CLINTON COUNTY

NATURAL HERITAGE INVENTORY

Updated 2002

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ABSTRACT

The natural heritage sites that have qualified for inclusion in this report are ranked according to their significance as areas of importance to the biological diversity and ecological integrity of the county. Also included in this evaluation is the level of state and/or global significance ("S" or "G" rank). The three county significance ranks are **Exceptional**, **High**, and **Notable** significance. The three county ranks have been used to prioritize all identified sites and suggest the relative attention that sites should receive for the amount, degree and rate of protection. The sites are in alphabetical order for each level. Designation as to type of natural heritage site (NA=Natural Area, BDA=Biological Diversity Area, DA=Dedicated Area, LCA=Landscape Conservation Area, OHA=Other Heritage Area) is included as part of the site name. Refer to the "Introduction" section for explanations of these site categories. Definitions of the three county significance ranks are given in Appendix II.

* denotes sites added during 2002 NHI update.
+ denotes areas for which boundaries were edited during the 2002 NHI update.

Table 1: Summary of Natural Heritage Areas in order of relative county significance.

SITE	QUADRANGLE	DESCRIPTION
EXCEPTIONAL		
Castle Rocks BDA	Carroll	Habitat for a lupine population, a plant species of special concern.
Hyner View BDA	Glen Union	Habitat for a population of cranesbill (*Geranium bicknellii*), a plant species of special concern.
Whetham Fire Tower Wetland BDA	Glen Union	Herbaceous vernal pond communities and a site for a species of special concern.
Sugar Camp Wetlands BDA	Glen Union	Herbaceous vernal pond wetland communities and a site for a species of special concern.
Montour Road Ridge BDA	Hammersley Fork	Site occupied by an animal species of global concern.
+ John Summerson Branch Trout Run BDA	Hammersley Fork	Exceptional Value Stream watershed holding two significant wetland communities.
F.H. Duttlinger NA DA	Hammersley Fork	Dedicated Area containing an old growth hemlock forest, mesic and dry-mesic central forest communities, and a northern conifer swamp.

SITE	QUADRANGLE	DESCRIPTION
EXCEPTIONAL (cont.)		
Bucktail State Park Natural Area DA	Glen Union Farrandsville Renovo East Renovo West Keating Sinnemahoning	Nearly 17,000 acres of steep slopes along the the West Branch and Sinnemahoning Valleys. Its size, the identified communities within and possibility for large scale conservation of biodiversity make it an important resource.
+ Hammersley Fork Watershed BDA	Hammersley Fork Tamarack	Large and remote Exceptional Value Stream watershed containing the Dutlinger Natural Area and its associated communities.
Slaughtering Ground Barrens BDA	Howard N.W.	An excellent example of a high elevation pitch pine-scrub oak woodland community.
+ Keating Mountain BDA	Keating	Mountain within the Bucktail State Park NA supporting an old growth hemlock forest and a maturing second growth hemlock (white pine)-red oak-mixed hardwoods forest.
Cooper Run BDA	Loganton	Habitat for a species of special concern.
Robbin's Run BDA	Loganton	An area containing a highbush blueberry-sphagnum wetland community and habitat for two plant species and an animal species of special concern.
Rosecrans Bog Natural DA	Loganton	Bureau of Forestry Natural Area - that area contains a non-glacial bog that is home to two plants and an animal of special concern.
+ Rosecrans Bog BDA	Loganton	Leatherleaf-cranberry peatland and its accompanying watershed, containing Rosecrans Bog Natural Area and supporting two plants and an animal of special concern.
Pond Road Wetland BDA	Loganton	Small, herbaceous vernal pond community and its immediate watershed. Home to a plant of special concern.
Mt. Logan Natural Area DA	Loganton Jersey Shore	Dedicated Bureau of Forestry natural area occupying a section of the Bald Eagle Ridge. Holds good examples of mesic, dry-mesic and ridge-top forests.

SITE	QUADRANGLE	DESCRIPTION
EXCEPTIONAL (cont.)		
Pepper Run Pools BDA	Loganton Mill Hall	Wet area at the headwaters of Pepper Run containing a number of herbaceous vernal ponds that are home to a plant of special concern.
Fishing Creek Bend Gap BDA	Mill Hall	Probably the best example of a hemlock (white pine) - northern hardwoods dominated gap community in the county. Almost completely contained within State Game Lands #285.
+ Cedar Hill Cliffs BDA	Mill Hall	The largest calcareous cliff community along Fishing Creek in Clinton County. Supports a variety of ferns, herbs and shrubs and represents rare habitat in the county.
+ Stoltzfus Outcrop BDA	Mill Hall	Calcareous opening/cliff community supporting a variety of ferns and herbs. A good example of a limestone based community which also includes a wet, solution cave.
Mt. Riansares BDA	Mill Hall	Undisturbed old-growth hemlock (white pine) forest community on the steep upper slopes of Mt. Riansares. Also included are examples of scree slopes supporting boulder field communities.
+ Fairpoint Swamp BDA	Mill Hall Lock Haven	County rare habitat containing water willow (*Decodon verticillatus*) shrub wetland and buttonbush wetland communities within old within old channel scars and on oxbow lake along Bald Eagle Creek.
Cherry Run LCA	Millheim Mill Hall Loganton Beech Creek	Landscape conservation area encompassing a large piece of the Nittany Ridge line that includes an Exceptional Value stream watershed and several other Natural Heritage Areas.
Cranberry Swamp Natural Area DA	Renovo East Howard N.W.	Dedicated Bureau of Forestry natural area to the protection of a hemlock palustrine forest recovering from early logging. Also contains an undisturbed spring community.
+ Lower Jerry Run DA & BDA	Sinnemahoning	Dedicated Bureau of Forestry natural area that holds a patch of old growth eastern hemlock forest and second growth mixed-oak forest.

SITE	QUADRANGLE	DESCRIPTION
EXCEPTIONAL (cont.)		
East Branch Swamp Natural Area DA	Snow Shoe N.E. Howard N.W.	Bureau of Forestry natural area dedicated to the protection of a recovering hemlock palustrine forest community. Includes a section of tornado damaged, old-growth patch of eastern hemlocks.
+ East Branch Big Run Watershed BDA	Snow Shoe N.E. Howard N.W.	Natural Heritage area containing two hemlock palustrine forests which form the headwaters of the Exceptional Value East Branch of Big Run. This area includes the entire upper watershed of East Branch.
Tamarack Swamp Natural Area DA	Tamarack	Bureau of Forestry natural area dedicated to the protection of a section of a large, boreal wetland that contains several plants and animals of special concern.
+ Tamarack Swamp BDA	Tamarack	This area includes the Tamarack Swamp Natural Area and a boreal bog; a rare community in the county and the state. This one includes several plants and animals of special concern.
+ Round Island Run Watershed	Sinnemahoning	An Exceptional Value watershed.
+ Fork Hill Road BDA	Young Woman's Creek	Example of a mature eastern hemlock-beech community that supports a heron rookery.
* Kettle Creek BDA	Hammersley Fork	An area supporting a species of global concern.
+ Kettle Creek Watershed LCA	Hammersley Fork, Tamarack	The largest Exceptional Value watershed in Pennsylvania and a large block of contiguous forest.
+ Shintown Slopes BDA	Renovo West	A site hosting a population of the globally rare plant species Fogg's goosefoot (*Chenopodium foggi*)
* Carrier Road BDA	Glen Union	Occupied habitat of lupine, a plant species of special concern.
* Eagleton Road BDA	Farrandsville	Occupied habitat of lupine, a plant species of special concern.
* Beech Creek Road BDA	Howard N.W.	Occupied habitat of lupine, a plant species of special concern.

SITE	QUADRANGLE	DESCRIPTION
HIGH		
Snyder's Swamp BDA	Beech Creek	This area along Bald Eagle Creek contains a cattail marsh community and represents rare habitat in Clinton County.
Breon Road Wetlands BDA	Carroll	Long band of wetlands on a watershed divide that contains several herbaceous vernal ponds and a highbush blueberry-sphagnum wetland.
Baker Run Confluence BDA	Farrandsville	Historically a site for two plants of special concern that includes a riverside ice scour community.
+ Lick Run Watershed LCA	Farrandsville Glen Union Jersey Mills Lock Haven	Large landscape conservation area that includes several significant wetlands, an Exceptional Value stream and its watershed, and State Game Lands #295.
Bearfield Run Hemlocks BDA	Hammersley Fork	An example of moderate size old second growth hemlock (white pine) forest dominated by eastern hemlocks.
Spicewood Saddle BDA	Hammersley Fork Keating	An example of an undisturbed herbaceous vernal pond and surrounding community which may support an animal of special concern.
Bear Run Swamp BDA	Howard N.W. Howard	Area containing a large hemlock palustrine forest recovering from early logging.
+ Clendenin Swamp BDA	Howard N.W. Snow Shoe N.E. Renovo West Renovo East	One in a series of four headwater wetlands north of Beech Creek containing a recovering hemlock palustrine forest community.
+ Mt. Logan Lower Slope Slope Forest BDA	Jersey Shore Lock Haven	Long, narrow patch of maturing second growth tuliptree-beech-maple forest on the north facing slope of the Bald Eagle Ridge. Includes a section of the Bureau of Forestry's Mt. Logan Natural Area.
Smith Run Swamp BDA	Keating	Site of a red maple-black ash palustrine forest; a rare community in Clinton County.

SITE	QUADRANGLE	DESCRIPTION
HIGH (cont.)		
+ Round Island BDA	Keating	Large island in Sinnemahoning Creek with examples of big bluestem-indian grass river grassland and sycamore-mixed hardwood floodplain forest communities; both rare community types in Clinton County.
McElhattan Creek LCA	Loganton	Area encompassing most of the McElhattan Creek Valley; a physically diverse landscape containing numerous habitats and a recognized community of significance.
Spring Run Hemlocks BDA	Loganton	Within the McElhattan Creek LCA, this old growth eastern hemlock forest sits on rugged lower valley slopes.
Bald Eagle Mountain Scree BDA	Lock Haven	Although frequent in the valley and ridge province, one of the largest and most prominent of the boulder field communities in the region.
Fishing Creek Narrows Floodplain BDA	Madisonburg	One of the few floodplain areas remaining along the entire length of Big Fishing Creek.
+ Belle Springs Woods BDA	Mill Hall	Relatively large section of sugar maple-basswood forest remaining along steep limestone slopes of Fishing Creek.
+ Cherry Run Watershed BDA	Millheim Mill Hall Loganton	Exceptional Value stream watershed draining a large section of ridgeline.
+ Montour Run Island BDA	Sinnemahoning	An island supporting big bluestem-indian grass river grassland and sycamore floodplain forest communities.
+ Fish Dam Run Watershed BDA	Snow Shoe N.E. Renovo West	Moderate size but compact watershed containing an Exceptional Value stream and the Bureau of Forestry's Fish Dam Wild Area.
Seven Mile Branch Pond BDA	Young Woman's	The area at the confluence of Seven Mile Branch Creek and the main branch of Young Woman's Creek. Containing a small natural pond community.

SITE	QUADRANGLE	DESCRIPTION
HIGH (cont.)		
+ Staver Run Swamp BDA	Jersey Mills	The watershed of a recovering hemlock palustrine forest within the Lick Run Watershed Landscape Conservation Area. Also shelters a population of a rare plant, *Bartonia paniculata*.
* Chatham Run Headwaters Seep BDA	Jersey Mills	A seepage wetland community occupied by a plant species of special concern.
* Clinton West Branch Cliffs #1 BDA	Pottersdale	Habitat occupied by an animal species of special concern.
* Clinton West Branch Cliffs #2 BDA	Snow Shoe N.W.	Habitat occupied by an animal species of special concern.
* Clinton West Branch Cliffs #3 BDA	Renovo West	Habitat occupied by an animal species of special concern.
* Clinton West Branch Cliffs #4 BDA	Renovo East	Habitat occupied by an animal species of special concern.
* Clinton West Branch Cliffs #5	Renovo East	Habitat occupied by an animal species of special concern.
* Clinton West Branch Cliffs #6	Glen Union	Habitat occupied by an animal species of special concern.
* Clinton West Branch Cliffs #7	Farrandsville	Habitat occupied by an animal species of special concern.
* Sinnemahoning Creek Cliffs #1 BDA	Sinnemahoning	Habitat occupied by an animal species of special concern.
* Sinnemahoning Creek Cliffs #2 BDA	Keating	Habitat occupied by an animal species of special concern.
* Sinnemahoning Creek Cliffs #3 BDA	Keating	Habitat occupied by an animal species of special concern.
* Sinnemahoning Creek Cliffs #4 BDA	Keating	Habitat occupied by an animal species of special concern.
* Kettle Creek Cliffs BDA	Keating	Habitat occupied by an animal species of special concern.

SITE	QUADRANGLE	DESCRIPTION
NOTABLE		
Eastville Cave BDA	Carroll	Largest solution cave in Clinton County, a habitat for bats. Also contains aquatic habitat.
Green Gap BDA	Carroll	Gap containing a patch of hemlock (white pine) forest with maturing eastern hemlock and white pine.
Boiler Run Wetland BDA	Farrandsville	Small herbaceous vernal pond at the headwaters of Boiler Run.
+ Lushbaugh Run Watershed BDA	Hammersley Fork	Exceptional Value stream watershed extending from Cameron into Clinton County.
+ Cooks Run Watershed BDA	Hammersley Fork Keating	Exceptional Value stream watershed.
Cold Fork Wetland BDA	Howard N.W.	Moderate sized herbaceous vernal pond community.
+ Haneyville Church Swamp BDA	Jersey Mills	Somewhat disturbed hemlock palustrine forest community within the Lick Run Watershed Landscape Conservation Area.
Yost Run Watershed BDA	Snow Shoe N.W.	Exceptional Value stream watershed
Avis Swamp BDA	Jersey Shore	Remnant patch of water willow (*Decodon verticillatus*) shrub wetland community, once part of a very large wetland complex.
+ Hopple Hollow Swamp BDA	Loganton	Large but heavily disturbed hemlock palustrine forest.
+ Boggs Hollow Watershed BDA	Renovo East Renovo West	Exceptional Value stream watershed.
+ Barney Run Watershed BDA	Renovo West	Exceptional Value stream watershed with undisturbed qualities and a diversity of physical features.
+ West Branch Big Run Watershed BDA	Snow Shoe N.E.	Exceptional Value stream watershed
+ Middle Branch of Big Run Watershed BDA	Snow Shoe N.E.	Exceptional Value stream watershed.

SITE	QUADRANGLE	DESCRIPTION
NOTABLE (cont.)		
Bear Run Ridge Barren BDA	Snow Shoe N.E.	A small pocket of pitch pine-scrub oak woodland community, uncommon in Clinton County.
+ Burns Run Watershed BDA	Snow Shoe N.W Snow Shoe N.E.	Exceptional Value stream watershed containing the Bureau of Forestry's Burns Run Wild Area.
+ Haystack Floodplain BDA	Tamarack	One of the best examples of floodplain forest along Kettle Creek.
+ Drury Run Watershed BDA	Tamarack Renovo West	Exceptional Value stream watershed originating in Tamarack Swamp.
+ Paddy Run Watershed BDA	Tamarack Renovo West Renovo East	Exceptional Value stream watershed furnishing water to the town of Renovo and containing a moderately disturbed highbush blueberry-meadowsweet wetland.
Dry Run Road Wetland BDA	Young Woman's Creek	Herbaceous vernal pond wetland community
Lick Run Valley Forest BDA	Farrandsville	Contains a good example of a tuliptree-beech-maple forest community
* Trout Run Slopes #1 BDA	Hammersley Fork	Forested slope supporting a biological resource of special concern.
* Trout Run Slopes #2 BDA	Hammersley Fork	Forested slope supporting a biological resource of special concern.
* Painter Hollow Confluence Slopes BDA	Tamarack	Forested slope supporting a biological resource of special concern.
* Paddy Run Slopes #1 BDA	Tamarack	Forested slope supporting a biological resource of special concern.
* Paddy Run Slopes #2 BDA	Tamarack	Forested slope supporting a biological resource of special concern.
* Shingle Branch Slopes BDA	Young Woman's Creek	Forested slope supporting a biological resource of special concern.
* Left Branch Young Woman's Creek Slopes BDA	Young Woman's Creek	Forested slope supporting a biological resource of special concern.

SITE	QUADRANGLE	DESCRIPTION
NOTABLE (cont.)		
* Oxbow Hollow BDA	Young Woman's Creek	Forested slope supporting a biological resource of special concern.
* Baldwin Branch Slopes BDA	Slate Run	Forested slope supporting a biological resource of special concern.
* Cooks Run Slopes BDA	Keating	Forested slope supporting a biological resource of special concern.
* Kettle Creek Slopes BDA	Keating	Forested slope supporting a biological resource of special concern.
* Renovo Slopes BDA	Renovo East	Forested slope supporting a biological resource of special concern.

Table 2: Summary of Natural Heritage Areas by Municipality

Municipality	**Site Names & *Managed Lands***	**U.S.G.S. Quadrangle**	**see page**
Townships			
Allison	none		
Bald Eagle	+ Snyder's Swamp BDA	Beech Creek	115
	+ Fairpoint Swamp BDA	Mill Hall	122
		Beech Creek	115
		Lock Haven	129
	* Eagleton Road BDA	Farrandsville	112
	Sproul State Forest		
	State Game Lands #255		
Beech Creek	Slaughtering Ground Barrens BDA	Howard N.W.	96
	Bear Run Swamp BDA	Howard N.W.	96
	* Beech Creek Road BDA	Howard N.W.	96
		Howard	94
	Bear Run Ridge Barren BDA	Snow Shoe N.E.	86
	+ West Branch Big Run Watershed BDA	Snow Shoe N.E.	86
	+ Middle Branch Big Run Watershed BDA	Snow Shoe N.E.	86
	+ East Branch Big Run Watershed BDA	Snow Shoe N.E	86
		Howard N.W.	96
	+ Fish Dam Run Watershed BDA	Snow Shoe N.E.	86
		Renovo West	82
	+ Burns Run Watershed BDA	Snow Shoe N.W.	63
		Snow Shoe N.E.	86
	Sproul State Forest		
	State Game Lands #255		
	Fish Dam Wild Area		
	Burns Run Wild Area		
Chapman	Hyner View BDA	Glen Union	109
	+ Boggs Hollow Watershed BDA	Renovo East	100
		Renovo West	82
	+ Paddy Run Watershed BDA	Tamarack	77
		Renovo West	82
		Renovo East	100
	Seven Mile Branch Pond BDA	Young Womans Cr.	104
	+ Fork Hill Road BDA	Young Womans Cr.	104
	* Clinton West Branch Cliffs #4 BDA	Renovo East	100
	* Clinton West Branch Cliffs #5 BDA	Renovo East	100
	Dry Run Road Wetland BDA	Young Womans Cr.	104
	Bucktail State Park NA DA	Renovo East	100
		Renovo West	82
	* Paddy Run Slopes #1 BDA	Tamarack	77

Municipality	Site Names & *Managed Lands*	U.S.G.S. Quadrangle	see page
Townships (cont.)			
Chapman, cont.	* Paddy Run Slopes #2 BDA	Tamarack	77
	* Renovo Slopes BDA	Renovo East	100
	* Shingle Branch Slopes BDA	Young Womans Cr.	104
	* Left Branch Young Woman's Creek Slopes BDA	Young Womans Cr.	104
	* Oxbow Hollow BDA	Young Womans Cr.	104
	* Baldwin Branch Slopes BDA	Slate Run	107
	Sproul State Forest		
	Susquehannock State Forest		
	Hyner Run State Park		
	Hyner View State Park		
	Bucktail State Park Natural Area		
Castanea	none		
Colebrook	+ Lick Run Watershed LCA	Farrandsville	112
		Glen Union	132
		Jersey Mills	131
		Lock Haven	129
	Lick Run Valley Forest BDA	Farrandsville	112
	Bucktail State Park NA DA	Farrandsville	112
	* Clinton West Branch Cliffs #7 BDA	Farrandsville	112
	Sproul State Forest		
	State Game Lands #89		
	Bucktail State Park Natural Area		
Crawford	Castle Rocks BDA	Carroll	145
	Pond Road Wetland BDA	Loganton	137
	+ Rosecrans Bog BDA	Loganton	137
	Rosecrans Bog Natural Area DA	Loganton	137
	Bald Eagle State Forest		
	Tiadaghton State Forest		
	Ravensburg State Park		
	Rosecrans Bog Natural Area		
Dunnstable	none		

Municipality	Site Names & *Managed Lands*	U.S.G.S. Quadrangle	see page
Townships (cont.)			
East Keating	Montour Road Ridge BDA	Hammersley Fork	70
	+ Kettle Creek Watershed LCA	Hammersley Fork	70
	+ Cooks Run Watershed BDA	Keating	65
		Hammersley Fork	70
	+ Keating Mountain BDA	Keating	65
	+ Round Island BDA	Keating	65
	* Sinnemahoning Creek Cliffs #2 BDA	Keating	65
	* Sinnemahoning Creek Cliffs #3 BDA	Keating	65
	* Sinnemahoning Creek Cliffs #4 BDA	Keating	65
	+ Montour Run Island BDA	Sinnemahoning	56
	+ Round Island Run Watershed BDA	Sinnemahoning	56
	* Sinnemahoning Creek Cliffs #1 BDA	Sinnemahoning	56
		Keating	65
	* Cooks Run Slopes BDA	Keating	65
	Bucktail State Park NA DA	Keating	65
		Sinnemahoning	56
	* Clinton West Branch Cliffs #2 BDA	Snow Shoe N.W.	63
	Elk State Forest		
	Sproul State Forest		
	Bucktail State Park Natural Area		
Gallagher	+ Lick Run Watershed LCA	Farrandsville	112
		Glen Union	109
		Jersey Mills	131
		Lock Haven	129
	Whetham Fire Tower Wetland BDA	Glen Union	109
	+ Haneyville Church Swamp BDA	Jersey Mills	131
	+ Staver Run Swamp BDA	Jersey Mills	131
	* Chatham Run Headwaters Seep BDA	Jersey Mills	131
	Sproul State Forest		
	State Game Lands #89		
Greene	+ Rosecrans Bog BDA	Loganton	173
	Breon Road Wetlands BDA	Carroll	145
	Eastville Cave BDA	Carroll	145
	Green Gap BDA	Carroll	145
	Robbin's Run BDA	Loganton	137
	Rosecrans Bog Natural Area DA	Loganton	137
	McElhattan Creek LCA	Loganton	137
	+ Hopple Hollow Swamp BDA	Loganton	137
	Cooper Run BDA	Loganton	137

Municipality	Site Names & *Managed Lands*	U.S.G.S. Quadrangle	see page
Townships (cont.)			
Greene (cont.)	+ Cherry Run Watershed BDA	Millheim	120
		Mill Hall	122
		Loganton	137
	Cherry Run LCA	Millheim	120
		Mill Hall	122
		Loganton	137
		Beech Creek	115
	Bald Eagle State Forest		
	Tiadaghton State Forest		
	Rosecrans Bog Natural Area		
Grugan	Baker Run Confluence BDA	Farrandsville	112
	Boiler Run Wetland BDA	Farrandsville	112
	+ Lick Run Watershed LCA	Farrandsville	112
		Glen Union	109
		Jersey Mills	131
		Lock Haven	129
	* Clinton West Branch Cliffs #7 BDA	Farrandsville	112
	* Clinton West Branch Cliffs #6 BDA	Glen Union	109
	Sugar Camp Wetlands BDA	Glen Union	109
	* Carrier Road BDA	Glen Union	109
	Cranberry Swamp Natural Area DA	Renovo East	100
		Howard N.W.	96
	Sproul State Forest		
	Bucktail State Park Natural Area		
	Cranberry Swamp Natural Area		
Lamar	McElhattan Creek LCA	Loganton	137
	+ Stoltzfus Outcrop BDA	Mill Hall	122
	+ Belle Springs Woods BDA	Mill Hall	122
	+ Cedar Hill Cliffs BDA	Mill Hall	122
	Mt. Riansares BDA	Mill Hall	122
	+ Cherry Run Watershed BDA	Millheim	120
		Mill Hall	122
		Loganton	137
	Cherry Run LCA	Millheim	120
		Mill Hall	122
		Loganton	137
		Beech Creek	115
	Bald Eagle State Forest		
	State Game Lands #255		
	State Game Lands #295		

Municipality	Site Names & *Managed Lands*	U.S.G.S. Quadrangle	see page
Townships (cont.)			
Leidy	Bearfield Run Hemlocks BDA	Hammersley Fork	70
	F. H. Duttlinger Natural Area DA	Hammersley Fork	70
	+ Lushbaugh Run Watershed BDA	Hammersley Fork	70
	Montour Road Ridge BDA	Hammersley Fork	70
	+ John Summerson Branch Trout Run BDA	Hammersley Fork	70
	Spicewood Saddle BDA	Hammersley Fork	70
	+ Hammersley Fork Watershed BDA	Hammersley Fork	70
	* Kettle Creek BDA	Hammersley Fork	70
	* Trout Run Slopes #1 BDA	Hammersley Fork	70
	* Trout Run Slopes #2 BDA	Hammersley Fork	70
	+ Kettle Creek Watershed LCA	Hammersley Fork	70
		Tamarack	77
	+ Haystack Floodplain BDA	Tamarack	77
	+ Tamarack Swamp BDA	Tamarack	77
	Tamarack Swamp Natural Area DA	Tamarack	77
	* Painter Hollow Confluence Slopes BDA	Tamarack	77
	* Kettle Creek Slopes BDA	Keating	65
	+ Drury Run Watershed BDA	Tamarack	77
		Renovo West	82
	+ Paddy Run Watershed BDA	Tamarack	77
		Renovo West	82
		Renovo East	100
	Elk State Forest		
	Sproul State Forest		
	Susquehannock State Forest		
	Kettle Creek State Park		
	F.H. Dutlinger Natural Area		
	Tamarack Swamp Natural Area		
Logan	Pepper Run Pools BDA	Loganton	137
		Mill Hall	122
	+ Cherry Run Watershed BDA	Millheim	120
		Mill Hall	122
		Loganton	137
	Cherry Run LCA	Millheim	120
		Mill Hall	122
		Loganton	137
		Beech Creek	115
	Bald Eagle State Forest		
	State Game Lands #295		

Municipality	Site Names & *Managed Lands*	U.S.G.S. Quadrangle	see page
Townships (cont.)			
Noyes	+ Clendenin Swamp BDA	Howard N.W.	96
		Snow Shoe N.E.	86
		Renovo West	82
		Renovo East	100
	Smith Run Swamp BDA	Keating	65
	+ Kettle Creek Slopes BDA	Keating	65
	Cranberry Swamp Natural Area DA	Renovo East	100
		Howard N.W.	96
	+ Boggs Hollow Watershed BDA	Renovo East	100
		Renovo West	82
	+ Barney Run Watershed BDA	Renovo West	82
	* Clinton West Branch Cliffs #3 BDA	Renovo West	82
	+ East Branch Big Run Watershed BDA	Snow Shoe N.E.	86
		Howard N.W.	96
	East Branch Swamp NA DA	Snow Shoe N.E.	86
		Howard N.W.	96
	+ Shintown Slopes BDA	Renovo West	82
	+ Fish Dam Run Watershed BDA	Snow Shoe N.E.	86
		Renovo West	82
	+ Drury Run Watershed BDA	Tamarack	77
		Renovo West	82
	Bucktail State Park NA DA	Glen Union	109
		Renovo East	100
		Renovo West	82
		Keating	65
	Sproul State Forest		
	Bucktail State Park Natural Area		
	Cranberry Swamp Natural Area		
	East Branch Swamp Natural Area		
	Fish Dam Wild Area		
Pine Creek	Avis Swamp BDA	Jersey Shore	134
	Tiadaghton State Forest		
Porter	Fishing Creek Narrows Floodplain BDA	Madisonburg	118
	Fishing Creek Bend Gap BDA	Mill Hall	122
	+ Cherry Run Watershed BDA	Millheim	120
		Mill Hall	122
	Bald Eagle State Forest		
	State Game Lands #255		
	State Game Lands #295		

Municipality	Site Names & *Managed Lands*	U.S.G.S. Quadrangle	see page
Townships (cont.)			
Wayne	+ Mt. Logan Lower Slope Forest BDA	Jersey Shore	134
		Lock Haven	129
	Spring Run Hemlocks BDA	Loganton	137
	McElhattan Creek LCA	Loganton	137
	Bald Eagle Mountain Scree BDA	Lock Haven	129
	Mt. Logan Natural Area DA	Loganton	137
		Jersey Shore	134
	Bald Eagle State Forest		
	Tiadaghton State Forest		
West Keating	+ Round Island Run Watershed BDA	Sinnemahoning	56
		Keating	65
	+ Lower Jerry Run Natural Area DA & BDA	Sinnemahoning	56
	Bucktail State Park NA DA	Sinnemahoning	56
	* Clinton West Branch Cliffs #1 BDA	Pottersdale	61
	Elk State Forest		
	Sproul State Forest		
	Bucktail State Park Natural Area		
Woodward	*Sproul State Forest*		
	State Game Lands #89		
Boroughs			
Avis	none		
Beech Creek	none		
Flemington	none		
Lock Haven	none		
Loganton	none		
Mill Hall	none		
Renovo	none		
South Renovo	none		

DEDICATED AREAS

Table 3: Important managed lands protecting biotic resources in Clinton County.

The objective of the Clinton County Natural Heritage Inventory is to provide information that can be utilized in planning for the protection of the biological diversity and ecological integrity of the county. Ultimately, the preservation of such resources will depend in part upon the establishment of management plans and dedicated areas to protect these resources.

Presently, there are seven locations in Clinton County that are managed largely to protect natural ecological systems and biological diversity. For this reason, the dedicated areas listed below are regarded as among the most important public and private Natural Heritage Areas. Those responsible for the management of these sites and surrounding lands should continue with their programs of protection and management and strongly consider increased protection for these areas. In many cases, these dedicated areas do not follow the real ecological boundaries that define the habitats, communities and ecosystems recognized in the report. Often, therefore, the dedicated area boundaries for a site will fall within the "BDA", "NA", etc. boundaries, indicating that the dedicated area needs to be expanded to fully buffer and protect the site. Planning within government and private sectors should recognize the role of these important areas and work toward their expansion. Still, with the degree of protection conferred, dedicated areas represent an important core for expanding biodiversity conservation in Clinton County.

Managed Lands Name/Owner	**Comments and Recommendations**
Lower Jerry Run Natural Area/ DCNR, Bureau of Forestry	In part, the focus of this dedicated area is a grove of old-growth eastern hemlocks situated in the lower valley. With the natural area boundaries extending nearly to the watershed divides of Lower Jerry Run, this represents an opportunity for protection of an entire small watershed. The natural boundaries should be extended to encompass the watershed.
Bucktail State Park Natural Area/ DCNR, Bureau of State Parks	An extensive area of steep valley slopes running along the West Branch of the Susquehanna River and Sinnemahoning Creek north of Lock Haven. Many places within the Bucktail should be further surveyed for natural communities and unique species, but the most valuable asset of this area is the linkage it provides with other managed lands and dedicated areas on the plateau. Expansion of the Bucktail to include areas like Fish Run Wild Area and Exceptional Value stream watersheds would create an exemplary network for biological protection within the county.

East Branch Swamp Natural Area/ DCNR, Bureau of Forestry	An area which includes one of a series of four northern conifer swamp recovering from early logging. The natural area barely provides direct protection of the swamp and needs to be expanded to include the watershed of East Branch Swamp. Only if the hydrology of the wetland is protected can the protection of the swamp be considered complete. Swamp Branch Swamp, East Branch's sister wetland, should be considered as part of an area dedicated to the protection of the East Branch of Big Run; an Exceptional Value aquatic ecosystem.
Cranberry Swamp Natural Area/ DCNR, Bureau of Forestry	Another area dedicated to the protection of one in a series of four recovering northern conifer swamps on the plateau north of Beech Creek. The boundaries of this natural area do not encompass the watershed of the swamp and just as for East Branch Natural Area, need to be expanded to fully protect the swamp.
Tamarack Swamp Natural Area/ DCNR, Bureau of Forestry	Includes less than one-half of a large non-glacial bog; one of the most unique ecological features in the county. Historically the location of numerous rare species, and presently two plants and three animals of special concern. Under multiple ownerships, the bulk of Tamarack Swamp has no management plan or protection strategy. Several gas pipelines have heavily impacted this wetland. Expansion of the natural area to include as much of the watershed as possible and agreements from the numerous land owners aimed at protection of the wetland are needed.
Mt. Logan Natural Area/ DCNR, Bureau of Forestry	Encompasses a piece of the Bald Eagle Ridge and includes mesic, dry-mesic and ridgetop forest communities. The mesic forest on the lower slope is a maturing second growth mixed hardwood forest and of high significance in the county. This natural area is unusual in PA in protecting a representative slice of ridge and valley communities. Building from this dedicated area to one including the ridge from one water gap to the next, would provide the space necessary for these forest communities to function naturally.

Rosecrans Bog Natural Area/ DCNRF, Bureau of Forestry	Features a non-glacial bog containing two plants of special concern. Historic records of other unique species exist. Surrounded by farmland and commercial forest, the natural area does not include the watershed for the bog. Also, beaver activity in the area is changing the character of the wetland. Expansion of the natural area boundaries and decision on management of beaver and adjacent lands are needed for protection of this site.

INTRODUCTION

Few would hesitate to describe Clinton County as a quiet, rural county; some would describe much of it as remote. A drive through the bucolic valleys in the southern part of the county is very much like a drive through many farming communities in central Pennsylvania, while a trip along the West Branch of the Susquehanna in the northern part of the county reveals the rugged terrain and very large tracts of forest that link the county to the expanse of forested land covering most of northern Pennsylvania. Clinton County is at the crossroads of five physiographic provinces, between the glaciated and unglaciated sections of the state, and between the northern hardwood-conifer forest communities of northern Pennsylvania and the more mesic central forest communities to the south and west.

Like most of Pennsylvania, Clinton County has been extensively farmed and combed for timber, coal, limestone, shale, natural gas and a variety of other natural resources. The extraction of these resources profoundly changed the composition, structure and appearance of many of the county's natural communities. Very few areas and communities in Clinton County were not touched or minimally impacted. Natural Heritage Inventories place a high value on these pristine communities. However, the inventory must unavoidably also consider communities that have been disturbed. These disturbed communities must be assessed not so much by their present condition but by what they have the potential of becoming if left alone or managed for their ecosystem values. By considering the recovery potential of areas in the county, the Natural Heritage Inventory can focus attention on the future value of specific areas and better evaluate the significance of sites relative to other sites within the county.

The natural communities and ecosystems in Clinton County have, relative to many parts of the state, a strong potential for recovery for a number of reasons related to the county itself. First of all, the urban centers in Clinton County are relatively confined, reducing population pressure on the more rural and remote sections of the county. Secondly, a large percentage of the county is publicly owned, predominately as State Forest or State Game Land. This makes protection of specific areas much more feasible under a variety of designations and programs. Thirdly, Clinton County is surrounded by counties that have similar characteristics, making it integral with other large, remote and publicly owned lands. Also, Clinton County has the largest number of Exceptional Value (EV) [designated by Pennsylvania Department of Environmental Protection, Bureau of Water Quality] streams of any county in the state (13 as of 2002). Along with thousands of square miles of forest, these EV streams make the county uniquely well suited for watershed and landscape level management and protection.

Although a predominately rural county, Clinton County and its natural communities nonetheless face problems associated with growth. Such problems include: second home development in remote areas that have minimal infrastructure; large-scale land speculation in areas with large tracts of inexpensive land and few land-use regulations; interstate highway interchange development; and general expansion of the State College-Lock Haven-Williamsport population corridor.

The first step in protecting ecologically important places in the county is identifying them and determining their importance in comparison to other (similar) sites in the county. This information can help county, state, and municipal governments, the public, and business interests plan development with the preservation of these environmentally important sites in mind. The Clinton County Natural Heritage Inventory is designed to identify and map important biotic (living) and ecological resources that make up the rich natural heritage of Clinton County. The most significant biotic resources inherited by the citizens of Clinton County include: areas that have been undisturbed by human activity, habitats for species of special concern (endangered, threatened, etc.), significant natural communities (assemblages of plants and animals), and areas important for open space, recreation, and wildlife habitat

NATURAL HERITAGE AREAS CLASSIFICATION

The Natural Heritage Areas identified in this report have been recognized according to the classification below. Sites chosen are those which are believed to be of sufficient size and quality (i.e., the natural systems are relatively intact) to continue as viable communities into the foreseeable future. The inventory includes sites that are unique or uncommon in the county, but not necessarily of state or global significance, although sites with state or global significance are included. For example, a dry conifer forest consisting of pitch pine, table mountain pine, virginia pine and chestnut oak is not uncommon in northcentral Pennsylvania but would be rare in Clinton County and would likely be included in the inventory.

The following classification provides definitions and examples of the five types of Natural Heritage Areas included in this report. Following the definitions of Natural Heritage Areas are explanations of Managed Lands, Geological Features and Fossil Localities in the county. The types of Natural Heritage Areas found in the report are:

- NATURAL AREAS (NA)
  - I. Pristine Natural Areas
  - II. Recovering Natural Areas
- BIOLOGICAL DIVERSITY AREAS (BDA)
  - I. Special Species Habitat
  - II. High Diversity Area
  - III. Community/Ecosystem Conservation Area
- DEDICATED AREAS (DA)
- LANDSCAPE CONSERVATION AREAS (LCA)
- OTHER DESIGNATIONS
  - I. Managed Areas
  - II. Geologic Features
  - III. Important Bird Areas

Definitions and examples of each Natural Heritage Area follow:

NATURAL AREAS (NA)

I. Pristine Natural Area

A site that has the same ecological conditions that are believed to have existed prior to European settlement, and is large enough, and buffered enough, to support and permanently protect the natural community.

Example: A tract of virgin forest community ten or more acres in size, the surrounding landscape is only moderately disturbed, and the forest community has long term viability.

II. Recovering Natural Area

An area that is relatively undisturbed, or past disturbances are essentially minor, and the landscape has largely recovered to a pristine condition.

Example: A tract of forest that, although harvested a century ago, has regenerated so that it now supports a recovered old growth forest community and its associated qualities.

BIOLOGICAL DIVERSITY AREAS (BDA)

I. Special Species Habitat

An area that includes natural or human influenced habitat that harbors one or more occurrences of plants or animals recognized as state or national species of special concern.

Examples: A forested stream valley that supports a threatened plant population.
A stream that provides habitat for a rare animal.

II. High Diversity Area

An area found to possess a high diversity of species of plants and animals native to the county.

Example:A relatively large tract of land that provides a variety of habitats.

III. Community/Ecosystem Conservation Area

An area that supports a rare or exemplary natural community (assemblage of plants and animals), including the highest quality and least disturbed examples of relatively common community types.

Example:A marshland that supports a wetland community found in no or few other sites in the county.

DEDICATED AREAS (DA)

A property, possibly disturbed in the past, where now the owner's stated objectives are to protect and maintain the ecological integrity and biological diversity of the property largely through a hands-off management approach (e.g. control of a highly invasive exotic plant) and then only to the minimum degree necessary to address the threat.

Example:A forested tract that was previously harvested, but is now under the ownership of a conservation organization that has dedicated its management to the protection of the forest community.

LANDSCAPE CONSERVATION AREAS (LCA)

A large contiguous area that is important because of its size, open space, and habitats and although including a variety of land uses, has not been heavily disturbed and thus retains much of its natural character.

Example:An entire watershed that includes several thousand acres of forest that is interspersed with agricultural lands, limited residential and commercial development, and park land.

OTHER DESIGNATIONS

I. Managed Lands

"Managed Lands" as defined in this county natural heritage inventory are owned or leased properties that are included in the report because of their importance, or potential importance, to the overall maintenance and protection of ecological resources of the county. Managed Lands are of two types:

- Public properties established and managed to a large extent for natural resources, and/or those that have the potential to manage such resources in order to maintain or enhance important ecological assets in the county, and by this evaluation are deemed by the inventory to be among the most ecologically "valuable" of public properties. Examples include: state game lands, state parks, national historic sites, county or municipal park lands.

- Private properties that are held by private organizations concerned with the management and protection of natural resources, and which upon evaluation have been deemed by this inventory to be among the most ecologically "valuable" of such properties. Examples include: private nature preserves, private environmental education centers.

Managed Lands are properties that do not necessarily include, or are included within, identified natural heritage areas, e.g. Natural Areas, Biological Diversity Areas. However, these properties are often large in size (e.g., essentially all state game lands) and, for this and potentially for other reasons, are ecologically important in a general sense. The ecological importance and value of some Managed Lands is due to their association with an area identified for natural heritage significance, e.g., a Managed Land within the boundaries of a Natural Area, or Biological Diversity Area. However, Managed Lands are legally bounded properties, and are not to be confused with areas of natural heritage importance, which are identified by their ecological significance. An important consideration is that many Managed Lands have the potential to become even more ecologically valuable if their management becomes more sensitive to biological diversity issues and protection.

There are already some Managed Lands that are dedicated to the protection of natural ecological systems and biological diversity. Referred to as **Dedicated Areas**, these properties are distinct from other Managed Lands because of the ecological emphasis of the owner's management practices and goals. Dedicated Areas are among the most important natural heritage areas since plans to protect the ecological resources therein already exist. An evaluation of Dedicated Areas in the inventory was based upon the stated management criteria and existing practices of the owner/manager. A definition for "Dedicated Areas" is given earlier in this section of the report, and a summary of the Dedicated Areas identified in Clinton County is supplied in Table 3.

II. Geologic Features and Fossil Localities

Geologic features include those areas that illustrate regional geologic processes, landforms or scenery and are those recognized as outstanding in Pennsylvania by Geyer and Bolles (1979, 1987). Fossil localities are those recognized by Hoskins et. al. (1983). These places are not necessarily of importance to biological diversity and are therefore not considered Natural Heritage Areas. However, they are included as natural history references in the county.

III. Important Bird Areas (IBA)

The Pennsylvania Important Bird Area Program is administered by the Pennsylvania Audubon Society. The following information and definitions are from their brochure and book, available on their website (Audubon 2002).

Definition

An IBA is a site that is part of a global network of places recognized for their outstanding value to bird conservation. An IBA can be large or small, public or private and must meet one of several objective criteria. Since the IBA program is voluntary, there are no legal or regulatory restrictions.

To qualify as an IBA in Pennsylvania, a site must satisfy at least one of several criteria, as follows (Crossley 1999):

1. Any site having exceptional concentration* and/or diversity of birdlife when breeding, in winter, or during migration
2. Sites supporting state or federal endangered or threatened species
3. Sites supporting one or more species on Pennsylvania's "special concern" list
4. Sites containing representative, rare, threatened, or unique habitats, with birds characteristic of those habitats
5. Sites where long-term avian research or monitoring is in process

*Defined as: 2,000 waterfowl (at one time), 100 shorebirds (at once), 50 breeding pairs of wading birds, or 10,000 migrant raptors/season.

Background

Pennsylvania's Important Bird Area (IBA) Program is part of a dynamic worldwide effort to identify and protect outstanding habitats for birds and all wildlife. The IBA concept was first developed in Europe (in 1985) by BirdLife International. The program's resounding success in the Old World quickly spread to North America, where the IBA Program has become pivotal to a continent-wide bird conservation strategy. Working in partnership with the American Bird Conservancy, the National Audubon Society has already identified over 400 Important Bird Areas in the U.S.

Pennsylvania was the first state to develop an IBA program in the United States. Based on strict scientific criteria (given above), a group of scientific advisors (known as the Ornithological Technical Committee) selected 73 IBA sites encompassing over one million acres of public and private lands. These areas include migratory staging areas, winter feeding and roost sites, and prime breeding areas for songbirds, wading birds and other species. They also include critical habitats, such as spruce-fir bogs, tidal saltmarsh, bottomland hardwood swamps, and open grasslands. Additional IBA sites in Pennsylvania will be selected by the technical committee on an ongoing basis.

More information on Important Bird Area program in Pennsylvania can be found on their website, at "pa.audubon.org/Ibamain.htm"

This document is presented in several sections. The County Overview section reviews county geology, soils, and past and present vegetation. The second section provides information on the Pennsylvania Natural Diversity Inventory and the methodology used to conduct the inventory. The third section supplies general recommendations concerning the management of the different categories of Natural Heritage Areas. The fourth section discusses land-uses that threaten Natural Heritage Sites and provides a description of buffers and how they are relevant to natural communities and to the sites that the report recognizes. The last section, Results, presents for each USGS quadrangle, a summary table of Natural Heritage Areas, managed areas, and geologic and fossil sites; and a text discussing the quadrangle, its Natural Heritage Areas, and recommendations for management and protection of those areas. The appendices include additional background information natural community classification, Heritage program definitions, and county inventory procedures.

The inventory is a joint effort of the Pennsylvania Department of Community Affairs, the Clinton County Planning Commission and the Western Pennsylvania Conservancy. Its purpose is to provide the county and state with a useful tool for planning development and for setting protection priorities for significant natural heritage resources in Clinton County. It is, however, only a preliminary report of the important areas in Clinton County. Further investigation is needed and therefore this inventory should not be viewed as the final word on this subject of natural heritage sites in the county.

Any questions concerning sites or updates should be addressed to the Western Pennsylvania Conservancy, 316 Fourth Ave., Pittsburgh, Pennsylvania, 15222; Phone: (412)288-2777.

COUNTY OVERVIEW

Clinton County is the 15th largest county in Pennsylvania with a total land area of 902 square miles. Bordered by Centre, Clearfield, Cameron, Potter, Lycoming, and Union Counties, Clinton County sits in the northcentral part of the state within the largest block of State Forest in Pennsylvania. The county is within the Susquehanna River drainage basin and all of its streams are tributaries to the West Branch of the Susquehanna River.

With a population 37,182, it is among the 14 counties with population densities below 50 people per square mile. Nearly 85 percent of the population resides in the lower one third of the county making the northern two thirds among the most sparsely populated areas in the state. Clinton County contains all or part of four state forests, seven State Forest natural areas, four state parks and an extensive network of hiking trails. Over 60 percent of the county exists as managed commercial forest.

PHYSIOGRAPHY AND GEOLOGY

Clinton County straddles the division of two major physiographic provinces; the Appalachian Plateau Province and the Ridge and Valley Province. The northern two-thirds of the county fall within the Appalachian Plateau and largely within the Mountainous High Plateau section of that province although two fingers of the Pittsburgh Plateau and the northern tip of the Allegheny Mountain section poke into the county on its western edge (Figure 2). The southern one third of the county lies within the Appalachian Mountain Section of the Ridge and Valley Province. The major physiographic divisions, along with the underlying geology, are responsible for creating many of the striking contrasts in population distribution, land-use, natural communities distribution and landscape features in the county.

