Among these include small white-snakeroot, arrow-feathered three-awn, Mead's sedge, Richardson's sedge, field chickweed, tufted hairgrass, serpentine panic-grass, Heller's witchgrass, cluster fescue, annual fimbry, St. Andrews cross, sandplain wild flax, plain ragwort, sand blackberry, few-flowered nutrush, prairie dropseed and a serpentine aster. In the past, natural disturbance, such as wild fires, would have helped to keep these areas in an open condition. With the relatively recent suppression of fire, the open areas have gradually closed due to natural succession. An active restoration effort to restore the serpentine openings will be necessary to ensure the continued existence of these habitats and the species they contain. Other plants within this area are not



Serpentine Aster  
(*Symphyotrichum depauperatum*)

specifically adapted to the open habitats, but are more closely associated with wooded and forested habitats. These include fringe-tree, American holly, stagger-bush, and southern red oak. Efforts to restore serpentine openings should take into account the presence of these species and avoid disturbing the habitat where they occur.

- Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

### Threats and Stresses

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

Specific threats and stresses to the elements present at this site include:

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks (along with a nearly impenetrable tangle of greenbrier). Active management to maintain herbaceous openings will be necessary in the absence of wildfire.
- Management activities can inadvertently damage the habitat of sensitive species of concern.
- Use of pesticides to control gypsy moths or other insect pests can pose a significant hazard to the insect species of concern at this location. Elimination of specific insect host plants can also eliminate insect species of concern.
- Aggressive invasive species of plants can displace native species.
- Overbrowsing by deer can have a severely negative impact on small populations of plant species of concern.



Joan King

Flowers of Stagger-bush  
(*Lyonia mariana*)

### Conservation Recommendations

Much of the primary serpentine influenced habitat is owned by Chester County and managed as public park. There appears to be no specific formal management plan for Nottingham Serpentine Barrens, and the site would benefit from a thorough review of the site-specific goals and procedures for management



here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008). Park staff along with an all-volunteer organization, the Friends of the State Line Serpentine Barrens, has been conducting habitat management on this site for many years to maintain the serpentine openings. These serpentine habitats occur in isolated patches along this section of the Pennsylvania / Maryland border as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long-range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. The area between and around these habitats should be maintained to provide the necessary buffer to allow prescribed burns to maintain the mosaic of open habitat once a network of the woody species have been removed.

The following steps are recommended to ensure the persistence of these species at this site:

- The plants that characterize these habitats are adapted to the dry, nutrient poor soils and periodic fire events. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained.
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no “one-size-fits-all” management recommendation for this habitat other than to provide for a mosaic of habitat diversity. “It’s essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. ...the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem.” (Roger Latham, personal communication November 7th, 2014)
- Management activities should be coordinated with long-term habitat monitoring. “Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside.” (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to



Prescribed fire is an excellent vegetation management tool for serpentine habitats.

Roger Latham, Continental Conservation

indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (*Smilax rotundifolia*)." (Roger Latham, personal communication November 18th, 2014)

- Avoid unintentional destruction of species of concern. Management activities should be conducted with the site-specific knowledge of the presence of species of concern, so that management actions coincide with the habitat needs of the species of concern present. Regular park maintenance and mowing should be conducted by personnel informed on the specific locations of sensitive species of concern.
- Avoid the use of pesticides to control gypsy moths in this area to avoid the collateral damage to sensitive insect species of concern.
- Conservation of the core habitat and supporting landscape and connecting linkages between this serpentine habitat and those nearby should be considered among the highest conservation priorities in the county.
- Expand herbaceous openings on convex landscapes by removing trees and other woody plants. Focus woody plant removal on pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil removal may be necessary to establish thin soils over serpentine bedrock.
- Locate, preserve and expand nectar plants for specialized Lepidoptera species, in particular, wild indigo (*Baptisia tinctoria*) and New Jersey tea (*Ceanothus americanus*). These species are the preferred larval host for two Lepidoptera species of concern. Deer exclosures may be necessary to protect these host plant populations.
- In the past, naturally occurring fires helped maintain the open aspect characteristic of the serpentine barren habitat. Today, active vegetation management, primarily in the form of volunteer work crews of the "Friends of the State Line Serpentine Barrens", as well as County park personnel help to remove trees and shrubs that in the past would have been cleared by fire events, or active large mammal grazing. These work crews have made great progress over the years to create the mosaic of patchy openings resembling in places, a grass land, in others, an oak savannah, or pitch pine woodland, or juniper-catbrier shrubland, or mixed oak forest, or bare soil gravel bed. All these, as well as other small patch natural communities, play an important role in sustaining the diversity of plants and animals in these important ecosystems.
- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.

- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

#### Location

Municipalities: *West Nottingham Township*

USGS quads: *Kirkwood, Rising Sun*

Previous CNHI reference: *Kirks Bridge Woods, Black Run, Nottingham Serpentine Barrens*

Associated NHAs: *New Texas Serpentine Barrens, Goat Hill Serpentine Barrens, Oxford Airport Barrens, Chrome Serpentine Barrens*

Overlapping Protected Lands: *Goat Hill Serpentine Barrens, Nottingham Serpentine Barrens, Valley Forge State Forest, Nottingham Serpentine Barrens, Octoraro Creek Greenway, Brandywine Conservancy Easement, Agricultural Easement*

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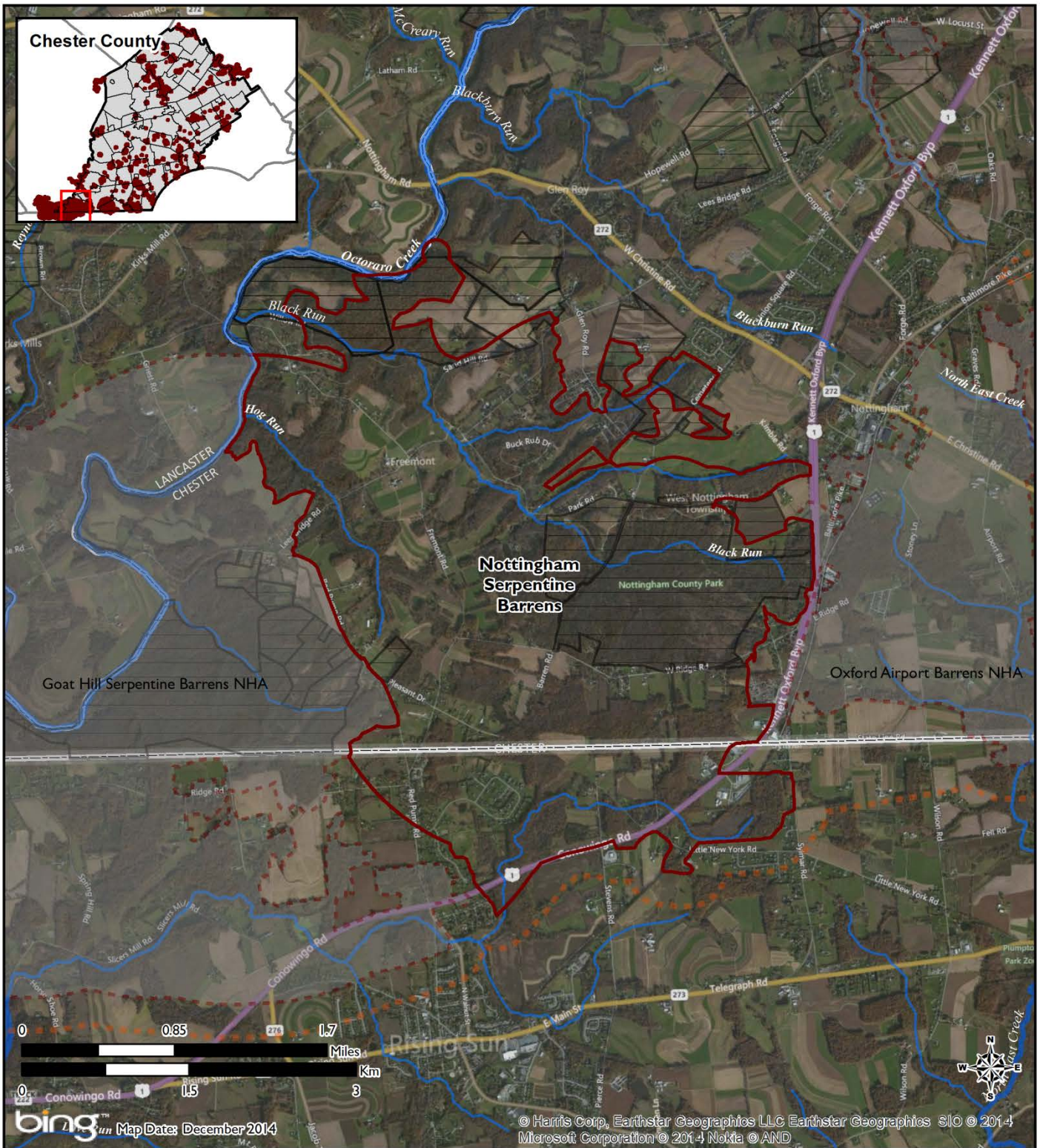
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## Nottingham Serpentine Barrens Natural Heritage Area

This diverse site contains globally rare Serpentine Grassland and Serpentine Pitch Pine-Oak Forest communities and supports populations of more than 70 species of concern - including many moths and butterflies, numerous plants, and some vertebrates.

**Significance Rank:**  
**GLOBAL**



**Pennsylvania  
Natural Heritage Areas**

- Core Habitat
- Other Core Habitat
- Other Supporting Landscape
- Conservation Lands