The Appalachian Plateau is a mildly folded formation of Mississippian and Pennsylvanian sandstone, highly dissected by numerous streams that have, over the millennia, eroded the layers of sedimentary rock to produce the steep-walled, narrow valleys that are now so characteristic of the region. Coal deposits in this part of the county lie mostly within the Pennsylvanian strata and strip mining of the larger deposits has drastically altered the landscape in the southern and western parts of the county. Elevations on the Plateau range from 600 feet along the West Branch to over 2000 feet on a number of locations on the Mountainous High Plateau. The breakdown of the parent sandstones and shales produced the rugged, rocky slopes and the generally acidic and low fertility soils that cover most of the plateau. Not surprisingly, most agriculture in this region is limited to the West Branch Valley and several of its major tributaries where fine, rich silts have accumulated over the centuries.

In contrast to the Appalachian High Plateau, the Valley and Ridge Province in the county appears as a series of southwest to northeast running ridges, separated by broad, gently concave valleys. The Ridge and Valley finds its origins in tectonic movements that compressed and folded the layers of sedimentary rock perpendicular to the generally northwest movement of the crust. The softer limestone folds wore away much more rapidly than the more resistant sandstone layers that today remain as forested ridges rising above the agricultural valleys. Elevations in this province range from about 700 feet in the Nittany Valley to over 2200 feet on Bald Eagle Ridge. Much of the rock found on the ridges in the Ridge and Valley section of Clinton County is Tuscarora sandstone, a fine-grained sedimentary rock, occasionally interbedded with pure quartzite. Exposures of Tuscarora sandstone are easily recognized as bald or "scree" patches of unvegetated boulders on the slopes of many ridges throughout the Valley and Ridge section of Pennsylvania. In Clinton County, one of the best examples lies on the north-facing slope of Mt. Logan between Lock Haven and McElhattan viewed from either Route 220 or Route 150 in the Susquehanna

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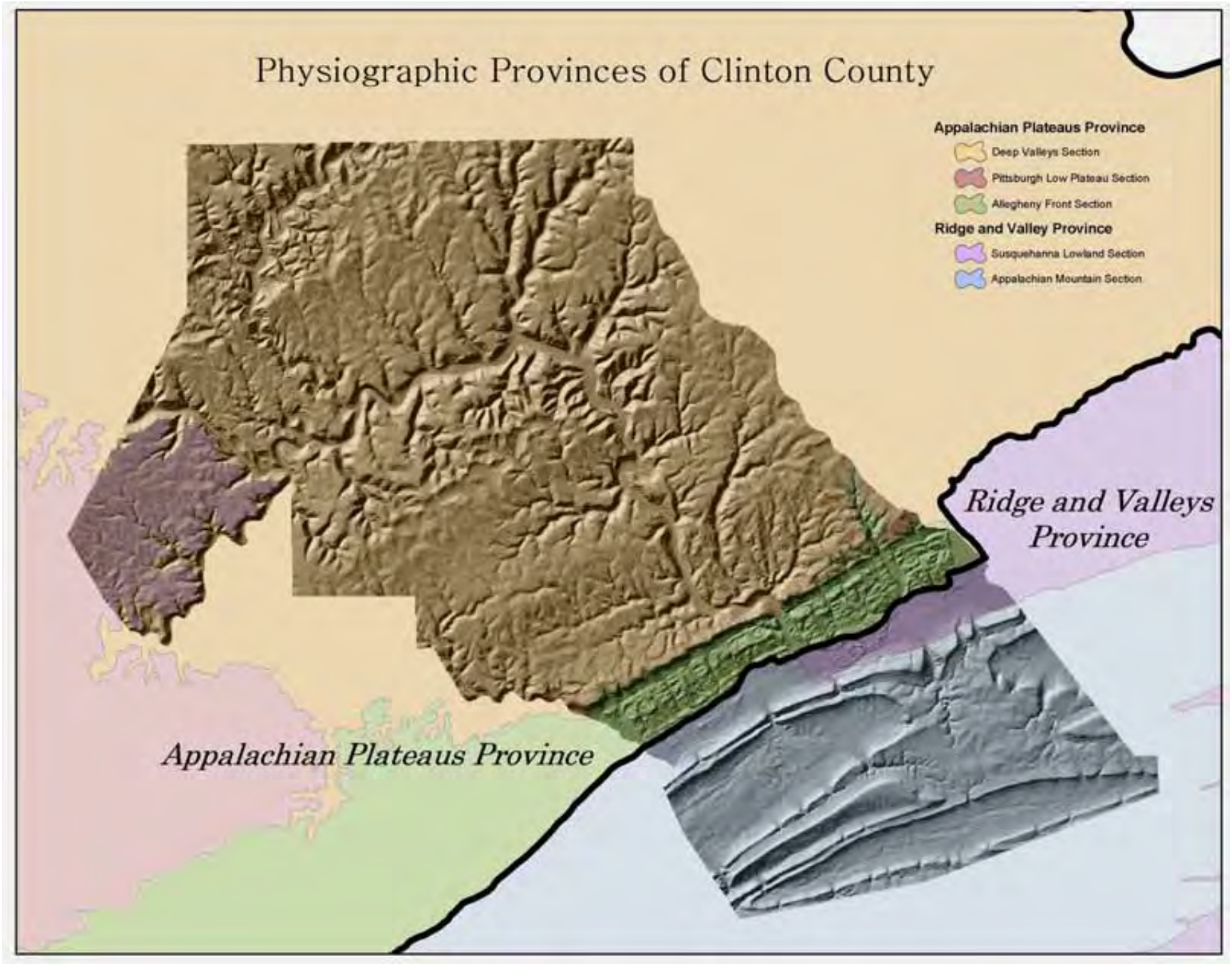


Figure 2: Physiographic Provinces of Clinton County

along Route 220 or Route 150 in the Susquehanna Valley. Nittany, Nippenose and Sugar Valleys are underlain with Ordovician limestone encircled by shale of the Reedsville Formation (USDA Soil Conservation Service, 1965). The Susquehanna Valley is underlain mostly by Silurian and Devonian shales (Van Diver, 1990). The three limestone valleys in the Ridge and Valley section of the county are prime agricultural areas and exhibit many Karst or solutional features such as sinkholes, solution caves, and dry streambeds (White, 1976).

A formation of low hills marks the transition between the Ridge and Valley and the Appalachian Plateau Provinces. This section at the base of the Allegheny Front stretches across the county as a band of rolling hills and tightly undulating terrain in a three to four mile wide diagonal from Beech Creek to and beyond Avis. Hard, fine-grained Pocono sandstone beds underlay much of the front and are capped by a thin layer of Mauch Chunck red shale (USDA Soil Conservation Service, 1965). Although the soils derived from these materials are not particularly fertile, flatter sections at the base of the front lend themselves to small-scale agriculture.

Clinton County sits near the southern edge of glaciation in central Pennsylvania and though some evidence exists of disjunct ice flows along the Susquehanna Valley (USDA Soil Conservation Service, 1965), the landscape is largely devoid of direct glacial features. However, extended periods of freezing and thawing, ice blockages of major drainages, and high volumes of melt water have all contributed to the physical landscape we see today.

SOILS

Ten major soil associations cover Clinton County (USDA Soil Conservation Service, 1965), two being by far the most prevalent: the Dekalb-Hartsells-Cookport and the Dekalb-Lehew associations. This is particularly true of the Appalachian Plateau Province where the Dekalb-Hartsells-Cookport soils occupy the more level plateau tops or ridges and the Dekalb-Lehew soils occupy the eroding plateau slopes and valleys. These soils are derived from the sandstone formations that underlay much of the plateau and tend to be moderately deep, sandy and often quite stoney. Consequently, they drain away water quickly and on the upper slopes and ridgetops, can be extremely dry. As a result of their high sand content and quick water percolation rates, these soils are fairly acidic and support dry-mesic acidic central forests of mixed oak through much of the county. In some areas, pockets of almost pure sand support barrens communities that have adapted to the low moisture conditions and to the fires which likely struck these excessively dry areas.

Another soil type occupies many of the plateau tops and slopes which face the West Branch Valley: the Cavode-Leadvale-Gilpin association. The three soils that make up this association are derived, to varying degrees, from shale, clay shale, siltstone and sandstone. This association tends to be well drained, but local variations with higher clay contents drain poorly and will hold surface water. The high shale content predisposes these soils to sloughing and erosion, and many of the slopes in the West Branch Valley show the crumbling sheets of shale below the layers of soil. These soils tend to support a similar type of vegetation as the Dekalb soils, although the outcrops and cliffs associated with these soils may harbor some yet as uncharacterized unique species and communities.

A small section of Pope-Barbour-Sequatchie soils run along Kettle Creek above the Bush Dam and along the lower portions of Young Woman's Creek. These alluvial soils formed along major drainages from material washed from the upper plateau. They are the most fertile soils in the northern half of the county

and have supported, and continue to support, various forms of agriculture. However, they are largely acidic and are not comparable to the rich, neutral soils of the southern valleys in the county.

In the Ridge and Valley Province, the stony Dekalb-Lehew soils cover the ridges and mix with a narrow band of Murrill-Buchanan-Laidig soils at the bases of the mountains. The latter are deep colluvial soils resulting from the downward movement of material eroding from the ridges. The Nittany, Nippenose, and Sugar Valleys are blanketed with the Aston-Huntington association; soils that resulted largely from erosion of the limestone bedrock underlying these valleys. These are the most strongly bufferred and most fertile soils in the county, and the most utilized for agriculture. Previous to agricultural use of these valleys, these areas supported rich, mesic central forests and likely rare communities in the state, such as calcareous seep, calcareous marsh and limestone glade communities.

A block of Dekalb-Hartsells-Cookport soils cover the plateau drained by McElhattan Creek and Antes Creek, and Aston-Huntington soils, formed from the eroding limestone valleys, sit on the floodplains and adjacent areas along the West Branch of the Susquehanna River and parts of Fishing Creek. These soils are rich, well bufferred and cover some of the most prized agricultural land in the state. Historically, broad stretches of floodplain forest and circumneutral wetlands existed on these soils but are now largely gone, displaced by agriculture and development.

Two side by side bands of shaly soils stretch over the low hills between the Allegheny Front and the West Branch of the Susquehanna River: the Leck Kill-Meckesville-Klinesville association and the Berks-Hartleton-Allenwood association. These moderately well-drained soils are rich enough to support farming and represent an ecological transition from the mesic forest communities of the limestone valleys to the higher, drier hardwood and conifer forests of the Appalachian Plateau.

VEGETATION

Clinton County sits centrally within the eastern deciduous forest province, or biome, as described by numerous authors including Gleason and Chronquist (1965). On a finer scale, we can consider the county as a transition zone between the Hemlock-White Pine-Northern Hardwood forest association to the north, the Mixed Mesophytic forest association running across the Applalachian Plateau in the central part of the county, and the Oak-Chestnut forest region that follows the Ridge and Valley province through the southern part of the county. These divisions as described by Braun (1950) and Jennings (1929, 1953) encompass a broad range of community types that blend together throughout the county.

The Hemlock-White Pine-Northern Hardwood association extends from northern Minnesota through the upper Great Lakes region, across southern Canada and New England and south to include approximately the lower half of New York and the northern quarter of Pennsylvania. This association consists of varying proportions of hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*), beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), black cherry (*Prunus serotina*), and white pine (*Pinus strobus*) (Jennings, 1953), and represents the overlap of the north-south distributions of at least four species groups (Nichols, 1935).

The Mixed Mesophytic forest described by Braun (1950) includes a diverse mixture of co-dominant species - beech, tuliptree (*Liriodendron tulipifera*), basswood (*Tilia spp.*), sugar maple, sweet buckeye (*Aesculus octandra*), red oak (*Quercus rubra*), white oak (*Quercus alba*), and eastern hemlock. Blanketing all but the northern section of the Appalachian Plateau in Pennsylvania, the mixed mesophytic forests intergrade with

both the hemlock-white pine-northern hardwood forests to the north and east, and the chestnut-oak forests in the Valley and Ridge Province to the south.

The Appalachian Plateau Section of Clinton County can be described as an interlocking or dovetailing of these two associations, where the mixed mesophytic community extends northward through the moist, temperate valleys and lower slopes of the plateau and the hemlock-white pine-northern hardwood community extends southward along the cooler ridge tops of the plateau. The Hemlock-White Pine-Northern Hardwood association that we find today on the plateau conspicuously lacks the large white pine component that, prior to the late 1800's logging, was so extensive. These early forests, dominated locally by massive white pine may have resulted from fire in the mid-1600's (Lutz, 1930) and represent an early or seral form of the hemlock-white pine-northern hardwood association. The forests of the plateau are now mixtures of red oak, white oak, chestnut oak (*Quercus prinus*), black and yellow birch (*Betula lenta* and *B. alleghaniensis*), black cherry and red maple (*Acer rubrum*), with increasing amounts of sugar maple, beech and eastern hemlock moving toward the northern border of the county. Southward, nearing the Ridge and Valley section, chestnut oak, scarlet oak (*Quercus coccinea*), pitch pine (*Pinus rigida*), sassafras (*Sassafras albidium*), and ericaceous shrubs increase in importance and the plateau forest resembles more the Chestnut Oak association than the Hemlock-White Pine-Northern Hardwood association. Some of the steeper slopes of the plateau, particularly facing the West Branch Valley, show remnants of the hemlock/hemlock-white pine-birch forests that once were so prominent on the plateau.

The Ridge and Valley Section of the county falls within the Chestnut Oak Forest Region described by Braun (1950). This association covers the ridges and transforms to increasingly mesic communities on the lower slopes and broad valleys between the ridges. Following the introduction and spread of the chestnut blight (*Endothia parisitica*), and subsequent loss of all chestnuts from this forest complex, the ridge forests transformed to the present mixture of oak-dominated communities. Numerous gaps that interrupt the ridgelines, support mesic hardwood and hemlock communities, contrasting dramatically with the dry, rocky ridgetop forests and the open agricultural valleys.

Essentially, all the forests in Clinton County were logged, first selectively for white pine, then for hemlock, and lastly for all remaining timber. The last big logging boom ended by the 1920's with the clearing of the last sections of northern Clinton County. The miles of narrow gauge railbed running up the tributary valleys remain as evidence of the massive clearings that begun over 100 years ago. Fires often followed the cuttings - many ignited by locomotive sparks, some begun intentionally - and for some years, parts of the county appeared as a ravaged landscape.

Patches of white oak communities are a large part of what remains untilled in the valleys and large, old white oaks are common along roads, at the edges of fields and in the patches of woodland scattered along the valley streams. These communities are the most mesic and diverse in the county and include tuliptree, red oak, basswood, shagbark and pignut hickory (*Carya ovata* and *C. glabra*), swamp white oak (*Quercus bicolor*), white and green ash (*Fraxinus americana* and *F. pensylvanica*), flowering dogwood (*Cornus florida*), redbud (*Cercis canadensis*), elderberry (*Sambucus spp.*) and bladdernut (*Staphylea trifolia*).

Althought the forested communities described thus far cover the vast majority of Clinton County, there are numerous wetland, spring, cliff, river gravel and subterranean communities within the county. These areas are particularly important because of the unique habitat they offer plants and animals, their relative rarity, and their vulnerability to disturbance.

IMPORTANT BIRD AREAS

Clinton County includes portions of three Important Bird Areas (the Natural Heritage Areas Classification, pg.--, provides background regarding the IBA designation, including selection criteria). As these areas typically span across several municipal divisions, they are described separately from the results grouped by municipality. As can be seen in Figure 4, several IBAs extend beyond Centre County; features described below pertain to the entire area and are not necessarily confined to Centre County.

Note: the following information is adapted from the Audubon Society of Pennsylvania IBA site descriptions (Audubon 2002).

Bald Eagle Ridge

Bald Eagle Ridge has varied habitats, including mature forests, late successional stage fields, wetlands, perennial and intermittent streams, and hillside seeps. In some areas, it appears that the entire side of the ridge is seeping water. These areas remain open all year and are important for amphibians, turkeys, grouse, woodcock, and other species that are dependent on open water for survival during the winter. The large expanses of unfragmented forest are important habitat for breeding Neotropical migrant species such as Cerulean Warbler, Worm-eating Warbler, Wood Thrush, Scarlet Tanager, and Ovenbird. Bald Eagle Ridge is also an important flyway for raptors. Counts of Golden Eagles are some of the highest recorded in eastern North America and consistently exceed those of migration count sites along the Kittatinny Ridge.

<u>This area satisfies the following IBA criteria:</u>

1—Exceptional concentration/diversity of birdlife: It is a major flyway for raptor migration in the northeastern US. 174 species of birds have been documented along this ridge, including high counts of Golden Eagle and Broad – winged Hawk.

4—Unique or representative habitat: The area provides large expanse of unbroken forest for forest interior species, such as Cerulean Warbler and Worm – eating Warbler, and provides spring seeps valuable to Woodcock and Turkey.

<u>Conservation Concerns</u>

PennDOT has applied to construct a Traffic Improvement Project on Rt. 220 in Centre and Blair counties. Part of this project is an alignment including 17.5 miles of limited-access highway on the ridgetop of Bald Ealge Mountain. David Densmore, a supervisor with the Fish and Wildlife Service has stated that this project “will have substantial adverse effects on aquatic and terrestrial wildlife habitat that will not, and in some cases cannot, be mitigated.” In October 1997, the Federal Highway Administration approved the building of the four-lane highway up and over the mountain. The only hurdle now left for this project is approval from the Army Corps of Engineers. There is no official management plan for this area, other than Game Commmission management of SGL 278.

Southern Sproul State Forest

This is an extremely large, remote area representative of northern hardwood forest. Southern Sproul State Forest extends from the West Branch of the Susquehanna River south to approximately the Beech Creek watershed. There are no permanent residences and no electricity within this area, with the only human disturbances being timber sales, limited oil and gas development, and seasonal cabins. The Fish Dam and Burns Run Wild Areas, Bucktail State Park, Cranberry Swamp, and East Branch Swamp Natural Areas are all included within this area.

This site supports breeding species associated with very wild, mixed forest types. Deciduous woods provide habitat for breeding Cerulean and Prairie warblers. Other species include Whip-poor-will, Eastern Wood-Pewee, Least Flycatcher, Eastern Phoebe, Eastern Bluebird, Hermit Thrush, Cedar Waxwing, Black-and-white Warbler Black-throated Green Warbler, Pine Warbler, Black-throated Blue Warbler, Chestnut-sided Warbler, Ovenbird, Rose-breasted Grosbeak, Indigo Bunting, and Eastern Towhee.

<u>This area satisfies the following IBA criteria:</u>

1— Exceptional concentration/diversity of birdlife: Southern Sproul State Forest is one of the largest areas dominated by forest-interior birds in Pennsylvania.

4— Unique or representative habitat: Southern Sproul State Forest contains rare, threatened, or unusual habitat within the Allegheny Plateau Province. It is exceptionally representative of a characteristic hardwood forest within the province.

<u>Conservation Concerns</u>

Major threats to this area are forest insect pests, and fire. White tailed deer overbrowsing has severely limited the forest habitat diversity, both in structural and species diversity.

Portions are currently protected by State Forest Natural and Wild Area status. Restricting the use of motorized vehicles, thinning of the White-tailed Deer herd, limiting timbering and encouraging passive recreational use will help insure the stability of this valuable area.

Tamarack Swamp

Tamarack Swamp is situated at the head of Drury Run in Clinton County. From Renovo, it is reached by following Route 144, which skirts the western edges of the swamp. Francis R. Cope published in 1925 his "Observations on the Summer Birds of Parts of Clinton and Potter Counties, Pa." He described Tamarack Swamp as, "a little oasis in the desert – the dense growth of hemlock, spruces and balsams and other heavy foliaged forest trees keeps out the hot rays of the summer sun and affords a cool retreat for both birds and plants – everywhere we find beautiful beds of sphagnum moss – one sees little pools of icy water collected around the roots of trees – we find many birds typical of the Canadian fauna such as Brown Creeper, Winter Wren and many of the northern forms of warblers."

The above description of Tamarack was made at the turn of the century. Tamarack Swamp bears little of its original condition. Logging, residential and commercial encroachment have destroyed much of

the undisturbed qualities that Cope reported. Still, Tamarack Swamp holds valuable and unique habitat. Bird species include: Turkey Vulture, Sharp-shinned Hawk, Broad-winged Hawk, Ruffed Grouse, Killdeer, American Woodcock, Spotted Sandpiper, Black-billed Cuckoo, Whip-pool-will, Flicker, Hairy Woodpecker, Downy Woodpecker, Kingbird, Crested Flycatcher, Phoebe, Alder Flycatcher, Barn Swallow, Cliff Swallow.

This area satisfies the following IBA criteria:

1— Exceptional concentration/diversity of birdlife: Southern Sproul State Forest is one of the largest areas dominated by forest-interior birds in Pennsylvania.

4— Unique or representative habitat: Boreal Swamp – southern-most naturally occurring in the state. Bird species include: Golden-winged Warbler, Magnolia Warbler, Canada Warbler, Northern Waterthrush, and Rose-breasted Grosbeak.

Conservation Concerns

The destruction of the conifers is / was one of the most serious environmental changes to occur in this area. Despite these losses, there seems to be no absolute evacuation of all boreal species at and near Tamarack. However, many of the species that Cope reported 75 years ago are gone. Most notably are: Olive-sided Flycatcher, Brown Creeper, and Winter Wren.

Public acquisition, enforcement of regulations governing destruction of wetlands and public education would help preserve this unique area. Restriction of logging, ATV use and other consumptive recreational uses would limit damage to the fragile habitat

PENNSYLVANIA NATURAL DIVERSITY INVENTORY

The Pennsylvania Natural Diversity Inventory (PNDI) was established in 1982 as a joint effort of the Western Pennsylvania Conservancy, the Pennsylvania Department of Environmental Resources (D.E.R.)-Bureau of Forestry, and the Pennsylvania Science Office of The Nature Conservancy. The Nature Conservancy developed and continues to refine the methodology that PNDI uses as part of a network of "Natural Heritage Programs" around the country. Heritage Programs are now established in each of the 50 United States, as well as in Canada and Latin America.

PNDI uses as computer indexed data base that contains location and baseline ecological information about rare plants, rare animals, unique plant communities, significant habitats and geologic features in Pennsylvania. Presently, PNDI is Pennsylvania's chief storehouse of such information with approximately 9,000 detailed occurrence records stored on computer and cross-referenced to location on 881 7.5-minute United States Geologic Survey (USGS) topographic maps that cover Pennsylvania. Extensive manual files store additional information covering over 150 natural community types, over 800 plant and animal species, and about 1100 managed areas.

PNDI uses a system of "global ranks" and "state ranks" to describe the relative degree of rarity for species and natural communities. This system puts the status of these biotic resources into perspective, especially those resources that do not have official state status, such as invertebrate animals and natural communities of organisms. Appendix I provides a summary of global and state ranks. Appendix II provides a separate county ranking system.

The value of PNDI lies largely in its ability to supply technically sound information about natural ecological resources, including those that are rare and possibly regulated (e.g. endangered species). Knowing about such resources as early as possible can greatly streamline decision making concerning land-use in the counties. Information on the occurrences of elements (species and natural communities) of special concern has been gathered from museums, universities, colleges, and recent field work by professionals throughout the state. County Inventories, including this one, employ the same approach in identifying the areas of highest natural integrity and significance.

For more information regarding PNDI contact :

Department of Conservation and Natural Resources
Bureau of Forestry
PO Box 8552
Harrisburg, PA 17105-8552
(717) 787-3444

NATURAL HERITAGE INVENTORY METHODS

Presently, two County Natural Heritage Inventories have been completed for western Pennsylvania. These include the Butler County Natural Heritage Inventory (Smith, et al., 1991) and the Centre County Natural Heritage Inventory (Stack, et al., 1991). Methods used in this inventory are based on both the Butler and Centre County reports, as well as those used by Anonymous (1985); Reese, G.A., et al. (1988); and Davis A.F., et al. (1990) to conduct similar projects. The Clinton County Natural Heritage Inventory proceeded in the following stages:

- gathering existing information
- aerial photo and map interpretation
- aerial reconnaissance
- ground survey
- data analysis.

Gathering existing information

The PNDI database supplied a list of species of special concern and important natural community sites for Clinton County. Local individuals and organizations donated information concerning natural areas and unique habitats in the county. Some of this information came from responses to recommendation forms mailed to over 100 individuals in the county. Organizations including, the Pennsylvania Bureau of Forestry, the Pennsylvania Game Commission, the Pennsylvania Department of Environmental Resources, and the USDA Soil Conservation Service, also provided recommendations.

The Western PA Conservancy and the Clinton County Planning Commission held a public meeting to introduce the inventory to county citizens and to solicit their input on sites of potential Natural Heritage quality. Recommended Natural Heritage Forms (Appendix IV) were available to those who wished to recommend sites. Additional information used to choose potential sites in the county included: soil maps, previous field surveys, planning documents, and various published material referencing Clinton County.

Aerial Photograph and Map interpretation

The Clinton County office of the USDA Agricultural Stabilization and Conservation Service (ASCS) kindly made available the most recent aerial photos of the county (1987-1990) and the USDA Soil Conservation Service (SCS) likewise made available the older photo sets from 1938, 1951, 1966, and 1983. Initial study of these photos revealed large-scale natural features (e.g. ponds, streams, cobble shoreline), small but conspicuous features (e.g. ridgetop emergent wetlands, rock outcroppings, glades or barrens), disturbances (e.g. power cuts, utility ROWs, strip mining, clearcutting), and a variety of easily interpretable features. Investigation of areas on the ground and review of the same areas on the photos helped to establish a set of "signatures" that allowed a more detailed review of areas not visited on the ground. Some sites could be eliminated if they proved to be highly disturbed or fragmented or purely attributable to human-made features (e.g. impoundments, clearings, farm fields). Some that required closer or more updated information were directly observed from the air.

Aerial Reconnaissance

Flying over the landscape greatly helps in interpretation of features because of color and tonal differences and because of the 3-Dimensional perspective gained of areas and objects that on photographic sheets,

appear as 2-Dimensional. Again, some sites can be eliminated after such direct inspection. Also, information concerning extent, quality and context can be gathered easily from the air. Any sites that can be eliminated via aerial inspection can save many hours of ground inspection, particularly when dealing with remote areas. Although extensive aerial surveys were not made of Clinton County, what was done proved valuable and allowed a number of decisions concerning specific sites to be made.

Ground Survey

Areas that were identified on maps, aerial photographs and from the air as potential sites were examined to evaluate the condition and quality of the habitat and to classify the communities present. Researchers did not enter sites that were posted unless the land owner granted permission. Field survey forms (Appendix III) were completed for each site. Boundaries for each site were drawn on the USGS topographic maps. Site boundaries include both the key features of the site and the additional "buffer areas" critical to the protection of the site.

The flora, fauna, level of disturbance, approximate age of community, and local threats were among the most important data recorded for each site. Sites for species of special concern were visited and the condition of the habitat and of the species' population evaluated.

Data Analysis

A dedicated file exists for each visited site and contains the site survey form for that site and any additional information about or pertinent to the site. Characteristics such as size, condition, recoverability and rarity are contained in these files. The quality of the site was determined by examining how well it fulfilled the definition as one of the Natural Heritage Area types described in the introduction. Each natural community and species of special concern (elements) was ranked by PNDI using factors of rarity and threat on a state-wide (state element ranking) and range-wide (global element ranking) basis (Appendix I and V). In addition, each site was ranked by inventory methods according to its relative significance in the county (Table 1 and Appendix II).

Field data for natural communities and for all plant and animal species of special concern found were synthesized with existing data, summarized, and locations were transcribed on to clear polyester sheets which serve as overlays for each of the 7 1/2 minute U.S.G.S. quadrangle maps found in Figure 2.

GENERAL RECOMMENDATIONS FOR THE PROTECTION OF NATURAL HERITAGE AREAS

The inventory identifies natural heritage areas in order to promote their protection. Specific site recommendations for the maintenance of these important biotic and ecological resources are made based upon (1) type of natural heritage site; (2) the ecological characteristics of each site; (3) evidence of past or present disturbance within the site; and (4) the potential effects of the land-use activities that surround the site. Thus, these recommendations and site mapping recognize the interaction between the site's biotic resources and the natural ecosystems and/or land-use activities in proximity to the site. The general recommendations furnished below are meant to further clarify the differences between the various natural heritage areas and to provide a general framework into which specific management recommendations can be made.

Natural Areas

Natural Areas are recognized as areas whose communities have flourished with little or no human disturbance, particularly recent disturbances. Their continuance as the best examples of natural communities in the county depends upon the maintenance of the undisturbed qualities. Therefore, the protection of Natural Areas requires that the disturbances associated with all land-uses, including those described below, be eliminated from the site and its buffer. In some cases, specific and non-invasive management may be required to maintain the qualities of the Natural Area (e.g. removal of exotic plant species that are threatening the integrity of the natural community may be an acceptable practice, whereas, spraying for gypsy moth would not be considering the broad scale effects of the pesticide).

Biological Diversity Areas

Biological Diversity Areas include those sites that are recognized as supporting special species (Special Species Habitat), relatively large numbers and kinds of species (High Diversity Areas), or entire communities or ecosystems (Community/Ecosystem Conservation Areas). Occasionally, Special Species Habitats and High Diversity Areas require some manipulation to maintain suitable conditions for the species or group of species. This is particularly true in places where natural habitats have been displaced and where species are now surviving in human influenced/created areas that mimic certain natural habitats. Beyond such specific cases, however, these BDAs should remain as free from other disturbances as possible. BDAs which include communities or ecosystems of significance should be managed in a similar way as Natural Areas, but with, again, the potential of management designed to provide habitat that has been displaced or compromised by various land uses (e.g. an oak barren that has not been permitted to burn under fire suppression policies may require periodic controlled burns).

Dedicated Areas

Dedicated Areas are recognized because of the owner's intention to protect their present and potential future ecological resources. Under protection, those sites that are not presently examples of special habitat or exemplary communities will be permitted to mature and attain qualities recognized for natural areas or biodiversity areas. Sites that are already significant as natural areas or biodiversity areas will be allowed to continue, undisturbed, as the best examples of natural communities in the county. The management of DA's may therefore follow the recommendations furnished for NA's and BDAs and may involve some level of carefully planned intervention to maintain their significant ecological resources. Usually, management involves simply leaving the area alone to mature and recover from previous disturbance. Generally, many

land-uses, including those discussed below, are not compatible with the protection granted by DA's and should be avoided.

Landscape Conservation Areas

LCAs recognize large pieces of the landscape that are relatively undisturbed, but may include a variety of land-uses. Also, LCAs may contain NA's, BDAs, OHA's or managed land - all which serve to increase the significance and complement the integrity of the LCA. Management requirements for LCAs are less stringent than those for either NA's or BDAs because they are generally not delineated to protect specific species or communities. Whereas with NA's and BDAs, disturbances must be evaluated in terms of direct impacts to areas, with LCAs disturbances must be considered on a broad scale in terms of fragmentation and general habitat integrity. Construction of new roads and utility corridors, timber harvesting, clearing or disruption of large pieces of land, and other activities that divide and alter the character of the LCA landscape should be avoided. People and human created features are often part of LCAs but should not dominate the landscape. Very importantly, the management of existing activities within LCAs needs to emphasize the integrity of the recognized natural systems and be sensitive to the effects of even small alterations in habitat. By limiting the amount of land in intensive use (agricultural zones, residential zones, etc.) and by compressing development into already disturbed areas (villages, roads, existing ROW's, etc.), large pieces of the landscape can be maintained intact.

Other Heritage Areas

Areas containing ecological resources that involve public education or scientific study fall into this category of Natural Heritage Area's. These activities lend importance to places that might not otherwise be considered as unique or significant relative to other areas in the county. OHA's require that resources emphasized for study be protected from disturbances that are not within the context of the study (e.g. a stream may be studied as a pristine aquatic habitat or as an aquatic habitat effected by a land-use within its watershed, each study requiring a different protection approach). This protection should include the environment and processes necessary for the sustanance of the resource. For example, if aquatic resources are the focus of the OHA, an entire watershed may require protection. If the focus is a small patch of forest, a much more compact area of protection may be appropriate. Also, the study of the resource may require management or sampling and may alter the natural character of the site. Such management would not be appropriate within an NA or BDA but is acceptable in an OHA.

LAND-USES AND POTENTIAL THREATS TO NATURAL HERITAGE AREAS

The activities that take place on lands that surround a natural heritage site can cause physical, chemical and biological modifications that significantly effect the site's ecological resources. In western Pennsylvania the land-uses that most often pose a threat to the protection of natural heritage sites are: mineral extraction, development, agriculture, utility right-of-ways, timber harvesting and gypsy moth control. Fragmentation of habitat caused by these and other land-uses poses a further threat that is both pervasive and cumulative. Some of the potentially adverse effects of each of the land-uses above on biological systems are described below. While land-use activities can threaten the protection of the areas identified in the inventory, there is a range of options for dealing with the threats that depend upon site characteristics and the particular land-uses in proximity to the site. All natural heritage areas identified in this report include buffer zones that provide a critical areas necessary for the protection of ecological resource of concern. A description of buffer zones follows the discussion of land-uses and threats to natural heritage areas.

Mineral Extraction

Mineral extraction is a term used to describe the removal of natural resources via mining or well drilling operations. Mining operations are used to access coal, rock, sand and gravel deposits. Drilling operations recover petroleum, natural gas, sulfur, mineral brines, and water from wells drilled into formations containing the minerals. Generally, mineral extraction changes the topographic, physical, and/or chemical characteristics of terrestrial or aquatic resources (Darnell, 1976). These changes have the potential to affect biological resources on and off the site of the mineral extraction operation.

All mining operations change topography and can destroy natural habitat(s) via the removal of natural vegetation, soil, bedrock overburden, mineral deposits, and the creation of spoil and mineral storage areas. Sand and gravel mining in streams or lakes can significantly reduce or eliminate aquatic habitats/communities by modifying substrate composition and stream hydrology. Topographic and physical changes caused by mining activities can lower water tables, lake levels and spring flow, and can significantly modify stream flow rates. Erosion, mineral washing, and aggregate sorting can change neighboring surface waters and wetlands via the input of sediment and fine particulates. Sediment and fines can alter bottom topography, increase turbidity, reduce light penetration, increase water temperature, reduced dissolved oxygen, modify natural water chemistry, and reduce habitat diversity for plants and animals (Darnell, 1976).

Despite the efforts of the mining industry, mine drainage and wastewaters still have the potential to adversely effect the water quality of surface waters, ground water, and aquifers. Wastewaters and stormwater runoff from mining operation can contain suspended sediment, acids, toxics, and total dissolved solids (Darnell, 1976). Coal mine drainage and washing facilities have a low pH; high concentrations of metals, such as iron and manganese; and high concentrations of suspended solids. These pollutants, as well as leachates from coal piles and slurries reduce water quality and inhibit plant and animal life (Michaud 1989).

Well drilling operations generally involve a limited amount of land area and therefore, tend to result in less habitat loss than mining operations. Drilling operations that produce water can lower local water tables and result in groundwater loss. When properly operated, well drilling activities do not discharge liquids or foreign materials outside the drill area. However, petroleum spills can contaminate soil, surface waters and groundwater. Brines are a by-product of oil and gas wells and contain high concentration of salts. When improperly discharged, brines can pollute surface waters or shallow groundwater (Darnell 1976). It is

recommended that the best management practices be employed during mineral extraction activities and that impacts to surrounding ecological communities be strongly considered.

Further information regarding regulations and proper mining and drilling techniques can be obtained by contacting the Department of Environmental Resources-Bureau of Mining and Reclamation (phone: 717-787-5103) or the Department of Environmental Resources-Bureau of Oil and Gas Management (phone: 717-783-9645).

Development

The effects of development activities on the environment can be categorized as (1) during construction impacts, (2) effects that occur immediately after construction, and (3) the long-term effects related to the permanent physical changes brought about by development and by subsequent human use and management. The overall effect of any development activity varies with environmental features including physical characteristics (soils, slope, and vegetative cover), timing, type of construction, and the care taken during the active construction periods. Long-term effects related to subsequent human use depend upon environmental features, intensity of use, and management practices (Darnell, 1976). Development activities generally result in the permanent loss or modification of terrestrial and/or aquatic biological ecosystems. The extent of the loss or modification is related to the size and type of development.

Development activities can have effects that extend beyond the areas directly involved in the development. Therefore, the predicted impacts must consider more than the biota whose habitat will be altered on-site (Ghiselin, 1980). Of these changes habitat fragmentation (discussed in a later section), nonpoint-source pollution, erosion, and wastewater discharges are of particular concern.

"Nonpoint-source pollution" is pollution generated by stormwater runoff from land-based activities. The types of pollutants contained in stormwater runoff are related to the land-based activity. Generally speaking, the pollutants in stormwater runoff originating from urban and infrastructure development are: nutrients, suspended solids, septic effluent, pathogens, organic compounds, petroleum hydrocarbons, heavy metals, pesticides and industrial chemicals, road deicing salts, toxic chemicals, fertilizers, and eroded soil (Guldin, 1989; Newton, 1989). Nonpoint-source pollution can have significant adverse effects on water quality by entering surface waters, wetlands, or infiltrating groundwater. It is also the most difficult pollution source to track and remediate.

Erosion occurs when wind or water wear away soil or rock. Erosion is a continual, natural process that results in substantive changes that take place over many years or, in the case of rapid changes caused by flooding, windthrow or rock slides, that take place in a limited area predisposed to those kinds of changes. Many natural communities and individual species have adapted to and depend upon cycles of habitat change brought about by erosional forces. However, human activities often precipitate erosion in ecosystems not adapted to rapid or extensive change and hence, can damage or destroy natural communities. Such mediated erosion can result in land loss (e.g., stream bank recession) and degradation of water quality through sedimentation and mineral release, adversely effecting aquatic life and habitats. Development can increase erosion by removing vegetation, roots, leaves, and litter that retard erosion. On a larger scale, development may require the grading of hillsides and the complete removal of topsoil, leaving large areas of land bare and vulnerable to erosion (Erie County Metropolitan Planning Commission, 1977).

Wastewater discharges are liquid effluents discharged from a relatively self-contained (point) source that generally carry pollutants (Kunz 1970). Pollutants in these discharges are most often total suspended solids,

compounds that increase biochemical oxygen demand, nitrogen, phosphorus, and heavy metals (Council on Environmental Quality, 1981). While wastewater discharges, by law, have effluent limits which restrict the quantities, rates and concentrations of pollutants that enter the receiving waters (Department of Environmental Resources, 1979), an effluent may still contain one or more pollutants that can adversely effect a habitat, species, or ecosystem. For example: depending on the level of treatment, municipal wastewater treatment plant effluent can contain nutrient levels that would significantly accelerate the eutrophication of a lake, adversely effecting the water quality and biota of the lake. Additionally, chlorine used to sterilize sewage treatment plant effluent discharges is itself a toxic compound and a precursor to other compounds that are toxic to aquatic life.

Two agencies that serve as regulators of most construction activity are the U.S.D.A. Soil Conservation Service (phone: 717-726-4928) and the Department of Environmental Resources (phone: 717-783-2300). Both agencies can be contacted if further information is needed.

Agriculture

The removal of natural vegetation to create crop land can result in the loss of terrestrial and aquatic biological resources. Conversion to agricultural land-use is also one of the three primary reasons for the continued decline of wetlands in the United States (Guldin, 1989). In addition to the direct loss of natural communities by conversion to crop land, crop and animal production activities can produce nonpoint-sources of pollution that effect water quality by entering surface waters or ground water via runoff, seepage, or percolation. Water quality problems related to agricultural nonpoint-source pollution generally result from eroded sediments, nutrients, and animal wastes (Terrell and Perfetti, 1989).

Sediment is the primary pollutant contributed by agriculture to receiving waters. Sediment destroys spawning areas, food sources, and the habitat of fish, crustaceans and other aquatic life. Sediment loss varies significantly with the kind and extent of management practices. The use of conservation cropping systems (i.e., cover crops and conservation tillage) reduces the amount of sediment entering receiving waters (Guldin 1989; Terrell and Perfetti, 1989).

Agricultural activities, including use of cattle feedlots and the intensive application of fertilizers, add nutrients and chemicals to surface waters and groundwater (Erie County Metropolitan Planning Commission, 1977). Eutrophication rates are increased by agricultural inputs of nutrients, especially nitrogen and phosphorous. Nutrient inputs usually originate from either fertilizer (animal manures and chemical) runoff or erosion from fields or pastures (Terrell and Perfetti, 1989), far exceeding the rate brought about by natural processes.

Pesticides are commonly applied to agricultural lands. Most agricultural pesticides are either insecticides or herbicides. The longer the pesticide persists in the soil, the more likely it will be transported from the crop area to surface or ground waters where it may adversely effect nontarget organisms (animals, humans, noncrop plants). The effects of pesticides on aquatic organisms vary with the toxicity of the pesticide, how long it remains active in the environment, and its tendency to accumulate in the food chain. Pesticides can be directly toxic to fish and other organisms in the food chain (Guldin 1989, Terrell and Perfetti 1989) or may be toxic in combination with other chemicals. It is recommended that pesticides should be used only to the extent necessary and not overapplied.

The Clinton County Conservation District (phone: 717-726-3798), U.S.D.A. Agricultural Stabilization and Conservation District (phone: 717-726-3196), or the Penn State Cooperative Extension Service (phone: 717-893-4050) can be contacted for further information regarding agricultural practices in Clinton County.

Utility and Road Right-of-Ways

Utility Right of Ways (ROW's) are typically unforested ribbons of leased land that are cleared of vegetation to accommodate the construction and maintenance of overhead electric and telephone lines or oil and gas pipelines. Varying in width from 40 or 50 feet to hundreds of feet, these utility ROW's stretch long distances across the landscape, through both densely populated and sparsely populated areas. After construction, vegetation on these ROW's is controlled through mechanical and chemical methods, designed to discourage growth of woody plants, especially trees.

To keep costs as low as possible and reduce the amount of potential maintenance on ROW's, utility companies attempt to stretch their lines over as short a distance as possible. Often that means running up and down steep slopes, crossing wetlands, crossing streams, or cutting through blocks of forest. In all cases, utility ROW's serve to fragment the landscape by breaking contiguous habitats and communities into smaller sections (see the Fragmentation section that follows). In some cases, utility ROW's have more direct effects on natural communities.

Lacking sufficient vegetation, particularly overstory vegetation, to intercept, store and transpire water, ROW's that traverse steep slopes open up hillsides to weathering and erosion. Siltation of streams, severe run-off events, and even changes in local hydrology can all result from ROW's channeling water rapidly down slopes. Unforested corridors, like ROW's, that link remote interior areas of forest to more disturbed, open habitats - including the ROW's themselves - invite invasion of exotic plants [e.g. multiflora rose (*Rosa multiflora*), garlic mustard (*Alliaria officinalis*), non-native grasses)]; aggressive native plant species like hay-scented fern (*Dennstaedtia punctilobula*); opportunistic animal predators like raccoon, fox, and even domestic dogs and cats; aggressive birds species [e.g. brown-headed cowbird (*Molothrus ater ater*)], and possibly many insect pests.

The maintenance of ROW can create another set of problems. Mechanical clearing and cutting, often done with heavy equipment, further compacts the soil, decreasing the ability of the soil to absorb water and making the ROW more susceptible to erosion. Also, where ROW's cross streams or wetlands, use of heavy equipment can damage natural drainages and disrupt slow to recover aquatic habitats. Application of herbicides can impact adjacent vegetation, particularly when applied from the air, through overspray and excessive treatment. Loss or damage of adjacent vegetation compounds the problem associated with erosion and siltation.

Little research has been undertaken regarding the effects of herbicide (broad-leaf, broad spectrum, or otherwise) overspray and runoff on nearby aquatic systems. Alternative management strategies should be strongly considered in the decision to use herbicides on ROW's. Currently, examples of cooperative management between conservation groups and utility companies show a trend toward more limited and specific application of herbicides as well as toward development of strategies for decreasing maintenance needs of ROW's (e.g., planting of shrubs and periodic sapling cutting) (Pers. comm.; Mary Droege, Maryland Chapter of The Nature Conservancy; Keith Langdon, U.S. Park Service). It is important to note that planting of exotic shrubs or cover vegetation would introduce species that could outcompete natural vegetation, even in areas beyond the ROW, and accelerate changes in composition of communities intercepted by the ROW. This would compound the problem that this new type of management is designed

to resolve. Even plantings of native vegetation may introduce new genes into existing local populations, possibly affecting the vigor and ability of existing communities and individual species to survive local conditions. Planting and encouragement of native *local* species is the best solution. When establishing utility ROW's, the best general practice is to avoid steep slopes, wetlands, highly erodable soils, and large, contiguous patches of forest or other natural landscapes. To avoid further fragmentation of the landscape and multiplying the impacts mentioned above, new transmission lines should be routed along existing ROW's or roads or through areas that have been already highly fragmented.

Road ROW's impact the landscape and natural communities in much the same way that utility ROW's do - mainly by dividing and isolating habitats and restricting species movement. However, because of vehicular traffic, guardrails and berms, and surfaces that are often paved, roads create an even more effective barrier than Utility ROW's do. Additionally, impervious surfaces of concrete and asphalt cause an increase in water runoff which can lead to erosion problems, and ditching and draining can changes in the hydrology of watersheds containing the roads. Other problems associated with road ROW's include pollution from soils and water resulting from oil, rubber and other hydrocarbons washing from the road surface; from use of deicing salts and chemicals; and from asphalt, cement and other compounds used in road construction and resurfacing.

Forestry Practices

Timber harvesting was once the economic staple for many regions in Pennsylvania and is still important in rural areas near large blocks of state or national forest. In the past 150 years, most areas in Pennsylvania have been cut at least once, many two or three times. In general, there are two approaches to timber management; even-aged and uneven aged management. Even-aged management refers to the removal of most or all the trees in a section of forest to encourage regeneration of a stand where all trees are of the same age and to some extent, the same species. "Clearcutting", "shelterwood" cutting, or "seed tree" cutting are types of even-aged management techniques. These types of activities lower diversity of a stand in a number of ways (Soulé and Wilcox, 1980). Large openings created by extensive cuts allow pioneer tree species like aspen (*Populus spp.*) and cherry (*Prunus spp.*) to out-compete slower growing, lower seed producing trees characteristic of more mature forests. Loss of original forest seed trees compounds the effect, slowing succession and recovery to an even greater degree. Below the canopy, dramatic increases in light level and decreases in humidity and soil moisture, resulting from overstory removal, lead to loss of many species of flora and fauna not able to tolerate the new environmental conditions or unable to compete with more opportunistic species. Soil disruption and loss during and after the harvest operation can also change the long-term character of a forest community by eliminating or reducing the soil "bank" of seeds.

Uneven-aged, or selective cutting, usually requires that only certain trees are removed from a stand. Stand improvement cuts may remove decadent, diseased or oddly growing trees to allow the remaining trees better access to light, water and nutrients. Unfortunately, these trees are the most valuable to wildlife (Noss, 1992) and will diversify the habitat and supply food to the invertebrates and microorganisms living on the forest floor when they succumb and fall. "High-grading" is a term used to describe a selective cut that only removes the highest quality trees. "Highest quality" means the largest, most vigorous, and dominant trees and consequently, those which are genetically best selected to grow in a particular place. Removing these trees means reducing the species gene pool by removing the best genes and reducing overall (genetic) diversity.

Timber harvests necessarily result in the loss of soil to erosion and the compaction of soil from use of heavy machinery and vehicles as well as some damage to a portion of the trees left unharvested. The degree of

soil loss and alteration is dependent upon the type and location of the cut and the amount of care taken during the operation. Steep slopes, areas with fine soils and areas recovering from fire damage are places that are obviously very susceptible to erosion. Large cuts, especially even-age cuts, increase the risk of high volume runoff events. Roads required to access the site and later remove timber, impact communities outside the harvest area and increase fragmentation and the potential for erosion. An increase in road densities is known to be harmful to sensitive wildlife and may have other deleterious effects (Noss, 1992).

Current timber management practices have addressed some of these concerns, particularly those related to erosion and the impact of siltation on streams and other waters. Practices used within the state forests are exemplary and designed to reduce adjacent impacts as much as possible. However, the effect of timber removal, however carefully controlled, is the disruption of natural forest communities. Forested wetlands communities because of their sensitivity to changes in the height of the water-table, are often more severely impacted than the terrestrial communities. The ability of those communities to recover after one or two or more cuts, is not known. Uneven-aged management and longer rotation cuts are ecologically preferable to clear cutting and other even-aged management methods. Keeping the number of roads to an absolute minimum and reducing the size of cuts can help to minimize fragmentation. Avoiding highly erodible areas and areas with fine, compactable soils is a basic management consideration.

Gypsy Moth Control

The gypsy moth (*Lymantria dispar*) poses a threat to the forest communities of Pennsylvania and the eastern United States. Since accidental introduction into Massachuttes in the late 1860's, the gypsy moth has worked it's way south and west across the northeast, increasing in population size and areaa, and rapidly defoliating trees during the larval; stage of its life cycle. The insect will feed on many tree species but prefers a few species, particular oak (*Quercus spp.*). Extensive outbreaks of the insect occur in forests where oaks comprise at least 15-25% of the community (Nichols, 1980). Unfortunately, a large portion of Pennsylvania forests consist of a high percentage of oak. The threats posed by these extensive outbreaks include mortality of individual trees, reduction of food available for other forest insects and possible long term changes in the understory of the forest as a result of increased light reaching the forest floor (Schweitzer, 1988). Increased light levels can also encourage invasion of exotic or weedy species.

In an attempt to control the gypsy moth, a number of measures have been taken such as spraying insecticides and introducing parasites. Dimilin, Sevin, Orthene, Dylox, and Bt (*Bacillus thuringiensis*, a biological control), are five currently used insecticides; all impact more than just the gypsy moth. The toxicity of these insecticides extends to many species, potentially thousands depending on the pesticide, and some remains active in the environment (terrestrial and aquatic systems) for at least several weeks following application (Schweitzer, 1988).

In general, insecticides will negatively impact biodiversity more than defoliation by the gypsy moth. Introducing parasites to control the gypsy moth is a questionable control method since, in most cases, little is known about the long term effects of such releases on the environment. One concern is that these organisms may have an impact on native insect populations when the gypsy moth populations decrease and the parasites are forced to find an alternative food source.

Based on this information, it is recommended that Natural Areas, Biological Diversity Areas and Landscape Conservation Areas be eliminated from, or not considered for any type of gypsy moth control program. If spraying is needed in other parts of the county, to protect forested residential or commercial property, then Bt should be the method of control used. Bt is a bacterium which serves as a more benign biological

control that disrupts the digestive system of the larva when ingested. The spraying of Bt eliminates the use of more harmful chemicals in the environment, however, it is considered a broad spectrum insecticide and as such, can have the same effects on many native insects.

Fragmentation

The land uses and activities discussed above can each affect natural communities and natural heritage sites in very specific ways. However, beyond the direct impacts associated with these activities are the general, but very real and cumulative problems of habitat and landscape fragmentation. In this context, fragmentation refers to the breaking apart of natural features (e.g. forests, streams, ridgelines) and the natural transitions between features (e.g. dry forest to mesic forest to swamp forest) on the landscape by human activities and development.

Both natural and human features can serve to divide habitats, for example, streams and roads. Occasionally, human features provide habitats that are analogous to natural habitats (e.g. road cuts vs. eroding slopes), however, more often they are not comparable to natural habitats in form, function or position on the landscape. Roads, railroads, pipeline ROW's, farm fields, villages and housing developments not only occupy a substantial portion of the landscape, but break it into a large number of various size patches that function differently from natural patches of habitat.

Landscapes can be considered as a network of interacting patches that are sustained through the exchange of materials including genes, species, energy and biomass. If these exchanges are impeded, islands of habitat can be created and the processes of species movement, migration, colonization and extinction that function to maintain biological diversity, can no longer operate effectively. Cut off from larger populations, the species and communities within these areas face the problems of limited genetic diversity and low (species) recruitment rates. Ultimately, the number of existing species decline and fewer are available to take their place. It is precisely this decline in the ability of pieces of the landscape to support many species with different requirements that leads to a decline in biodiversity.

The effect of fragmentation on a specific species or ecological community depends upon the type and size of the community patch and upon the nature of the fragmentation. A grass-covered powerline, for example, could serve as a breeding habitat and as a dispersal corridor for grassland species but exist as a barrier to dispersal of interior forest species (Noss and Harris, 1986). Unfortunately, even though many of the most common and abundant species of plants and animals can take advantage of edges and manipulated habitats, many of the rarer ones can not. Fragmentation is of particular concern to "interior" dependent species - species which require the stable, low competition habitats found within contiguous forest ecosystems. The spotted owl is a well known example of an interior dependent species. It should be noted however, that interior species function as part of a system and, although protection and management may focus on the individual species, it is the entire ecosystem which the species depends upon that should be the concern of the protection efforts.

In evaluating the fragmentation of landscapes, it is important to consider the biological resources that are being protected or impacted within specific patches. These are complex considerations and require imput from natural resource professionals who have a working understanding of landscape ecology as well as individual species biology. Management efforts directed toward providing linkages between habitats to facilitate the species movement, gene and energy flow, etc., will be required if significant ecological areas are to maintain their natural diversity. Riparian corridors, under-road culverts, abandoned rail ROW's, and ridgelines can all be utilized to provide linkage between sites and habitats. Generally, it is preferable to

concentrate land-use activities rather than spreading them out. Clustering development, improving existing roadways rather than building new ones, and using existing ROW's to expand transmission capabilities are some approaches to limiting fragmentation.

BUFFERS

Buffers or buffer zones are the areas surrounding the core area of a site that provide insulation between significant ecological qualities and the existing, or potential, negative disturbances nearby. The size of the buffer depends upon physical factors (slope and topography) and ecological factors (species present, disturbance regime, etc.) as well as characteristics of the buffer itself, such as uniformity, species composition, and age. Although similar sites may have similar *kinds* of buffers, no two buffers will be exactly alike in size or extent. Two wetlands, for instance, of exactly the same size, in the same region, may require very different buffers if one receives mostly ground water and the other mostly surface water, or if one supports migratory waterfowl and the other does not.

Also, the buffer and the area being "buffered" constantly interact and affect one another. As an example, protecting a section of old growth forest surrounded by second growth forest would involve creating a buffer that would allow plant species to spread outward from the old growth section and at the same time, discourage inward colonization by weedy, opportunistic species. The buffer would also protect the site from heavy winds and storms. Buffers must always be considered in the context of what they are protecting and how these zones will evolve when functioning as buffers. In the case of the old growth forest, a hiking trail through the buffer would probably not significantly change the buffer or impact the old growth forest. However, the expansion of camping facilities into the buffer could slow or prevent the build-up of humus and the reproduction of trees, introduce invasive species and pollutants, and eventually alter the character of the buffer, ultimately decreasing its effectiveness in protecting the old growth site.

Each site recognized in this report (Natural Heritage Areas) is mapped to include a buffer area. The decision as to how large a buffer should be for an individual site took into account the requirements of the natural community or species habitat that were the focus of the site. Buffers were not regarded as fixed distance areas around sites and the often irregular site boundaries demonstrate that point. A fixed buffer may serve to reduce direct impacts on a site, but may not account for the connections a site has with other parts of the landscape. By either failing to protect the natural system of which the site is a part (e.g. ground water recharge zone for a spring) or by allowing other land-uses nearby (e.g. ore extraction within a rock formation supporting a bat cave), a buffer can fail to provide adequate protection to a site.

RESULTS

Detailed maps and description of Clinton County's natural features follows, organized by USGS 1:24,000-scale quadrangle. Twenty-eight 7.5-minute U.S.G.S. quadrangle maps cover Clinton County (Figure 3). These maps are arranged beginning with Sinnemahoning in the northwest and ending with Carroll in the southeast. For each quad a map, a summary table, and full report are provided.

Biological Diversity Areas, Landscape Conservation Areas, Managed Lands, Dedicated Areas, and Important Bird Areas are indicated on the quad maps and are labeled in bold.

SUMMARY TABLE CONVENTIONS

A summary table of sites precedes each map and lists identified Biological Diversity Areas, Landscape Conservation Areas, and Managed Lands.

- Managed lands are listed after the Natural Heritage Areas
- Following each site name is the site's relative significance. Table 1 (pg. 3) summarizes sites by significance category, and definitions of the significance categories are listed in appendix II (pg. 163).
- Listed under each site name are the natural communities and state-significant species of special concern that have been documented within the area.
    - see Appendix V (pg. 167) for a list of Natural Communities recognized in Pennsylvania.
    - Some species which are perceived to be highly vulnerable to intentional disturbance are referred to as "special animals" or "special plants" rather than by their species name. Within each site these species are numbered.
    - The PNDI (Pennsylvania Natural Diversity Inventory) ranks and current legal status (detailed in Appendix I, pg. 155) are listed for each community and species.
- The text that follows each table discusses the natural qualities of the site and includes descriptions, potential threats, and recommendations for protection.

This report does not intend to encourage visitation of private lands without explicit permission of the landowner. Also, the report does not contain all the detailed information required to manage the species of special concern. If more information is needed, ecological professionals at the Western Pennsylvania Conservancy or at the state natural resource agencies should be contacted. Hopefully, this report will encourage communication between ecological professionals—at the Conservancy and within state natural resource agencies— with municipalities, organizations, and individuals.

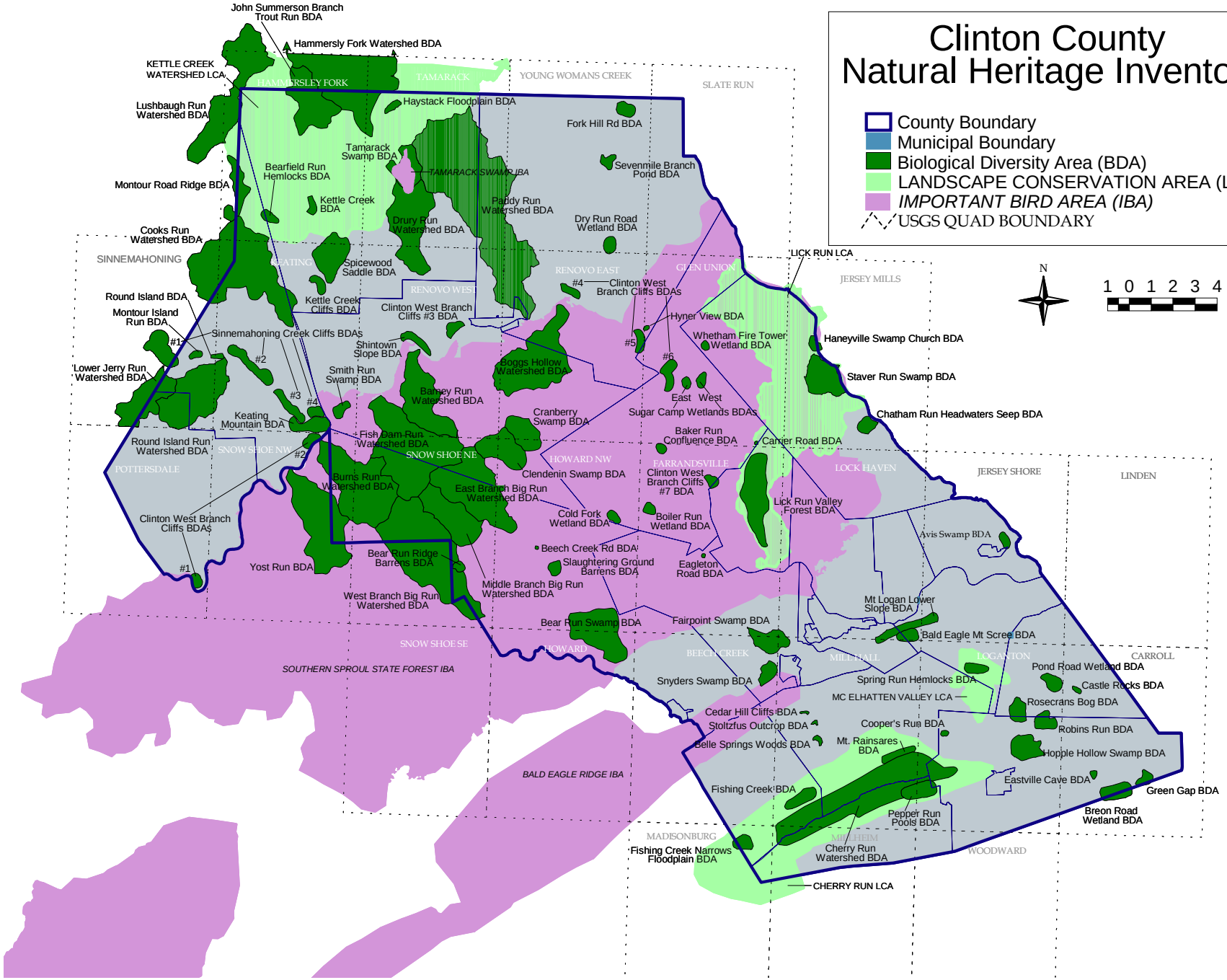
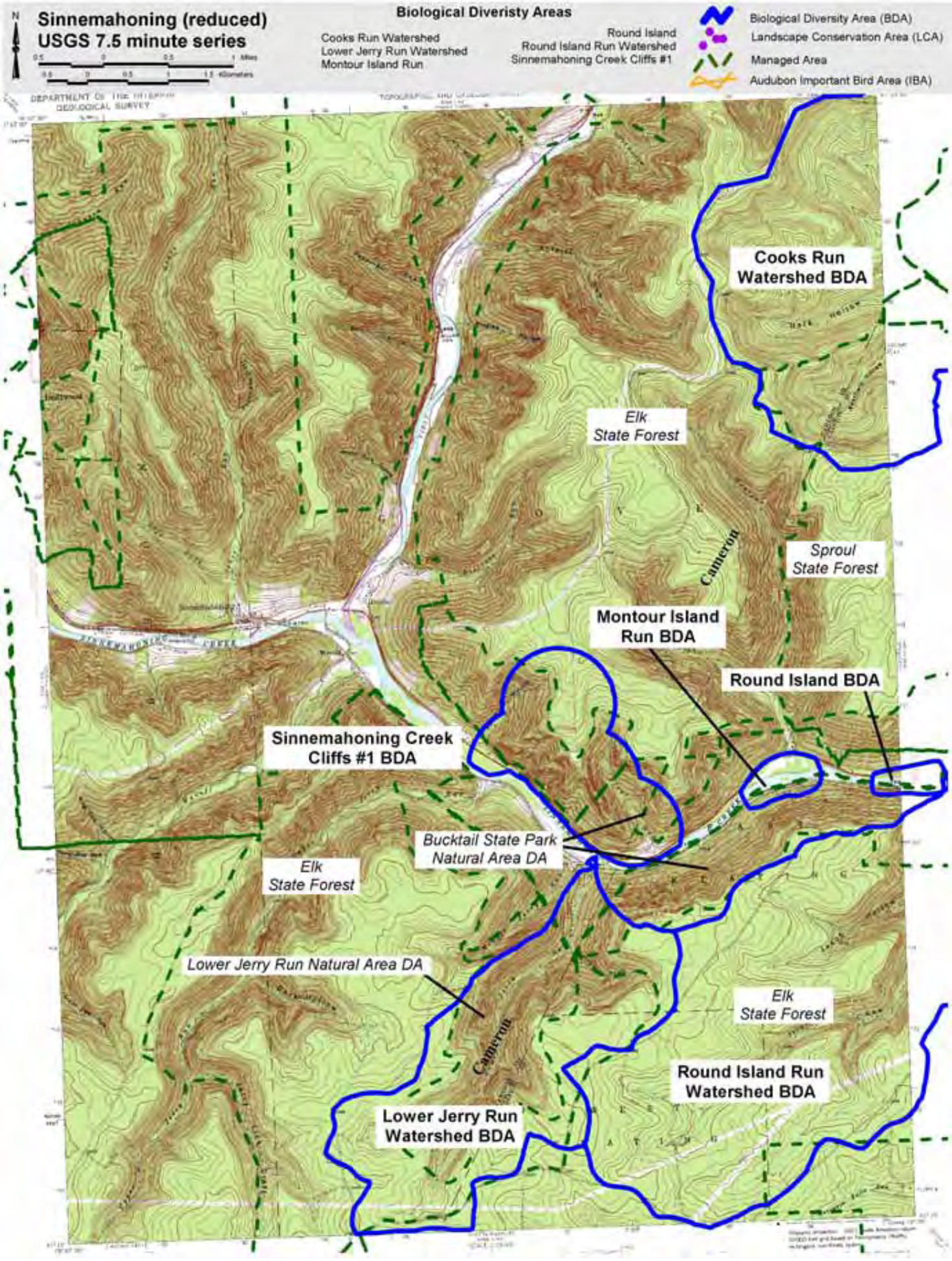


Figure 3: Clinton NHI Summary Map.

USGS QUADRANGLE **SINNEMAHONING**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
SINNEMAHONING CREEK CLIFFS #1 BDA		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	2/98
ROUND ISLAND RUN WATERSHED BDA		*Exceptional Significance*			
High gradient clearwater stream	G?	S3	N	N	7/92
Hemlock (white pine) – northern hardwood forest community	G5	S5	N	N	7/92
LOWER JERRY RUN WATERSHED BDA		*Exceptional* Significance			
Northern hardwood forest	G?	S5	N	N	11/92
LOWER JERRY RUN NATURAL AREA DA		*Exceptional Significance*			
Northern hardwood forest	G?	S5	N	N	11/92
MONTOUR RUN ISLAND BDA		*High Significance*			
Big bluestem – Indian grass river grassland community	G?	S4S5	N	N	8/92
Sycamore floodplain forest community	G?	S2	N	N	8/92
BUCKTAIL STATE PARK NATURAL AREA DA		*Exceptional Significance*			

MANAGED AREAS: Elk State Forest
Sproul State Forest
Lower Jerry Run Natural Area
Bucktail State Park Natural Area


Sinnemahoning (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Cooks Run Watershed
Lower Jerry Run Watershed
Montour Island Run
Round Island
Round Island Run Watershed
Sinnemahoning Creek Cliffs #1
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Cooks Run Watershed BDA
Elk State Forest
Sproul State Forest
Cameron
Montour Island Run BDA
Round Island BDA
Sinnemahoning Creek Cliffs #1 BDA
Bucktail State Park Natural Area DA
Elk State Forest
Lower Jerry Run Natural Area DA
Elk State Forest
Cameron
Round Island Run Watershed BDA
Lower Jerry Run Watershed BDA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

SINNEMAHONING QUADRANGLE

The Sinnemahoning quadrangle includes the western border of Clinton County where the Sinnemahoning Creek flows out of Cameron County and into Clinton County. The Sinnemahoning Valley in this and the Keating quadrangle to the east, is steep and rugged and provides excellent views of hemlock-hardwood forests on many of the southern slopes, and mixed oak forests on the northern slopes. The portion of Clinton County contained in this quadrangle sits almost entirely within the Elk and Sproul State Forests. Included are several significant stream communities, a mature hemlock forest, a river gravel community, the Bucktail State Park Natural Area, and the eastern section of Lower Jerry Run Natural Area.

The **Sinnemahoning Creek Cliffs BDA #1** includes habitat occupied by a population of the Allegheny Woodrat (*Neotoma magister*), a Pennsylvania Threatened animal species. Most of this area falls within Cameron County. Please see the "Allegheny Woodrat Overview" (pg. 151) for information regarding the ecology and management needs of this species.

The upper section of Round Island Run and Jacob Hollow lie in the southeastern section of this quadrangle. Contained within the **Round Island Run Watershed BDA**, Round Island Run is a High Gradient Clearwater Stream that includes a number of waterfall and plunge pool communities. One waterfall, in particular, drops six to eight feet from a flat ledge of shale and sandstone to a pool of water several feet deep and 10 feet wide. In general, the physical habitat features of this stream, as it twists through bedrock channels and plunges over rock shelves, are exceptional. A foot trail, at one time a narrow gauge railbed, runs the full length of the stream, winding through the dense rhododendron (*Rhododendron maximum*) and understory eastern hemlock (*Tsuga canadensis*), eventually branching and supplying access to the Jacob Hollow tributary. A handful of camps and an access road sit between Jerry Ridge Road and Round Island Run Ridge Road at the top of the watershed. A powerline parallels the stream on the upper watershed and crosses a small tributary to the south. Aside from detracting from the wild quality of watershed, the cleared areas associated with the powerline ROW and camps open the watershed up to invasion by opportunistic species. Erosion on the ROW during large storm events could also become a problem (see the Land Uses and Threats to Natural Heritage Areas section of the report for more discussion on ROW's). The use of heavy equipment and herbicides to maintain the powerline ROW is not recommended. Encouragement of local native shrubs and selective removal of trees from the ROW would reduce possible impacts to the streams and watersheds. Also, other activities that would further fragment the watershed or lead to increased erosion should be minimized. Timber sales within the BDA are not recommended. Although not classified as an Exceptional Value stream by the Pennsylvania Department of Environmental Protection, Round Island Run and its tributaries appear to be excellent candidates for water quality testing and upgrade to exceptional value waters if biological and physical parameters deem it.

The north slope of the Jacob Hollow Valley supports a discontinuous community of hemlock (white pine) forest (previously listed as Northern Conifer Forest following Smith 1991) dominated by old eastern hemlocks. These trees are likely the young trees left after the watershed was cut in the early part of the century. This community is prominent on the upper (western) section of the valley and represents a community type once prevalent in the county. The stream, although not as large or dramatic as Round Island Run, is a high gradient clearwater stream and should receive the same considerations as Round

Island Run. Both the stream (Jacob Hollow) and the northern conifer community are also within the Round Island Run Watershed BDA. Again, timber sales within the BDA are not recommended. Because of their exceptional features, Round Island Run and Jacob Hollow watersheds, now part of Sproul State Forest, should be considered together for special Bureau of Forestry status as a Natural Area.

A section of the **Lower Jerry Run Natural Area DA** crosses into Clinton County just west of Round Island Run. A northern hardwood forest community dominated by oak and birch blankets the deep valley of Lower Jerry's Run and a stand of old growth hemlock occupies a section of the valley along the stream (this section of the natural area lies in Cameron County). Disastrously, the tornado of 1986 felled many of the old trees and severely altered the natural area. However, as a Dedicated Area, the forest community will be allowed to recover without removal of downed trees and may, potentially, provide some important research opportunities. This natural area abuts the Bucktail State Park Natural Area and provides an important link between the counties and between the habitats of the West Branch Valley and the upper plateau.

The **Lower Jerry Run Watershed BDA** includes the Lower Jerry Run Natural Area DA and is designated around the watershed in which the DA falls.

Montour Island is a large island in the Sinnemahoning Creek west of the mouth of Montour Run. Typical of many riverine islands, Montour Island is slowly migrating downstream as the upstream (west) end loses finer silts and the downstream (east) end collects them in the protected eddy area behind the island. The result of this process is a section of rocky, occasionally inundated shore at the upstream end, slowly sloping upward to the normally dry interior of the island. Within the **Montour Island BDA**, this is a good example of a big bluestem – Indian grass river grassland (previously listed as a river gravel community following Smith 1991) on the island's upstream end and a section of sycamore floodplain forest (previously listed as flood plain forest community following Smith 1991) on its interior sections. The poor water quality of the mine acid impacted Sinnemahoning Creek poses a threat to the island communities. The acidification of the soil and subsequent precipitation of dissolved metals can have gradual but significant effects on both the aquatic and terrestrial vegetation associated with an island. The invasion of an asian exotic, japanese knotweed (*Polygonum cuspidatum*), poses a big threat to Montour Islands as well other islands and shoreline communities. A prolific seed and rhizome producing plant, japanese knotweed can reproduce from a single, small piece of root carried downstream by the current. Extensive populations of the plant now exist along the entire Susquehanna River drainage and have displaced much of the natural ground and bank cover. A very focused and methodical program would be required to control this plant. Attempts to eliminate or control the plant on a single island or piece of shoreline may prove difficult and inefficient without larger scale control. However, islands can provide a good setting for experimentation with control methods. Once satisfactory controls are established, programs of control could be expanded and more predictable results expected. The Western PA Conservancy, the Bureau of State Parks, the Bureau of Forestry and any other relevant organizations should be included in such a management project.

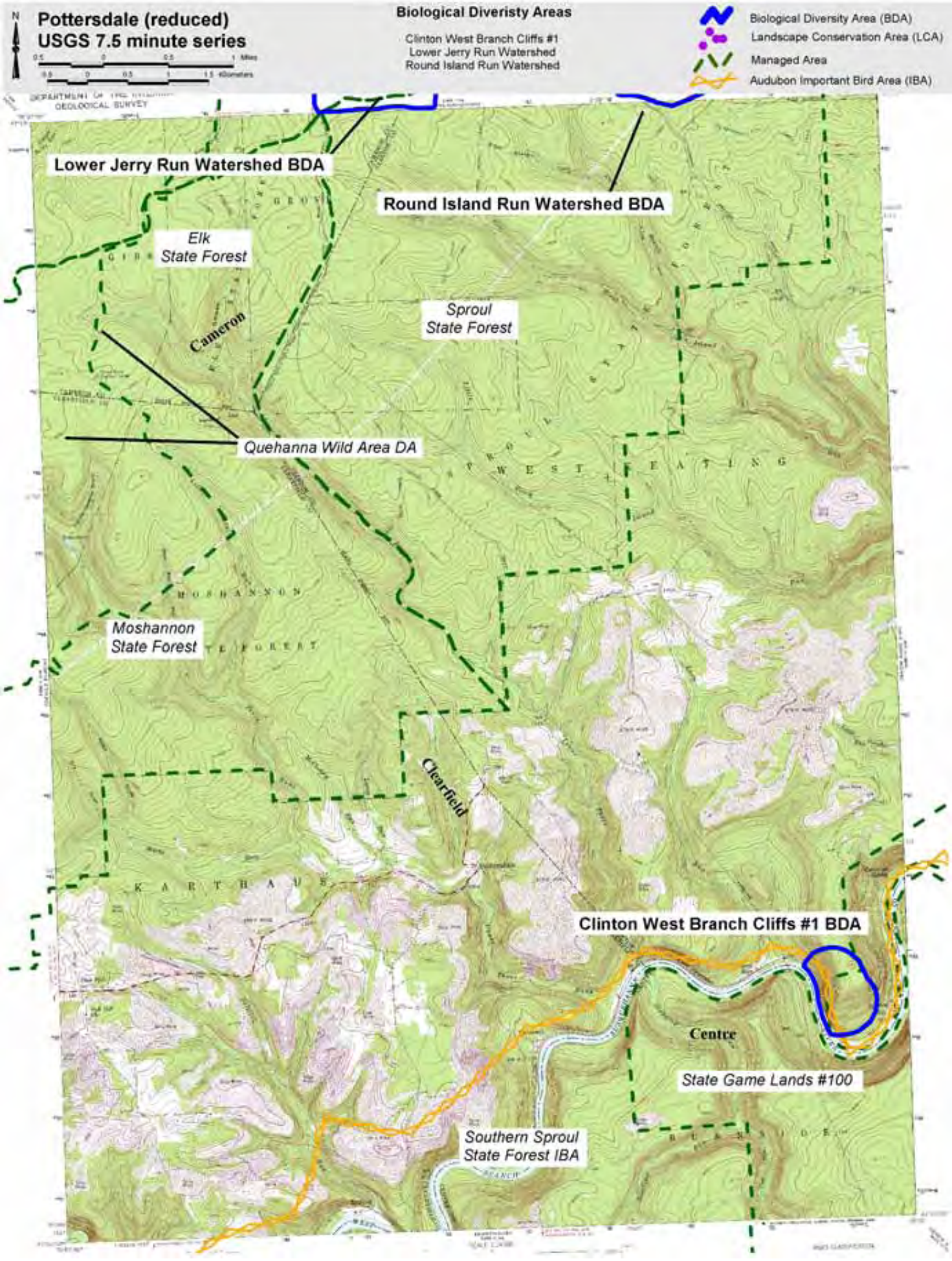
A section of the Bucktail State Park Natural Area runs west to east across the Sinnemahoning quadrangle along Sinnemahoning Creek. This natural area, covering nearly 17,000 acres, stretches 75 miles from Emporium in Cameron County, along Sinnemahoning Creek and the West Branch of the

Susquehanna River, to Tangascootack Creek just west of Farrandsville in Clinton County. Although described as running from "rim to rim" along these major drainages, numerous inholdings break its continuity and only in a few spots does the Bucktail include the lands immediately adjacent to the river. Because of its steep slopes, limited roads and numerous inholdings, access to the Bucktail is difficult. Many area can best be visited from the river. Generally, the north-facing slopes support more of the mesic and shade tolerant forests of hemlock, sugar maple (*Acer saccharum*), beech (*Fagus grandifolia*), white oak (*Quercus alba*), ash (*Fraxinus spp.*), and basswood (*Tilia americana*) and the south-facing slopes support chestnut, red, black, and scarlet oaks (*Quercus prinus, Q. rubra, Q. velutina, Q. coccinea*), pitch pine (Pinus rigida), and yellow and black birch (*Betula alleghaniensis* and *B. lenta*). The natural area contains a number of communities, including northern conifer forest, acidic cliff communities, mesic central forest, and high gradient clearwater streams. Unfortunately, the Bucktail is not sufficiently contiguous to provide a truly protected corridor along the West Branch and the Sinnemahoning. Many of the private holdings adjacent to the Bucktail are indistinguishable from the natural area. However, some have been logged or cleared for camps and access roads. These activities further fragment the communities and habitats within this large river valley and decrease the value of the Bucktail as a natural area. Still, when all the pieces of the Bucktail are combined, it stands as the largest state park in Pennsylvania and the largest Dedicated Area in Clinton County. Expansion and linkage of the individual sections of the Bucktail should be a high priority for the Bureau of Forestry, for the County, and for the municipalities of which it is a part.

USGS QUADRANGLE **POTTERSDALE**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
CLINTON WEST BRANCH CLIFFS #1		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	5/97

MANAGED LANDS: Sproul State Forest
Elk State Forest


Pottersdale (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Clinton West Branch Cliffs #1
Lower Jerry Run Watershed
Round Island Run Watershed
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Lower Jerry Run Watershed BDA
Round Island Run Watershed BDA
Elk
State Forest
Sproul
State Forest
Cameron
Quehanna Wild Area DA
Moshannon
State Forest
Clearfield
Clinton West Branch Cliffs #1 BDA
Centre
State Game Lands #100
Southern Sproul
State Forest IBA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

POTTERSDALE QUADRANGLE

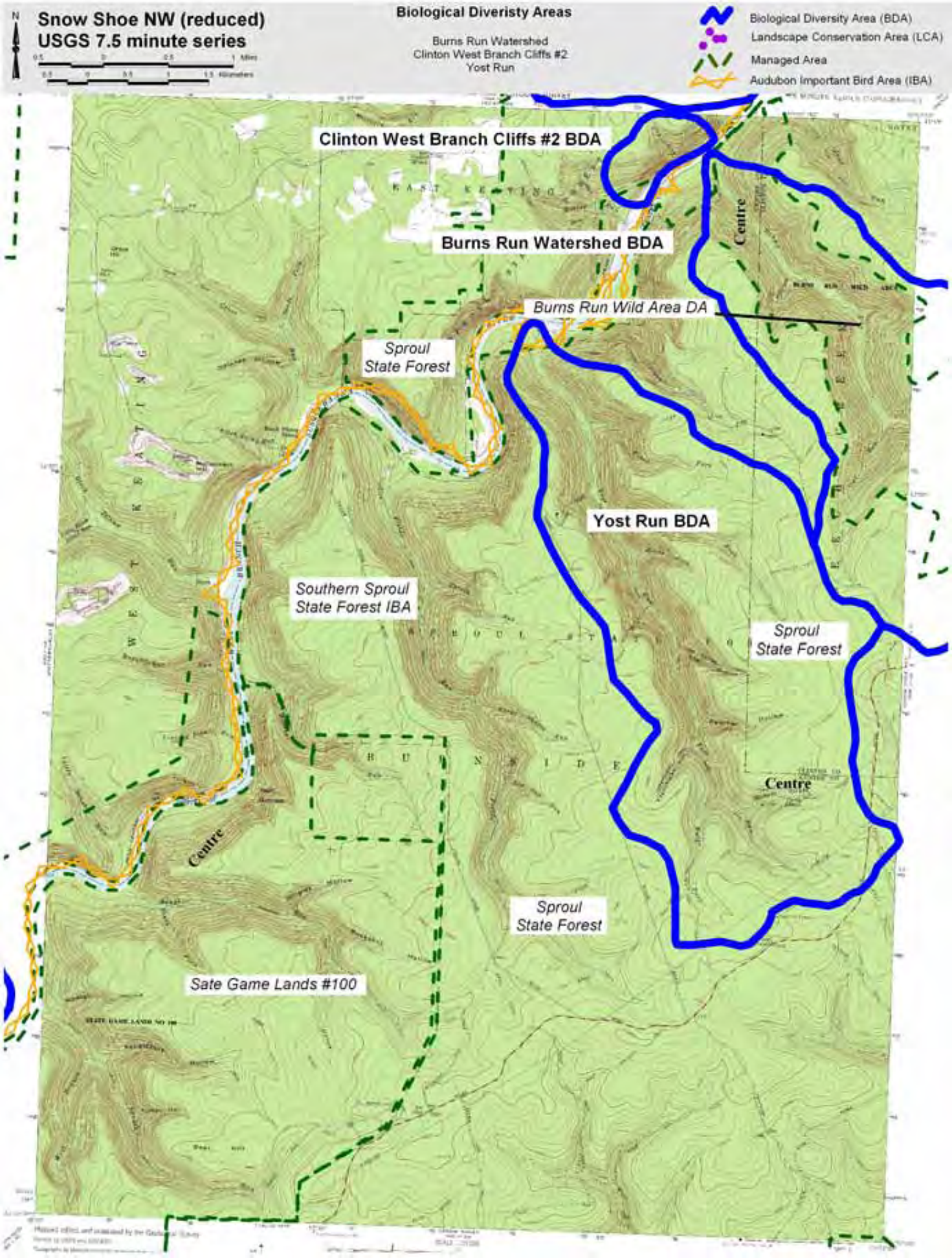
Clinton County reaches its most westerly extent in the Pottersdale quadrangle. The Sproul State Forest covers approximately the northwestern one-half of the county contained in the Pottersdale quadrangle. Strip mined areas dominate the land in the southeastern section and many of the tributaries to the West Branch in Clinton and neighboring Clearfield County have been severely impacted by the acidic drainage from these mines. The West Branch Susquehanna River runs through the southern portion of this quadrangle. Immediately along the river the terrain contains steep hills and valleys that are largely forested. One BDA has been identified in this area.

The **Clinton West Branch Cliffs #1 BDA** contains habitat occupied by the Allegheny woodrat (*Neotoma magister*), a Pennsylvania Threatened animal species. Please see the "Allegheny Woodrat Overview" (pg. 151) for information regarding the ecology and management needs of this species.

USGS QUADRANGLE **SNOW SHOE NORTHWEST**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
BURNS RUN WATERSHED BDA		*Notable Significance*			
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	9/92
Hemlock (white pine) northern hardwood forest community	GS	S5	N	N	9/92
YOST RUN WATERSHED BDA		*Notable Significance*			
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	9/92
CLINTON WEST BRANCH CLIFFS #2		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	

MANAGED LANDS: Sproul State Forest
Burns Run Wild Area


Snow Shoe NW (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Burns Run Watershed
Clinton West Branch Cliffs #2
Yost Run
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Clinton West Branch Cliffs #2 BDA
Burns Run Watershed BDA
Burns Run Wild Area DA
Sproul State Forest
Yost Run BDA
Southern Sproul State Forest IBA
Sproul State Forest
Sproul State Forest
Sate Game Lands #100
Centre
Centre
Centre

SNOW SHOE NORTHWEST

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The West Branch of the Susquehanna River flows through this quadrangle from southwest to northeast, marking the border between Clinton and Centre Counties. All of Clinton County contained within the Snow Show Northwest quadrangle is part of the Sproul State Forest. The Burns Run watershed occupies most of this section of Clinton County and a small piece of the Yost Run watershed crosses into this quadrangle.

Burns Run is a High Gradient Clearwater Stream that is designated as Exceptional Value by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality over its entire length. This stream is included in the **Burns Run Watershed BDA**. The interior of the watershed that includes the stream, valley bottomland and valley slopes, comprises the Bureau of Forestry's Burns Run Wild Area. All but the very lower part lies within Clinton County; the stream meets the West Branch in Centre County. The tornado of 1986 cut through the middle of the watershed, leveling trees and creating a nearly impenetrable mass of trunks, branches, saplings and brambles. Subsequently, in 1989, much of the eastern section of the area burned, the fire running almost perpendicular to the path of the tornado. Still, the valley supports a hemlock (white pine) northern hardwood forest community (previously listed as Northern Conifer Forest following Smith 1991) consisting of eastern hemlocks (*Tsuga canadensis*), patches of rhododendron (*Rhododendron maximum*), witch hazel (*Hamamelis virginiana*), and little or no ground cover or herbaceous growth. Although the Wild Area does afford protection to Burns Run, the upper sections of the watershed are part of the commercial forest. This stream and watershed are in the process of recovering after the natural disturbances mentioned and are particularly susceptible to changes in hydrology and runoff patterns associated with activities like road building and maintenance, and timber salvage operations. All activities effecting the watershed should be reviewed in this light and restricted where possible. Also, consideration should be given to the value of naturally evolving habitat to flora, fauna, and managed wildlife.

The very upper eastern watershed of Yost Run crosses from Centre County into Clinton County just west of Burns Run. It is also a High Gradient Clearwater Stream and is designated as Exceptional Value water by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality. The **Yost Run Watershed BDA** is quite diverse and contains a number of natural communities. The Centre County Natural Heritage Report discusses Yost Run in more detail.

The **Clinton West Branch Cliffs #2 BDA** contains habitat occupied by the Allegheny woodrat (*Neotoma magister*), a Pennsylvania Threatened animal species. Please see the "Allegheny Woodrat Overview" (pg. 151) for information regarding the ecology and management needs of this species.

USGS QUADRANGLE **KEATING**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
KETTLE CREEK WATERSHED LCA		*Exceptional Significance*			
ROUND ISLAND BDA		*High Significance*			
Big bluestem – Indian grass river grassland	G?	S3S4	N	N	9/92
Sycamore – mixed hardwood floodplain forest	G?	S2	N	N	9/92
KEATING MOUNTAIN BDA		*High Significance*			
Hemlock (white pine) – northern hardwood forest community	G5	S5	N	N	7/92
Hemlock (white pine) – red oak – mixed hardwood forest community	G?	S4	N	N	7/92
SMITH RUN SWAMP BDA		*High Significance*			
Red maple – black ash palustrine forest community	G5	S2S3	N	N	9/92
COOKS RUN WATERSHED BDA		*Notable Significance*			
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	8/92
SPICEWOOD SADDLE WETLAND BDA		*High Significance*			
Skunk cabbage – golden saxifrage forest seep	G?	S4S5	N	N	9/92
Flypoison borer moth (*Papaipema sp. 1*)	G2G3	S2	N	N	

ROUND ISLAND RUN WATERSHED BDA		*Exceptional Significance*			
High gradient clearwater stream	G?	S3	N	N	7/92
Hemlock (white pine) – northern hardwood forest community	G5	S5	N	N	7/92
High gradient clearwater stream	G?	S5	N	N	7/92

KETTLE CREEK CLIFFS BDA		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	4/01
Biological resource of concern	G4	S3S4	N	PR	2001

SINNEMAHONING CREEK CLIFFS #2 BDA		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	3/98

SINNEMAHONING CREEK CLIFFS #3 BDA		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	3/98

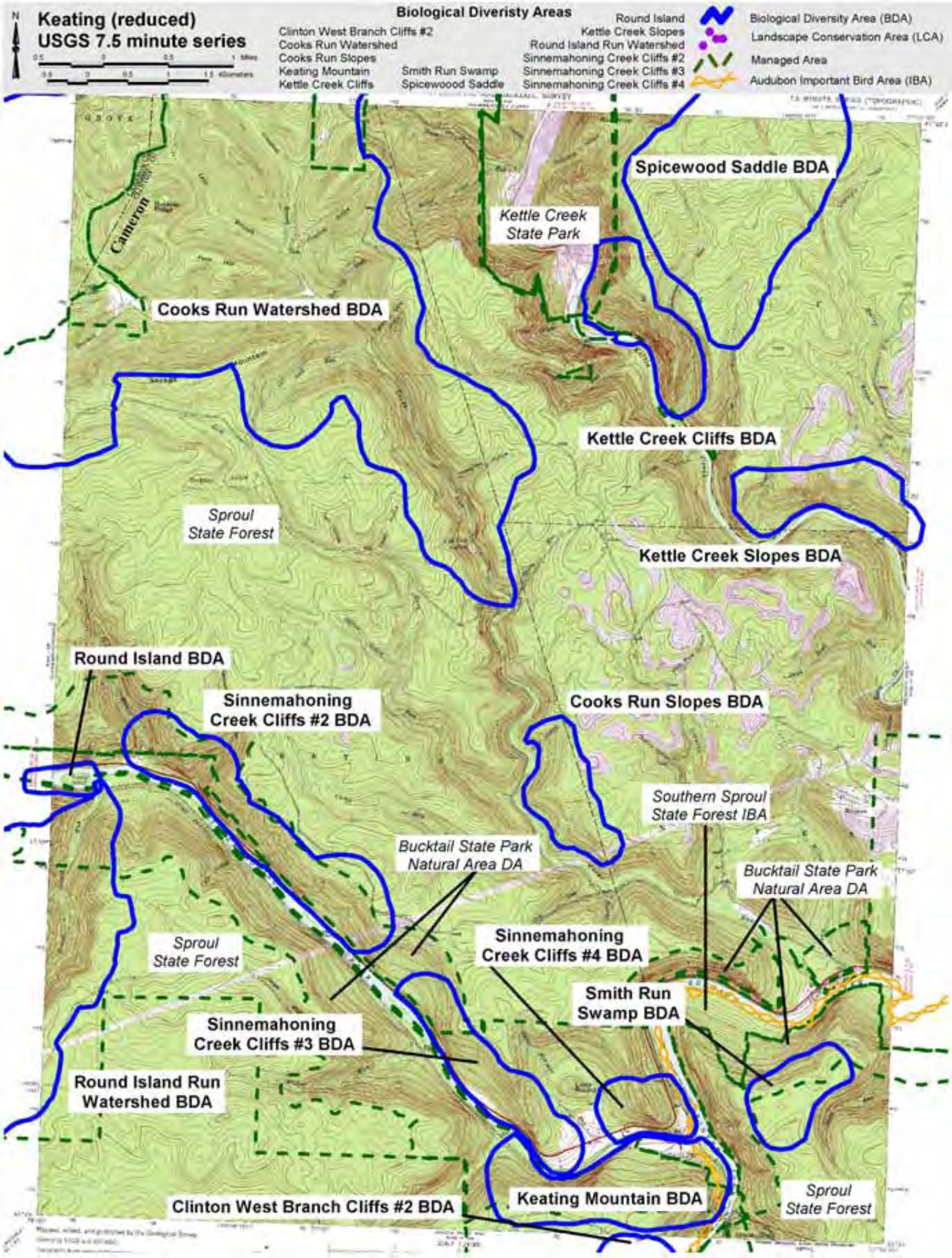
SINNEMAHONING CREEK CLIFFS #4 BDA		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	3/98

COOKS RUN SLOPES BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001

KETTLE CREEK SLOPES BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001

BUCKTAIL STATE PARK NATURAL AREA DA *Exceptional Significance*

MANAGED LANDS: Sproul State Forest
Elk State Forest
Bucktail State Park Natural Area
Kettle Creek State Park


Keating (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Clinton West Branch Cliffs #2
Cooks Run Watershed
Cooks Run Slopes
Keating Mountain
Kettle Creek Cliffs
Smith Run Swamp
Spicewoood Saddle
Round Island
Kettle Creek Slopes
Round Island Run Watershed
Sinnemahoning Creek Cliffs #2
Sinnemahoning Creek Cliffs #3
Sinnemahoning Creek Cliffs #4
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Spicewood Saddle BDA
Kettle Creek State Park
Cameron
Cooks Run Watershed BDA
Kettle Creek Cliffs BDA
Sproul State Forest
Kettle Creek Slopes BDA
Round Island BDA
Sinnemahoning Creek Cliffs #2 BDA
Cooks Run Slopes BDA
Southern Sproul State Forest IBA
Bucktail State Park Natural Area DA
Bucktail State Park Natural Area DA
Sproul State Forest
Sinnemahoning Creek Cliffs #4 BDA
Smith Run Swamp BDA
Sinnemahoning Creek Cliffs #3 BDA
Round Island Run Watershed BDA
Clinton West Branch Cliffs #2 BDA
Keating Mountain BDA
Sproul State Forest

bold = mapped natural heritage areas
underline = PBS species/communities of concern

KEATING

Sproul State Forest covers all but a few small sections of this quadrangle. The **Bucktail State Park Natural Area DA**, described in the Sinnemahoning quadrangle, continues along Sinnemahoning Creek from the west, through Keating, and then along the West Branch of the Susquehanna toward the town of Renovo. Kettle Creek State Park occupies a large part of the area set aside for flood control purposes which includes the Alvin R. Bush Dam. A large reservoir above the dam provides a resource for swimming, fishing and boating, and numerous trails connect both the lower camping and upper park areas with vistas above the Kettle Creek Valley and with the Donut Hole Trail. Also, a section of the **Kettle Creek Watershed LCA** (discussed in the Hammersley Fork quadrangle) falls within this quadrangle.

Round Island Run flows into the Sinnemahoning Creek in this quadrangle (see the Sinnemahoning quadrangle for a discussion of Round Island Run) and just to the west of the confluence sits Round Island - one of the largest islands in the Sinnemahoning Creek. As the focus of the **Round Island BDA**, this island supports a significant big bluestem – Indian grass river grassland community (previously listed as a river gravel community following Smith 1991) on its upstream and northeastern shore. Tufts of big bluestem (*Andropogon gerardi*), herbs like clasping-leaved dogbane (*Apocynum sibericum*), and seedlings of eastern sycamore (*Platanus occidentalis*) and river birch (*Betula nigra*) grow on the gravel shores. The interior of the island is flooded periodically, but probably not frequently, and supports a sycamore – mixed hardwood floodplain forest community (previously listed as a flood plain forest community following Smith 1991) of eastern sycamore, black cherry (*Prunus serotina*), green ash (*Fraxinus pensylvanica*), red maple (*Acer rubrum*), and numerous other species. Patches of dense Japanese knotweed (*Polygonum cuspidatum*) cover large sections of the ground, choking out nearly all other vegetation. As with the other islands in the Sinnemahoning and the West Branch (see the Hammersley Fork quadrangle), this exotic member of the Polygonaceae family poses a threat to the long-term equilibrium of these natural communities and to the survival of many shrub and herbaceous species. Islands can be good places to experiment with control methods but long-term control will, ultimately, require a focused, extensive effort involving the whole West Branch basin. Any control efforts should involve the Bureau of Forestry, the Western PA Conservancy and all other relevant organizations.

One of the steepest slopes in the Sinnemahoning Valley lies just west of the town of Keating, to the south of the creek. This area is known as Keating Mountain and much of its north slope is included in the **Keating Mountain BDA**. Easily viewed from Route 120 west of Keating, a hemlock (white pine) – northern hardwood forest community (previously listed as Northern Conifer Forest following Smith 1991) composed predominately of eastern hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*), sits in and extends from a steep-walled cove on the north side of the mountain. The hemlocks are generally large, some "topped" by wind or other tree falls, and are likely quite old considering the rugged conditions in which they grew. Old black birch (*Betula lenta*) and an occasional chestnut oak (*Quercus prinus*) grow among the hemlocks, and dense rhododendron (*Rhododendron maximum*) patches cover the ground where there is sufficient light. To the west, the hemlocks give way to dry-mesic central forest, but to the east, where the slope moderates, more mesic conditions support a good example of a hemlock (white pine) red oak – mixed hardwood forest community (previously listed

as Mesic Central Forest following Smith 1991). This community straddles a trail that gradually climbs the slope up to the Bureau of Forestry-designated Sinnemahoning Vista. At one time, this trail was the Keating Mountain Road and remnants of flanking walls and stones removed from the road are visible along the trail. The forest on this slope may have been thinned at one time, but the large red maple, yellow birch, basswood (*Tilia americana*), and tuliptree (*Liriodendron tulipifera*) that form the canopy and the rich ground cover of wood ferns (*Dryopteris marginalis* and *D. carthusiana*) and healthy sapling stands within canopy gaps, evidence a maturing forest.

Both of these communities are contained within the Bucktail State Park Natural Area DA and are protected from cutting and other disturbances. The Bureau of Forestry's no management policy for natural areas should continue and activities adjacent to, but outside, the natural area should be carefully monitored.

Smith Run drains a section of plateau just to the east of the town of Keating. A wetland classified as a red maple – black ash palustrine forest community (previously listed as Acidic Broadleaf Swamp following Smith 1991) sits almost on the watershed divide of Smith Run and the West Branch. The **Smith Run Swamp BDA** includes this community; one that is unique in the county, especially on the high plateau section. Swamp white oak (*Quercus bicolor*), black ash (*Fraxinus nigra*), red maple, and black gum (*Nyssa sylvatica*) form an open canopy around pools of water containing rice cutgrass (*Leersia oryzoides*), sedge (*Carex intumescens*), and numerous wetland herbs and mosses. This site is within the Sproul State Forest and was spared from damage when the 1986 tornado passed several hundred yards to its south. A salvage timber sale is on-going along the southern edge, but will not include any of the wetland. However, this expanse of damaged and cut forest lays open the wetland to wind and storm damage, erosion and drainage changes and invasion by open site weedy species like hay-scented fern (*Dennstaedtia punctilobula*) and deer tongue grass (*Panicum clandestinum*). Buffers for this site should be extended beyond the standard 100 foot Bureau of Forestry buffer for permanent wetlands to include sizable sections of forest on all sides of this shallow basin (see quad map for BDA boundaries). Facilitating regeneration through seeding and planting of native trees along the southern border of the site could provide protection much sooner and more successfully than could natural regeneration in this highly disturbed area. Local seeds and propagules are preferable to those from non-local sources given the possibility that the unique genetic characteristics of local species could be diluted.

Several miles south of Bush Dam, the Donut Hole Trail crosses Kettle Creek and follows Summerson Run up to the plateau below Spicewood Run. This section of plateau that includes pieces of the Summerson Run, Owl Hollow, and the Hurling Branch of Two Mile Run watersheds, designated as **Spicewood Saddle BDA**, supports a plant in the lily family (fly-poison, *Amianthium muscaetoxicum*) that is a primary food source for the flypoison borer (*Papaipema sp.*), an animal of special concern in Pennsylvania that is also globally rare. As noted in the Hammersley Fork quadrangle, the confirmed presence of this animal is awaiting positive identification of specimens taken from the Kettle Creek Watershed. However, the animal is likely to occur here given the proximity to the Montour Road site. Also containing a significant wetland community (a skunk cabbage – golden saxifrage forest seep), this area is entirely within the Sproul State Forest. It is recommended that timber sales be discontinued in this area and that no spraying for gypsy moths, including the use of Bt, be done in or near this area until more is known about populations of the animal and about its sensitivity to insecticides.

The bulk of Cooks Run and its watershed lie within the Keating quadrangle and are included in the **Cooks Run Watershed BDA**. This High Gradient Clearwater Stream is designated as Exceptional Value (EV) by Pennsylvania Department of Environmental Protection, Bureau of Water Quality from Onion Run north. Onion Run as well as the Lebo and Crawford branches are included in the EV designation. Below Onion Run, Cooks Run receives substantial acid runoff from coal strip mines directly adjacent to its watershed and from Rock Run to the west and Crowley Hollow to the east. Crowley and Sugar Camp Roads provide the main access to the watershed and many camps sit off of these roads in the headwaters areas of the Lebo and Crawford Branches. Broad sections of the Cooks Run Valley are unforested meadow, possibly a result of repeated fires after initial timbering of the area. Plantings of white spruce (*Picea glauca*), norway spruce (*Picea abies*) and larch (*Larix sp.*) are prevalent in the Cooks Run and Lebo Branch Valleys. Survey of the stream valleys revealed no significant terrestrial communities.

Activities within this BDA should be limited to those that do not increase erosion and result in sedimentation in the stream. Timber sales should avoid the valley slopes and clearing or cutting within the valley should be limited to trail and road maintenance. Remediation and reclamation efforts focused on the coal strip mines in the lower watershed are strongly recommended.

Kettle Creek Cliffs BDA and the **Sinnemahoning Creek Cliffs BDAs** (**#2-#4)** contain habitat occupied by the Allegheny woodrat (*Neotoma magister*), a Pennsylvania Threatened animal species. Please see the "Allegheny Woodrat Overview" (pg. 151) for information regarding the ecology and management needs of this species.

The **Kettle Creek Cliffs, Cooks Run Slopes** and **Kettle Creek Slopes BDAs** include forested slopes that support a biological resource of concern. Any direct disturbance within this area will likely impact this resource. Please contact Western Pennsylvania Conservancy for more information regarding this resource, or with any questions regarding the impact of potential activities in these areas.

USGS QUADRANGLE **HAMMERSLEY FORK**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
KETTLE CREEK WATERSHED LCA		*Exceptional Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	6/92
KETTLE CREEK BDA		*High Significance*			
Special animal	G3	S2	N	N	8/97
HAMMERSLEY FORK WATERSHED BDA		*Exceptional Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	6/92
F.H. DUTLINGER NATURAL AREA DA		*Exceptional Significance*			
Dry white pine (hemlock) – oak forest community	G?	S4	N	N	10/92
Hemlock palustrine forest community	G?	S3	N	N	10/92
Hemlock - tuliptree – birch forest community	G?	S4	N	N	6/92
Hemlock (white pine) forest community	G5	S4	N	N	6/92
JOHN SUMMERSON BRANCH TROUT RUN WATERSHED BDA		*Exceptional Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	8/92
Hemlock – mixed hardwood palustrine forest community	G?	S3S4	N	N	10/92
Mixed forb marsh community	G?	S3	N	N	10/92
BEARFIELD RUN HEMLOCKS BDA		*High Significance*			
Hemlock (white pine) forest community	G?	S4	N	N	9/92

MONTOUR ROAD RIDGE BDA		*Exceptional Significance*			
Flypoison borer moth (*Papaipema sp. 1*)	G2G3	S2		N	9/92
SPICEWOOD SADDLE BDA		*High Significance*			
Skunk cabbage – golden saxifrage forest seep community	G?	S1S2	N	N	9/92
COOKS RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	8/92
LUSHBAUGH RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	9/92
TROUT RUN SLOPES #1 BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001
TROUT RUN SLOPES #2 BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001

MANAGED LANDS: Sproul State Forest

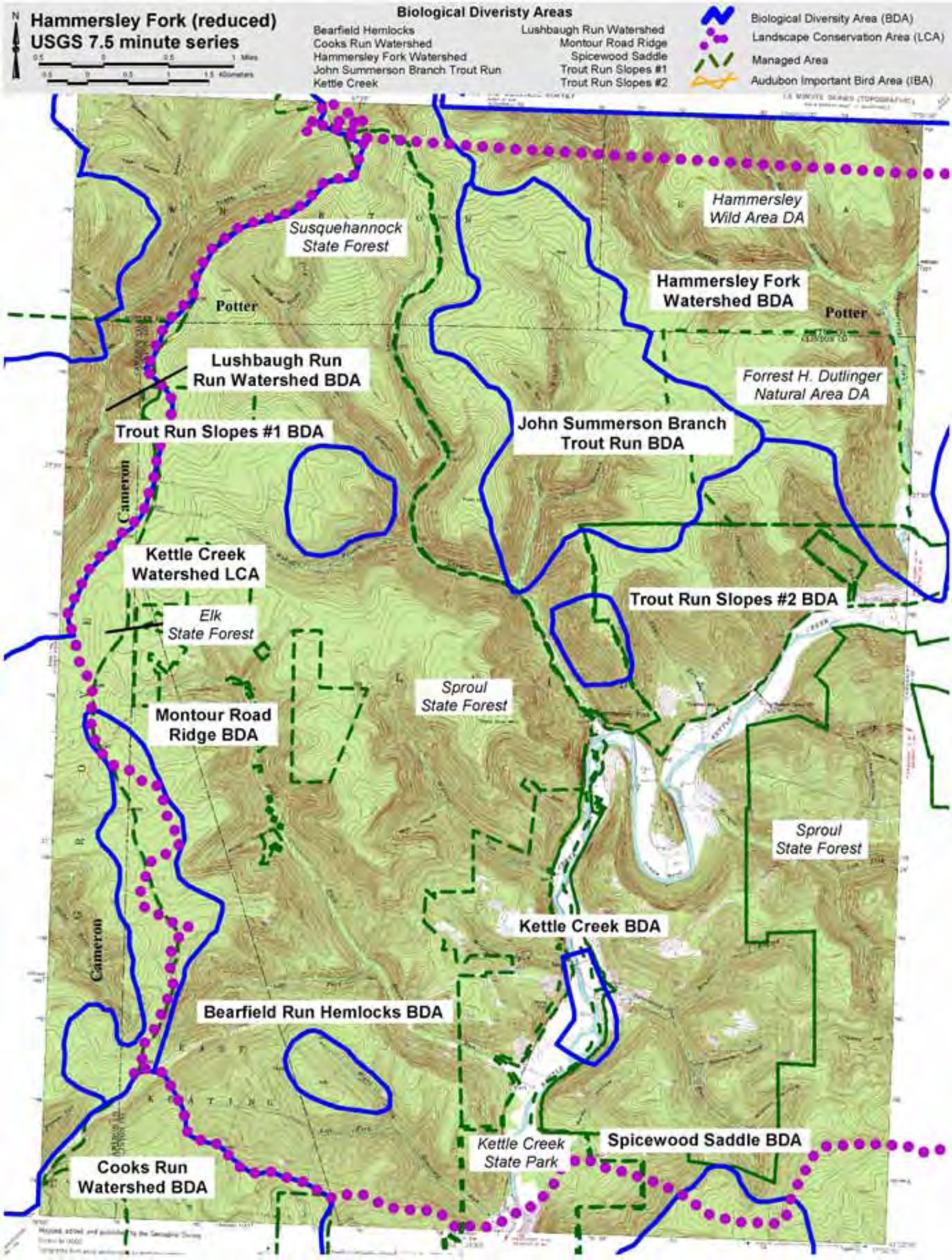
Susquehannock State Forest

Hammersley Wild Area

F. H. Dutlinger Natural Area

Kettle Creek State Park

GEOLOGIC FEATURE/FOSSIL LOCALITIES: The Bunk


Hammersley Fork (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Bearfield Hemlocks
Cooks Run Watershed
Hammersley Fork Watershed
John Summerson Branch Trout Run
Kettle Creek
Lushbaugh Run Watershed
Montour Road Ridge
Spicewood Saddle
Trout Run Slopes #1
Trout Run Slopes #2
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Susquehannock State Forest
Hammersley Wild Area DA
Hammersley Fork Watershed BDA
Potter
Lushbaugh Run Run Watershed BDA
Forrest H. Dutlinger Natural Area DA
Trout Run Slopes #1 BDA
John Summerson Branch Trout Run BDA
Cameron
Kettle Creek Watershed LCA
Trout Run Slopes #2 BDA
Elk State Forest
Sproul State Forest
Montour Road Ridge BDA
Kettle Creek BDA
Bearfield Run Hemlocks BDA
Kettle Creek State Park
Spicewood Saddle BDA
Cooks Run Watershed BDA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

HAMMERSLEY FORK

This northern corner contains some of the most remote sections of Clinton County and includes sections of two state forests, a state forest natural area (F. H. Dutlinger), and the southern portion of the proposed Hammersley Wild Area. All but a very small portion of this quadrangle lies within the watershed of Kettle Creek, a stream that has been designated by the PA Department of Environmental Protection as Exceptional Value above the inlet to the reservoir upstream of Bush Dam. This quad includes all or part of the three largest tributaries to Kettle Creek; Hammersley Fork, Trout Run, and Bearfield Run. The watersheds of all three tributaries contain significant natural communities. The **Kettle Creek Watershed Landscape Conservation Area (LCA)** is designated around the boundaries of the watershed above the reservoir to recognize the importance of this large network of high-quality streams and the largely forested matrix of natural communities that occupy the land within its watershed.

While a high fraction of all waterways have suffered impairments in their capacity to support natural ecological communities due to pollution and physical alterations (dams, dredging, channelization), healthy and relatively pristine streams of large size are especially scarce across the state and the region. Large streams and rivers host a different suite of species than do small waterways, and many species that depend specifically on this habitat are now imperiled due to the widespread degradation of large streams and rivers. For example, many freshwater mussels whose global viability is considered threatened utilize large (low order) waterways. Kettle Creek is the lowest order water body designated as Exceptional Value in the state of Pennsylvania, and one species (special animal) among those specific to larger waterways has been documented at two different sites along its length, providing evidence that this stream is an exceptional example of a state- and regionally- imperiled habitat type.
Because of its size and quality it also has the potential of supporting freshwater mollusks; a variety of freshwater fishes including trout; and kingfishers, osprey, bald eagles and numerous other animals that depend upon moderate to large riverine systems with intact food chains.

The health of the waterways depends upon the condition of the land within the Kettle Creek watershed, which currently contains several natural heritage areas of significance and is a large, minimally developed segment of the landscape in Clinton County. This conservation area extends from Hicks Hollow, south of the Bush Dam in the Keating quadrangle, north to and including the Hammersley Wild Area (see map). It encompasses the Kettle Creek watershed and its tributaries and is centered in the Hammersley Fork quadrangle, although it crosses into the Keating and Tamarack quadrangles and continues north into Potter County, following the Hammersley Wild Area boundaries. Although outside the boundaries of this inventory, the LCA in Potter County could appropriately follow the boundaries of the Kettle Creek watershed. Here it would include a portion of the Hammersley Wild Area , and encompass a major tributary watershed (to Kettle Creek) and a remote but potentially protectable piece of the high plateau.

The portion of Kettle Creek below the Bush Dam is not recognized as a heritage area because several impairments diminish its ability to support natural biodiversity. Strip mines along Sevenmile and Slide Hollows have impacted the creek several miles below Bush Dam and the dam itself severely disrupts the ecological integrity of the creek by reducing water velocity, warming the water and breaking the continuity of aquatic habitat along the creek. Additionally, the dam impedes movement and migration of biota along the large north/south running valley.

The land within the conservation area is a mixture of farmland, federal flood protection land, state park, state forest, village and residential land. The possible impacts of these and other land uses upon natural heritage sites is discussed at the beginning of this report. Activities that increase erosion in any part of the LCA should be restricted to protect water quality. Farms should follow the best conservation management practices and reduce inputs of sediment, animal wastes and chemicals into the watershed. Timber sales should be limited and carefully designed to avoid slopes and minimize fragmentation. Residential development, when necessary, should be encouraged near villages and existing housing clusters. Utility corridors should be channeled around the LCA and those existing within the area should move toward more limited and specific applications of herbicides, as well as toward the development of strategies for decreasing maintenance needs (e.g. encouragement of local native shrubs and periodic sapling cutting). Overall, avoidance of further fragmentation of the LCA should be a conservation priority.

The area along Kettle Creek that supports the special animal species (which is unnamed due to its sensitivity) is designated as the **Kettle Creek BDA**. This species is imperiled within Pennsylvania and globally. Its continued survival can be safeguarded by ensuring that high water quality continues in Kettle Creek, according to the recommendations provided for the Kettle Creek LCA. The area outlined as the Kettle Creek BDA is especially critical to the species: any earth disturbance in this area is likely to reduce harmful sediment pollution in close proximity to the special concern species, while establishment of a buffer of natural vegetation along the stream edge in this area can help protect the natural stream conditions that enable this species to survive. Physical alteration of the stream channel could alter the flow and substrate conditions the species depends upon, and is not recommended in this area. This species also depends upon the continued presence of the fish species it uses during one portion of its lifecycle, which may include Margined Madtom, Blacknose Dace, Longnose Dace, Pumpkinseed, Slimy Sculpin, or Yellow Perch (if this non-native species has been introduced to Kettle Creek). The exotic invasive zebra mussel has not been documented from Kettle Creek, and this relatively rapid-flowing stream is not optimal habitat for the explosive growth pattern the zebra mussel has shown in still and slow-moving water bodies. However, if it were introduced it could detrimentally impact the special animal population, as well as any native freshwater mollusks that occupy Kettle Creek. Due to the importance of this habitat it is recommended that signs be placed at the reservoir and along the creek warning boaters to thoroughly clean boats and gear if they have been in any water body where zebra mussels are known: these include the Great Lakes, several of the natural lakes in NW PA, and most major rivers in PA (including the Allegheny and Ohio).

Hammersley Fork drains a large watershed, most of which lies in Potter County. Hammersley Fork is a High Gradient Clearwater Stream that is classified as Exceptional Value (EV) by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality and is the community of focus in the **Hammersley Fork Watershed BDA**. The section of Hammersley Fork in Clinton County cuts through a wide floodplain and meets Kettle Creek just above the town of Cross Fork. A dirt road runs along the floodplain and numerous camps lie adjacent to the road. Much of the area has been spot cleared, periodically mowed, and likely used as pasture years ago. Though a sizeable floodplain, the present use and quality remove it from consideration as a significant natural community. However, floodplain forest communities are rare in Clinton County and the future recovery of such a site would be important. It is recommended that the floodplain area be permitted to recover without the further disturbance associated with cutting, clearing, or use of motorized vehicles. Also, consistent with the Bureau of Forestry's wild

area management policy, no timber sales should take place within the Hammersley Fork Watershed BDA.

Lying adjacent to and west of this floodplain area is the **F. H. Dutlinger Natural Area DA**. This Bureau of State Forest natural area includes all of the Beech Bottom Hollow watershed and a section of the high plateau to the west and south. The most outstanding feature of the Dutlinger Natural Area is a patch of hemlock (white pine) forest (previously listed as Northern Conifer Forest following Smith 1991) containing approximately 35 acres of old-growth eastern hemlock (*Tsuga canadensis*) forest. This community sits near the top of Beech Bottom Hollow for which the natural area was originally named (Beech Bottom Hemlocks NA). Although dominated by large eastern hemlocks, yellow and black birch (*Betula alleghaniensis and B. lenta*), beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*) are present. Because of the low light levels, few herbs and shrubs grow in the understory and, as characteristic of mature forests, broken branches and fallen trees litter the ground. Much of the plateau contained in the natural area supports a dry white pine (hemlock) - oak forest (previously listed as Dry-mesic Acidic Central Forest following Smith 1991) dominated by mixed oak (*Quercus spp.*) and birch (*Betula spp.*), but on the western edge above the Locke Branch of Trout Run, sits a small wetland classified as a hemlock palustrine forest (previously listed as a Northern Conifer Swamp following Smith 1991). This eastern hemlock dominated swamp has reestablished a canopy after early periods of logging and numerous sedges (*Carex spp.*) and ferns (*Osmunda cinnamomea, O. sp.*) grow in the shady, sphagnum (*Sphagnum sp.*) covered hummocks under the hemlocks. Also, a good example of hemlock – tuliptree – birch forest (previously listed as Mesic Central Forest following Smith 1991) covers the lower valley and slopes of Beech Bottom Hollow. The tree species present include; beech, sugar maple, white oak (*Quercus alba*), white ash (*Fraxinus americana*) and cucumber magnolia (*Magnolia acuminata*).

This Dedicated Area is well buffered, as it is within the proposed Hammersley Wild Area and within the Susquehannock State Forest. The old growth hemlock forest area receives a good amount of hiking traffic in the summer, but impacts of off trail use appear minimal. A gas pipeline ROW running through the south-central section of the natural area creates the general concerns discussed at the beginning of the report and more specific ones regarding the wetland (hemlock palustrine forest) located immediately to the northeast of the ROW. Because of its close proximity to the ROW and its dependence on surface waters that accumulate on the plateau (and drain across the ROW), contamination of local surface water by, and direct impact of, overspray of herbicide could have negative impacts on the wetland community. Use of herbicide and heavy equipment as well as periodic mowing is not recommended to maintain this section of pipeline ROW. Encouragement of local native shrub cover and spot removal of trees on the ROW would reduce impacts to the surrounding communities.

The John Summerson Branch of Trout Run drains the section of plateau immediately to the west of the Dutlinger Natural Area DA. Included in the **John Summerson Branch Trout Run Watershed BDA**, this stream is a High Gradient Clearwater Stream and is designated as Exceptional Value by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality. The Summerson Valley exhibits the integration of more northern with more southern forest types as evidenced by the mix of sugar maple, beech, and yellow birch with basswood (*Tilia americana*), ash, red oak (*Quercus rubra*) and white oak. Numerous small rock outcroppings, dense patches of wood fern (*Dryopteris sp.*) in canopy gaps, and several small (less than 3 foot drops) waterfalls lend diversity to the stream and

terrestrial habitats. Included in the John Summerson Watershed BDA is a wetland complex that contains a hemlock – mixed hardwood palustrine forest (previously listed as Broadleaf Conifer Swamp following Smith 1991) and a mixed forb marsh (previously listed as Mixed Graminoid Marsh following Smith 1991). Although the wetland itself shows little evidence of recent disturbance, an area immediately adjacent to the north shows a history of timbering: scattered old white pine stumps from the early logging days and hardwood stumps from subsequent cuttings cover an open area colonized by trembling aspen (*Populus tremuloides*) and white birch (*Betula papyrifera*). Undoubtedly, this wetland was impacted by direct cutting and subsequent raising of the water table from removal of surrounding forest cover. This wetland is now in the process of recovering to the forested swamp that it once was. The same gas pipeline ROW discussed above may also impact this community and the recommendations given there apply here.

All the areas discussed so far in the Hammersley Fork quadrangle lie within the extensive proposed Hammersley Wild Area. Mapped, posted and managed as a wild area by the Bureau of Forestry, the official designation of this area is pending negotiations over mineral rights within several sections. Because of the size, remoteness, and number of quality natural communities contained within the Hammersley Wild Area, protection under the Wild Areas Program is critical. Mining or drilling and construction of the necessary road infrastructure to do so would fragment this large forested area and could lead to problems of mine acid runoff, brine runoff, and increased erosion and sedimentation in the Hammersley Fork watershed. Presently, several gas pipeline ROW's fragment the proposed wild area, crossing perpendicular to some very steep slopes. Potential problems of erosion, exotic invasion, and herbicide application are discussed at the beginning of this report and specific management recommendation detailed above for the John Summerson Branch Trout Run BDA also apply here. Additionally, consolidation of existing individual pipelines and removal/abandonment od any lines requiring replacement or substantial upgrade, should be strongly considered.

Bearfield Run flows into Kettle Creek just above the Alvin Bush Dam. On the northeast slope of the ridge separating the right and left forks of Bearfield Run, sits an exemplary old second growth hemlock (white pine) forest community (previously listed as Northern Conifer Forest following Smith 1991) dominated by eastern hemlock. Designated as the **Bearfield Run Hemlocks BDA**, this 30 to 35 acre tract was either cut well before the last logging camp closed in Bearfield Hollow in 1904, or cut selectively during the early 1900's. Now this slope supports a maturing forest of hemlock in association with mature yellow birch, sugar maple and beech. Low light levels accented by occasional "gap" openings and substantial downed wood and debris, evidence a maturing and recently undisturbed community. However, a newly widened access road defines the lower boundary of this site and separates it from a similar but younger section of forest downslope. Before the road is committed to the multiple use trail system associated with Kettle Creek State Park, consideration should be given to relocation of the trail and road around the site. A number of timber sales were completed on the adjoining areas and one is scheduled for the adjacent area on top of the ridge. Cutting in areas adjacent to the site may make the stand more susceptible to windthrow and increase erosion within the site. Larger buffers are recommended for adequate protection of the site (see the Bearfield Run Hemlocks BDA boundaries). This site should be considered for protection under one of the Bureau of Forestry's special designations.

Montour Road runs along the western border of Clinton County in this quadrangle, following the plateau ridge between the Kettle Creek and First Fork of the Sinnemahoning watersheds. Above Sugar Camp Road on this ridge, exists a large population of fly poision (*Amianthium muscaetoxicum*), a plant in the lily family that is the primary food source for an animal of global significance and of special concern in Pennsylvania—the flypoison borer moth (*Papaipema sp I.*). This site is classified as the **Montour Road Ridge BDA**. Specimens taken from the area in 1993 have been positively identified as the flypoison borer moth. This species' global range appears to be a very limited geographic area, which elevates the importance of areas such as this site where it is known to occur. Dividing the Sproul and Elk State Forests, Montour Road is well used with numerous camps on either side. Timber sales should be restricted in this area and use of pesticides, including Bt, for gypsy moth control should be prohibited, at least until more is known about the life history and pesticide sensitivity of this animal.

A small skunk cabbage – golden saxifrage forest seep community sits on a saddle at the top of the Spicewood Run watershed, at the very bottom of the quadrangle. A number of grasses, sedges and aquatic mosses grow within this minimally disturbed wetland designated as the **Spicewood Saddle Wetland BDA**. Also contained within this BDA is a large population of fly poison, the primary food source to the fly poison borer moth (an animal of special concern noted above for the Montour Road Ridge BDA). This animal sampled at the Montour Road site is likely here considering that both sites lie within the same watershed. Sampling and further investigation will be required in the Spicewood Saddle BDA, but until then, it is recommended that no timber harvests take place within either of these sites and most critically, that spraying for gypsy moth or use of any insecticides not take place on or near these sites until more is known about the populations of this special animal.

Several miles above the Bush Dam, Kettle Creek makes two 180 degree turns before continuing south. This section of the creek shows how oxbows are formed as rivers downcut their outer banks and deposit sediment on their inner banks in contour like "meander scrolls". When the bottom parts of the loop meet, the oxbow is cut off and an oxbow lake is formed. The meander scrolls of "The Bunk" are recognized as a natural geological site in Pennsylvania by Geyer and Bolles (1979, 1987).

Lushbaugh Run has been designated as Exceptional Value by the PA Department of Environmental Protection; the portion of the watershed which occurs in Clinton County has been designated as the **Lushbaugh Run Watershed BDA**.

The headwaters area of Cooks Run, an Exceptional Value, High Gradient Stream lies partially within this quadrangle but will be discussed in the Keating Quadrangle under **Cooks Run Watershed BDA**. Kettle Creek State Park will also be discussed in the Keating quadrangle.

USGS QUADRANGLE **TAMARACK**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
TAMARACK SWAMP NA		*Exceptional Significance*			
Black spruce – tamarack palustrine woodland	G?	S2	N	N	9/92
Red oak – mixed hardwood forest community	G?	S5	N	N	9/92
Soft-leaved sedge (*Carex disperma*)	G5	S3	N	PR	1989
Showy mountain-ash (*Sorbus decora*)	G4G5	S1	N	PE	1989
Special animal SA001	G5	S2	N	N	1987
Special animal SA002	G5	S2	N	N	1987
Special animal SA003	G2G3	S1	N	N	1987
TAMARACK SWAMP NATURAL AREA DA		*Exceptional Significance*			
Black spruce – tamarack palustrine woodland	G?	S2	N	N	9/92
Red oak – mixed hardwood forest community	G?	S5	N	N	9/92
Soft-leaved sedge (*Carex disperma*)	G5	S3	N	PR	1989
Showy mountain-ash (*Sorbus decora*)	G4G5	S1	N	PE	1989
Special animal SA001	G5	S2	N	N	1987
Special animal SA002	G5	S2	N	N	1987
Special animal SA003	G2G3	S1	N	N	1987
DRURY RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	9/92
HAYSTACK FLOODPLAIN BDA		*Notable Significance*			
Sycamore – mixed hardwood floodplain forest community	G?	S2	N	N	8/92
PADDY RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	6/92
Highbush blueberry – meadowsweet wetland Community	G?	S5	N	N	6/92

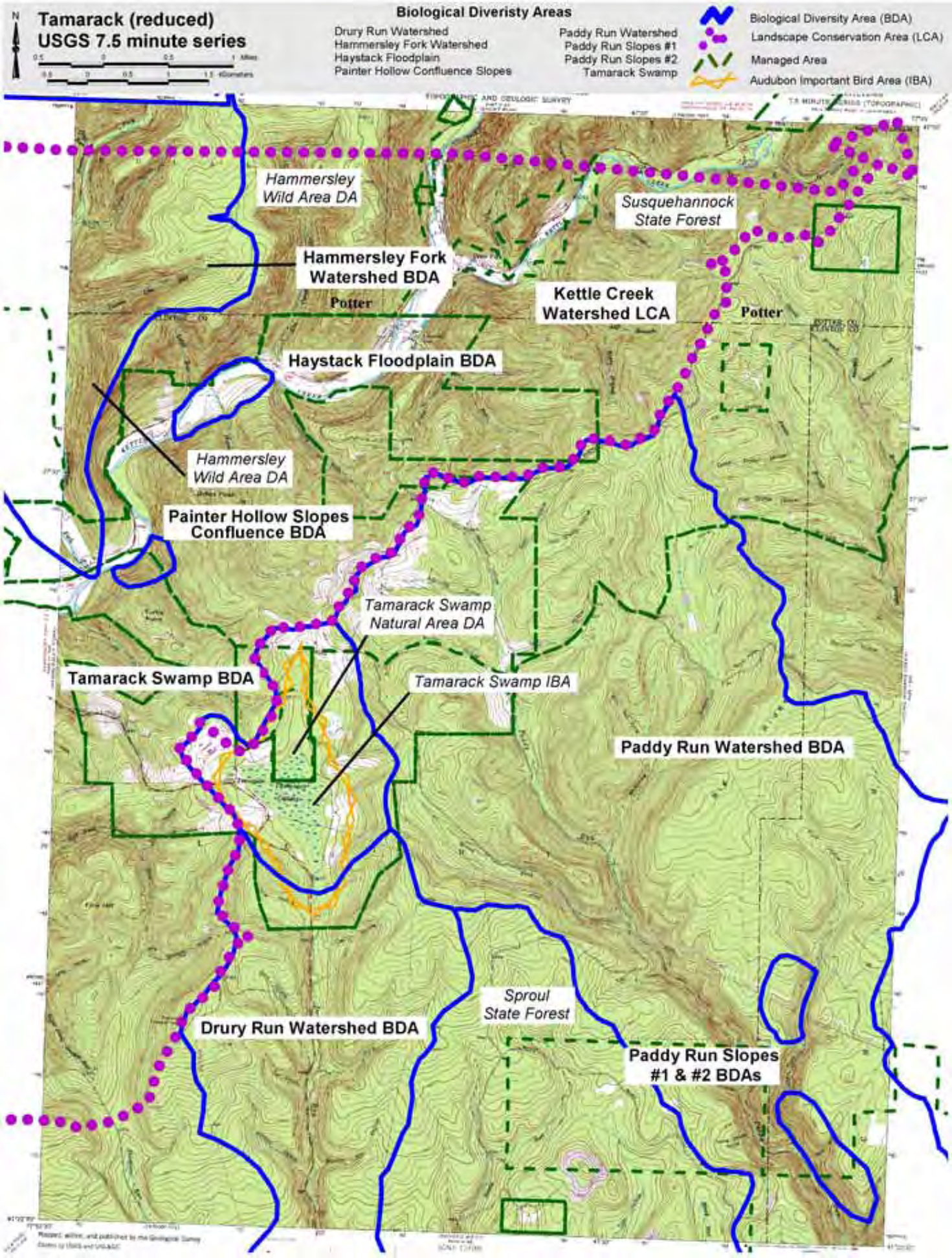
KETTLE CREEK WATERSHED LCA		*Exceptional Significance*			
HAMMERSLEY FORK WATERSHED BDA		*Exceptional Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	6/92
PAINTER HOLLOW CONFLUENCE SLOPES BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001
PADDY RUN SLOPES #1 BDA		*Notable significance*			
Biological resource of concern	G4	S3S4	N	PR	2001
PADDY RUN SLOPES #2 BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001

MANAGED LANDS: Sproul State Forest

Susquehannock State Forest

Tamarack Swamp Natural Area

Hammersley Wild Area


Tamarack (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Drury Run Watershed
Hammersley Fork Watershed
Haystack Floodplain
Painter Hollow Confluence Slopes
Paddy Run Watershed
Paddy Run Slopes #1
Paddy Run Slopes #2
Tamarack Swamp
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Hammersley Wild Area DA
Susquehannock State Forest
Hammersley Fork Watershed BDA
Potter
Kettle Creek Watershed LCA
Potter
Haystack Floodplain BDA
Hammersley Wild Area DA
Painter Hollow Slopes Confluence BDA
Tamarack Swamp Natural Area DA
Tamarack Swamp BDA
Tamarack Swamp IBA
Paddy Run Watershed BDA
Sproul State Forest
Drury Run Watershed BDA
Paddy Run Slopes #1 & #2 BDAs

TAMARACK

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The Tamarack quadrangle covers a section of northcentral Clinton County where Kettle Creek flows out of Potter County and joins Hammersley Fork before crossing into the Hammersley Fork quadrangle. The section of Appalachian High Plateau contained within this quadrangle includes a boreal wetland, a floodplain forest, all or part of two exceptional value streams, and a northern conifer swamp. Also included are large blocks of the Sproul and Susquehannock State Forests, a Bureau of Forestry natural area and wild area, and small sections of the **Kettle Creek Watershed LCA** (discussed in the Hammersley Fork quadrangle).

The **Tamarack Swamp NA** contains one of the most unique natural features in the county; Tamarack Swamp. Although commonly referred to as a swamp, the main section is a black spruce – tamarack palustrine woodland community (previously listed as a Non-glacial Bog following Smith 1991) dominated by northern and boreal conifers. Todd (1940) described the wetland as a series of concentric bands, from perimeter to center, of eastern hemlock (*Tsuga canadensis*), tamarack (*Larix laricina*), and black spruce/balsam fir (*Picea mariana/Abies balsamea*). That pattern is not obvious today because of the fragmentation and disturbance of the natural vegetation in the past century. The open grass/sedge meadows along the southern section of the wetland contain the large, old white pine stumps that are so characteristic of the headwater wetlands on the plateau logged off in the early 1900's. Patches of cattail (*Typha latifolia*) and alder (*Alnus rugosa*) swamp also occupy parts of the southern section and eventually transform to the tamarack and tamarack/black spruce interior. Smaller patches of meadow and cattail swamp sit on the northern section of the wetland.

A large and diverse wetland, Tamarack Swamp contains populations of two plant species of special concern in Pennsylvania, the soft-leaved sedge (*Carex disperma*) and the showy mountain-laurel (*Sorbus decora*), three animals of special concern (**SA001, SA002, SA003**), and one of the few examples of a black spruce - tamarack palustrine woodland community in Pennsylvania. Also, Tamarack Swamp forms the headwaters of Drury Run, an Exceptional Value, High Gradient Clearwater Stream included within the **Drury Run Watershed BDA** and discussed in the Renovo East quadrangle. Consequently, protection of Tamarack Swamp and its watershed - Tamarack Swamp BDA - complements and is linked to the protection of the Drury Run watershed. Approximately one third of the wetland is included in the Bureau of Forestry's **Tamarack Swamp Natural Area DA** and is afforded protection under that designation. Also included in the natural area, bordering the wetland to the north, is a red oak – mixed hardwood forest community (previously listed as a Dry-mesic Central Forest following Smith 1991) dominated by white oak (*Quercus alba*).

Selective logging, fire and most recently, laying of gas pipelines have altered and compromised the natural community at Tamarack Swamp. Construction of the gas pipeline appears to have been particularly disruptive, physically separating contiguous sections of wetland, altering hydrological patterns and introducing strips of highly altered substrate that will not easily recover. The present natural area falls short in providing substantial protection to even the area contained within its boundaries. Part of the uniqueness and viability of this wetland is related to its size and low fertility. Runoff from lawns and roads, and channelized flow along pipeline ROW's introduces water and nutrients into interior sections of the swamp. Long-term protection must address these inputs. Any maintenance of existing pipelines is strongly unadvised as is construction of any new lines within the

BDA. Removal of these lines is also not recommended as that process would lead to further disruption of the community. Consolidated Natural Gas should consider new lines outside the wetland watershed as primary transmission lines and prepare for the contingency of discontinued flow through the lines presently within the wetland.

To the north of Tamarack Swamp, Kettle Creek winds through a broad valley into Clinton County from the town of Cross Forks in Potter County. Once a primarily agricultural valley, several sections of floodplain forest remain along the creek. One, in particular, has recovered much of its structure after previous pasturing and associated disturbances. This site, **Haystack Floodplain BDA**, supports a sycamore – mixed hardwood floodplain forest community (previously listed as a Floodplain Forest following Smith 1991) dominated by eastern sycamore (*Platanus occidentalis*), ironwood (*Carpinus caroliniana*), grasses, and cinnamon fern (*Osmunda cinnamomea*). This site is privately owned and currently not in use for agriculture or other purposes. Management of the site should be one of, essentially, no management or disturbance. Notification of the owner as to the possibility of easement, purchase or donations of land to the county would begin the process of permanent protection for the site.

Paddy Run Watershed BDA includes most of Paddy Run and its watershed. Paddy's Run is a High Gradient Clearwater Stream that, at the same time as Drury Run, was upgraded to Exceptional Value waters by Pennsylvania Department of Environmental Protection, Bureau of Water Quality. This designation applies to the entire Paddy Run basin. Paddy Run supplies Renovo with its drinking water. The reservoir sits about one-half mile north of town and does show low pH and other signs of impact from the acid drainage upstream. McNearney Run Swamp lies at the top of the McNearney Branch of Paddy's Run. The McNearney Run Swamp is a large wetland that once supported a hemlock palustrine forest community. As typical of these headwater wetlands, removal of large white pines and eastern hemlocks in the early 1900's elevated the water table, encouraged the growth of wet site species like alder and cattails and discouraged the re-colonization of conifers. Today highbush blueberry – meadowsweet wetland community predominates at the site (previously listed as a Northern Conifer Swamp following Smith 1991). McNearney Swamp shows signs of beaver (*Castor canadensis*) activity as well as human-made impoundments and manipulation of the site. The U.S. Fish and Wildlife Service (USFWS) along with the Bureau of Forestry, constructed several ponds as part of a wildlife habitat improvement program. Civilian Conservation Corps (CCC) plantings of norway spruce (*Picea abies*), Scott's pine (*Pinus sylvestris*), and white spruce (*Picea glauca*), have grown along the perimeter and are now colonizing sections of the open grass/sedge meadow in the wetland. Although more extensively and recently disturbed than the other similar wetlands in the county, the potential for recovery exists and its unique habitat makes it a significant resource in the county. The site should be allowed to recover without further disturbances within its watershed, such as; non-native tree planting, timber harvests, and water impoundments. As for Drury's Run, protection of this aquatic resource involves protecting and managing the watershed to limit the activities that produce erosion, flash runoff, or contamination of any part of the stream or tributaries. A gas pipeline crosses the stream just south of the Henzel Fork confluence and continues across the Dark Hollow tributary to the east. Use of herbicides along the ROW in this area should be restricted and heavy equipment and vehicles should avoid the slopes and drainages in the BDA.

The **Painter Hollow Confluence Slopes, Paddy Run Slopes #1** and **Paddy Run Slopes #2 BDAs** are forested slopes that support a biological resource of concern. Any direct disturbance within this area

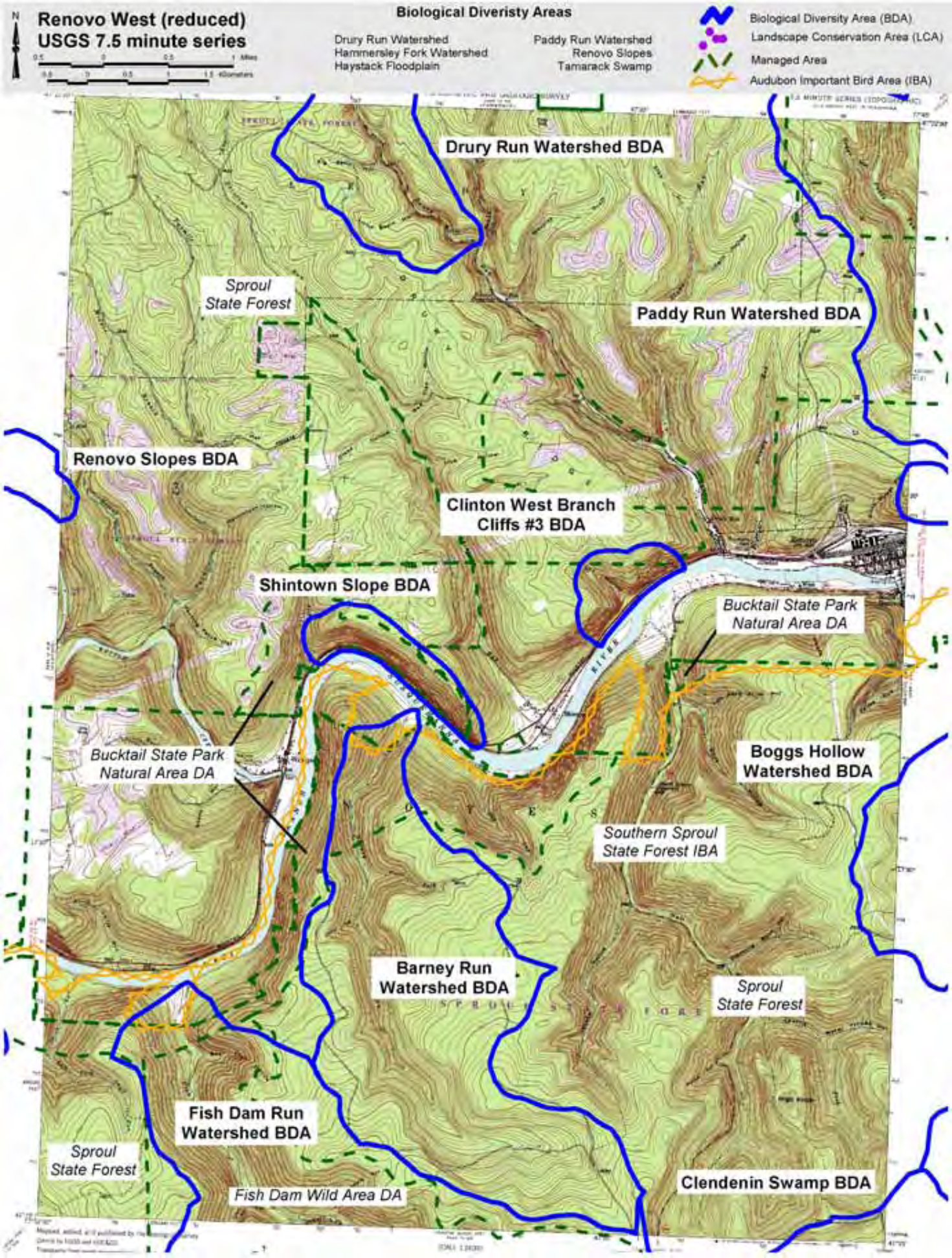
will likely impact this resource. Please contact Western Pennsylvania Conservancy for more information regarding this resource, or with any questions regarding the impact of potential activities in these areas.

The **Hammersley Fork Watershed BDA** is discussed under the Hammersley Fork quadrangle.

USGS QUADRANGLE **RENOVO WEST**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
BARNEY RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	8/92
SHINTOWN SLOPE BDA		*Exceptional Significance*			
Fogg's goosefoot (*Chenopodium foggii*)	G3Q	S1	N	PE	9/92
DRURY RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	9/92
FISH DAM RUN WATERSHED BDA		*High Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	10/92
CLENDENIN SWAMP BDA		*High Significance*			
Hemlock palustrine forest community	G?	S3	N	N	6/92
Highbush blueberry – meadowsweet wetland community	G?	S5	N	N	6/92
BOGGS HOLLOW WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	6/92
CLINTON WEST BRANCH CLIFFS #3 BDA		*High Significance*			
Allegheny woodrat (*Neotoma magister*)	G3G4	S3	N	PT	4/98
BUCKTAIL STATE PARK NATURAL AREA DA		*Exceptional Significance*			

MANAGED LANDS: Sproul State Forest
Fish Dam Wild Area
Bucktail State Park Natural Area


Renovo West (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Drury Run Watershed
Hammersley Fork Watershed
Haystack Floodplain
Paddy Run Watershed
Renovo Slopes
Tamarack Swamp
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Drury Run Watershed BDA
Sproul State Forest
Paddy Run Watershed BDA
Renovo Slopes BDA
Clinton West Branch Cliffs #3 BDA
Shintown Slope BDA
Bucktail State Park Natural Area DA
Bucktail State Park Natural Area DA
Boggs Hollow Watershed BDA
Southern Sproul State Forest IBA
Barney Run Watershed BDA
Sproul State Forest
Fish Dam Run Watershed BDA
Sproul State Forest
Fish Dam Wild Area DA
Clendenin Swamp BDA

RENOVO WEST

bold = mapped natural heritage areas
underline = PBS species/communities of concern

All the lands within the Renovo West quadrangle are within Clinton County and include the lower section of **Fish Dam Run Watershed BDA**, Fish Dam Wild Area (both discussed in the Snow Shoe Northeast section), part of the **Bucktail State Park Natural Area DA** (described in the Sinnemahoning quadrangle), and the entire Barney Run watershed. Also included is a section of an Exceptional Value stream and the location for Fogg's goosefoot (*Chenopodium foggii*), a plant of special concern.

Barney Run is a High Gradient Clearwater Stream that drains a section of the plateau in the Sproul State Forest east of Fish Dam Run. Supporting a population of native brook trout (*Salvelinus fontinalis*), Barney Run is designated as Exceptional Value by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality, and is the focus of the **Barney Run Watershed BDA**. The Barney's Run Valley is a fairly typical plateau valley with rugged, rocky slopes of yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*), and mixed oak (*Quercus spp.*) forest and a valley bottom of tuliptree (*Liriodendron tulipifera*), beech (*Fagus grandifolia*), white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*) forest. The First Fork ravine is particularly rugged; large sandstone boulders sit balanced on the steep slopes and the stream runs through piles of smaller rock debris. Protecting the integrity of the stream means protecting the watershed. Activities should be limited in the watershed, especially on the slopes, and those that substantially effect the character of runoff (e.g. timber cutting on the slopes) should be avoided. Likewise, spraying for gypsy moths should be avoided.

West of Shintown, on the rock strata cut away when Route 120 was built, grows a plant of special concern, Fogg's goosefoot (*Chenopodium foggii*). The rock slides that are common in this area, furnish the occasional disturbance and exposed soils required for this plant to colonize and compete effectively. Other plants that grow on the sparsely vegetated slopes in association with this plant are: columbine (*Aquilegia canadensis*), white goldenrod (*Solidago bicolor*), sunflower (*Helianthus sp.*), stiff aster (*Aster linariifolius*) and three-seeded mercury (*Acalypha rhomboidea*). Although confirmed only at this one site in Clinton County, some of the surrounding (natural) rock outcroppings may also support populations of this plant of special concern. Spraying of herbicide should be avoided within the **Shintown Slope BDA** and any construction or manipulation in this area should be brought to the attention of the Western PA Conservancy.

Drury Run stretches from the West Branch, one mile west of the town of Renovo, to its headwaters at Tamarack Swamp. It is a High Gradient Clearwater Stream that is classified as Exceptional Value (EV) by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality. The EV designation begins at the Sandy Run confluence and extends north to the headwaters. The Woodley Draft and Stoney Run tributaries drain watersheds with a substantial amount of strip mined lands. Both tributaries and the section of Drury's run below Sandy Run show physical and chemical evidence of acid mine runoff impacts. Protection of the stream means protection of the watershed of Drury Run. The **Drury Run Watershed BDA** encompasses both the stream and its watershed. The Tamarack Swamp BDA completes the watershed protection to the north and is part of the Drury Run Watershed. It is designated as its own BDA to recognize its exceptional significance and special circumstances in the Drury Run watershed and in the county.

State route 144 runs the entire length of Drury Run, often within 50 feet of the stream. Application of salt, herbicides and road paving material should be carefully planned to limit the impact on the stream. In general, activities in the Drury Run Watershed BDA should be limited to those that do not promote erosion and siltation, produce unvegetated (especially paved) areas, nor lead to chemical contamination of Drury Run or its tributaries.

Clinton West Branch Cliffs #3 BDA contains habitat occupied by the Allegheny woodrat (*Neotoma magister*), a Pennsylvania Threatened animal species. Please see the "Allegheny Woodrat Overview" (pg. 151) for information regarding the ecology and management needs of this species.

Clendenin Swamp BDA is discussed under the Howard Northwest quadrangle, and **Boggs Hollow Watershed BDA** is discussed under the Renovo West quadrangle.

USGS QUADRANGLE **SNOW SHOE NORTHEAST**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
EAST BRANCH BIG RUN WATERSHED BDA		*Exceptional Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	5/92
Hemlock palustrine forest community	G?	S3	N	N	5/92
Red oak – mixed hardwood forest community	G?	S5	N	N	5/92
Alder – sphagnum wetland community	G?	S4	N	N	5/92
EAST BRANCH SWAMP NATURAL AREA DA		*Exceptional Significance*			
Hemlock palustrine forest community	G?	S3	N	N	5/92
Red oak – mixed hardwood forest community	G?	S5	N	N	5/92
MIDDLE BRANCH BIG RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	9/92
WEST BRANCH BIG RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	9/92
BURNS RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	10/92
FISH DAM RUN WATERSHED BDA		*High Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	10/92

BEAR RUN RIDGE BARRENS BDA		*Notable Significance*			
Pitch pine – mixed oak forest community	G?	S4	N	N	9/92
Pitch pine – scrub oak woodland community	G?	S2S3	N	N	9/92

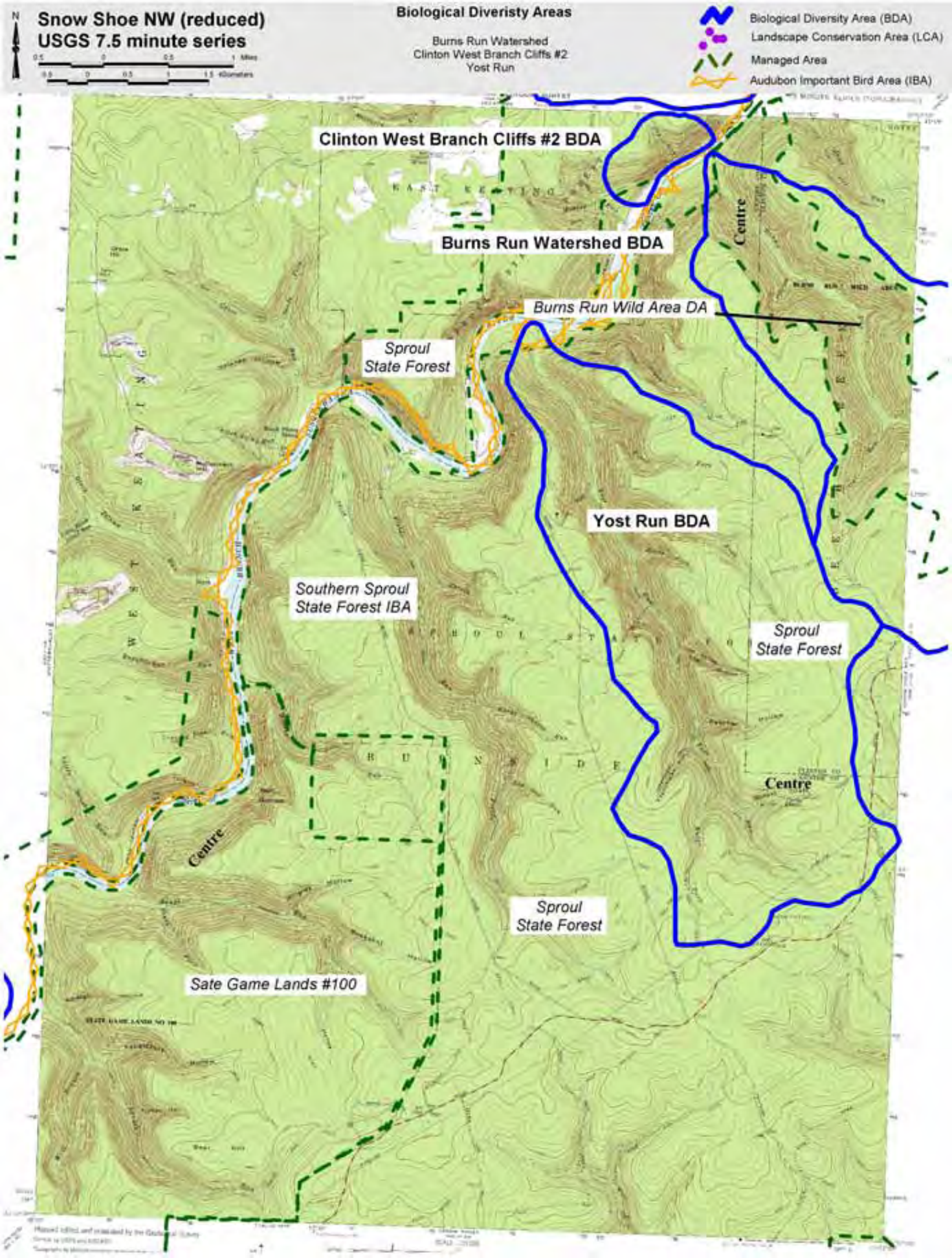
CLENDENIN SWAMP BDA		*High Significance*			
Hemlock palustrine forest community	G?	S3	N	N	6/92
Highbush blueberry – meadowsweet wetland community	G?	S5	N	N	6/92

MANAGED AREAS: Sproul State Forest

Burns Run Wild Area

Fish Dam Wild Area

East Branch Natural Area


Snow Shoe NW (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Burns Run Watershed
Clinton West Branch Cliffs #2
Yost Run
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Clinton West Branch Cliffs #2 BDA
Burns Run Watershed BDA
Burns Run Wild Area DA
Sproul State Forest
Yost Run BDA
Southern Sproul State Forest IBA
Sproul State Forest
Sproul State Forest
Sate Game Lands #100
Centre
Centre
Centre

SNOW SHOE NORTHEAST

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The southern end of Burns Run watershed, most of the Fish Dam Run watershed, and a large portion of the Big Run watershed dominate this quadrangle and the southcentral section of Clinton County contained within. Two significant wetlands, an Appalachian sand barren community, portions of five Exceptional Value streams, portions of two wild areas, and two Bureau of Forestry natural areas are included in this quadrangle. The Sproul State Forest covers much of this quadrangle.

Big Run stretches from Beech Creek just west of Monument to a broad headwaters area that roughly follows Route 144 in Clinton County. Three of its branches; the East, Middle, and West Branches are High Gradient Clearwater Streams and are classified as Exceptional Value Waters by Pennsylvania Department of Environmental Protection, Bureau of Water Quality.

The East Branch of Big Run loops into this quadrangle, connecting Swamp Branch and East Branch Swamps to the main channel of Big Run Creek in the Snow Shoe Southeast quadrangle. The **East Branch Big Run Watershed BDA** contains the entire upper portion of the East Branch of Big Run and includes East Branch and Swamp Branch Swamps. The East Branch of Big Run is a High Gradient Clearwater Stream and its upper portion (source to river mile 4.5) is designated as Exceptional Value (EV) by Pennsylvania Department of Environmental Protection, Bureau of Water Quality. Seepage from a strip mine within the watershed on the plateau to the west has degraded the water quality on the lower section of East Branch and in the main drainage of Big Run. Re-stripping, wetland construction and sludge composting have reduced the amount of acid drainage into East and Middle Branches. Continued remediation and reclamation efforts are strongly encouraged and any further activities within the East Branch watershed, particularly those affecting the EV section of the stream, should be carefully evaluated. Removal of vegetation in this watershed (e.g. timber sales) could be especially harmful to water quality given the high potential for runoff to be contaminated by mine seepage.

The headwaters of the East Branch of Big Run form in two basins high on the plateau; East Branch Swamp and Swamp Branch Swamp. Contained within the East Branch Watershed BDA, these two wetlands— and a number of other headwater wetlands on the Appalachian Plateau— have similar appearances and histories.

White Pine (*Pinus strobus*) stumps scattered over grass-sedge meadows and invading rings of white pine and eastern hemlock (*Tsuga canadensis*) indicate that these now open swamps were probably once northern conifer swamps where open wetland occupied a minority rather than a majority of the basins. The stumps remain from logging completed in the early 1900's, and many show evidence of subsequent fire. With removal of the large trees and decreased transpiration, the water table rose, promoting sedges and grasses and impeding the colonization of trees. Fire would have further delayed the colonization. These areas are now considered recovering communities.

East Branch Swamp is part of the Bureau of Forestry's East Branch Natural Area and is afforded a high degree of protection under that designation. The **East Branch Big Run BDA** includes the whole East Branch Swamp basin and the **East Branch Swamp Natural Area DA**. As is typical of these recovering wetlands, East Branch Swamp today contains mainly shrub and herbaceous wetland communities.

There are sections of cattail (*Typha latifolia*) marsh, alder (*Alnus rugosa*) swamp and grass-sedge meadow in its lower, wetter areas and blueberry-huckleberry (*Vaccinium spp.-Gaylussacia baccata*) thickets around the drier edges and on scattered hummocks. The herbaceous/shrub portions are classified as alder – sphagnum wetland community. Unique to East Branch Swamp is a section containing a mature hemlock palustrine forest community (the entire wetland was previously listed as Northern Conifer Swamp following Smith 1991). Although it sustained heavy damage from the 1986 tornado, this forested section stands as an example of what pre-logging hemlock palustrine forest communities may have once looked like in many headwaters wetlands in the county. Also included in the East Branch Natural Area is a red oak – mixed hardwood forest community (previously listed as a Dry-mesic Central Forest following Smith 1991) dominated by red, black and white oak (*Quercus rubra, Q. velutina,* and *Q. alba*). Under the protection of the natural area, this forest will mature and may gradually diversify as more northern species replace the oaks.

The buffer around the swamp provided by the natural area, especially on the east side, is not sufficient to fully protect the natural communities within. An area of protection, provided by the East Branch Watershed BDA, that includes the entire watershed of East Branch Swamp is recommended. The Chuck Keiper Trail borders the natural area on the east and required some local re-routing through East Branch Swamp following the tornado. Hiking traffic has probably impacted the site only minimally. A gas pipeline cuts across the head of the swamp at the edge of the old hemlock section. Because it directly borders the wetland and passes through a natural area, application of even limited amounts of herbicide is not recommended. Mechanical clearing and cutting with heavy equipment could compact soils and lead to erosion problems. Simply maintaining an open ROW is problematic (see discussion of powerline ROW at the beginning of the report). Relocation of the pipeline out of the BDA should be strongly considered as an important step toward long term and total protection of this Natural Heritage Area. Spraying for gypsy moths is also not recommended. Additionally, a section of Route 144 falls within the East Branch Swamp BDA. The effect of the road on surface and subsurface water flow should be considered and appropriate steps taken, if necessary, to assure that East Branch Swamp receives the amount of water it naturally would in the way it naturally would (e.g., avoid channelized flow from drainage culverts). Timber harvests within the East Branch BDA are not recommended.

Swamp Branch Swamp is another example of a site that likely held a hemlock palustrine forest community in previous times and now contains a shrub/ herbaceous wetland community type. The community type here is an alder – sphagnum wetland (previously listed as a Northern Conifer Swamp following Smith 1991). The entire Swamp Branch Swamp basin is included in the **East Branch Big Run BDA**. Swamp Branch Swamp is similar to East Branch Swamp, exhibiting the characteristic white pine stumps, alder swamps and sedge-grass meadows; however, it is larger and the conifer communities are not as mature as those at East Branch. White pine fringes the swamp and several patches at the northern end of the swamp are fairly extensive. These white pine tend to grow on drier soils very slightly above the bottom of the basin. The tornado did not directly impact Swamp Branch Swamp but did damage a piece of slope to the northeast. The swamp itself appears recently undisturbed and continues to be used primarily by hunters and hikers.

Although part of the Sproul State Forest, Swamp Branch Swamp has no special status or designation and receives the same protection given to other wetlands on Bureau of Forestry lands (100 foot buffer surrounding a permanent wetland). A larger buffer is recommended that will include the entire

watershed of the swamp. The East Branch Big Run BDA includes this buffer area. The same gas pipeline that passes through the East Branch Swamp also passes through the Swamp Branch Swamp on its northern border. The same recommendations given for East Branch apply here. Its extent, features and potential to develop exemplary natural communities make Swamp Branch Swamp as qualified as East Branch Swamp to receive natural area designation. Combined with an East Branch Natural Area DA that includes the entire watershed of the swamp, a Swamp Branch Swamp Natural Area DA (also watershed inclusive) would be an important step in securing the fullest protection of the Exceptional Value East Branch of Big Run.

The Middle Branch of Big Run is a high gradient clearwater stream considered EV north of the Thornapple tributary; below that point it receives acidified waters from strip mines in the upper watershed. As for the East Branch of Big Run, reclamation efforts are strongly encouraged and activities that would further impact the vegetation within the **Middle Branch Big Run Watershed BDA** are not recommended.

The West Branch of Big Run is a high gradient clearwater stream considered EV throughout its length. A typical watershed on the Appalachian Plateau, the dry mixed-oak (*Quercus spp.*) ridges and slopes of the **West Branch of Big Run BDA** give way to northern hardwood-conifer forest on the valley bottom. The Centre County Natural Heritage Inventory recognizes a portion of the terrestrial valley community as a significant natural community. Two gas pipeline ROW's intersect on the northern end of the watershed. Both cut across steep slopes and one crosses the main branch of the stream just north of the Centre-Clinton County border. These ROW's are potential sources of sediment to the stream, corridors to invasion by exotic/opportunistic species, and sources of fragmentation in a roadless section of plateau valley forest. Spot cutting of saplings and encouragement of local native shrubs should be favored over the use of heavy equipment, non-specific cutting and use of herbicides. In general, activities that lead to increased erosion or fragmentation should be avoided. Consolidation of utility ROW's, especially those impacting significant areas like the East, Middle, and West Branches of Big Run, should be a long term goal of protection within these areas.

The southeastern end of **Burns Run Watershed BDA** lies in the Snow Shoe Northeast quadrangle. This Exceptional Value High Gradient Clearwater Stream and its associated wild area are discussed in the Snow Shoe Northwest quadrangle.

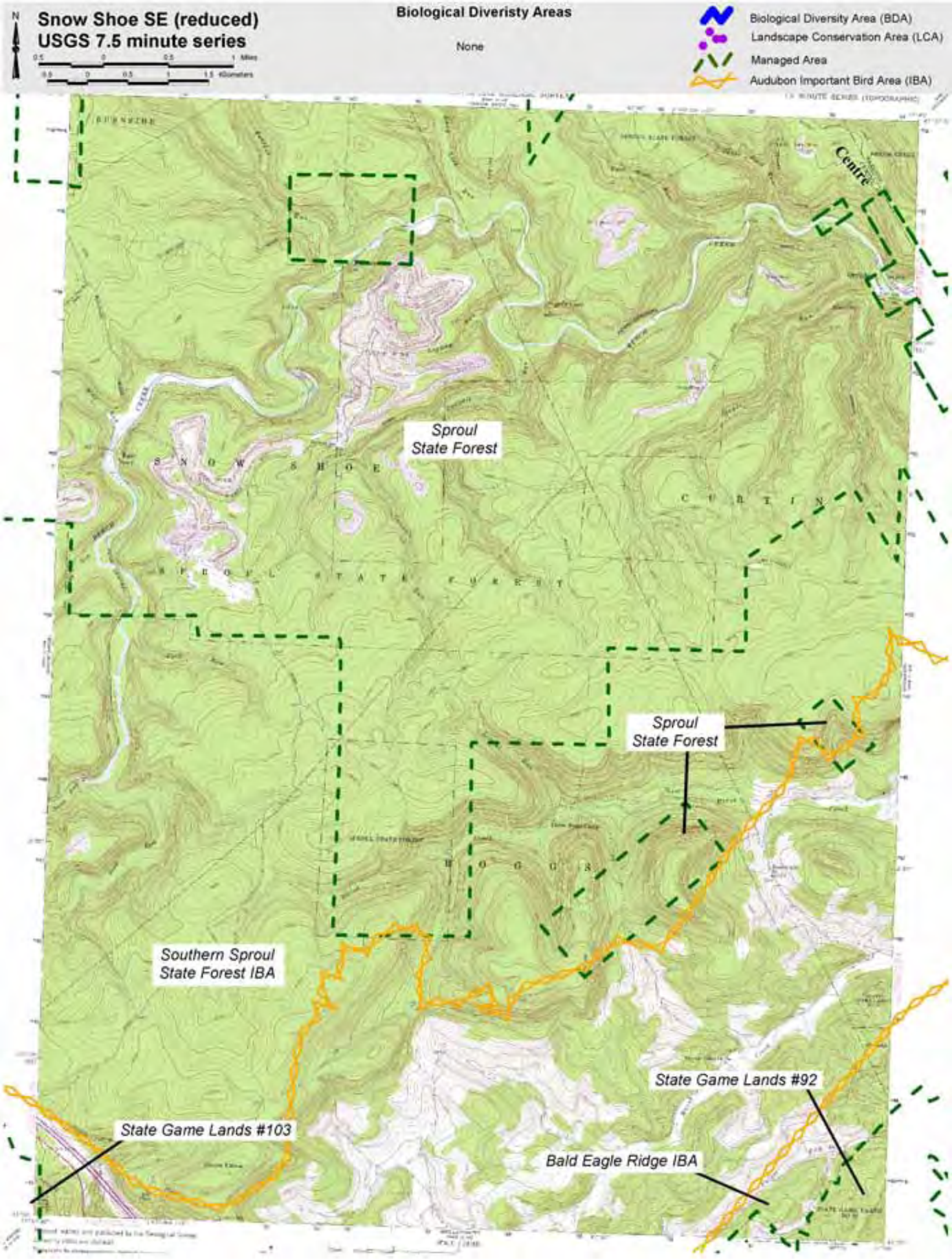
The bulk of the **Fish Dam Run Watershed BDA** lies in this quadrangle. Fish Dam Run drains a broad and highly scenic watershed and is classified as a High Gradient Clearwater Stream . Its waters are designated as Exception Value by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality. The steep slopes and valleys in this watershed comprise the Fish Dam Wild Area that extends from and is contiguous with the Bucktail State Park Natural Area to the north. Much like the Burns Run Watershed BDA, substantial sections of the Fish Dam Watershed BDA were damaged by the 1986 tornado and then by the 1989 fire. Once, the Chuck Keiper Trail ran down the Dennison Branch and back up the main branch and then across to Burns Run. The tornado forced the relocation of the trail to the top of the watershed just north of Route 144. With an almost continuous swath of uprooted trees, colonizing saplings, and thick brambles, access to the Fish Dam Watershed BDA is limited to the northern end near the mouth of Fish Dam Run. Increased and more rapid runoff from storm damaged sections has lead to new downcutting of the banks of the main branches of Fish Dam Run. Considerable

silt deposits are visible in the streams, but so are native brook trout (*Salvelinus fontinalis*). Although remote, the Fish Dam watershed was the site of a large farm that bordered the West Branch and extended one-half mile or more along Fish Dam Run. Evidence of pasturing and farming are visible throughout the valley. The old farmstead is now a camp and several other camps sit along this broad floodplain area of the stream (see Renovo West quadrangle). Protecting Fish Dam Run requires protection of its watershed. The wild area provides critical but not complete protection for this Exceptional Value stream. As with Burns Run, the forest communities covering this watershed are in the early stages of recovery and are particularly sensitive to disturbance. Road building and maintenance within the watershed should be carefully controlled and timber salvage should be limited or curtailed all together. Use of herbicide to maintain the gas pipeline ROW running through the southern section of the watershed should also be limited or stopped.

The **Bear Run Ridge Barrens BDA** contains areas of pitch pine – mixed oak forest community and of pitch pine – scrub oak woodland, a state rare community type (both types were listed as Appalachian Sand Barrens community following Smith 1991) and sits on the plateau east of Bear Run, a tributary to the West Branch of Big Run. The Bureau of Forestry owns approximately one-half of this site (Sproul State Forest); Texas Gulf Inc., Armstrong Forest Division owns the other half. Samples of soil in this area show nearly pure sand down to at least 1.2 meters below the surface. Dense blueberry and huckleberry cover the largely open community and single or small clumps of scrub oak (*Quercus ilicifolia*) grow scattered throughout. Scarlet oak (*Quercus coccinea*), pitch pine (*Pinus rigida*), and sassafras (*Sassafras albidium*) grow near the edges and on a bedrock shelf on the east side of the site. Never an extensive or diverse community, the Bear Run Barrens is unique in Clinton County and may be an important habitat for some species of invertebrates and birds. Timber sales on adjacent lands, management for wildlife, and mineral extraction, including natural gas extraction, pose threats to this site. Both the Bureau of Forestry and Texas Gulf, Inc. should be made aware of the significance of this community and should maintain a substantial buffer for the site (BDA boundaries that exclude all cutting and development activities). Also, easy road access, open land, and easily manipulated soils make this land highly developable. The Bureau of State Forests should consider acquisition of the remainder of the site and other possible protection strategies.

USGS QUADRANGLE **SNOW SHOE SOUTHEAST**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen


Snow Shoe SE (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
None
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Centre
Sproul
State Forest
Sproul
State Forest
Southern Sproul
State Forest IBA
State Game Lands #103
State Game Lands #92
Bald Eagle Ridge IBA

SNOW SHOE SOUTHEAST

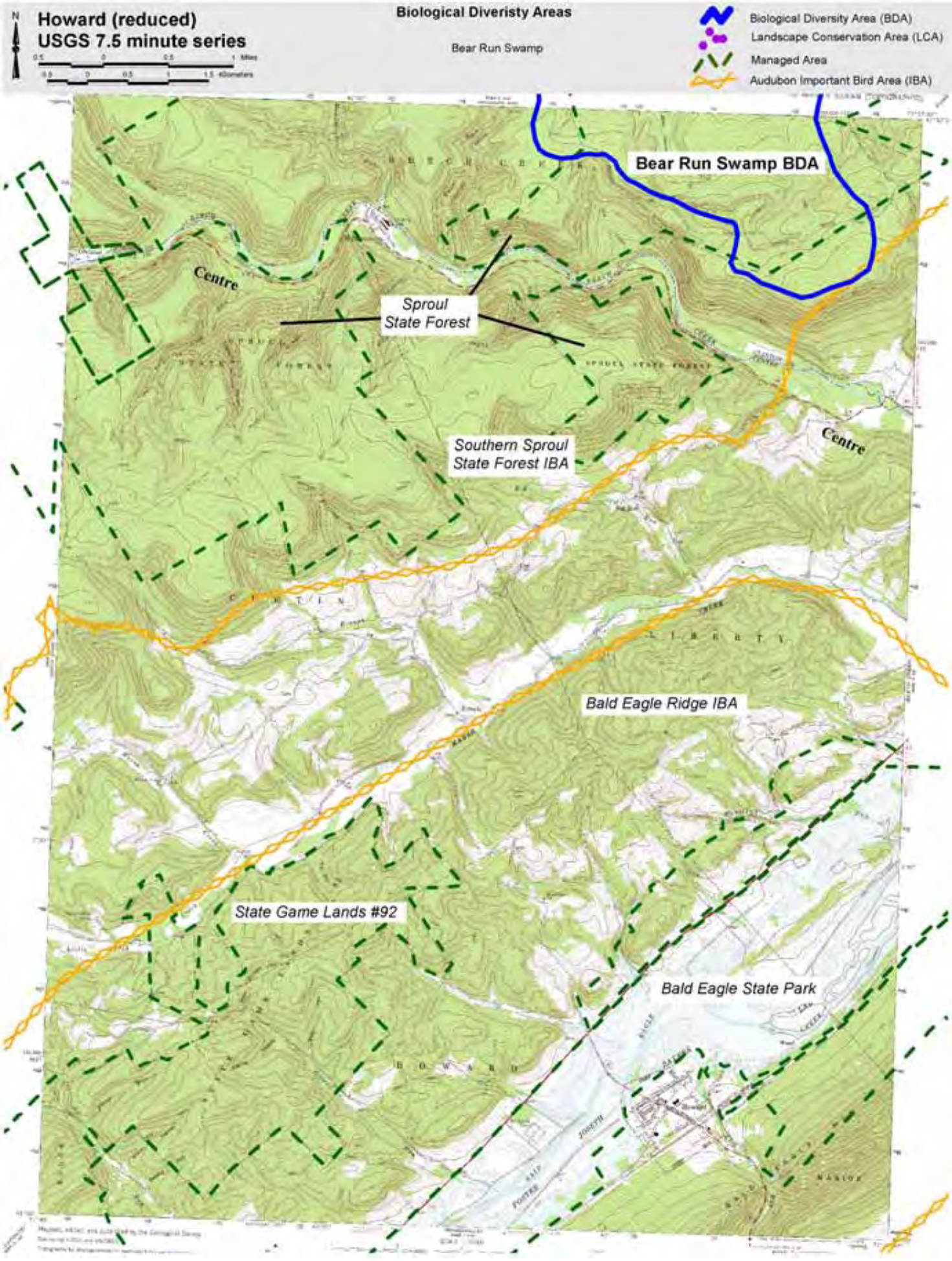
bold = mapped natural heritage areas
underline = PBS species/communities of concern

A very small section of Clinton County crosses into the northeastern corner of this quadrangle. This section of the county contains no Natural Heritage Areas and no managed lands.

USGS QUADRANGLE **HOWARD**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
BEAR RUN SWAMP BDA		*High Significance*			
Hemlock palustrine forest community	G?	S3	N	N	7/92
Highbush blueberry – meadowsweet wetland community	G?	S5	N	N	7/92

MANAGED LANDS: Sproul State Forest


Howard (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Bear Run Swamp
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Bear Run Swamp BDA
Centre
Sproul
State Forest
Southern Sproul
State Forest IBA
Centre
Bald Eagle Ridge IBA
State Game Lands #92
Bald Eagle State Park

bold = mapped natural heritage areas
underline = PBS species/communities of concern

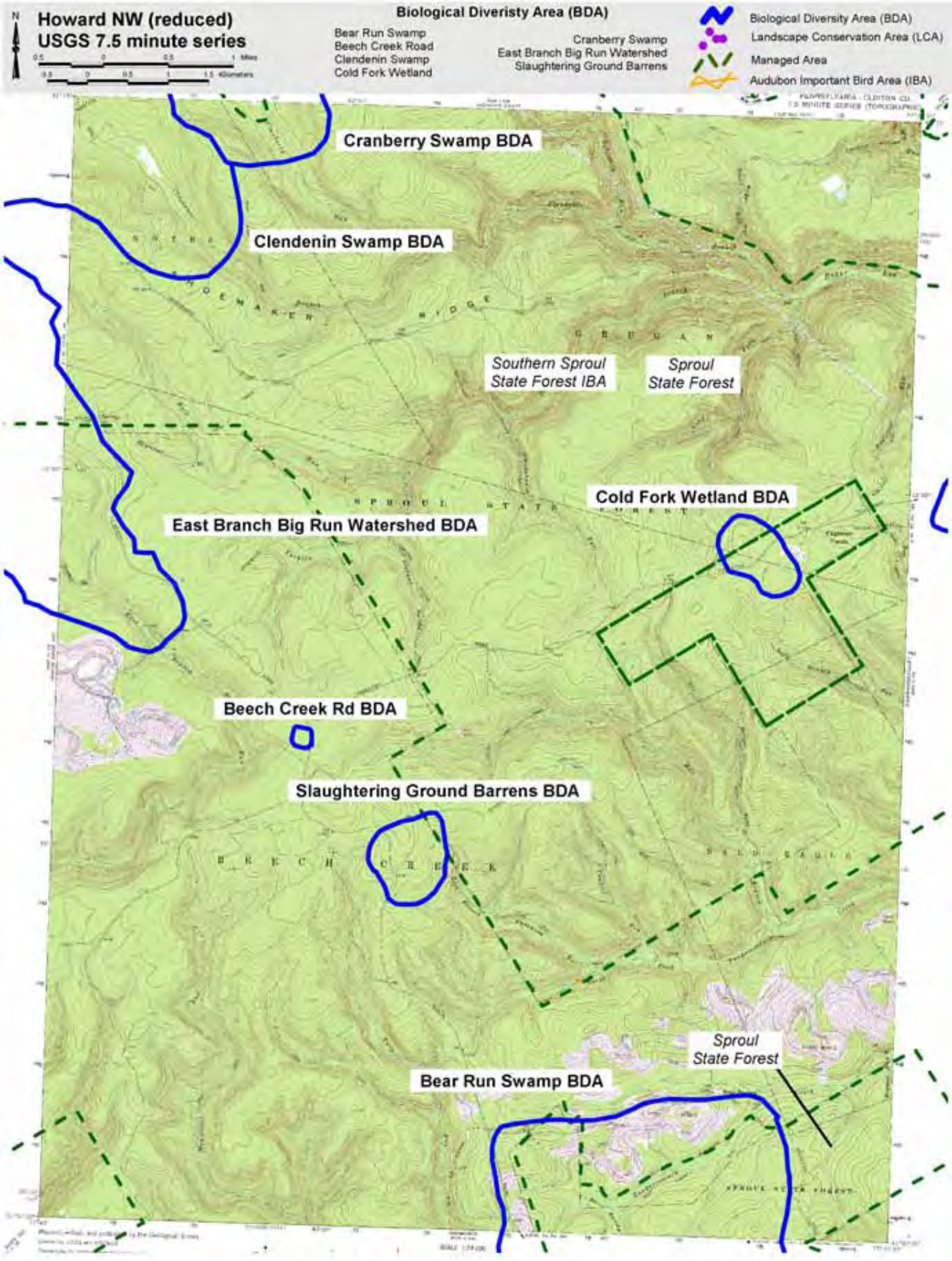
HOWARD

Beech Creek runs across the northern section of the Howard quadrangle and divides Clinton County from Centre County. Sproul State Forest covers most of this quadrangle and **Bear Run Swamp BDA** which includes a wetland with hemlock palustrine forest community and highbush blueberry – meadowsweet community (previously both listed as Northern Conifer Swamp community following Smith 1991). This area crosses into the quadrangle along its northern border and is discussed in detail in the Howard Northwest quadrangle.

USGS QUADRANGLE **HOWARD NORTHWEST**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
CLENDENIN SWAMP BDA		*High Significance*			
Hemlock palustrine forest community	G?	S3	N	N	6/92
Highbush blueberry – meadowsweet wetland community	G?	S5	N	N	6/92
EAST BRANCH BIG RUN WATERSHED BDA		*Exceptional Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	5/92
Hemlock palustrine forest community	G?	S3	N	N	5/92
Red oak – mixed hardwood forest community	G?	S5	N	N	5/92
Alder – sphagnum wetland community	G?	S4	N	N	5/92
BEAR RUN SWAMP BDA		*High Significance*			
Hemlock palustrine forest community	G?	S3	N	N	7/92
SLAUGHTERING GROUND BARRENS BDA		*Exceptional Significance*			
Pitch pine – scrub oak woodland community	G?	S2S3	N	N	9/92
COLD FORK WETLAND BDA		*Notable Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	9/92
BEECH CREEK RD BDA		*Exceptional Significance*			
Lupine (*Lupinus perennis*)	G5	S3	N	PR	5/95

MANAGED LANDS: Sproul State Forest


Howard NW (reduced)
USGS 7.5 minute series
Biological Diveristy Area (BDA)
Bear Run Swamp
Beech Creek Road
Clendenin Swamp
Cold Fork Wetland
Cranberry Swamp
East Branch Big Run Watershed
Slaughtering Ground Barrens
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Cranberry Swamp BDA
Clendenin Swamp BDA
Southern Sproul State Forest IBA
Sproul State Forest
Cold Fork Wetland BDA
East Branch Big Run Watershed BDA
Beech Creek Rd BDA
Slaughtering Ground Barrens BDA
Sproul State Forest
Bear Run Swamp BDA

HOWARD NORTHWEST

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The entire Howard Northeast quadrangle is within Clinton County and sits on the southern section of the high plateau between the West Branch of the Susquehanna and Beech Creek Valleys. This quadrangle contains a number of natural communities including several headwater wetlands, part of an Exceptional Value stream and a pitch pine-scrub oak barren. Large strip mined areas lie in the west and southeast sections and numerous well drilling sites are scattered throughout the quadrangle. The Sproul State Forest covers approximately one-half of the Howard Northwest quadrangle.

Clendenin Swamp BDA sits between Cranberry and East Branch Swamp BDAs and contains one of the group of four headwaters wetlands southeast of Route 144. Clendenin Swamp shows evidence of early logging of white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*) in the scattered stumps, bleached and sitting on their roots above the present ground level, that persist in the swamp today. As did the other swamps in this area, Clendenin lost considerable humus and soil as cutting, fire, and erosion opened the once-forested wetland. Today most of the area is an open grass-sedge meadow with patches of alder (*Alnus rugosa*) swamp and cattail (*Typha latifolia*) marsh, classified as a highbush blueberry – meadowsweet wetland, and a perimeter of re-colonizing white pine forms a ring of hemlock palustrine forest community. This swamp represents a unique habitat in the county and, if left alone, will eventually reestablish a canopy of northern conifers.

Clendenin Swamp is within the Sproul State Forest but, unlike Cranberry and East Branch Swamps, receives no special protection under the Bureau of Forestry's Natural Areas designation. Protecting this wetland requires that its watershed be protected from disturbances that lead to erosion, chemical inputs and invasion by opportunistic species. The gas pipeline ROW that borders to the northwest is the same ROW that borders all four swamps in this area. Recommended ROW management guidelines are the same as those mentioned for East Branch, Cranberry and Swamp Branch Swamps: very restricted use of herbicides, limited use of heavy equipment, and encouragement of local native shrub cover over periodic mowing. As mentioned, Clendenin Swamp is in may ways similar to East Branch and Cranberry Swamps and given the recent lack of disturbance and potential for recovery of its pre-logging character, deserves consideration for high-level protection under the Bureau of Forestry's Natural Areas Program.

The East Branch of Big Run flows northwest out of this quadrangle where it is joined by its largest tributary; Swamp Branch. Contained within the **East Branch Big Run Watershed BDA**, Swamp Branch is a High Gradient Clearwater Stream designated as Exceptional Value by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality. The East Branch of Big Run is discussed in detail in the Howard Northwest quadrangle.

Bear Swamp forms the headwaters of Tangascootack Creek and lies within the Howard Northwest and the Howard quadrangles. Contained within the **Bear Swamp BDA**, this extensive wetland shows many similarities to East Branch Swamp and the other three headwater wetlands to its northwest. Bear Swamp is predominately open grass-sedge meadow with patches of alder thicket, cattail marsh and blueberry (*Vaccinium spp.*) hummocks. This portion is classified as a highbush blueberry – meadowsweet wetland community. The white pine and eastern hemlocks that grew within this wetland were cut in the early part of this century, leaving behind stumps that persist today, scattered throughout

the swamp. Conifers grow along the perimeter of the swamp and have begun colonizing the wetter inner sections. One area, in particular, stands as a good example of a hemlock palustrine forest community and is probably much like the majority of the swamp was at one time. Eastern hemlocks dominate this area and masses of sphagnum cover the saturated soils that support golden ragwort (*Senecio aureus*), swamp saxifrage (*Saxifrage pensylvanica*), and a number of sedge species (*Carex spp.*). This BDA was previously classified as a Northern Conifer Swamp following Smith 1991.

A group of large strip mines occupy the plateau north of Bear Swamp and the Tangascootack drainage. These mines have impacted the lower section of Bear Swamp and continue to furnish heavily contaminated water to the wetland. The upper section of the swamp appears not to be receiving acidified waters although sections of the strip mining are within the immediate watershed. Only part of Bear Swamp is within the Sproul State Forest and given the nature of land-use within the watershed, complete protection will be difficult. However, Bear Swamp BDA is an important biodiversity site and efforts should be made to assess present and possible future impacts of the upper watershed strip mining and agreements forged to limit any new inputs into the wetland. Mine reclamation efforts are strongly encouraged.

Slaughtering Ground Barrens BDA crosses the plateau just north of the North Fork of Tangascootack Creek and stretches across a section of dry mixed-oak forest. A unique site of extremely sandy soils, dense thickets of scrub oak (*Quercus ilicifolia*), pitch pine (*Pinus rigida*) and numerous ericaceous shrubs, this area contains a pitch pine – scrub oak woodland community (previously listed as an Appalachian Sand Barren following Smith 1991), a type of special concern in Pennsylvania. Maintained by a combination of soil conditions and fire, parts of this area burned as recently as the early 1980's, but the frequency with which fires may have naturally occurred is not known. The surrounding forest is of the pitch pine – mixed oak community type. Numerous gas well drilling sites surround the barrens and access roads to the wells dissect the lands adjoining the BDA.

Because fire likely played an important role in shaping this community, protection of the barrens may involve more than simply letting it alone. Further investigation into the history of the site and determination of the historic fire frequency will be needed. Based upon that investigation, active management, specifically controlled burning, may prove necessary to maintain the community. Also, limiting the number of roads and general disturbance on the adjacent lands is recommended to prevent isolation of the barrens from other connected habitats. The Bureau of Forestry should consider protection of this site under one of their special use designations.

A small wetland community known as an herbaceous vernal pond sits off of Eagleton Road north of the Slaughtering Ground Barrens BDA at the headwaters of the Cold Fork of Baker's Run. Designated as the **Cold Fork Wetland BDA**, this pool supports numerous sedges, grasses, and a variety of wet site herbs including bugleweed (*Lycopus sp.*), nodding burr-marigold (*Bidens cernua*) and marsh bedstraw (*Galium palustre*). Although small and of limited diversity, this wetland, along with several others on this section of the plateau, represent a unique landscape feature and likely provides breeding habitat for a number of amphibian species. Water channeled from Eagleton Road could disrupt the hydrology of this pool and at least one ditch presently drains road water toward the wetland. Relocating this ditch and construction of others beyond the wetland and buffer (BDA) are recommended as is limitation of activities in this area, including timber harvesting.

Beech Creek Rd BDA is designated around a population of wild lupine (*Lupinus perennis*), a plant species of special concern in PA. This rare plant requires high light, low competition environments like those found after fire. The biggest threat to the plant is, consequently, reduced light levels stemming from overgrowth of the area with taller vegetation. The maintenance of Beech Creek Rd. may have helped to provide the right environmental conditions for this plant. However, the population would be negatively impacted by heavy trampling, coverage by slash, or application of herbicide. Care should be exercised within the Beech Creek Rd. BDA, and the Western PA Conservancy should be contacted for more details and advice concerning the management for this plant.

USGS QUADRANGLE **RENOVO EAST**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
CRANBERRY SWAMP BDA		*Exceptional Significance*			
Hemlock palustrine forest community	G?	S3	N	N	8/92
Herbaceous vernal pond community	G?	S3S4	N	N	8/92
CRANBERRY SWAMP NATURAL AREA DA		*Exceptional Significance*			
Hemlock palustrine forest community	G?	S3	N	N	8/92
Herbaceous vernal pond community	G?	S3S4	N	N	8/92
BOGGS HOLLOW WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	6/92
CLENDENIN SWAMP BDA		*High Significance*			
Hemlock palustrine forest community	G?	S3	N	N	6/92
Highbush blueberry – meadowsweet wetland community	G?	S5	N	N	6/92
EAST BRANCH BIG RUN WATERSHED BDA		*Exceptional Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	5/92
Hemlock palustrine forest community	G?	S3	N	N	5/92
Red oak – mixed hardwood forest community	G?	S5	N	N	5/92
Alder – sphagnum wetland community	G?	S4	N	N	5/92
BUCKTAIL STATE PARK NATURAL AREA DA		*Exceptional Significance*			

PADDY RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	6/92
Highbush blueberry – meadowsweet wetland community	G?	S5	N	N	6/92
CLINTON WEST BRANCH CLIFFS #4		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	11/98
CLINTON WEST BRANCH CLIFFS #5		*High Significance*			
Allegheny Woodrat (*Neotoma magister*)	G3G4	S3	N	PT	11/98
RENOVO SLOPES BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001

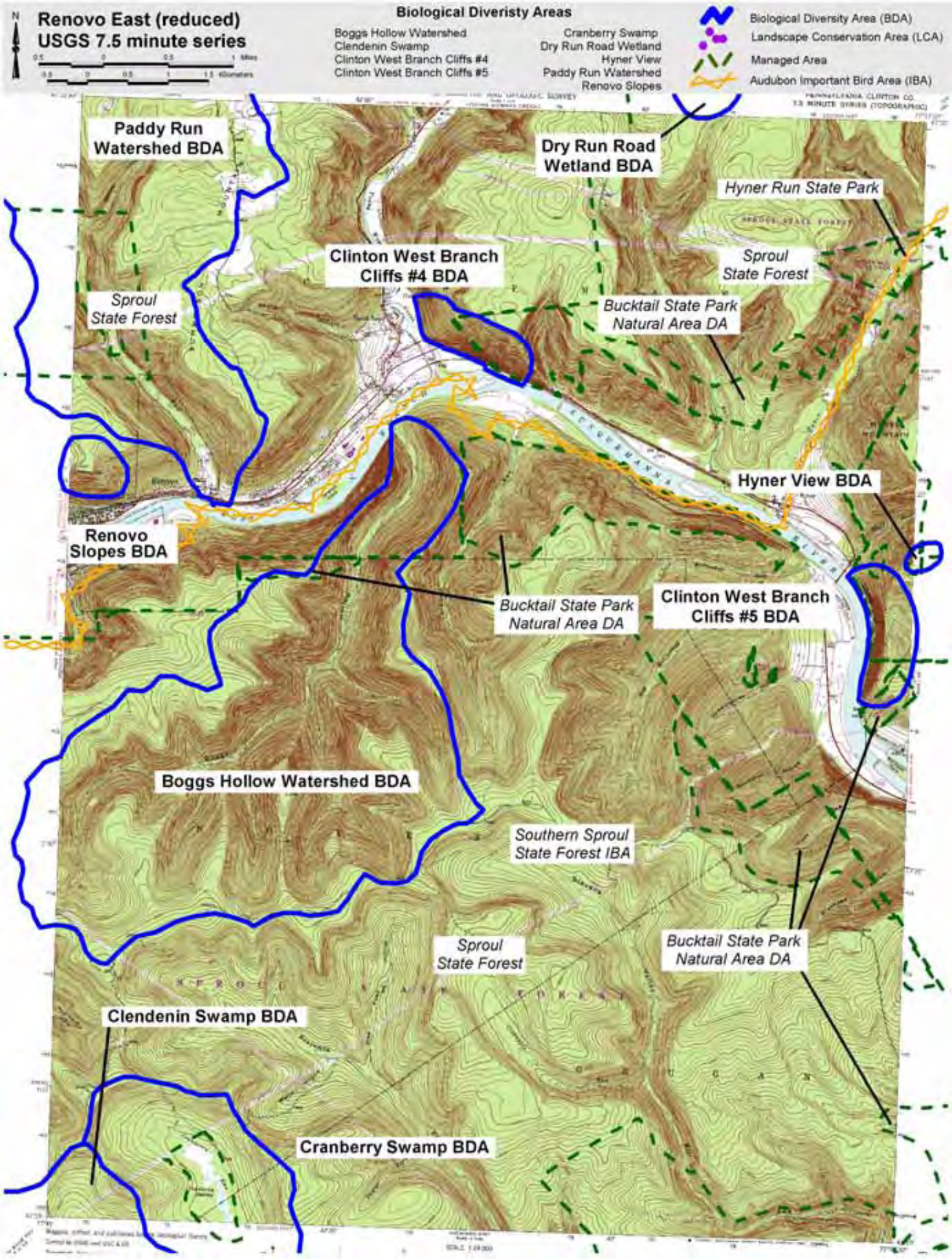
MANAGED LANDS: Sproul State Forest

Hyner Run State Park

Cranberry Swamp Natural Area

Bucktail State Park Natural Area

GEOLOGIC FEATURES/FOSSIL LOCALITIES: Renovo Overlook


Renovo East (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Boggs Hollow Watershed
Clendenin Swamp
Clinton West Branch Cliffs #4
Clinton West Branch Cliffs #5
Cranberry Swamp
Dry Run Road Wetland
Hyner View
Paddy Run Watershed
Renovo Slopes
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Paddy Run Watershed BDA
Dry Run Road Wetland BDA
Hyner Run State Park
Clinton West Branch Cliffs #4 BDA
Sproul State Forest
Bucktail State Park Natural Area DA
Sproul State Forest
Hyner View BDA
Renovo Slopes BDA
Bucktail State Park Natural Area DA
Clinton West Branch Cliffs #5 BDA
Boggs Hollow Watershed BDA
Southern Sproul State Forest IBA
Sproul State Forest
Bucktail State Park Natural Area DA
Clendenin Swamp BDA
Cranberry Swamp BDA

RENOVO EAST

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The West Branch of the Susquehanna River flows west to east across this quadrangle and Young Women's Creek meets the West Branch at the town of North Bend. This quadrangle includes a section of the **Bucktail State Park Natural Area DA** (described in the Sinnemahoning quadrangle), the Cranberry Swamp Natural Area DA, the entire Boggs Hollow watershed, part of the **Paddy Run Watershed BDA** (discussed in the Renovo West quadrangle), part of the **Clendenin Swamp BDA** (discussed in the Howard Northwest quadrangle), and Hyner Run State Park.

Cranberry Swamp forms the headwaters for Cranberry Run, a tributary tof Baker's Run, and is the most northerly of the group of four headwaters wetlands that sit just east of Route 144. Included in the **Cranberry Swamp BDA**, this swamp is in many ways similar to the other three swamps (Clendenin, East Branch and Swamp Branch), showing the evidence of the white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*) logging that occurred during the early 1990's and the concentric pattern of recolonization as the conifers slowly establish along the outer edges of the swamp (see East Branch in the Snow Shoe Southeast quadrangle for more description of the history and landscape pattern of these four swamps). Now largely an open wetland with patches of cattail (*Typha latifolia*) marsh, alder (*Alnus rugosa*) swamp and grass-sedge meadow, this wetland was, and should one day again become, a hemlock palustrine forest community. The current vegetation forms a highbush blueberry – meadowsweet wetland community (listed previously as Northern Conifer Swamp following Smith 1991). A number of springs feed this broad, flat wetland and one, in particular, is an excellent example of an undisturbed herbaceous vernal pond community (previously listed as a spring community following Smith 1991) that contains watercress (*Nasturtium officinale*), bittercress (*Cardamine sp.*), and water moss (*Fontinalis sp.*).

Cranberry Swamp is included in the Bureau of Forestry's Cranberry Swamp Natural Area (**Cranberry Swamp Natural Area DA**). Within this natural area, the wetlands receives a high degree of protection. However, the boundaries of the natural area do not include the swamp's entire watershed. It is recommended that the same level of protection conferred to the natural area be extended to include the whole Cranberry Swamp watershed (Cranberry Swamp BDA). This would entail little or no resource management and limited activites within the watershed. As for the other three headwater wetlands southwest of Cranberry, a gas pipeline runs across the wetland on its northwestern border. Maintenance of this ROW should involve minimal use of vehicles and other heavy equipment and very restricted use of herbicides. Encouragement of local, native shrub cover with spot removal of trees would be preferable to seasonal mowing and maintenance of the ROW as an open, grass-covered strip (see the Land Uses and Threats to Natural Heritage Sites section of the report for further discussion of utility ROW's).

The **Boggs Hollow Watershed BDA** lies just north of the Cranberry Swamp BDA. Boggs Hollow is a High Gradient Clearwater Stream with an Exceptional Value designation by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality, from its headwaters to its confluence with the West Branch of the Susquehanna River, south of the town of North Bend, PA. The Boggs Hollow watershed is compact and recently quite undisturbed. As typical of most streams in the county, an old rail-bed runs along the stream, crossing from one side to the other several times. Dry slopes of mixed oak (*Quercus spp.*), yellow and black birch (*Betula allegheniensis* and *B. lenta*), and red

maple (*Acer rubrum*) transform to a more mesic cover of sugar maple (*Acer saccharum*), tulip tree (*Liriodendron tulipifera*), black cherry (*Prunus serotina*) and rhododendron (*Rhododendron maximum*) on the lower slopes and along the stream. Although not exceptionally diverse, the Boggs Hollow watershed is a contiguous piece of forest that joins the Bucktail State Park Natural Area and the West Branch with the High Plateau; an important linkage of habitat. A gas pipeline and powerline ROW traverse the very upper section of the watershed. Although erosion does not, in this case, pose a great threat, invasion by opportunistic and weedy species does as evidenced by the profusion of hay-scented fern (*Dennstaedtia punctilobula*) along the utility ROW's and upper stream channels. The general recommendations for ROW management detailed at the beginning of the report apply here. Encouragement of local native shrub cover rather than periodic mowing or herbicide treatment is recommended. Consideration should also be given to extending the Bucktail State Park Natural Area to include this BDA.

Hyner Run State Park straddles Hyner Run and extends up a steep slope to the plateau. Utility ROW's border the park to the north, west and south, and Hyner road marks the eastern boundary. The developed section of the park lies to the west of Hyner Road and includes camp grounds, a swimming pool, picnic areas and an access to the Donut Hole Trail. Plantings of larch (*Larix sp.*) white pine, and Norway spruce (*Picea abies*) border the park roads, camp ground and picnic areas. Second growth mesic-dry forests of white ash (*Fraxinus americana*), shagbark hickory (*Carya ovata*), red, white and chestnut oak (*Quercus rubra, Q. alba, Q. prinus*), and sugar maple cover the section of park running up the slope. Under park protection, the pieces of second growth forest within its boundaries should mature and become good examples of mesic hardwood forest.

The **Clinton West Branch Cliffs BDAs #4 & #5** contain habitat occupied by the Allegheny woodrat (*Neotoma magister*), a Pennsylvania Threatened animal species. Please see the "Allegheny Woodrat Overview" (pg. 151) for information regarding the ecology and management needs of this species.

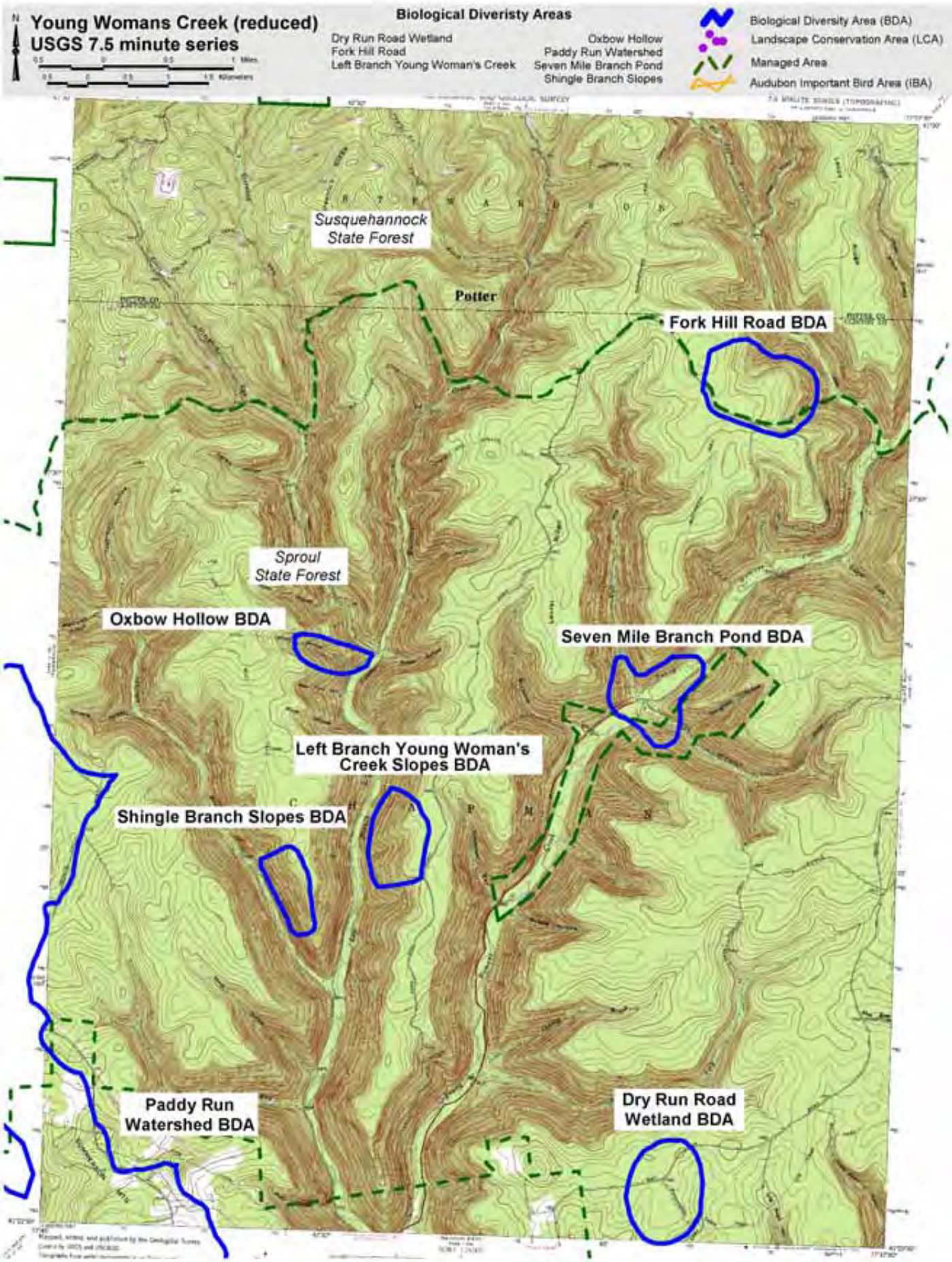
The **Renovo Slopes BDA** contains a forested slope supporting a biological resource of concern. Any direct disturbance within this area will likely impact this resource. Please contact Western Pennsylvania Conservancy for more information regarding this resource, or with any questions regarding the impact of potential activities in this area.

Just north of the town of Renovo, at the top the steep West Branch Valley slope, is a scenic overlook of the West Branch of the Susquehanna River (Renovo Overlook) recognized by Geyer and Bolles (1979, 1987) as an outstanding geological feature in Pennsylvania. The road to this point reveals exposures of sandstone, shale and conglomerate of the Catskill Formation, deposited during the Devonian age.

USGS QUADRANGLE **YOUNG WOMAN'S CREEK**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
SEVENMILE BRANCH POND BDA		*High Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	6/92
FORK HILL ROAD BDA		*High Significance*			
Hemlock (white pine) northern hardwood forest community	G?	S5	N	N	8/92
Great blue heron rookery (*Ardea herodias*)	G5	S3	N	N	1991
DRY RUN ROAD WETLAND BDA		*Notable Significance*			
Herbaceous vernal pool community	G?	S3S4	N	N	8/92
PADDY RUN WATERSHED BDA		*Notable Significance*			
High-gradient stream	G?	S3	N	PA Exceptional Value	6/92
Highbush blueberry – meadowsweet wetland community	G?	S5	N	N	6/92
SHINGLE BRANCH SLOPES BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001
LEFT BRANCH YOUNG WOMAN'S CREEK SLOPES BDA				*Notable Significance*	
Biological resource of concern	G4	S3S4	N	PR	2001
OXBOW HOLLOW BDA		*Notable Significance*			
Biological resource of concern	G4	S3S4	N	PR	2001

MANAGED LANDS: Sproul State Forest
Susquehannock State Forest


Young Womans Creek (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Dry Run Road Wetland
Fork Hill Road
Left Branch Young Woman's Creek
Oxbow Hollow
Paddy Run Watershed
Seven Mile Branch Pond
Shingle Branch Slopes
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Susquehannock State Forest
Potter
Fork Hill Road BDA
Sproul State Forest
Oxbow Hollow BDA
Seven Mile Branch Pond BDA
Left Branch Young Woman's Creek Slopes BDA
Shingle Branch Slopes BDA
Paddy Run Watershed BDA
Dry Run Road Wetland BDA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

YOUNG WOMAN'S CREEK

Young Woman's Creek extends south from Potter County and its watershed covers the bulk of this quadrangle. The creek flows through a steep walled plateau valley and winds across often broad floodplain areas, many with signs of beaver activity. Roads parallel all the major branches of Young Woman's Creek except the Shingle Branch where the road ends about halfway up the stream at a camp. Several bridges allow stream crossings and numerous camps sit along both the right and left branches of the creek. Designated as High Quality waters by Pennsylvania Department of Environmental Protection, Bureau of Water Quality, the creek appears to be a prime candidate for Exceptional Value designation based upon the lack of industrial and commercial impacts in the watershed and the apparently natural character of the stream and surrounding terrestrial communities. Testing of the physical, chemical and biological quality of the stream and initiating the petitioning process for a water quality upgrade are recommended. Most of the creek and the watershed are on State Forest land, therefore, the kinds of activities that may take place within the watershed are limited. However, timber sales, road construction and wildlife management areas should be designed to avoid the steep slopes and minimize erosion within the watershed.

Contained within the Young Woman's Creek watershed are several sites of natural heritage significance: the Sevenmile Branch Pond BDA, the Fork Hill Road BDA, a piece of the **Paddy Run Watershed BDA** (discussed in the Renovo West quadrangle), and the Dry Run Road Wetland BDA.

The **Sevenmile Branch Pond BDA** lies at the confluence of Young Woman's Creek and the Sevenmile Branch and contains an herbaceous vernal pool community (previously listed as a Natural Pond following Smith 1991), probably formed by beaver activity. Although not active recently, the grass-covered humps of the old beaver dams are scattered through the area. A colony of watershield (*Brassenia schreberii*) grows in the pond and numerous grasses, sedges and rushes grow around the perimeter. A cabin sits just to the south and sections of the wetland and forest bordering the camp have been maintained as open lawn/meadow. Plantings of white spruce (*Picea glauca*), larch (*Larix sp.*) and thickets of Japanese barberry (*Berberis thunbergii*) surround the cabin. Minimal management or disturbance should occur within the Sevenmile Branch Pond BDA. The activities associated with the camp within the BDA should be confined to the areas immediately adjacent to the cabin. Clearing or cutting for landscaping or wildlife management purposes should not occur within the BDA and road maintenance should be restricted to the minimum level necessary to allow passage along the Right Branch of Young Woman's Creek Road. Left alone, a mostly forested community will likely develop on the damp, alluvial soils.

On the ridge between Bull Run and the right branch of Young Woman's Creek is the **Fork Hill Road BDA**. This site includes a patch of hemlock (white pine) – northern hardwood forest community (previously listed as Northern Hardwood-Conifer Forest following Smith 1991) containing large, old eastern hemlocks (*Tsuga canadensis*) and beech (*Fagus grandifolia*). A number of large beeches were blown down by a storm sometime in the last three or four years and lay decaying on the forest floor. Just within the Susquehannock State Forest, this is one of the best examples of this forest type within Clinton County and is also a nest site for a colony of great blue herons, an animal species of special concern in Pennsylvania. To protect the herons and the older forest, no logging, wildlife management, or timber salvage should occur on this site and minimal activity on the north side of Fork Hill Road, east of the Rattlesnake Trail, is recommended, especially during the spring months.

The **Dry Run Road Wetland BDA** contains a small wetland that sits to the south of Dry Run Road. This herbaceous vernal pond community (previously listed as a Fluctuating Natural Pool following Smith 1991) supports several species of sedge (*Carex spp.*) and deserves recognition because of the diversity it lends to the surrounding dry oak forest and the possibility of its supporting a plant of special concern. This site needs to be further investigated and should be given at least the standard Bureau of Forestry two chain (132 feet) buffer for protection from timber harvests or other state forest related activities.

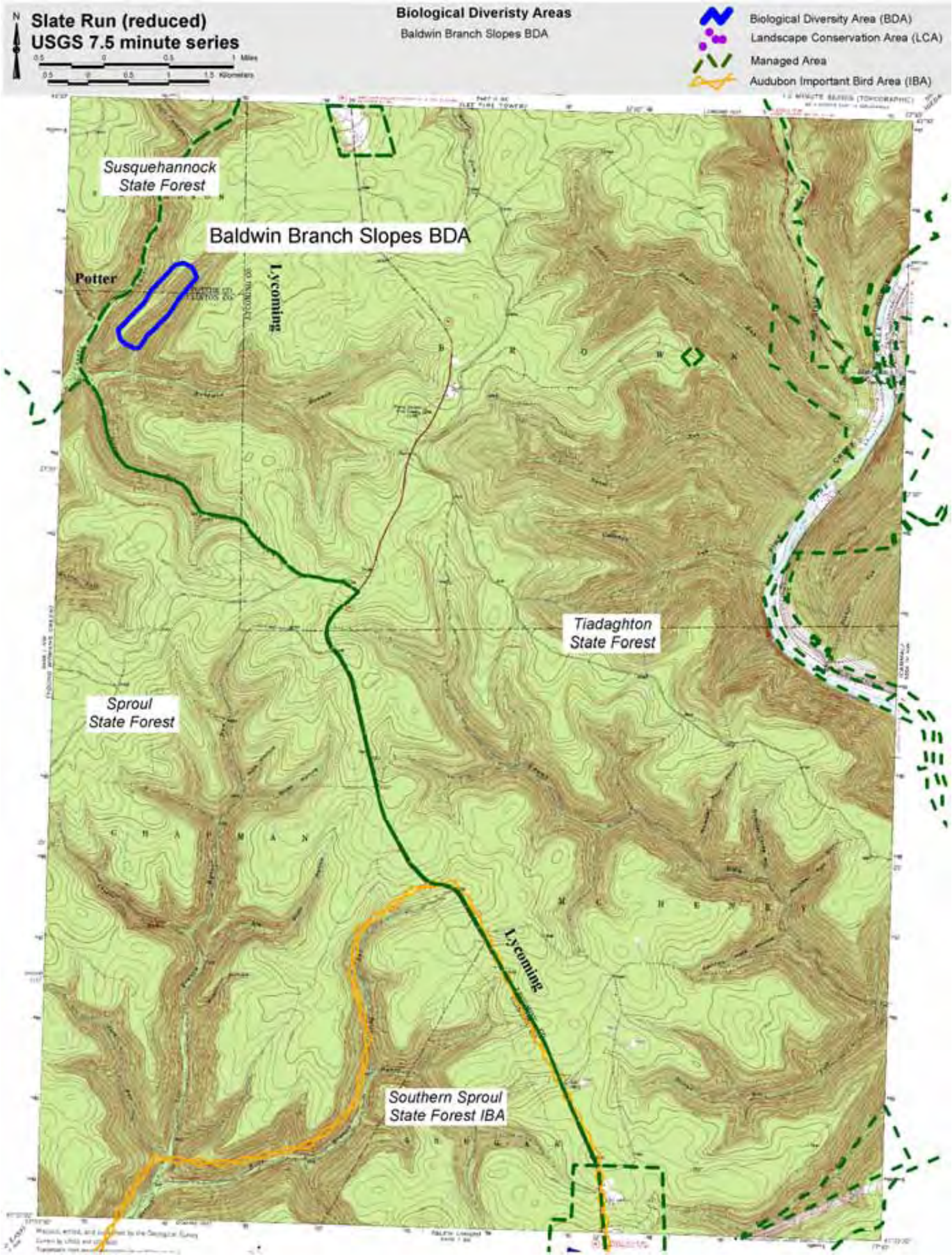
The **Shingle Branch Slopes, Left Branch Young Woman's Creek Slopes** and **Oxbow Hollow BDAs** are forested slopes that support a biological resource of concern. Any direct disturbance within this area will likely impact this resource. Please contact Western Pennsylvania Conservancy for more information regarding this resource, or with any questions regarding the impact of potential activities in these areas.

USGS QUADRANGLE **SLATE RUN**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
BALDWIN BRANCH SLOPES BDA	*Notable Significance*				
Biological resource of concern	G4	S3S4	N	PR	2001

MANAGED LANDS: Sproul State Forest

Susquehannock State Forest


Slate Run (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Baldwin Branch Slopes BDA
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Susquehannock State Forest
Baldwin Branch Slopes BDA
Potter
Lycoming
Tiadaghton State Forest
Sproul State Forest
Lycoming
Southern Sproul State Forest IBA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

SLATE RUN

The Slate Run quadrangle covers the Northeastern corner of Clinton County where the headwaters of the Left Branch of Hyner Run form and Young Woman's Creek crosses into the county from Lycoming and Potter Counties. This quadrangle is covered largely by the Sproul and Susquehannock State Forests, and also contains one Natural Heritage Area.

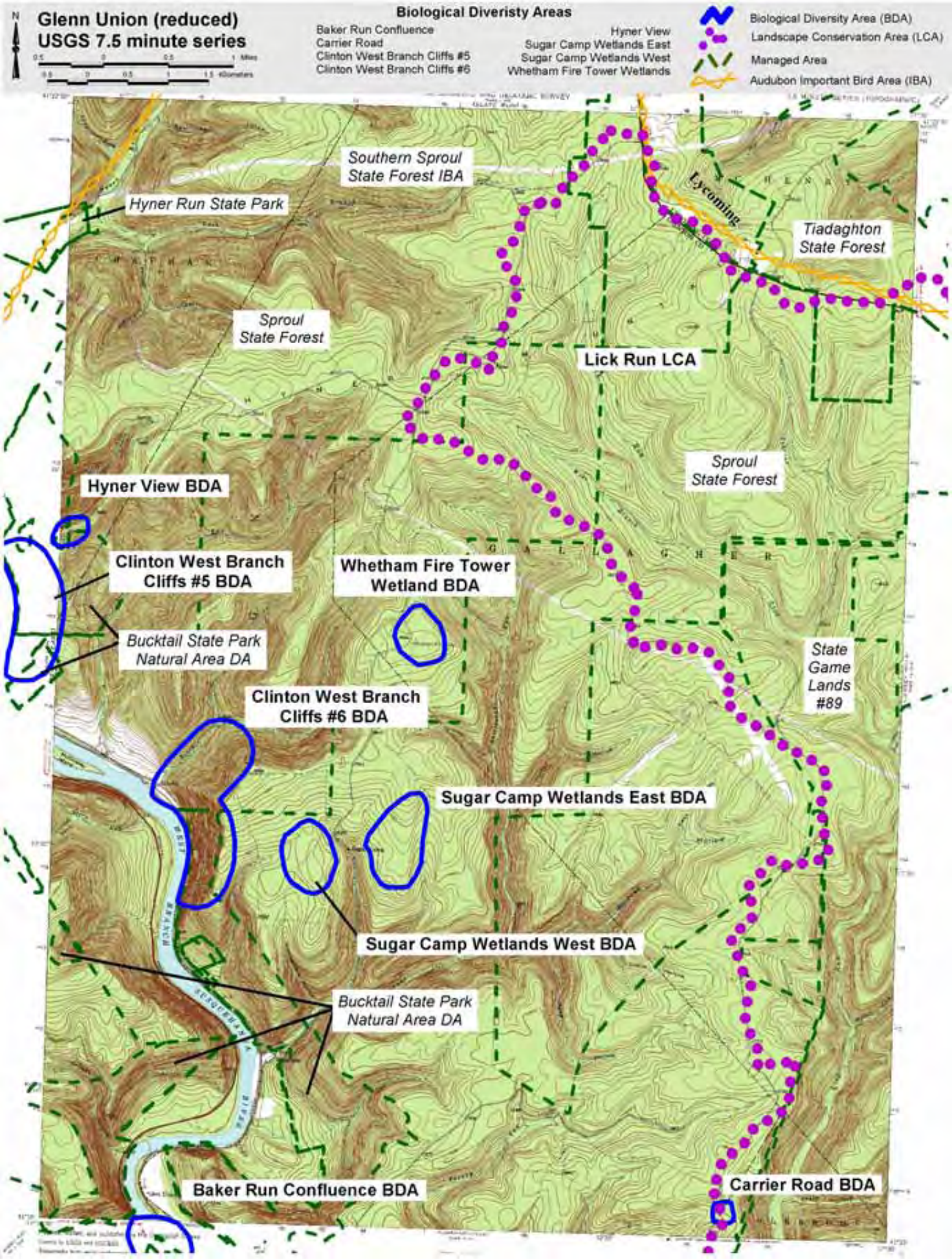
The **Baldwin Branch Slopes BDA** contains a forested slope supporting a biological resource of concern. Any direct disturbance within this area will likely impact this resource. Please contact Western Pennsylvania Conservancy for more information regarding this resource, or with any questions regarding the impact of potential activities in this area.

USGS QUADRANGLE **GLEN UNION**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
LICK RUN WATERSHED LCA		*High Significance*			
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	10/92
SUGAR CAMP WETLANDS BDA		*Exceptional Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	9/92
Northeastern bulrush (*Scirpus ancistrochaetus*)	G3	S3	N	PT	9/92
WHETHAM FIRE TOWER WETLAND BDA		*Exceptional Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	9/92
Northeastern bulrush (*Scirpus ancistrochaetus*)	G3	S3	N	PT	9/92
HYNER VIEW BDA		*Exceptional Significance*			
Cranesbill (*Geranium bicknellii*)	G5	S1	N	TU	6/92
CARRIER ROAD BDA		*Exceptional Significance*			
Lupine (*Lupinus perennis*)	G5	S3	N	PR	5/95
BUCKTAIL STATE PARK NATURAL AREA DA		*Exceptional Significance*			

MANAGED LANDS: Sproul State Forest
Susquehannock State Forest
State Game Lands #89
Bucktail State Park Natural Area
Hyner View State Park

GEOLOGIC FEATURES/FOSSIL LOCALITIES: Hyner View


Glenn Union (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Baker Run Confluence
Carrier Road
Clinton West Branch Cliffs #5
Clinton West Branch Cliffs #6
Hyner View
Sugar Camp Wetlands East
Sugar Camp Wetlands West
Whetham Fire Tower Wetlands
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Southern Sproul State Forest IBA
Hyner Run State Park
Tiadaghton State Forest
Sproul State Forest
Lick Run LCA
Sproul State Forest
Hyner View BDA
Clinton West Branch Cliffs #5 BDA
Whetham Fire Tower Wetland BDA
Bucktail State Park Natural Area DA
State Game Lands #89
Clinton West Branch Cliffs #6 BDA
Sugar Camp Wetlands East BDA
Sugar Camp Wetlands West BDA
Bucktail State Park Natural Area DA
Baker Run Confluence BDA
Carrier Road BDA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

GLEN UNION

The West Branch of the Susquehanna River cuts through the southwestern edge of this quadrangle, and Lick Run, discussed in the Farrandsville quadrangle, continues north from Farrandsville along the eastern border of the quadrangle, within the **Lick Run Watershed LCA**. The majority of the Glen Union quadrangle is within the Sproul State Forest, but large sections are in private ownership. Included in this quadrangle is a section of the **Bucktail State Park Natural Area DA** (described in the Sinnemahoning quadrangle), Hyner View State Park, and four locations for species of special concern in Pennsylvania.

Two wetlands sit above the lower part of Sugar Camp Road north of and above Rattlesnake Run; Sugar Camp Wetlands (east) and Sugar Camp Wetlands (west). Considered together as the focus of **Sugar Camp Wetlands BDA**, these wetlands are small, herbaceous vernal pond communities (previously listed as Fluctuating Natural Pools following Smith 1991) that support the Northeastern bulrush (*Scirpus ancistrochaetus*)—a plant of special concern in Pennsylvania— along with various aquatic and wet-site sedges, rushes and grasses. Both of these sites are recently undisturbed, although the western site, Sugar Camp Wetlands (west), includes a jeep trail and areas that have been impacted from off road travel. Situated within a dry, oak forest on Sproul State Forest land, these wetlands receive water from surface drainage and precipitation. The populations of the Northeastern bulrush would be sensitive to any changes in hydrology associated with road maintenance and drain construction or with timber harvest operations. It is recommended that no timber management activities take place within the Sugar Camp BDAs and that existing roads be maintained with the wetlands and their watersheds in mind.

Moving north along Sugar Camp Road, the site of the old Whetham fire tower is marked by the CCC cabin that served as its headquarters. Near to this area sits another small herbaceous vernal pond community (previously listed as a Fluctuating Natural Pool following Smith 1991) inhabited by the Northeastern bulrush. Similar to the Sugar Camp Wetlands BDA, the **Whetham Fire Tower Wetland BDA** is, however, on private land that has recently been selectively logged. The effect of this disturbance on the wetland and the Northeastern Bulrush population is not known, but the increased light from the open canopy has encouraged a dense growth of huckleberry (*Gaylussacia baccata*) and mountain laurel (*Kalmia latifolia*). Because of its topographic position, this wetland likely depends heavily upon precipitation for moisture and the increased evaporation allowed by the open canopy could lead to more extended dry periods. The owners of the Whetham fire tower BDA should be contacted and alerted as to the significance of this wetland. All remaining trees, snags and debris should be allowed to remain within the site and care should be taken to avoid the site if more logging and skidding is done in the area.

Hyner View State Park sits atop Hyner Mountain and affords one of the most spectacular views of the West Branch Valley on the whole plateau. The park contains a picnic area and parking area and is mostly wooded except for the lookout area on its southern side. This area is periodically cleared to maintain an unobstructed view and to provide a take-off point for hang gliders. This small mountain top park is part of the **Hyner View BDA** and the home of a population of cranesbill (*Geranium bicknellii*), an endangered plant in Pennsylvania. Historically dependent on the natural openings in the forest created by fire and windthrow, this plant has found suitable habitat within the developed sections

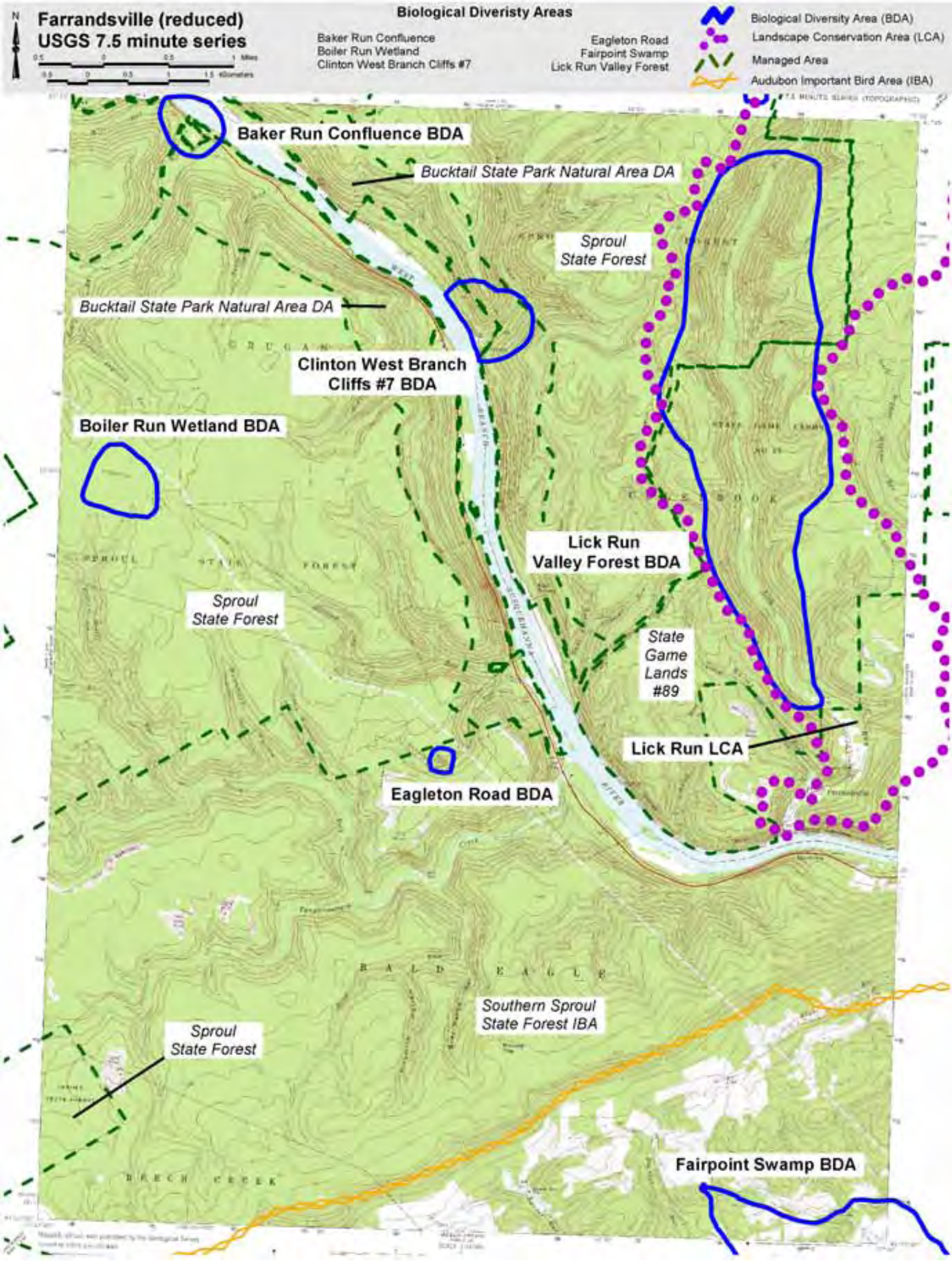
of the park. Further surveys within and adjacent to the park are recommended as is monitoring of the known populations of the plant. The Bureau of State Parks and the Western PA Conservancy should work together to assure that proper management practices take place at Hyner View, and that the necessary habitat for this special plant is maintained.

The **Carrier Road BDA** contains a population of wild lupine (*Lupinus perennis*) a Pennsylvania Rare plant. This plant requires open conditions; the natural settings it inhabits in Pennsylvania are steep, naturally open cliffs, or areas that have recently experienced fire or rockslides. It is also found in roadside areas, where mowing or other mechanical maintenance practices may provide the disturbance necessary to create suitable habitat for lupine. The greatest threat the plant may face in this area is the regrowth of woody species in such density as to shade the lupine plants. Periodic mowing or other methods of controlling woody regrowth may help the lupine population to persist over time.

USGS QUADRANGLE **FARRANDSVILLE**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
BAKER RUN CONFLUENCE BDA		*High Significance*			
Riverside ice scour community	G?	S1S2	N	N	9/92
LICK RUN WATERSHED LCA		*High Significance*			
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	10/92
LICK RUN VALLEY FOREST BDA					
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	10/92
Tulip tree – beech – maple forest community	G?	S4	N	N	10/92
BOILER RUN WETLAND BDA		*Notable Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	9/92
BUCKTAIL STATE PARK NATURAL AREA DA		*Exceptional Significance*			
EAGLETON ROAD BDA		*Exceptional Significance*			
Lupine (*Lupinus perennis*)	G5	S3	N	PR	6/93
CLINTON WEST BRANCH CLIFFS #7		*High Significance*			
Allegheny woodrat (*Neotoma magister*)	G3G4	S3	N	PT	12/98

MANAGED LANDS: Sproul State Forest
State Game Lands #89
Bucktail State Park Natural Area


Farrandsville (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Baker Run Confluence
Boiler Run Wetland
Clinton West Branch Cliffs #7
Eagleton Road
Fairpoint Swamp
Lick Run Valley Forest
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Baker Run Confluence BDA
Bucktail State Park Natural Area DA
Sproul State Forest
Bucktail State Park Natural Area DA
Clinton West Branch Cliffs #7 BDA
Boiler Run Wetland BDA
Lick Run Valley Forest BDA
Sproul State Forest
State Game Lands #89
Lick Run LCA
Eagleton Road BDA
Southern Sproul State Forest IBA
Sproul State Forest
Fairpoint Swamp BDA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

FARRANDSVILLE

The West Branch of the Susquehanna River cuts through the Farrandsville quadrangle from northwest to southeast and a combination of the Sproul State Forest and State Game Lands #89 dominate the northern section of the quadrangle. A section of the **Bucktail State Park Natural Area DA** (described in the Sinnemahoning quadrangle), an Exceptional Value stream, a natural pool and a riverside outcrop community are also included in the Farrandsville quadrangle.

The **Baker Run Confluence BDA** sits at the mouth of Baker Run where it meets the West Branch in the northwest corner of the quadrangle. Deposits of gravel at the mouth of Baker Run and large shelves of sandstone just upstream along the West Branch are historic sites for several species of concern in Pennsylvania, and are unique communities in their own right. Known as a riverside ice scour community (previously listed as a River Outcrop Community following Smith 1991), these exposed rock habitats are occasionally inundated, but are normally above river level and quite dry. The vegetation growing here must be able to grow on scant substrate between the cracks and crevices in the rock and be able to tolerate extremes of moisture. Willow (*Salix spp.*), royal fern (*Osmunda regalis*), and smartweed (*Polygonum spp.*) grow on the lower sections while grasses (*Andropogon gerardii* and *Panicum sp.*), dogbane (*Apocynum sibericum*), beggar ticks (*Bidens sp.*), and clumps of azalea (*Rhododendron sp.*) and winterberry (*Ilex verticillata*) grow among the rocks on the higher sections.

Paths into the area indicate at least moderate use, but little trash and trampling of surrounding vegetation suggest that activities are confined to viewing the river from the unvegetated rock faces. A thin strip of woodland separates the outcrop area from Route 120 and a number of larger trees were recently cut on the powerline ROW just east of the road. The small woodland serves as the only buffer between the road (and roadside weedy vegetation) and the outcrop community. Removal of trees and vegetation in this area is strongly discouraged. Trimming of ROW trees is sufficient to free the powerlines from encumbering branches without destroying the tree(s). Likewise spraying of herbicide along Route 120 or on the powerline ROW is not recommended adjacent to this site or along Baker Run where it crosses the road.

Lick Run meets the West Branch at the town of Farrandsville after draining a long, narrow watershed that extends to the county line at Route 44. Most of its watershed is within State Game Lands #89, although some portions are on private land and some are on state forest land. Lick Run is a High Gradient Clearwater Stream designated as Exceptional Value by Pennsylvania Department of Environmental Protection, Bureau of Water Quality. Lick Run is also designated as a Scenic River through the Department of Environmental Protection, Pennsylvania Scenic Rivers Program, and is the only waterway in Clinton County designated as such. The **Lick Run Watershed LCA** includes several important wetlands; one on the Campbell Branch and one on Staver Run. These will be discussed in the Jersey Mills quadrangle. The **Lick Run Valley Forest BDA** includes sections of second growth tulip tree – beech – maple forest (previously listed as Mesic Central Forest following Smith 1991), numerous wet backwater areas and several floodplain areas. Large eastern hemlock (*Tsuga canadensis*), tulip tree (*Liriodendron tulipifera*), beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*), with an understory and ground layers of spicebush (*Lindera benzoin*), rhododendron (*Rhododendron maximum*), bee balm (*Monarda diphylla*), New York fern (*Thelypteris noveboracensis*), and ostrich fern (*Matteuccia struthiopteris*), grow in the valley. The upper slopes

and plateau of the watershed are predominately dry, mixed oak (*Quercus spp.*) and birch (*Betula spp.*) forest.

The Hazard Road runs roughly along the watershed divide to the east and the Carrier Road runs along the western ridge for the entire length of Lick Run. Many wildlife plots sit along the roads within the game lands property. Two pipelines cross through the watershed and across the stream between Staver Run and Campbell Run. These openings and corridors in the watershed, although important for some wildlife, may serve as barriers for others and as pathways for invasion by opportunistic and exotic species. Of particular concern are the areas where the pipelines cross Lick Run or any of its tributaries. Because the protection of Lick Run requires that its watershed be protected, it is recommended that openings in the forest cover in the watershed be kept to a minimum and that the use of herbicides and heavy equipment on the pipeline ROW's be restricted, if this is not already being done. Local, native shrubs should be encouraged on the ROW's to reduce erosion and limit the spread of potentially invasive species.

At the headwaters section of Boiler Run sits an herbaceous vernal pond community (previously listed as a Permanent Natural Pool following Smith 1991) and a series of smaller wet areas draining from the pool. A good and undisturbed example of this kind of community in Clinton County, Boiler Run is recognized as a biodiversity area - **Boiler Run Wetland BDA**. Supporting a number of sedges (*Carex spp.*), bulrushes (*Scirpus spp.*) and grasses, this wetland complex is likely important to amphibian and invertebrate populations. Located within the Sproul State Forest, the Boiler Run Wetland BDA should be restricted from timber sales and spraying for gypsy moths. Apparently receiving much of its water from surface drainage to the north, the wetland could be impacted from water channeled across Eagleton Road. Maintenance of the road and construction of drainage channels should be planned to avoid changing the hydrology of the wetland.

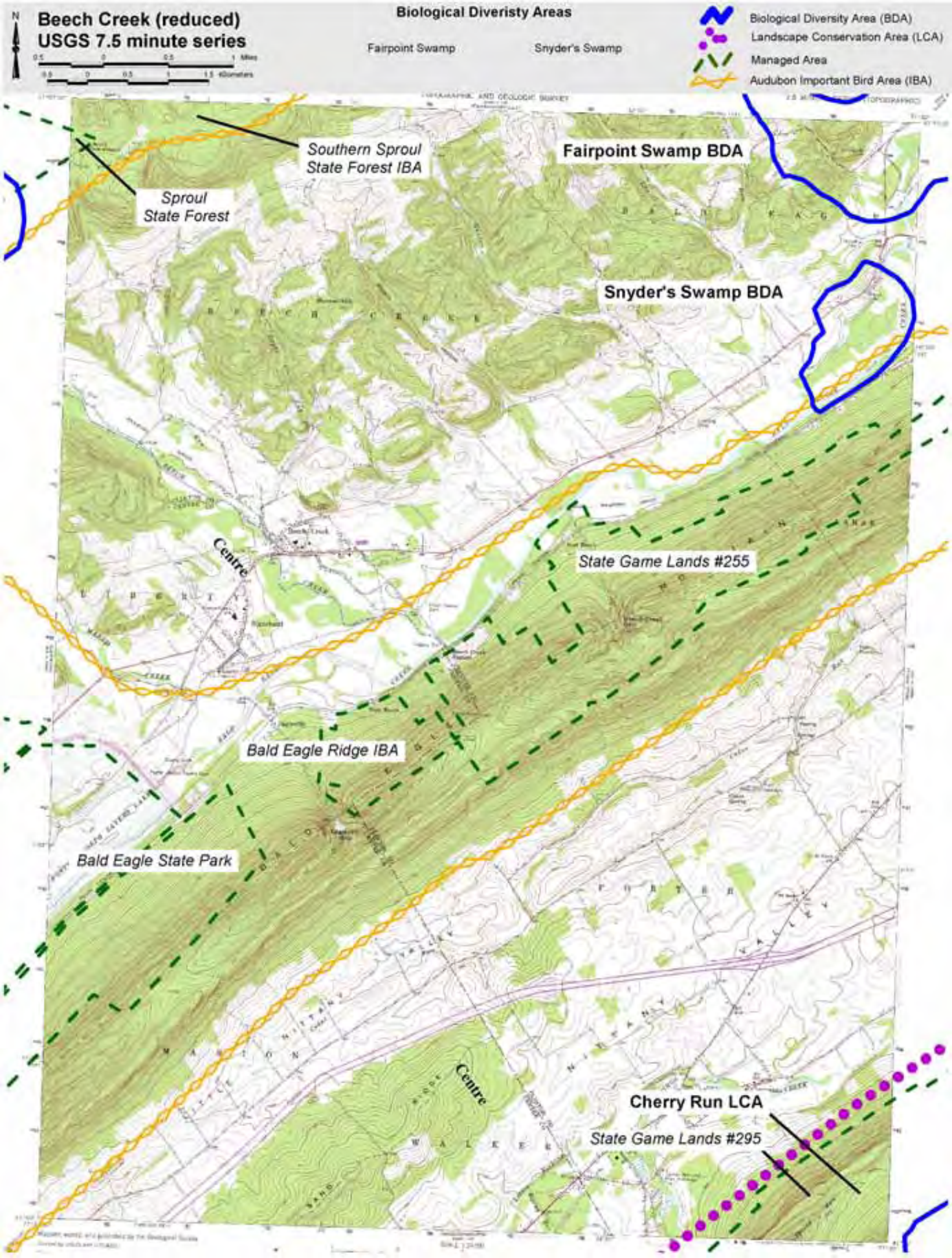
Eagleton Road BDA harbors a population of wild lupine (Lupinus perennis), a Pennsylvania Rare plant species.

The **Clinton West Branch Cliffs #7 BDA** contains habitat occupied by the Allegheny woodrat (*Neotoma magister*), a Pennsylvania Threatened animal species. Please see the "Allegheny Woodrat Overview" (pg. 151) for information regarding the ecology and management needs of this species.

USGS QUADRANGLE **BEECH CREEK**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
SNYDER'S SWAMP BDA		*High Significance*			
Cattail marsh community	G?	S5	N	N	9/92
FAIRPOINT SWAMP BDA		*Exceptional Significance*			
Water willow (*Decodon verticillatus*) shrub wetland community	G?	S3	N	N	9/92
Buttonbush wetland community	G?	S4	N	N	9/92

MANAGED LANDS: Sproul State Forest


Beech Creek (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Fairpoint Swamp
Snyder's Swamp
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Southern Sproul State Forest IBA
Sproul State Forest
Fairpoint Swamp BDA
Snyder's Swamp BDA
State Game Lands #255
Bald Eagle Ridge IBA
Bald Eagle State Park
Cherry Run LCA
State Game Lands #295
Centre
Centre

bold = mapped natural heritage areas
underline = PBS species/communities of concern

BEECH CREEK

Bald Eagle Creek flows through the Beech Creek quadrangle from northeast to southwest, marking the beginning of the Valley and Ridge Province to the south. Historically, numerous patches of extensive floodplain and floodplain swamp existed along the creek, but agriculture, flood control projects and a boat canal disrupted or destroyed most of these communities. However, several patches still exist and represent rare habitats and communities within Clinton County. Unlike many of the other quadrangles that make up Clinton County, Beech Creek contains only a very small portion of state forest (Sproul State Forest).

North of Bald Eagle Creek in Bald Eagle Township, lies a broad, wet area known as Snyder's Swamp. The construction of the Bald Eagle Canal in the late 1800's allowed much of this area to be drained and farmed. The fields within the swamp were abandoned in the 1930's and 40's and as the drainage channels filled with sediment and vegetation, the area began reverting to wetland. Much of the area now contains saturated soils and is recovering some of its character as a bottomland palustrine forest community. A section of cattail marsh community (previously listed as Robust Emergent Marsh following Smith 1991) with patches of cattail (*Typha latifolia*), swamp loosestrife (*Decodon verticillatus*), silky dogwood (*Cornus amomum*), and arrowhead (*Sagittaria latifolia*), is the least disturbed section of the swamp. Important as habitat for birds and amphibians, Snyder's Swamp is recognized as a biodiversity site - **Snyder's Swamp BDA**.

The threats to this site include adjacent residential development, dumping, exotic invasion - especially by multiflora rose (*Rosa multiflora*) and possible reestablishment of drainage ditches. It is recommended that no further alteration in the hydrology of this wetland occur and that (previous) agricultural drainage channels be allowed to fill with sediment and soil naturally and permanently. Dumping of automobile tires and parts, building materials and garbage should be strongly discouraged as should removal of saplings or mature trees on the site.

Just north of Snyder's Swamp along the Bald Eagle Creek is another large wetland complex designated as **Fairpoint Swamp BDA**. This historically extensive wetland has been partitioned by agricultural fields, roads, and summer and permanent residences. However, good examples of water willow (*Decodon verticillatus*) shrub wetland (previously listed as Robust Emergent Marsh following Smith 1991) and buttonbush wetland communities (previously listed as Circumneutral Shrub Swamp following) still exist in this area. The largest sections of shrub swamp exist in depressions that are the old oxbow lakes of Bald Eagle Creek. These swamps are dominated by buttonbush (*Cephalanthus occidentalis*) and contain sweet flag (*Acorus calamus*), bur-reed (*Sparganium sp.*) and numerous sedges (*Carex spp.*) and grasses. A large emergent marsh dominated by cow lily (*Nuphar luteum*) and swamp loosestrife, sits directly adjacent to the creek and continually exchanges water with the creek.

As mentioned, this area has been highly fragmented and threats from agricultural use continue. Unfortunately, even periodic opening of the drainage channels can substantially impact the communities present on the site. Use of herbicides, pesticides and fertilizers may also impact these communities. It is recommended that all land not currently farmed be left as buffer or reversion area, and that no further hydrological alteration be made to the site, including the maintenance of ditches and drains. Use of agricultural chemicals should be minimized and not used on the lower, or obviously wetter, sections of the site. Trees, shrubs and wetland vegetation should not be cut for any reason,

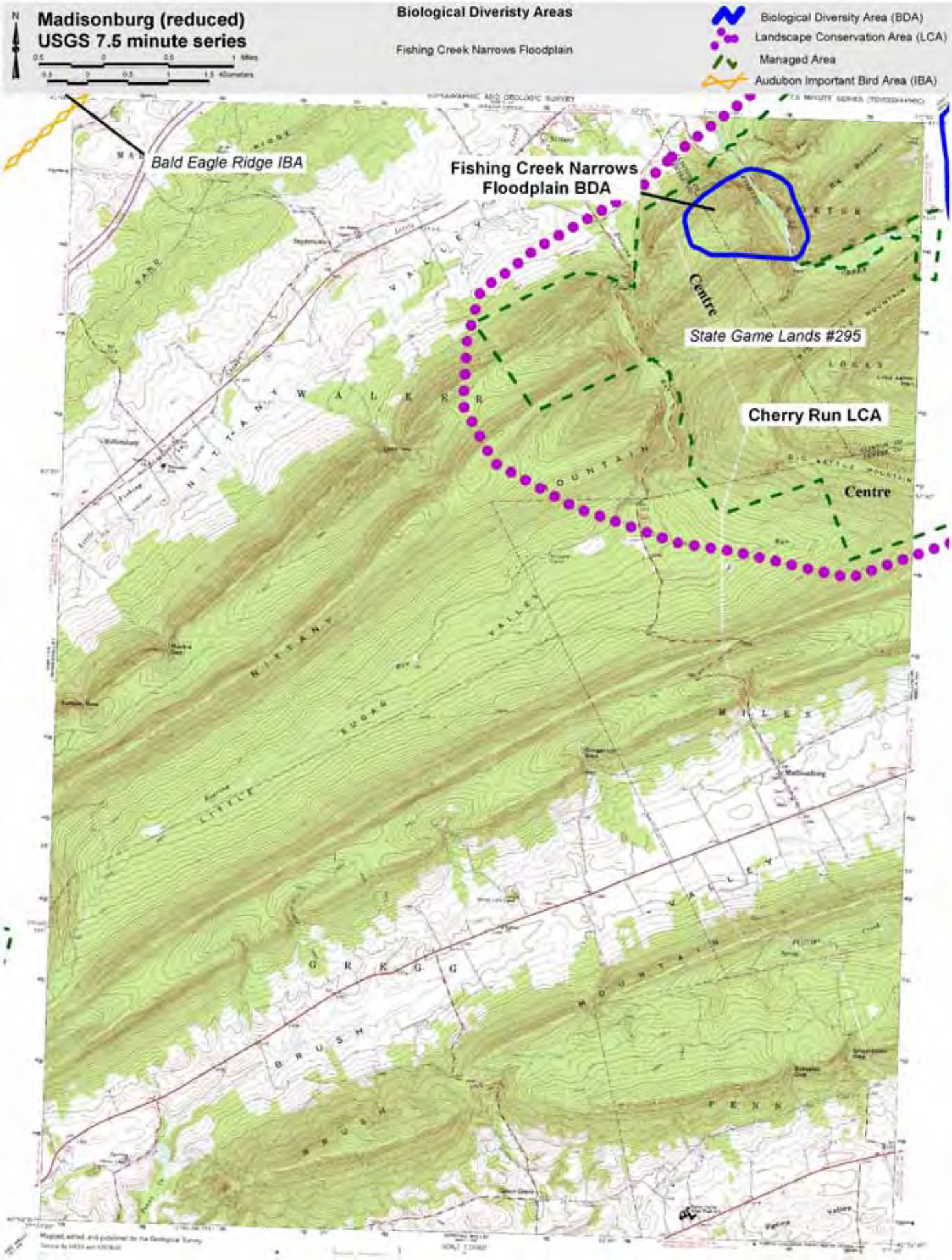
including waterfowl or wildlife management. Summer and permanent residences adjacent to the site should use a minimum of (lawn care) chemicals and avoid cutting or trimming of any areas but those already maintained as open.

USGS QUADRANGLE **MADISONBURG**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
FISHING CREEK NARROWS FLOODPLAIN BDA	*High Significance*				
Silver maple – black willow – box elder floodplain forest community	G?	S2	N	N	6/92
CHERRY RUN LCA	*Exceptional Significance*				

MANAGED LANDS: Bald Eagle State Forest

State Game Lands #295


Madisonburg (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Fishing Creek Narrows Floodplain
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Bald Eagle Ridge IBA
Fishing Creek Narrows
Floodplain BDA
State Game Lands #295
Cherry Run LCA
Centre
Centre
NITTANY VALLEY
NITTANY MOUNTAIN
WALKER
BRUSH
MILES
PENN

MADISONBURG

bold = mapped natural heritage areas
underline = PBS species/communities of concern

Clinton County covers only a small portion of the Madisonburg quadrangle, but this part of the county contains a section of floodplain forest along Fishing Creek, a section of gamelands #295 and part of the Cherry Run Landscape Conservation Area.

Near the border of Clinton and Centre Counties, Fishing Creek passes through a section of the Nittany Ridge known as the "Narrows". Within this steep sloped gap which links Sugar and Nittany Valley, Fishing Creek makes a sharp turn to the north and heads toward Lamar and Mill Hall. A railroad once ran through the Narrows and now Route 780 parallels Fishing Creek, crossing out of the Narrows into Nittany Valley just after Spring Run. Included in the **Fishing Creek Narrows Floodplain BDA**, the Narrows section of Fishing Creek holds the best undeveloped silver maple – black willow – box elder floodplain forest (previously listed as Floodplain Forest following Smith 1991) along the entire creek. Black Willow (*Salix nigra*), green ash (*Fraxinus pensylvanica*), red maple (*Acer rubrum*) and basswood (*Tilia americana*), furnish a partial canopy over the grass covered alluvial soils. Spicebush (*Lindera benzoin*) and speckled alder (*Alnus rugosa*) occupy some of the little islands and rock bars along the creek, and numerous grasses, sedges (*Carex spp.*) and herbs - meadow rue (*Thalictrum sp.*), forget-me-nots (*Myosotis scorpiodes*), stinging nettle (*Urtica dioica*) - grow on the banks and forested sections. The old rail-bed sits on the bottom of the south slope of the Narrows and evidence of pasturing on sections of the extended floodplain is present. This area is now part of the state gameland and is used primarily as a fly fishing zone and as an access to the gamelands extending west beyond the floodplain. It is recommended that this BDA be allowed to recover and that wildlife management activities be restricted, particularly clearing to create food plots or wildlife habitat.

The **Cherry Run LCA** encompasses the entire piece of Clinton County contained within the Madisonburg quadrangle. It is fully discussed in the Mill Hall quadrangle where the bulk of it lies. As conceptualized and drawn on the quadrangle map, the LCA includes all of the State Gamelands #295 and extends into Centre County, following closely the boundaries of the game lands. Extending the LCA into Centre County was not done to incorporate Natural Heritage areas within Centre County into the Cherry Valley LCA, but mainly to include a contiguous area with a high degree of protection in the LCA. Cases where individual sites in different counties are linked via an LCA or through another Natural Heritage designation will become more common as more counties are inventoried. Even without this kind of linkage, it is apparent that the Nittany Mountain ridgeline is important both in Clinton and in Centre Counties as a landscape level feature containing numerous significant natural communities (see Roaring Run Watershed in the Centre County Natural Heritage Report).

USGS QUADRANGLE **MILLHEIM**

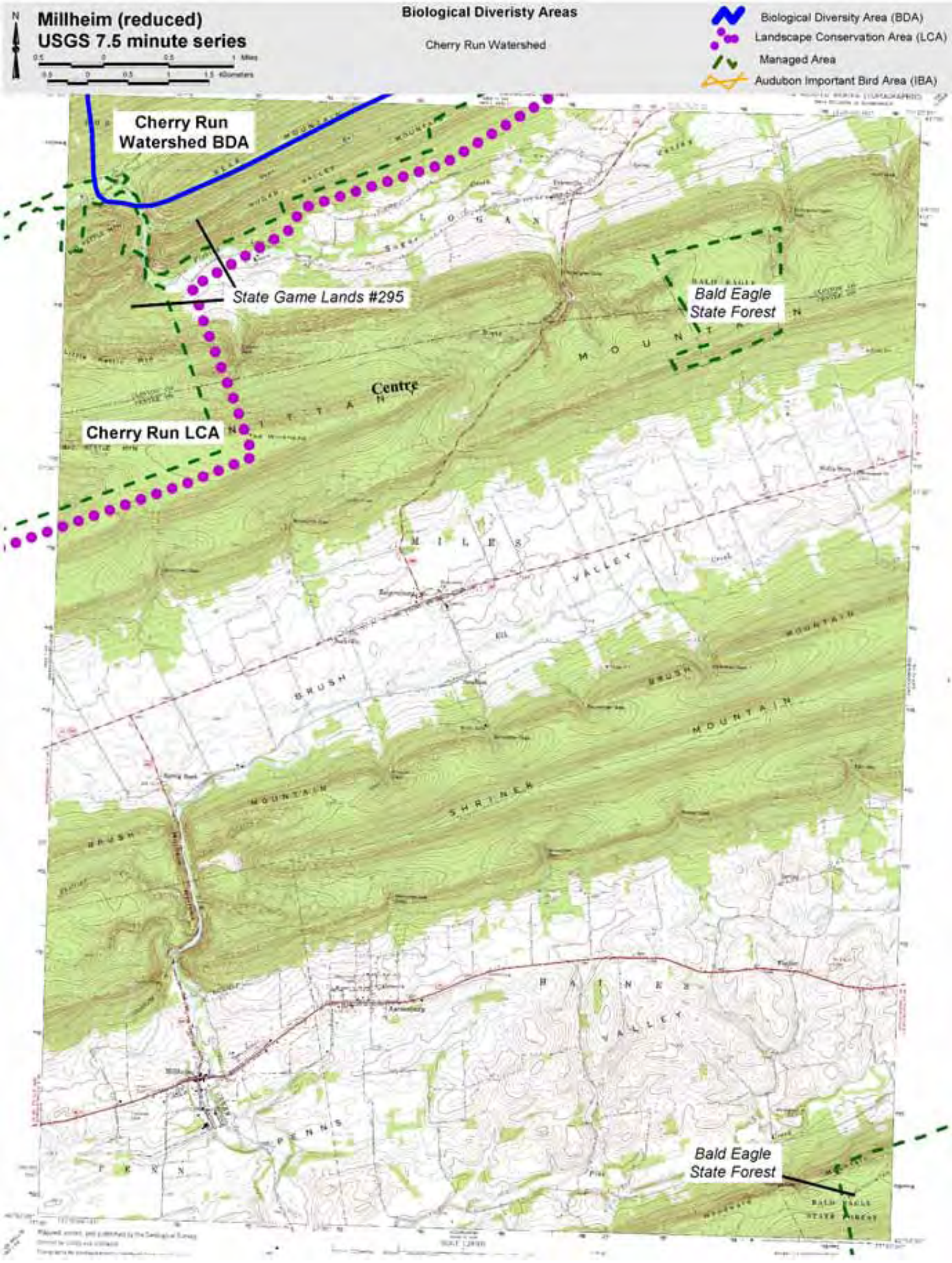
	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
CHERRY RUN LCA			*Exceptional Significance*		
CHERRY RUN WATERSHED BDA			*High Significance*		
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	8/92

MANAGED LANDS: Bald Eagle State Forest

State Game Lands #295

GEOLOGIC FEATURES/FOSSIL LOCALITIES: Tylersville Spring

Ruhl Springs


Millheim (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Cherry Run Watershed
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Cherry Run Watershed BDA
State Game Lands #295
Bald Eagle State Forest
Cherry Run LCA
Centre
Bald Eagle State Forest

MILLHEIM

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The western end of Sugar Valley and the bottom section of Fishing Creek Narrows cross into the Millheim quadrangle just north of the border of Clinton and Centre Counties. A small section of the Bald Eagle State Forest on Nittany Mountain straddles the county border and State Game Lands #295 extends into the quadrangle from the north. Cherry Run meets Fishing Creek in the Narrows on this quadrangle and the **Cherry Run LCA** encompasses a section of the **Cherry Run Watershed BDA** (discussed in the Mill Hall quadrangle), the Narrows and State Game Lands #295.

Cherry Run flows into Fishing Creek just north of Bear Run and forms a broad floodplain area. This section of floodplain is privately owned and numerous homes, mostly summer cottages, sit between Route 780 and the creek. Although a secluded area with a considerable number of trees, lawns and careful landscaping have displaced much of the natural community along this section of Fishing Creek.

Several springs in this part of Sugar Valley contribute over 50% of the total volume of water contained in Fishing Creek up to this point. The first spring, located just north of Tylersville, is known as simply Tylersville Spring. At 13,000 gallons per minute (gpm) of out flow, it is the 4th largest spring in Pennsylvania. The second spring is known as Ruhl Springs and is really two springs (Seven and Ruhl), very near to one another. Two miles west of Tylersville, Ruhl Springs is the second largest spring in the state with an outflow of 14,000 gpm. The Lamar Fish Hatchery uses water from this spring to supply their fish nurseries. Both of these springs are recognized as outstanding scenic geologic features in Pennsylvania by Geyer and Bolles (1979, 1987).

USGS QUADRANGLE **MILL HALL**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
BELLE SPRINGS WOODS BDA		*High Significance*			
Sugar maple – basswood forest community	G?	S4	N	N	8/92
STOLTZFUS OUTCROP BDA		*Exceptional Significance*			
Calcareous opening/cliff	G?	S2	N	N	8/92
CEDAR HILL CLIFFS BDA		*Exceptional Significance*			
Calcareous opening/cliff	G?	S2	N	N	10/92
CHERRY RUN LCA		*Exceptional Significance*			
FISHING CREEK BEND GAP BDA		*High Significance*			
Hemlock (white pine) – northern hardwoods forest community	G?	S5	N	N	9/92
MT. RIANSARES BDA		*Exceptional Significance*			
Hemlock (white pine) forest community	G?	S4	N	N	6/92
PEPPER RUN POOLS BDA		*Exceptional Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	7/92
Northeastern bulrush (*Scirpus ancistrochaetus*)	G3	S3	N	PT	7/95
CHERRY RUN WATERSHED BDA		*High Significance*			
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	8/92

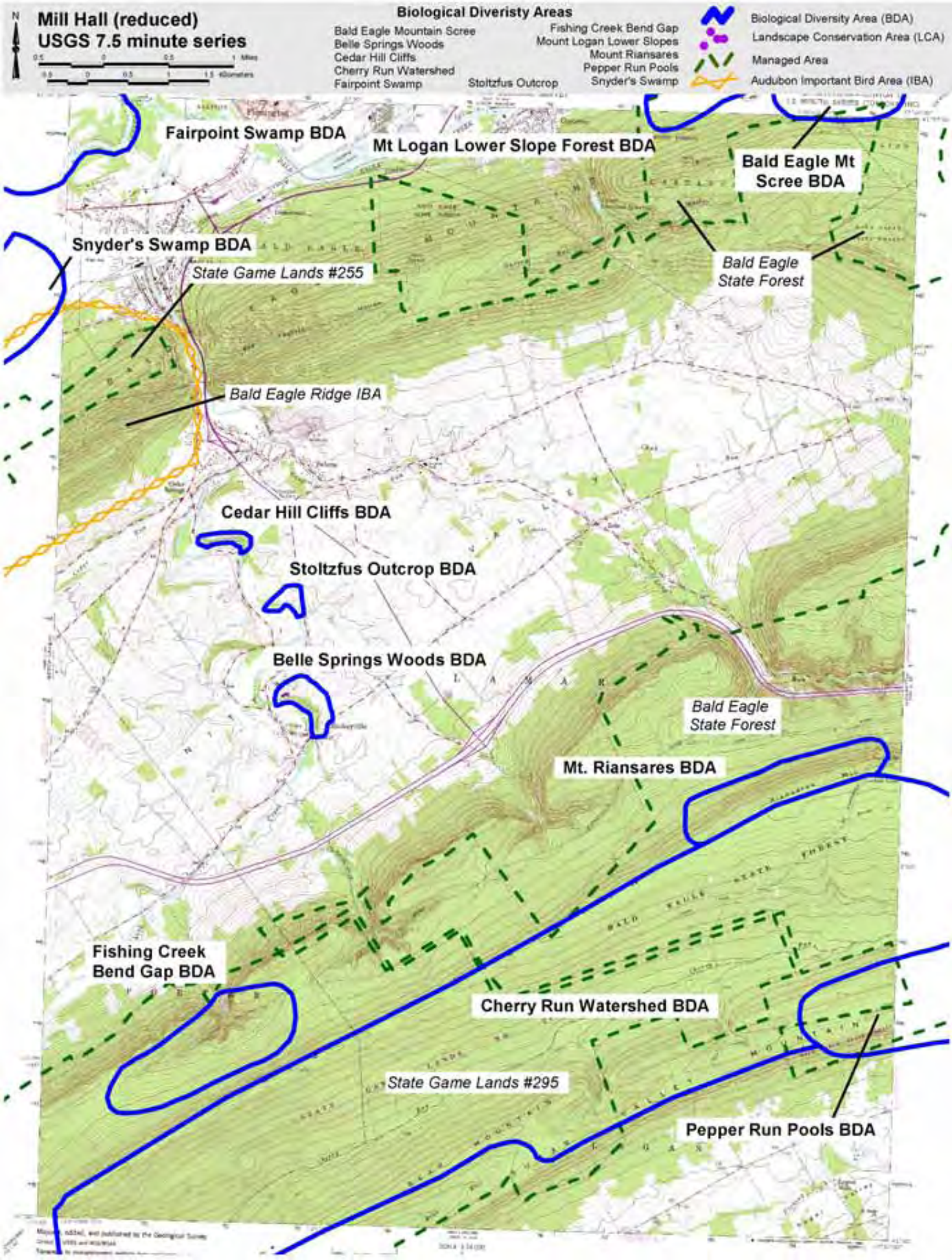
FAIRPOINT SWAMP BDA *Exceptional Significance*

Water willow (*Decodon verticillatus*) shrub wetland community	G?	S3	N	N	9/92
Buttonbush wetland community	G?	S4	N	N	9/92

MANAGED LANDS: Bald Eagle State Forest

GEOLOGIC FEATURES/FOSSIL LOCALITIES: Valley Diary Springs

Big Spring


Mill Hall (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Bald Eagle Mountain Scree
Belle Springs Woods
Cedar Hill Cliffs
Cherry Run Watershed
Fairpoint Swamp
Fishing Creek Bend Gap
Mount Logan Lower Slopes
Mount Riansares
Pepper Run Pools
Snyder's Swamp
Stoltzfus Outcrop
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Fairpoint Swamp BDA
Mt Logan Lower Slope Forest BDA
Bald Eagle Mt Scree BDA
Snyder's Swamp BDA
State Game Lands #255
Bald Eagle State Forest
Bald Eagle Ridge IBA
Cedar Hill Cliffs BDA
Stoltzfus Outcrop BDA
Belle Springs Woods BDA
Bald Eagle State Forest
Mt. Riansares BDA
Fishing Creek Bend Gap BDA
Cherry Run Watershed BDA
State Game Lands #295
Pepper Run Pools BDA

MILL HALL

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The Mill Hall quadrangle lies almost entirely within the Valley and Ridge Province and includes the eastern end of the Nittany Valley, part of the Bald Eagle Ridge, and the Big and Sugar Mountain sections of the Nittany Ridge. Several limestone based communities, an old growth hemlock forest, an Exceptional Value stream, a floodplain swamp, a large piece of the Cherry Run Landscape Conservation Area, and a section of the Bald Eagle State Forest are contained within the Mill Hall quadrangle.

Fishing Creek flows north through the limestone underlain Nittany Valley. In a number of places in the valley, especially along Fishing Creek, water has eroded and dissolved the soft limestone materials leaving steep slopes of exposed rock and neutral to alkaline soils. Solution cavities, caves and sink holes make these areas geologically unique and the habitats created make them potentially very interesting biological places. Communities associated with both limestone outcrops and limestone based soils often include many endemic species; species found nowhere else. Because valleys with well bufferred soils are prime agricultural areas, many of these unusual communities have been destroyed or degraded. What remains in the county and to a large extent, in the state, are rare and should be protected and allowed to recover.

At the village of Mackeyville, Fishing Creek makes a broad 180 degree turn. The **Belle Springs BDA** sits on the outside of this turn, between the creek and the Belle Springs Golf Course, and contains a wooded slope that is a good example of a sugar maple – basswood forest community (previously listed as Mesic Central Forest following Smith 1991)— the type of forest that once covered much of the Fishing Creek Valley. Dominated by white and red oak (*Quercus alba and Q. rubra*) and including sugar maple (*Acer saccharum*), basswood (*Tilia americana*), ash (*Fraxinus americana, F. pensylvanica*), and shagbark hickory (*Carya ovata*), this area also contains numerous smaller-growing trees like flowering dogwood (*Cornus florida*), hophornbeam (*Ostrya virginana*), and musclewood (*Carpinus caroliniana*), as well as a rich herbaceous layer of wild ginger (*Asarum canadense*), round-leaved hepatica (*Hepatica americana*), meadow rue (*Thalictrum sp.*), and wild geranium (*Geranium maculatum*). This site was once pastured as evidenced by scattered old fence posts, barbed wire strands embedded in older trees, and the large difference in age between the older and younger trees. The pasture bordered the top of the slope and therefore, the slopes have remained relatively undisturbed. Currently an extension of the golf course property, several trails run from the fairways through the upper section of the site, parallel to the slope. Apparently, these trails serve as both foot paths and equestrian trails. Threats to the site include encroachment of exotic vegetation - especially multiflora rose (*Rosa multiflora*), garlic mustard (*Alliaria petiolata*), and Japanese honeysuckle (*Lonicera japonica*); cutting and/or herbicide use associated with the golf course, and erosion precipitated by overuse of the trails, particularly by horses. This site is in the process of recovery and the existing overstory has help to discourage exotic/weedy species from establishing. Buffer between the site and the open edge is critical. Encouragement of existing trees along the edge and even the planting of appropriate native species near the edge is recommended. The Clinton County Recreational Authority, the owner of the site, should be alerted as to the presence of this significant site (Belle Springs BDA) and be advised of the above recommendations.

Just north of the Belle Springs BDA, Fishing Creek makes another 180 degree bend. The **Stoltzfus Outcrop BDA** includes the slope on the north side of the creek where an exposed wall of limestone extends from below creek level halfway up the slope. Growing on top of and between the rocks are numerous plant species including purple cliff brake fern (*Pellaea atropurpurea*), columbine (*Aquilegia canadensis*), maidenhair spleenwort (*Asplenium trichomanes*) and Schreberi's aster (*Aster schreberi*). On top of the outcrop, a narrow band of woodland with sugar maple, white ash, red oak and basswood separate the slope from the agricultural fields above. This community, called a calcareous opening/cliff community (previously listed as a Calcareous Riverside Outcrop following Smith 1991) is rare in Clinton County.

Also, just above the creek level, a gap in the rock face marks the opening to one of the largest caves in Clinton County. The cave, known by the name of its owner, J. H. Stoltzfus, is a solution cave that fills with ground water and surface water from the creek. According to the Nittany Grotto, several large rooms and a pool make this an interesting cave. The potential for subterranean natural communities exists and should be investigated.

The threats to the Stoltzfus BDA are those related to the small amount of buffer between the site and the open fields on top of the hill. Rocks, fence posts and cut branches have been pushed down the slope over the years and some erosion has occurred where the soil was disrupted. Dense poison ivy (*Toxicodendron radicans*) covers the field-woodland edge and non-native grasses and clovers grow on the upper slope in the more open spots. The potential for multiflora rose, garlic mustard, currant (*Ribes spp.*), and Japanese honeysuckle to invade is high, given their local abundance. Also, fertilizer, herbicide and insecticide runoff from the fields above could prove detrimental to both the plant and invertebrate populations on the site. The situation here is typical of many sites in the valley and requires that the landowner be at least aware of the resource, if not active in helping to preserve the site. A broader buffer and encouragement of tree seedlings and saplings within the BDA is recommended, and activities on the slope should be restricted (no cutting or pushing of debris over the slope).

Moving again north along Fishing Creek, a large limestone cliff sits between the creek and Cedar Hill Cemetery. This exposure is the largest surveyed in the county and is an excellent example of a calcareous opening/cliff community (previously listed as a Calcareous Cliff Community following Smith 1991). Designated as the **Cedar Hill Cliffs BDA**, many of the same plants found at the Stoltzfus BDA are found here - purple cliff brake, columbine, maidenhair spleenwort - plus others like walking fern (*Camptosorus rhizophyllus*), harebell (*Campanula rotundifolia*) and rock cress (*Arabis lyrata*). The cliff meets a slope of rock fragments with some soil and humus that in turn joins Fishing Creek. This slope of dense shrubs - bladdernut (*Staphylea trifolius*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy - and a partial canopy of eastern hemlock (*Tsuga canadensis*) and oak (*Quercus alba, Q. rubra*), extends and integrates the cliff community into its natural position along the creek. Above the cliff, a slope of mesic forest, much like that at the Stoltzfus Outcrop BDA, divides the cliff community from an agricultural field and Cedar Hill Cemetery. This site faces similar problems as the Stoltzfus BDA and most of the sites in the valley: inadequate buffer. Again, contact of the property owner and encouragement to limit activities and increase buffer via tree planting are recommended.

The large piece of the Nittany Ridge that runs across the Mill Hall quadrangle cradles Cherry Run between its Big and Sugar Mountain sections. Most of this ridge within Clinton County is part of state

gamelands #295 - an over 12,000 acre tract purchased by the Western PA Conservancy and later sold to the PA Game Commission. This ridge is a striking landscape feature being a continuous band of forest separating two highly agricultural valleys. As such, it serves as an important path for species movement and migration through the valley(s). Additionally, a number of significant natural communities lie within or adjacent to this ridgeline. As a way of denoting its importance at both the landscape and community levels, this inventory has designated a **Cherry Run Landscape Conservation Area (LCA)**. This area extends across the Beech Creek, Madisonburg, Mill Hall and Loganton quadrangles and includes all of gamelands #295 in both Clinton and Centre Counties, the Fishing Creek Narrows section of Fishing Creek (Madisonburg quadrangle), and the Pepper Run watershed west of Route 477.

Cherry Run LCA contains a variety of land-uses compatible with the ecological resources within. However, it is critical to LCAs in general and to this one in particular to avoid land-uses that will contribute to fragmentation. Activities occurring in the LCA should be carefully planned and monitored with this goal in mind. Construction of roads, utility ROW's and creek-side residences; damming of streams; logging and surface mining are among the land-uses not generally compatible with LCAs. Wildlife food plots, although beneficial to some species, are also sources of fragmentation in forest habitat. Likewise, timber sales may generate revenues and provide habitat for a limited number of species, but also significantly change the character of the forest and fragment the landscape.

Within the northern side of the Nittany Ridge (Big Mountain) are a number of gaps where the front ridgeline is open to the inner valley behind the next (southern) ridge. Small, very high quality streams flow through these gaps and cold air collects and drains from the higher elevations to the valley via the gaps. North-facing gaps are particularly unique, remaining moist and cool during even the warmest whether and furnishing an environment very different from the surrounding areas. Consequently, the communities they harbor can be equally unusual.

One gap along Big Mountain contains an exceptionally good example of a hemlock (white pine) – northern hardwood forest (previously listed as Northern Conifer Forest following Smith 1991) that is included in the **Fishing Creek Bend Gap BDA**. Dominated by eastern hemlock (Tsuga canadensis), this gap forest is different from both the dry-mesic acidic hardwood forests of mixed oak that cover most of the ridges and the mesic hardwood forests of white oak (*Quercus alba*), ash (*Fraxinus spp.*), black walnut (*Juglans nigra*) and basswood (*Tilia americana*) that once flourished in the valley. Still, numerous basswood, and occasional white ash (Fraxinus americana) show the affinity with the mesic valley communities. Also within the Fishing Creek Bend Gap BDA on the lower section of the gap, are several extensive scree slopes and their associated Boulder Field Communities. Although sparsely vegetated, mountain maple (*Acer spicatum*), chestnut oak (*Quercus prinus*) and weathered black birch (*Betula lenta*) grow among the rocks. Lichen, moss and common polypody fern (*Polypodium virginiana*) grow on the lower, moister sections of the slope and an occasional American yew (*Taxus canadensis*) grows along the outer edge of the forest.

The entire upper section of this gap is within State Game Lands #295 - the bottom section is on private land. Recent disturbances to the BDA have been few and both the boulder field and northern conifer communities are well on their way to maturity. This area is used primarily for hunting and footpaths run up each arm of the gap to the gameland access road on top of the ridge. This road poses some concern to the protection of the site given that it runs through the watershed of the gap and is wide and

well maintained. Activities along this road should be kept to a minimum and plantings of non-native trees, creation of wildlife management plots or cutting of trees bordering the road are not recommended.

East of Fishing Creek Bend Gap BDA is a section of Big Mountain known as Mt. Riansares. This peak was once the location of a fire lookout tower that was recently removed but is still marked by a stone cabin adjacent to its cement footings. The **Mt. Riansares BDA** extends along the north slope of Mt. Riansares over extremely steep, rocky and rugged terrain, and holds patches of scree slope and eastern hemlock forest. A hemlock (white pine) forest community (previously listed as Northern Conifer Forest following Smith 1991), dominated by old-growth eastern hemlock, grows on a section of this slope. Mixed with black birch, some red oak and an occasional white pine (*Pinus strobus*), the old hemlocks show the scruffy topped forms characteristic of trees that have survived winds, storms and nearby blow downs often with the loss of a top or major branches. The dense hemlock canopy helps to maintain moisture on the dry slopes and a rich cover of lichens, mosses and ferns flourish among the rocks and rubble. Because of the difficult access and steep slope, this forest community may never have been logged or significantly disturbed. Threats to this site appear minimal with the greatest concern being the sometimes heavy use and traffic around the fire lookout/cabin area. Moderate use of these slopes for hunting or hiking could lead to erosion and set back the slow growing and colonizing community. If signs of substantial use are noted in the future, the Bureau of Forestry should take steps to discourage activities within the Mt. Riansares BDA.

Continuing east along Big Mountain and through the Cherry Run LCA, Pepper Run drains the southeastern section of the ridge. Its headwaters are shared between the Mill Hall and Loganton quadrangles. Within this relatively level area, a number of herbaceous vernal pond communities (previously listed as Natural Pools following Smith 1991) support a variety of grasses, sedges (*Carex spp.*), bulrushes (*Scirpus spp.*), some winterberry (*Ilex verticillata*), and a plant of special concern, the Northeastern bulrush (*Scirpus ancistrochaetus*). Largely within a private inholding within State Forest land, protecting the **Pepper Run Pools BDA** means protecting the watershed of the Pepper Run headwaters. Deriving most of its water from the steep slopes to the north and south, this site is likely very sensitive to changes in the character of the forest on and drainage from the slopes of Sugar Mountain and Big Mountain. Of immediate concern for this site is a camp, Fern Lodge, that sits within the BDA. A large expanse of lawn and cleared ground separate the wetlands and stream from sections of the forested watershed to the north. Activities associated with the camp, including trash dumping, have impacted a pool containing the Northeastern bulrush. It is strongly recommended that activities associated with the lodge be limited to the areas immediately surrounding the buildings and that at least a 100 foot no disturbance buffer be observed for the pool nearest the cabin. Activities within the Pepper Run BDA should be restricted to passive use of the area (hunting, hiking, cabin use) and timber sales or clearing of areas for wildlife habitat or general camp use should not occur. Also, maintenance activities on Pepper Run Road, although not a problem now, should be sensitive to the wetlands to the north and should avoid ditching or manipulation that could effect the hydrology of the stream and wetlands.

Cherry Run flows the entire length of the Big Mountain portion of the Nittany ridgeline. This High Gradient Clearwater stream is designated as Exceptional Value waters by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality and as a special management area by the PA Game Commission. The **Cherry Run Watershed BDA** includes this stream and watershed and is

contained in the Cherry Run LCA. This stream contains native brook trout (*Salvelinus fontinalis*) populations and flows through a forested valley recovering from logging that continued until very recently. Dry, rocky slopes of mixed oak, black and yellow birch (*Betula lenta* and *B. alleghaniensis*) and mountain laurel (*Kalmia latifolia*) transform to a birch, mixed hardwood forest with a subcanopy of eastern hemlock. Dense thickets of rhododendron (*Rhododendron maximum*) and large tulip trees (*Liriodendron tulipifera*) grow in various spots along the stream. An old railbed/logging road runs along the slope on the south side of the stream and is now used for hunting and hiking access and for horseback riding. Sections of this trail are muddy and badly eroded, even though some efforts have been made to remedy the problem. As an EV stream watershed and as part of the Cherry Run LCA, activities within Cherry Run Watershed BDA should be limited and should not contribute to exotic invasion or fragmentation. Establishment of wildlife food plots that require cutting within the watershed is not recommended. Timber sales are also discouraged within the Cherry Run watershed.

In the northwestern corner of the Mill Hall quadrangle sits the eastern section of the **Fairpoint Swamp BDA** containing a water willow (*Decodon verticillatus*) shrub wetland community (previously listed as Robust Emergent Marsh following Smith 1991) and a buttonbush wetland community (previously listed as Circumneutral Shrub Swamp following Smith 1991). This site is discussed in detail in the Beech Creek quadrangle.

Just off of Trout Run Road north of Mackeyville is an outstanding scenic geologic feature in Pennsylvania known as Valley Diary Springs. Developed for agricultural purposes before the turn of the century, it is considered a large spring in PA, furnishing a volume of about 4000 gallons per minute (gpm) to Fishing Creek. Also, north of Valley Diary Spring, near the town of Salona, is another spring known as Big Spring that issues in excess of 5000 gpm of water to Fishing Creek. Originating from solution openings in the Ordivician dolomite, Big Springs is a large spring also recognized as an outstanding scenic geologic feature in Pennsylvania by Geyer and Bolles (1979, 1987).

USGS QUADRANGLE **LOCK HAVEN**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
BALD EAGLE MOUNTAIN SCREE BDA		*High Significance*			
Boulder Field Community	G?	S5	N	N	7/92
MT. LOGAN NATURAL AREA DA		*Exceptional Significance*			
Tulip tree – beech – maple forest community	G?	S4	N	N	7/92
Dry oak – heath forest community	G?	S4S5	N	N	7/92
FAIRPOINT SWAMP BDA		*Exceptional Significance*			
Water willow (*Decodon verticillatus*) shrub wetland community	G?	S3	N	N	9/92
Buttonbush wetland community	G?	S4	N	N	9/92
LICK RUN WATERSHED LCA		*High Significance*			
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	10/92

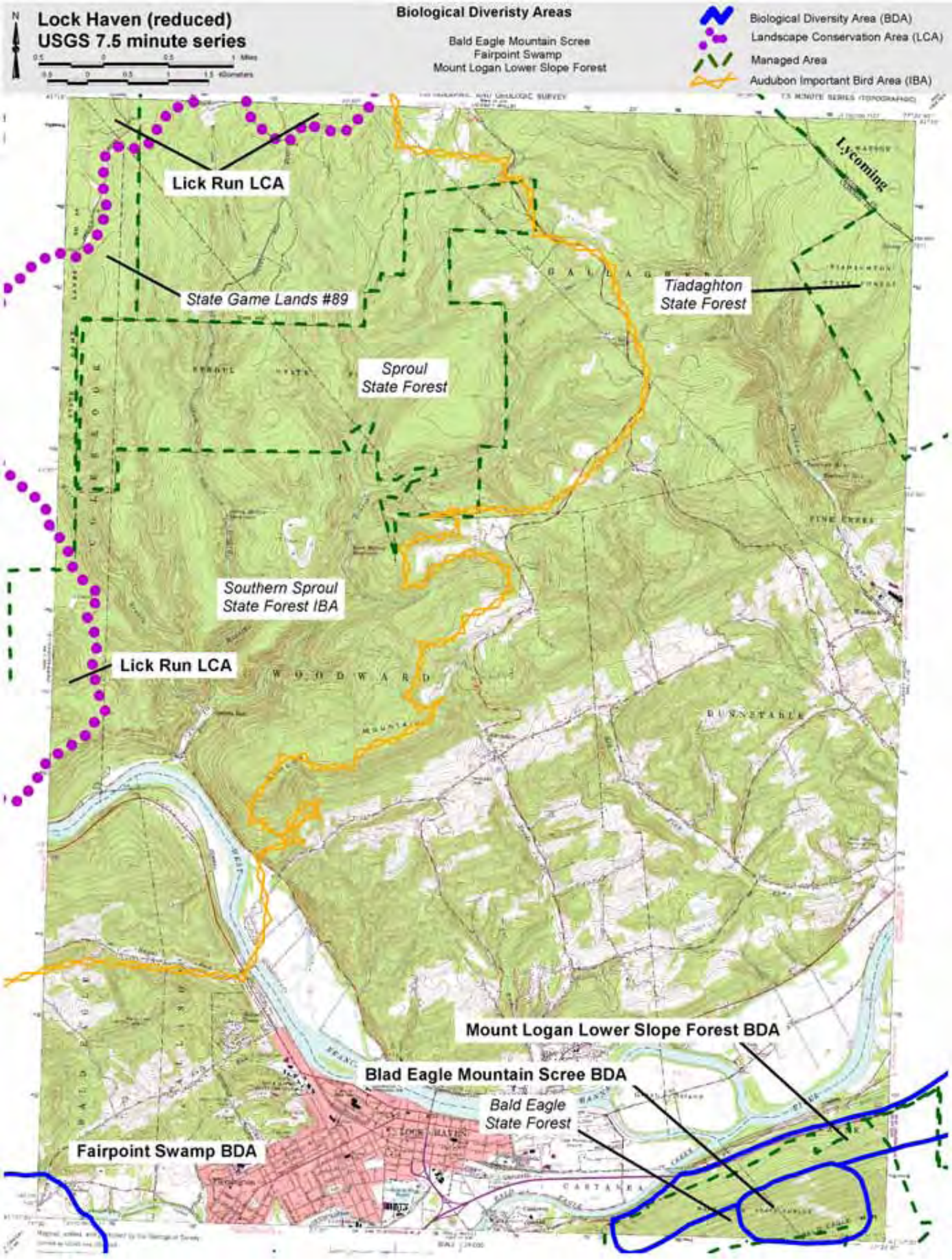
MANAGED LANDS: Sproul State Forest

Bald Eagle State Forest

Tiadaghton State Forest

Mt. Logan Natural Area

GEOLOGIC FEATURES/FOSSIL LOCALITIES: Silurian Coral Reef


Lock Haven (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Bald Eagle Mountain Scree
Fairpoint Swamp
Mount Logan Lower Slope Forest
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Lick Run LCA
State Game Lands #89
Sproul
State Forest
Tiadaghton
State Forest
Southern Sproul
State Forest IBA
Lick Run LCA
Mount Logan Lower Slope Forest BDA
Blad Eagle Mountain Scree BDA
Bald Eagle
State Forest
Fairpoint Swamp BDA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

LOCK HAVEN

The Lock Haven quadrangle sits on the band of low hills band that separates the Appalachian Plateau from the Ridge and Valley Provinces. The City of Lock Haven lies in the southern half of the quadrangle where Bald Eagle Creek meets the West Branch of the Susquehanna River. Small sections of the Sproul, Tiadaghton and Bald Eagle State Forests lie in the quadrangle as does part of the Mount Logan Natural Area DA and an example of a boulder field community.

On the side of Bald Eagle Ridge, facing northwest out into the Susquehanna Valley, lies a series of large patches of exposed rock that serve as a landmark to anyone traveling through the valley. This section of "scree" slope, as well as other areas in the Valley and Ridge Province in central Pennsylvania, likely originated during the freeze-thaw cycles around the periods of glaciation to the north and east. Largely composed of Tuscarora sandstone rubble, little is known about the evolution of these areas and the natural communities associated with them, although they may serve as important habitat for an animal of special concern in Pennsylvania. Known as a Boulder Field Community, the **Bald Eagle Mountain Scree BDA** supports an assortment of mosses, lichens and ferns. The growth of these plants is particularly abundant under the drip line of the surrounding hemlocks. Occasional gnarled black birch (*Betula lenta*) grow among the large rocks and eastern hemlock (*Tsuga canadensis*) seedlings have taken hold where sufficient debris and humus have accumulated between the cracks and crevices.

This and similar communities require further study but are, nonetheless, unique natural communities that deserve protection. Threats to this site seem minimal. However, as part of the Bald Eagle State Forest commercial forest, timber sales on adjacent land is possible. Also, additional communications lines, like those directly to the east, could impact this community. It is recommended that the BDA be removed from commercial forest designation and be considered for incorporation into the nearby Bureau of Forestry Mt. Logan Natural Area. **Mt. Logan Natural Area DA** and its associated natural communities will be discussed in the Jersey Shore quadrangle.

Southeast of Lock Haven along the McElhattan Road is an excellent example of an ancient coral reef, exposed in two adjacent roadcuts. These cuts show the deposits of Silurian age brachiopods and corals and are recognized as a fossil locality by Hoskins et al. (1983).

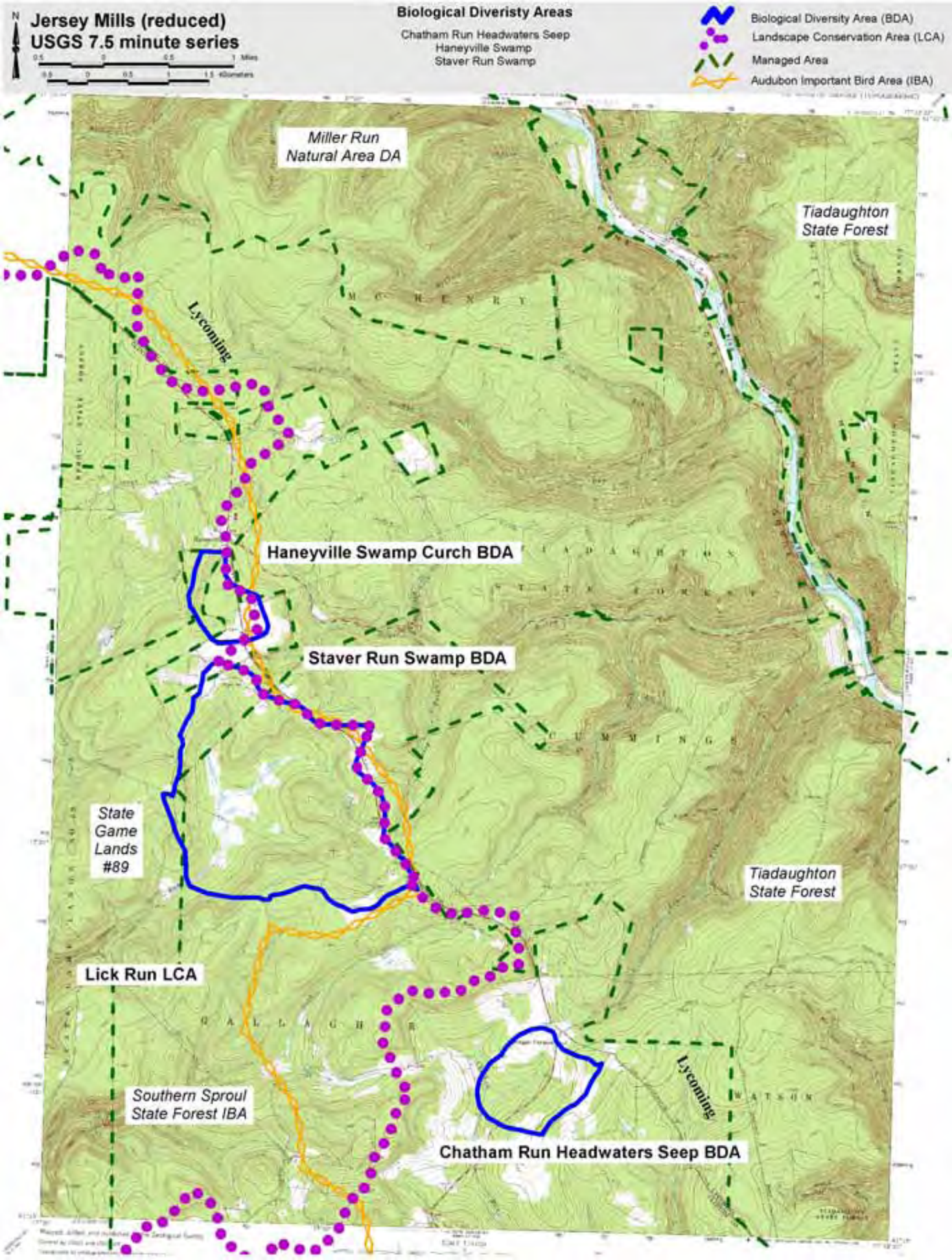
USGS QUADRANGLE **JERSEY MILLS**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
LICK RUN WATERSHED LCA		*High Significance*			
High Gradient Clearwater Creek	G?	S3		PA Exceptional Value	10/92
STAVER RUN SWAMP BDA		*Notable Significance*			
Hemlock palustrine forest community	G?	S3	N	N	5/92
Screw-stem (*Bartonia paniculata*)	G5	S3	N	N	8/02
HANEYVILLE CHURCH SWAMP BDA		*Notable Significance*			
Hemlock – mixed hardwood palustrine forest Community	G?	S3S4	N	N	7/92
CHATHAM RUN HEADWATERS SEEP BDA		*High significance*			
Mountain starwort (*Stellaria borealis*)	G5	S1	N	TU	9/02
Hemlock palustrine forest community	G?	S3	N	N	9/02

MANAGED LANDS: Sproul State Forest

Tiadaghton State Forest

State Game Lands #89


Jersey Mills (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Chatham Run Headwaters Seep
Haneyville Swamp
Staver Run Swamp
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Miller Run
Natural Area DA
Tiadaughton
State Forest
Lycoming
Haneyville Swamp Curch BDA
Staver Run Swamp BDA
State
Game
Lands
#89
Tiadaughton
State Forest
Lick Run LCA
Southern Sproul
State Forest IBA
Lycoming
Chatham Run Headwaters Seep BDA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

JERSEY MILLS

The Jersey Mills quadrangle occupies the northeastern edge of Clinton County, extends into Lycoming County and includes a section of Pine Creek. In Clinton County, this quadrangle includes the upper section of **Lick Run Watershed LCA**, a large headwaters wetland and a small hemlock swamp. State Game Lands #89 continues along Lick Run from the Glen Union and Farrandsville quadrangles, and both Sproul and Tiadaghton State Forest lands are represented.

The headwaters area of Staver Run form in a large basin, designated as the **Staver Run Swamp BDA**, that contains a hemlock palustrine forest community (previously listed as Northern Conifer Swamp following Smith 1991). Logging of white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*) in the early 1900's and subsequent prolific beaver activity, have left the wetland as a largely open patchwork of pools, grass-sedge meadow, alder (*Alnus rugosa*) thickets and blueberry (*Vaccinium spp.*) hummocks. In many parts of the swamp, old conifer stumps sit above the present substrate level and white pine saplings grow around the perimeter, slowly colonizing the wetland. Beaver (*Castor canadensis*) have apparently abandoned the main swamp but may be present in the lower Staver's Run drainage. This area was visited in 2002 as part of an update to the original NHI report, at which time alder shrub had regrown in several formerly open areas. Additionally, a population of a plant of special concern, screw-stem (*Bartonia paniculata*) was documented from the area. This diminutive member of the Gentian family is of concern because it appears to have a somewhat limited distribution among areas of its habitat, acidic herbaceous wetlands. Similar in many ways to the other large headwaters swamps in the county, the Staver Run Swamp is a unique feature and a recovering community that deserves protection.

The Staver Run Swamp BDA is just outside of the state game lands boundary on private land. A strip mine and several quarries lie within its watershed to the north, and a gas pipeline ROW crosses through its southern end. The mining and quarrying operations do nor appear to have affected water quality in the swamp but could be a problem in the future, particularly if vegetation was removed by logging or further mining. The pipeline ROW presents problems associated with erosion and sedimentation, habitat fragmentation and invasive/exotic species introduction (for further discussion, see the Threats and General Recommendations section of this report). Herbicides should be restricted from this ROW and local, native shrubs should be encouraged. In general, activities within the Staver Run BDA should be restricted to those that do not contribute to erosion, chemical and nutrient input, and fragmentation within the watershed.

North of Staver Run BDA is a small hemlock swamp, also classified as a hemlock – mixed hardwood palustrine forest (previously listed as Northern Conifer Swamp following Smith 1991) that sits at the head of a small tributary to Campbell Run. Situated behind the Haneyville Church, the inventory named this wetland area the **Haneyville Church Swamp BDA**. Although sections of the wetland were selectively logged, a canopy of eastern hemlock, yellow birch (*Betula alleghaniensis*), and black gum (*Nyssa sylvatica*) still remains. Small pools are scattered over the site among the living trees and dead stumps that are covered with sphagnum moss (*Sphagnum spp.*), mayflower (*Maianthemum canadense*) and gold thread (*Coptis groenlandica*). Patches of sedge (*Carex folliculata, Carex spp.*) surround the pools, and spicebush (*Lindera benzoin*) and rhododendron (*Rhododendron maximum*) grow in the understory.

This site straddles State Game Lands #89, and the private sections are divided among several landowners. It is on the privately owned land that the most recent logging has taken place. A small garbage/trash dump and a drainage channel sit on the southern edge of the BDA. The channel appears to have drained the field behind the church. Route 664 and several houses border the wetland to the east. To the north, the land has been subdivided for the installation of cabins adjacent to SGL #89. These structures will be in very close proximity to the wetland and can potentially impact its health in several ways. Physical disturbances, including tree removal, alteration of vegetation for landscaping purposes, and increased human traffic in the wetland area, should be limited— and if conducted, should consider impacts on the integrity of the natural wetland ecosystem. Runoff of sewage or of chemicals employed for landscape maintenance could threaten species inhabiting the wetland; amphibians and insects are particularly sensitive to chemical pollutants. It is recommended that no further cutting take place within the Haneyville Church BDA and that application of fertilizers, lawn care chemicals and road salt be limited in the watershed with possible impacts to the wetland in mind. The State Game Commission should consider purchase or easement of any section of the BDA that are either adjacent to the swamp area or within the watershed and contiguous with forested areas as a way of protecting the natural community and of increasing the level of protection in the Lick Run watershed.

Chatham Run Headwaters Seep BDA is designated around a large seepage wetland that feeds a tributary to Chatham Run. A fairly extensive area in the headwaters of this tributary is somewhat saturated from seepage flow. The wetland is a mosaic of two community types, hemlock palustrine forest and an herbaceous seepage wetland type. Most of the area is open, with a springy layer of dense herbaceous growth. Herbaceous species include a variety of sedge species (*Carex gynandra, Scirpus polyphyllus, Scirpus cyperinus, Carex trisperma, Carex frankii*), sensitive fern (Onoclea sensibilis), cinnamon or interrupted fern (Osmunda sp.), heart-leaved tearthumb (Polygonum sagittatum), golden ragwort (Chrysosplenium americanum), beggar-ticks (*Bidens frondosa*), goldthread (*Coptis trifolia*), and (*Hydrocotyle umbellatus*). Also abundant is the special concern plant mountain starwort (*Stellaria borealis*), which is listed as endangered in Pennsylvania. This species is typical of more northern climates; in Pennsylvania, it appears only to inhabit cold seepage-fed wetlands. In some portions of the wetland, a forest canopy of young-to-moderate aged hemlocks has formed. In these areas the herbaceous layer is much less diverse, consisting mainly of dense sphagnum and scattered clumps of cinnamon fern (*Osmunda cinnamomea*). To ensure the future health of this wetland and the special concern plant it hosts, physical disturbances to the site should be avoided. Within the watershed above the wetland, any activities conducted should take special care to avoid releasing pollutants, and to avoid bedrock alterations, which could disrupt the below-ground water flow that feeds the seepage wetland.

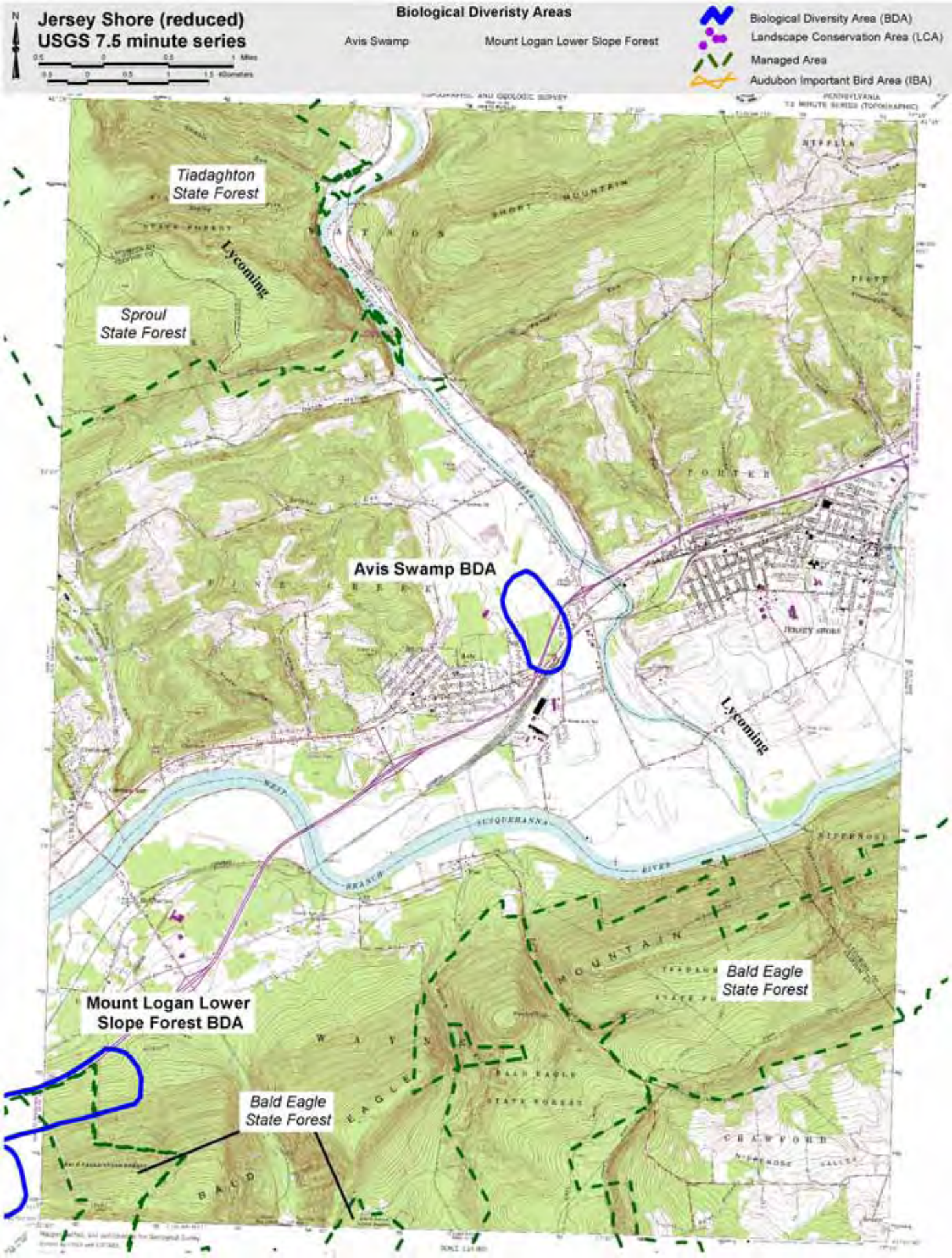
USGS QUADRANGLE **JERSEY SHORE**

	PNDI Rank Global	State	Legal Status Fed.	State	Last Seen
MT. LOGAN LOWER SLOPE FOREST BDA		*High Significance*			
Tulip tree – beech – maple forest community	G?	S4	N	N	7/92
MT. LOGAN NATURAL AREA DA		*Exceptional Significance*			
Tulip tree – beech – maple forest community	G?	S4	N	N	7/92
Dry oak – heath forest community	G?	S4S5	N	N	7/92
AVIS SWAMP BDA		*Notable Significance*			
Water willow (*Decodon verticillatus*) shrub wetland community	G?	S3	N	N	7/92

MANAGED AREA: Bald Eagle State Forest

Tiadaghton State Forest

Mt. Logan Natural Area


Jersey Shore (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Avis Swamp
Mount Logan Lower Slope Forest
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Tiadaghton State Forest
Sproul State Forest
Avis Swamp BDA
Mount Logan Lower Slope Forest BDA
Bald Eagle State Forest
Bald Eagle State Forest
Lycoming
Lycoming
SHORT MOUNTAIN
BALD EAGLE MOUNTAIN
WEST BRANCH SUSQUEHANNA RIVER
PINE CREEK

bold = mapped natural heritage areas
underline = PBS species/communities of concern

JERSEY SHORE

The Jersey Shore quadrangle, like the Lock Haven quadrangle, straddles the band of low hills that separate the Appalachian Plateau from the Ridge and Valley Province. Pine Creek meets the West Branch just across the border in Lycoming County and McElhattan Creek and Chatham Run meet the West Branch in Clinton County. A forest community of significance at the base of Bald Eagle Ridge, Mt. Logan Natural Area DA, and a disturbed but significant wetland community are found within this quadrangle.

A good example of second growth tulip tree – beech – maple forest community (previously listed as Mesic Central Forest following Smith 1991) extends along the lower slope of Bald Eagle Ridge from McElhattan Creek almost to the town of Castanea. Shagbark Hickory (*Carya ovata*), red maple (*Acer Rubrum*), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), tulip tree (*Liriodendron tulipifera*) and several oak species (*Quercus rubra, Q. prinus, Q. alba*) grow along this relatively mild slope. The canopy is dense and very little understory or herbaceous vegetation grows in the low light conditions. As trees age and die or are blown over, gaps will form in the canopy and light levels will increase, allowing vegetation to stratify in a way more characteristic of mature forests. Because this forest is approaching maturity, and is one of the best examples of mesic hardwood forest left in the valley, it should be protected. Designated as the **Mt. Logan Lower Slope Forest BDA**, a piece of this area is included in the Mt. Logan Natural Area DA, but the majority is not. The difficulty in accessing this area for inclusion in timber sales (restricted to the north by the Route 220 ROW and to the south by the mountain itself), has provided protection for this BDA. However, it is still designated as commercial forest and faces the possibility of future cutting. The Bureau of Forestry should consider inclusion of this slope community in the Mt. Logan Natural Area or provide some other form of protection.

Mt. Logan Natural Area DA lies across Bald Eagle Ridge just to the east of McElhattan Creek. The upper sections of the dedicated area are extremely rocky, dry and dominated by a mixture of chestnut oak (*Quercus prinus*), black oak (*Q. velutina*), and black birch (*Betula lenta*) with smaller amounts of pitch pine (*Pinus rigida*), sassafras (*Sassafras albidium*), and red maple (Acer rubrum). Mountain laurel (*Kalmia latifolia*) is pervasive and occasionally dense, over most of the upper slope. The lower slope and forest community are described in the Mt. Logan Lower Slope BDA above. The communities within the natural area include sections of tulip tree – beech – maple forest community (previously listed as Mesic Central Forest following Smith 1991) on the lower slopes, and dry oak-heath forest community (previously listed as Dry-mesic Central Acidic Forest and Rocky Summit communities following Smith 1991) on the mid and upper slopes and on top of the mountain. This cross section of communities is typical of the Valley and Ridge mountains and Mt. Logan Natural Area DA is one of the few areas that through its dedication, preserves such a feature. However, the natural area is small compared to the section of ridge on which it lies and to the Mt. Logan Lower Slope BDA below. Expansion of the natural area to include more or all the mountain and all of the Mt. Logan Lower Slope BDA is recommended.

A powerline ROW runs through the natural area, nearly perpendicular to the slope, to the communications antenna on the site of the old lookout tower. This ROW has become a drainage for the slope and a footpath to the top of the mountain. Erosion has stripped vegetation and soils from the

slope and now the most prominent feature of the ROW is the rock and boulder strewn path extending to the mountain top, covered in places by dense hay-scented fern (*Dennstaedtia punctilobula*). Continued maintenance of this area should be restricted to the trimming of branches directly interfering with the powerlines.

The Pine Creek Valley meets the West Branch Valley in a broad expanse of lowland and floodplain. This area has been extensively farmed but once was likely an incredible complex of wetland communities scattered over thousands of acres. The **Avis Swamp BDA** holds one of the largest remaining wetlands and lies just east of the town of Avis. This wetland contains distinct patches of cattail (*Typha latifolia*), swamp loosestrife (*Decodon verticillatus*), water smartweed (*Polygonum amphibium* var. *emersum*), speckled alder (*Alnus rugosa*) and silky dogwood (*Cornus amomum*), along with species like sensitive fern (*Onoclea sensibilis*), arrowhead (*Sagittaria latifolia*), arrowwood (*Viburnum recognitum*) and sedges (*Carex spp.*). These patches represent distinct natural communities, including cattail marsh community and water willow (*Decodon verticillatus*) shrub wetland community (previously both listed as Robust Emergent Marsh following Smith 1991), This wetland is also an important habitat for birds and migratory waterfowl and is a known roost for wood duck (*Aix sponsa*) and a breeding site for the willow flycatcher (*Empidonax trailii*).

The Avis Swamp has been highly disturbed over the years by draining for agriculture, building of the railroad, construction of Route 150, and most recently, construction of Route 220. Presently, Route 220 bisects the main section of the wetland and an under-the-highway culvert connects the two sections. No further cutting, draining, filling or physical manipulation of this wetland should occur. The hydrology of the site should be evaluated and at least the basic measures taken to restore the natural hydrological regime (sealing or opening of channels, removal of drains, etc.).

USGS QUADRANGLE **LOGANTON**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
ROSECRANS BOG NA		*Exceptional Significance*			
Leatherleaf – cranberry peatland	G?	S2S3	N	N	6/92
Heron rookery (*Ardea herodias*)	G3	S3S4	N	N	6/92
Torrey's bulrush (*Schoenoplectus torreyi*)	G5?	S1	N	PE	6/92
Northeastern bulrush (*Scirpus ancistrochaetus*)	G3	S3	N	PT	9/92
Oakes' pondweed (*Potamogeton oakesianus*)	G4	S1S2	N	PE	9/93
A bladderwort (*Utricularia geminiscapa*)	G4G5	S3	N	N	9/85
ROSECRANS BOG NATURAL AREA DA		*Exceptional Significance*			
Leatherleaf – cranberry peatland	G?	S2S3	N	N	6/92
Heron rookery (*Ardea herodias*)	G3	S3S4	N	N	6/92
Torrey's bulrush (*Schoenoplectus torreyi*)	G5?	S1	N	PE	6/92
Northeastern bulrush (*Scirpus ancistrochaetus*)	G3	S3	N	PT	9/92
Oakes' pondweed (*Potamogeton oakesianus*)	G4	S1S2	N	PE	9/93
A bladderwort (*Utricularia geminiscapa*)	G4G5	S3	N	N	9/85
ROBBINS RUN BDA		*Exceptional Significance*			
Highbush blueberry – sphagnum wetland	G?	S5	N	N	10/92
Northeastern bulrush (*Scirpus ancistrochaetus*)	G3	S3	N	PT	9/92
A bladderwort (*Utricularia geminiscapa*)	G4G5	S3	N	N	9/85
Flypoison borer moth (*Papeipema sp.*)	G2	S1	N	N	10/92
POND ROAD WETLAND BDA		*Exceptional Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	10/92
Northeastern bulrush (*Scirpus ancistrochaetus*)	G3	S3	N	PT	10/92
HOPPLE HOLLOW SWAMP BDA		*Notable Significance*			
Hemlock palustrine forest community	G?	S3	N	N	6/92

COOPER'S RUN BDA		*Exceptional Significance*			
Lupine (*Lupinus perennis*)	G5	S3	N	PR	7/92
MCELHATTAN CREEK LCA		*High Significance*			
SPRING RUN HEMLOCKS BDA		*High Significance*			
Hemlock (white pine) forest community	G?	S4	N	N	8/92
MT. LOGAN NATURAL AREA DA		*Exceptional Significance*			
Tulip tree – beech – maple forest community	G?	S4	N	N	7/92
Dry oak – heath forest community	G?	S4S5	N	N	7/92
CHERRY RUN LCA		*Exceptional Significance*			
PEPPER RUN POOLS BDA		*Exceptional Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	7/92
Northeastern bulrush (*Scirpus ancistrochaetus*)	G3	S3	N	PT	7/92

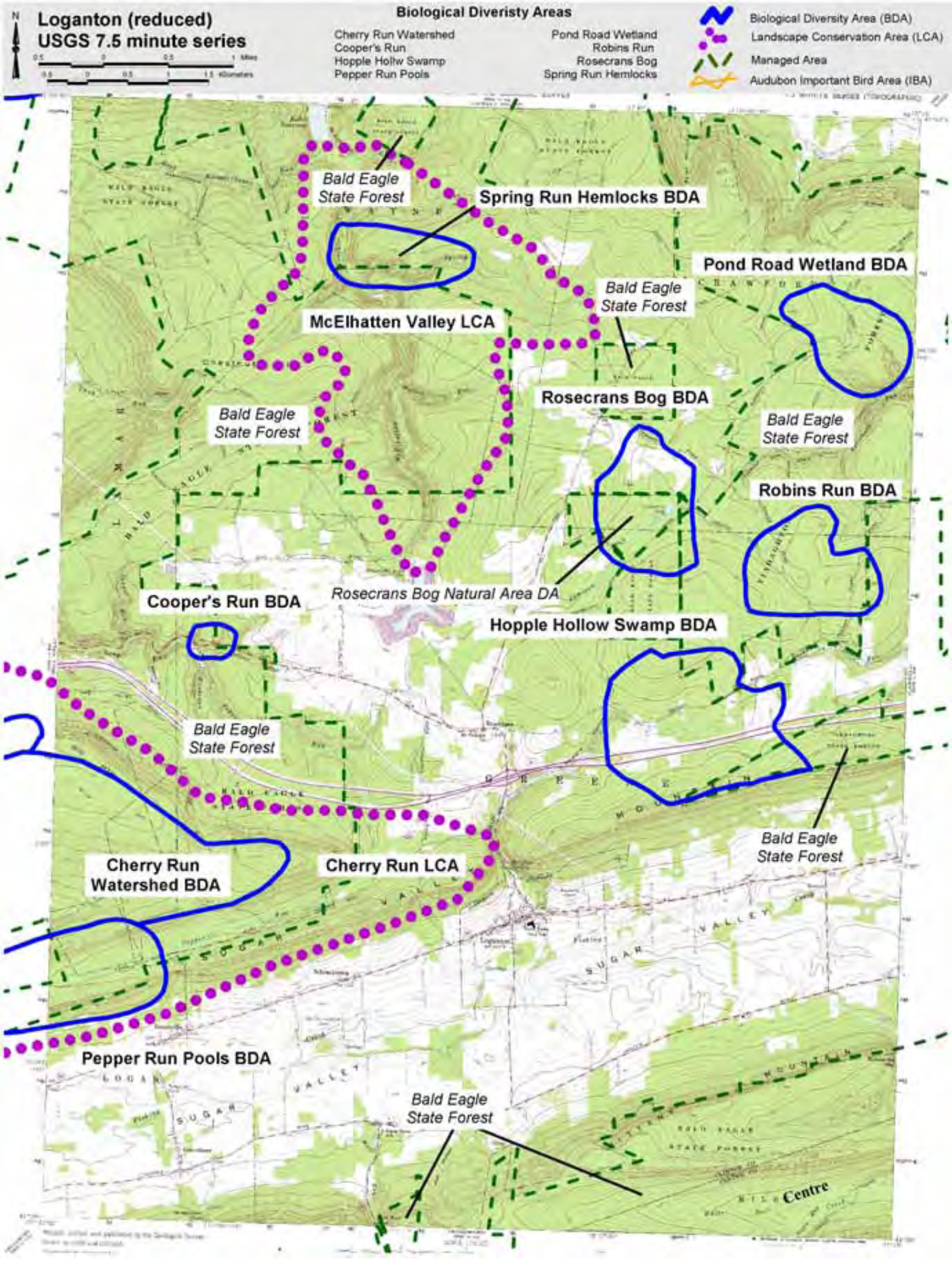
MANAGED LANDS: Bald Eagle State Forest

Tiadaghton State Forest

Mt. Logan Natural Area

Rosecrans Bog Natural Area

GEOLOGIC FEATURES/FOSSIL LOCALITIES: Sulfur Spring


Loganton (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Cherry Run Watershed
Cooper's Run
Hopple Hollw Swamp
Pepper Run Pools
Pond Road Wetland
Robins Run
Rosecrans Bog
Spring Run Hemlocks
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Bald Eagle State Forest
Spring Run Hemlocks BDA
Pond Road Wetland BDA
McElhatten Valley LCA
Rosecrans Bog BDA
Robins Run BDA
Rosecrans Bog Natural Area DA
Cooper's Run BDA
Hopple Hollow Swamp BDA
Cherry Run Watershed BDA
Cherry Run LCA
Pepper Run Pools BDA
Centre

bold = mapped natural heritage areas
underline = PBS species/communities of concern

LOGANTON

The largest section of Sugar Valley in Clinton County lies within the Loganton quadrangle. A broad ridge separates Sugar Valley from Nippenose Valley and although not a glaciated part of Pennsylvania, this rolling, high elevation section of the Bald Eagle Ridge holds a number of significant wetlands. Also within the quadrangle is an old-growth forest, several sites for the northeastern bulrush (a plant of special concern), the southern end of Mt. Logan Natural Area DA, Rosecrans Bog Natural Area DA, and the eastern end of the **Cherry Run LCA** (discussed in the Mill Hall quadrangle). The Bald Eagle or Tiadaghton State Forests cover most of the ridgelines contained within this quadrangle.

Rosecrans Bog sits at the headwaters of Jamison Run which flows into the large and prominent McElhattan Reservoir. Contained within the **Rosecrans Bog NA**, Rosecrans is a distinctive and diverse wetland complex that lies within a dry, mixed-oak forest typical of much of the ridge top. Hemlock (*Tsuga canadensis*), mixed with several hardwood species, forms a band around the wetland. Beaver (*Castor canadensis*) dams along the drainage have backed water up into the bog, creating a large area of standing water. Dead trees dominate this "swamp" section and supply habitat to the great blue heron (*Ardea herodias*)— an animal of special concern. A population of herons has established a rookery in this area. Also within the swamp area is a floating piece of the original bog mat that the progressively higher water levels have made essentially an island. This mat, composed of layers of sphagnum moss (*Sphagnum spp.*) that formed over hundreds or thousands of years, occupied a much larger portion of the bog than the present remnant mat. Covered by colonies of cranberry (*Vaccinium macrocarpon*), this mat is the location of a population of Torrey's bulrush (*Schoenoplectus torreyi*), a plant of special concern in Pennsylvania. The mat is an uncommon community provisionally characterized as a leatherleaf – cranberry wetland, although it is not well represented by any of the currently defined community types. Other rare plants (*Carex aquatilis, Scheuchzeria palustris*) have been reported on the mat but none have been recently confirmed. A cowlily - watershield colony (*Nuphar sp. - Brasenia schreberi colony*) covers several acres of water near the mat and three other plants of special concern—Oakes' pondweed (*Potamogeton oakesianus*), a species of bladderwort (*Utricularia geminiscapa*), and the northeastern bulrush (*Scirpus ancistrochaetus*) also grow within the wetland. The Oakes' pondweed and the bladderwort are aquatic plants that live in shallow water, rooted in mucky substrates, while the northeastern bulrush inhabits the edges of the wetland where there are seasonally fluctuating water levels. The sections of the bog below the dead tree swamp have saturated, sphagnum covered soils but only smaller pools of standing water. These areas are dominated by grasses, sedges (*Carex spp.*), bulrushes (*Scirpus spp.*) and on the drier hummocks, by blueberry (*Vaccinium spp.*), dewberry (*Rubus hispidis*) and goldthread (*Coptis groenlandica*).

Rosecrans Bog is contained within the Bureau of Forestry's Rosecrans Bog Natural Area which affords it a high degree of protection. However, the natural area does not include the entire watershed of the bog and therefore, cannot be expected to provide full protection to the wetland. This inventory has delineated the Rosecrans Bog NA to include the Rosecrans Bog Natural Area DA and the entire watershed of the bog. Of particular concern for this site is farmland that abuts the natural area to the north and east. Nutrient losses and pesticide runoff from the fields and pastures of this adjacent land could severely impact the bog - a community that has evolved in a limited nutrient environment. The owner(s) of the adjacent agricultural land should be encouraged to employ the best agricultural management practices and discouraged in the use of pesticides, particularly persistent ones, and

fertilizers beyond what is absolutely required. The increased water levels in the bog brought about by beaver activity may affect the species of special concern and the bog community as a whole, but more monitoring will be required to answer questions concerning potential impacts. Management of beaver within the natural area is an option, but questions concerning the natural hydrology of the bog, the role of beavers in the evolution of the bog, and the possible role of nearby activities (cutting, clearing, farming, etc.) in attracting beaver to the site need to be considered. Expansion of the natural area to include all of the state forest lands within the Rosecrans BDA is recommended. Easement or purchase of other lands within the BDA should be investigated.

A mile southeast of Rosecrans Bog, Robbins Run drains a narrow fold within the ridge. At the head of Robbins Run is a wetland dominated by shrubs like high bush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), purple chokeberry (*Aronia floribunda*), and mountain holly (*Nemopanthus mucronatus*). The moisture level in the wetland fluctuates from standing water in the spring to damp soils in the late summer. Several small pools, however, hold at least some water year round. These pools support few woody shrubs but a variety of grasses, sedges and bulrushes, and may serve as breeding sites for amphibians and invertebrates. Classified as a highbush blueberry – sphagnum wetland community (previously listed as Acidic Shrub Swamp following Smith 1991), Robbins Run Swamp is considered a biodiversity area - **Robbins Run BDA -** and is the home of the northeastern bulrush (*Scirpus ancistrochaetus*)— a plant of special concern globally— as well as fly poison (*Amianthium muscaetoxicum*), a plant in the lily family that is the primary food source for the flypoison borer moth (*Papaipema sp. 1*), an animal of special concern globally.

Although part of the Tiadaghton State Forest, the Robbins Run BDA receives no special protection. A section of the forest to the east within the BDA was cut sometime within the last 15 - 25 years and is now a dense patch of red maple (*Acer rubrum*) saplings. Other cutting activity related to or independent of the previous timber sale is evident adjacent to and within the corner of the swamp. Deer stands, parking pull-offs and trails through and around the swamp indicate that this is a much-visited area. The BDA boundaries are designed to include the watershed of the swamp and the plant populations mentioned above. No cutting is recommended within the BDA and clearing of shrubs for easier access, building of blinds or use of off-road vehicles should be strongly discouraged.

North of Robbins Run BDA is a small wetland known as an herbaceous vernal pond community (previously listed as a Fluctuating Natural Pool following Smith 1991) that is the home of the northeastern bulrush (*Scirpus ancistrochaetus*)— a plant of special concern globally. Included within the **Pond Road Wetland BDA**, this wetland, dominated by sedges and bulrushes, supports a small thicket of winterberry and a broad border of sphagnum moss. This pool depends upon precipitation and surface water draining from the land northwest of Pond Road to maintain its water level. Road maintenance within the BDA should be undertaken carefully to avoid rerouting water either directly into or away from the wetland. Located in the Tiadaghton State Forest, some cutting and clearing has occurred around the wetland and along the road ROW. Opening up areas may encourage weedy species like greenbriar (*Smilax sp.*) and exotic species like Japanese barberry (*Berberis thunbergii*) to further invade areas in and around the site. Changes in the hydrology associated with cutting could also impact the population of the northeastern bulrush growing in this wetland. It is recommended that no cutting take place within the BDA and that minimal clearing be done along Pond Road within the BDA.

Just north of I-80 on the southern section of the ridge where the wetlands discussed above lie, is another wetland at the headwaters of Mill Creek. Sitting in a basin between Sugar Mountain and the inner section of Nittany Ridge, this wetland drains through a narrow valley that runs under I-80 called Hopple Hollow. Classified as a hemlock palustrine forest (previously listed as a Northern Conifer Swamp following Smith 1991), the **Hopple Hollow BDA** is dominated by eastern hemlock but also contains white pine (*Pinus strobus*), yellow birch (*Betula alleghaniensis*), red maple, and black ash (*Fraxinus nigra*). A small meandering stream runs through the lower portion of the swamp and small pools and saturated areas are scattered throughout the site. Sphagnum covered hummocks of old roots and trunks hold dense goldthread colonies (*Coptis groenlandica*), sedge and grass. Spicebush (*Lindera benzoin*) and speckled alder (*Alnus rugosa*) form thickets in some of the more open areas and marsh marigold (*Caltha palustris*), false hellebore (*Veratrum viride*) and painted trillium (*Trillium undulatum*) grow in the central sections of the swamp.

Hopple Hollow Swamp is a very disturbed community - part of it was once cut and pastured, a section has recently been logged, I-80 construction opened up the southern end, and houses along Rockey Road have likewise displaced some of the upland community. Also, I-80 may have altered the hydrology of the area and the yellowing white pines near the highway attest to the effects of salt spray and runoff. All the land within the Hopple Hollow BDA is in private ownership and is divided among a handful of owners. Any level of protection will require their cooperation and agreement to preserve this wetland community. Recommendation for the management of this site are: cessation of cutting or clearing in or adjacent to the swamp, including the yard areas to the north along the swamp; no removal of already cut or downed trees; evaluation of the I-80 drainage into the swamp and the planting of local native trees or shrubs (white pine, spicebush, alder) on areas disturbed and eroded from the I-80 ROW.

To the west of the Hopple Hollow BDA, Route 477 winds through the mountains on its way to Salona. In numerous sections of soil and surface strata were cut away to accommodate the road and on one of these sections along Cooper's Run, grows a population of wild lupine (*Lupinus perennis*), a plant of special concern. Although these road cuts are not naturally created habitat, the loose soils and flaking rocks mimic the habitat where this plant would naturally grow. This rare plant requires high light, low competition environments like those found after fire. The biggest threat to the plant is, consequently, reduced light levels stemming from the growth of trees and shrubs. The maintenance of Route 477 may have helped to provide the right environmental conditions for this plant. However, the population would be negatively impacted by heavy trampling, coverage by slash, or application of herbicide. Care should be exercised within the **Cooper's Run BDA** and the Western PA Conservancy should be contacted for more details and advice concerning the management for this plant.

McElhattan Creek flows from the McElhattan Reservoir north to the Kellor Reservoir and then through the town of McElhattan to the West Branch of the Susquehanna. A large portion of the watershed is owned by City of Lock Haven and is managed as a municipal water supply area. Other sections are within the Bald Eagle State Forest and other small pieces are in private ownership. The valley above the Kellor reservoir is remarkably undisturbed for this section of the county and only the old logging road runs through the broader sections of the floodplain and valley. This road is occasionally used by the city to access parts of the watershed. A diverse stream valley with natural springs, fern-covered outcrops of sandstone and shale, backwater ephemeral pools and open scree slopes, the inventory has recognized this and parts of some tributary valleys as the **McElhattan Creek Landscape Conservation Area (LCA)**.

Included within the McElhattan Creek LCA is a section of old-growth hemlock (white pine) forest community (previously listed as Northern Conifer Forest following Smith 1991). Located along the north slope of Spring Run and east slope of McElhattan Creek, these hemlocks darken sections of the floodplain as well. Fallen trees, wind damaged crowns and a littering of decaying branches and debris are characteristics that confirm that the area has not been disturbed for some time. These trees may have been missed, considered too inaccessible or selectively cut during the early logging in the valley. The hemlock (white pine) forest community extends through the Spring Run Valley and although the hemlocks dominating the valley are not old-growth, they are maturing. Therefore, the BDA extends along Spring Run and is called simply, **Spring Run Hemlocks BDA**.

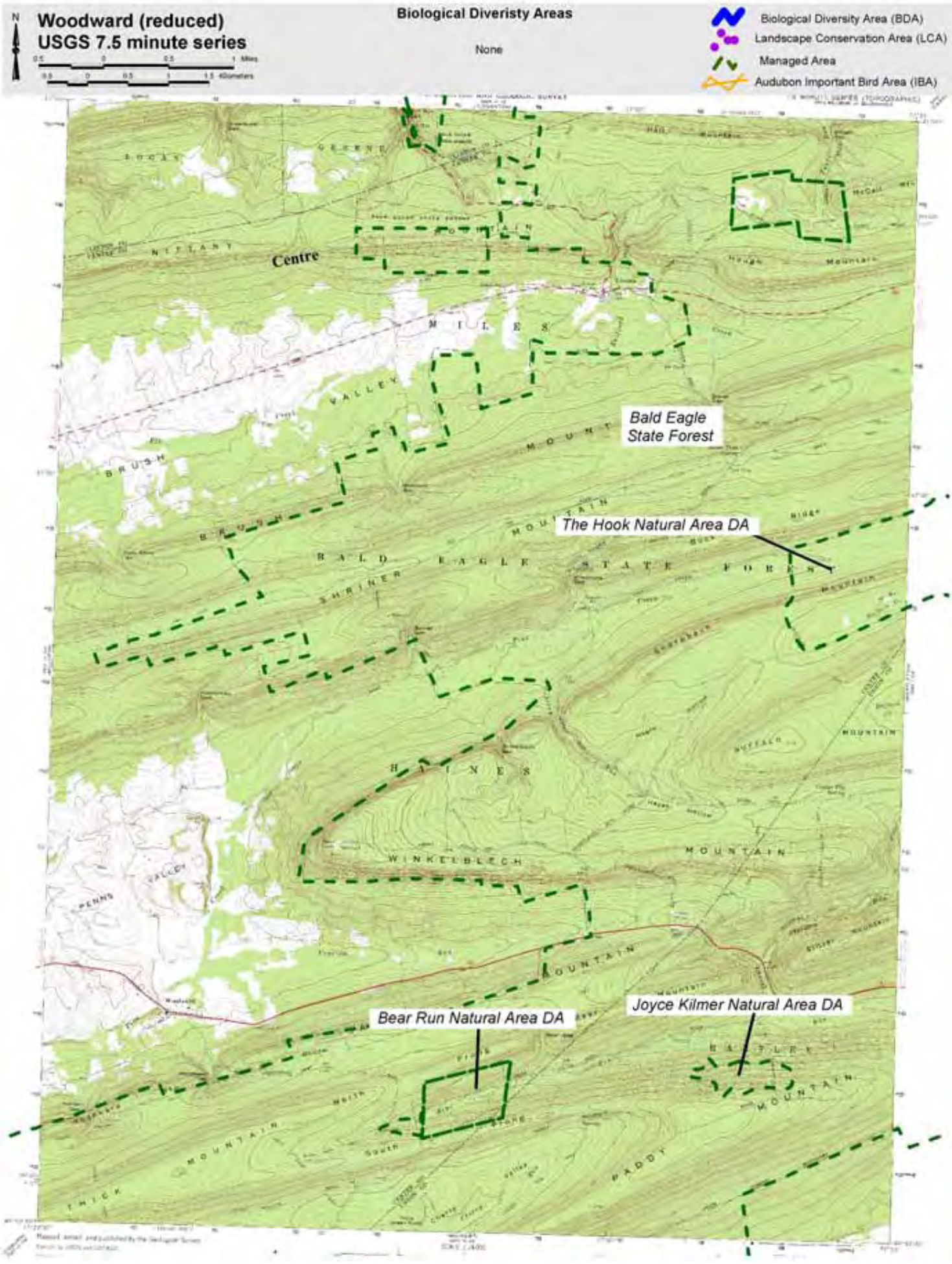
The ridge tops to the east and west of McElhattan Creek lie mostly within the Bald Eagle State Forest and have been logged. It is recommended that no logging take place within the McElhattan Creek LCA or within the Spring Run Hemlocks BDA. Use of the logging road along the creek by motorized vehicles should be kept to a minimum. As part of an LCA and a municipal watershed, no spraying for gypsy moth or other pests should occur in the McEllhattan Valley.

Mt. Logan Natural Area DA extends into the Loganton quadrangle from the Jersey Shore quadrangle and includes a section of ridgetop partially within the McElhattan watershed. This natural area is discussed in the Jersey quadrangle. Also, the **Pepper Run Pools BDA** - home of the Northeastern bulrush (*Scirpus ancistrochaetus*), a plant of special concern globally- extends into the Loganton quadrangle from the Mill Hall quadrangle and is discussed there.

USGS QUADRANGLE **WOODWARD**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen

MANAGED LANDS: Bald Eagle State Forest


Woodward (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
None
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Centre
Bald Eagle
State Forest
The Hook Natural Area DA
Bear Run Natural Area DA
Joyce Kilmer Natural Area DA

WOODWARD

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The Woodward quadrangle holds only a small piece Clinton County where Nittany Mountain crosses between the Loganton and Millheim quadrangles. Woodward contains small sections of the Bald Eagle State Forest, but presently no Natural Heritage Areas are recorded in this quadrangle.

USGS QUADRANGLE **CARROLL**

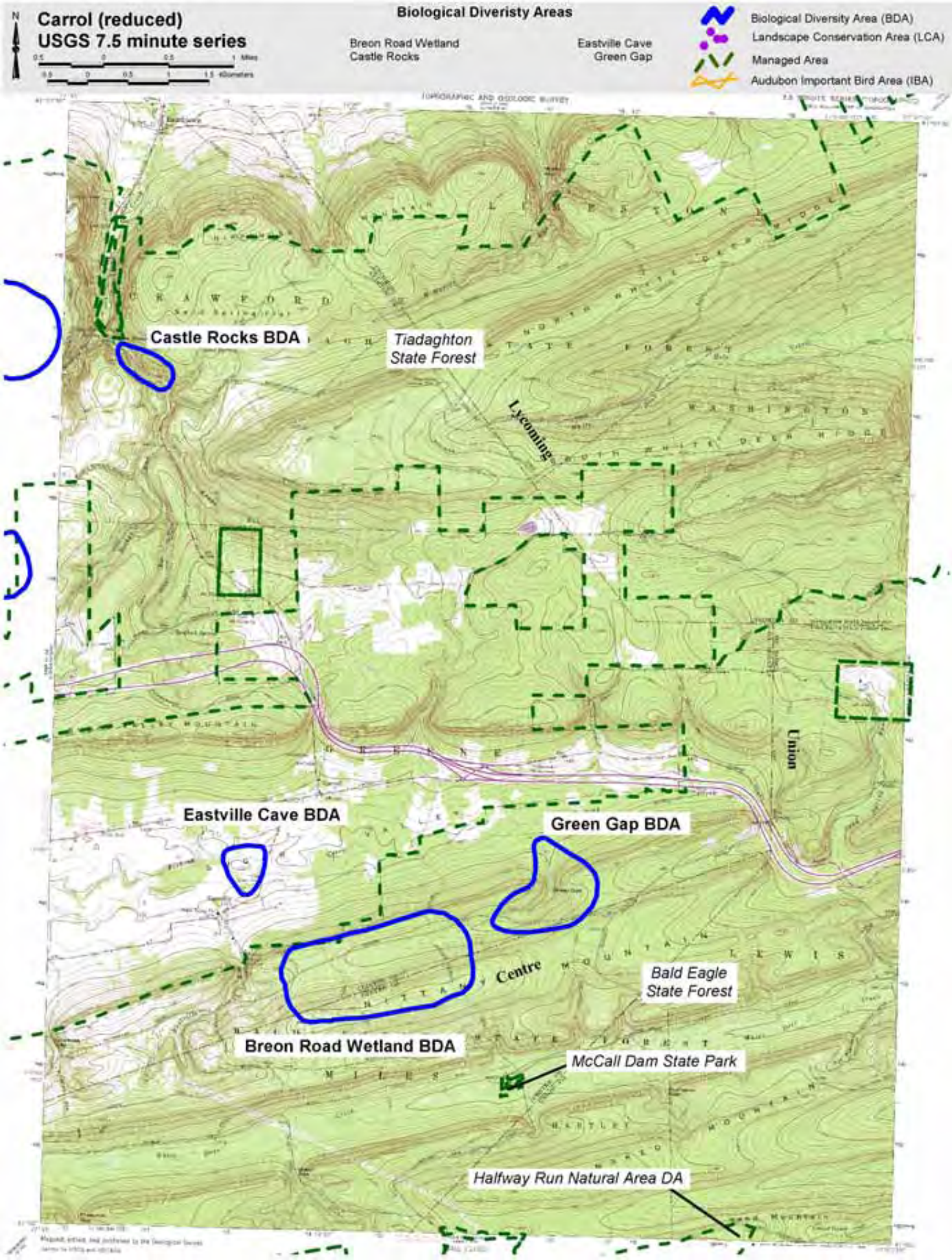
	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen
BREON ROAD WETLAND BDA		*High Significance*			
Herbaceous vernal pond community	G?	S3S4	N	N	10/92
Highbush blueberry – sphagnum wetland community	G5	S5	N	N	10/92
GREEN GAP BDA		*Notable Significance*			
Hemlock (white pine) forest community	G?	S4	N	N	7/92
EASTVILLE CAVE BDA		*Notable Significance*			
Limestone Solution Cave Terrestrial Community	G?	S3	N	N	7/92
CASTLE ROCKS BDA		*Exceptional Significance*			
Lupine (*Lupinus perennis*)	G5	S3	N	PR	7/92

MANAGED LANDS: Bald Eagle State Forest

Tiadaghton State Forest

Ravensburg State Park

GEOLOGIC FEATURES/FOSSIL LOCALITIES: Castle Rocks


Carrol (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
Breon Road Wetland
Castle Rocks
Eastville Cave
Green Gap
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Castle Rocks BDA
Tiadaghton State Forest
Lycoming
Eastville Cave BDA
Green Gap BDA
Union
Centre
Bald Eagle State Forest
Breon Road Wetland BDA
McCall Dam State Park
Halfway Run Natural Area DA

bold = mapped natural heritage areas
underline = PBS species/communities of concern

CARROLL

The headwaters of Fishing Creek originate in this quadrangle at the far eastern end of Clinton County where the ridgelines pinch together and end Sugar Valley. Much of this portion of the county in this quadrangle is within either the Tiadaghton or Bald Eagle State Forests. Also included in this quadrangle is a high elevation wetland complex, a maturing second growth conifer forest, a large solution cave, a site for a species of special concern, and a state park.

At the very southeastern end of Clinton County, Breon Road runs along the ridge between Eastville and Green Gaps. Just south of Breon Road on the flat area that separates the watersheds of the two gaps, lies a ribbon of wetlands that includes several Herbaceous vernal pond communities (listed as Fluctuating Natural Pools NC001 following Smith 1991 in the previous edition) and an extended section of highbush blueberry – meadowsweet wetland community (listed as Acidic Broadleaf Swamp NC002 following Smith 1991 in the previous edition). The natural pools at the Eastville Gap end of the site are open, sparsely vegetated and during the spring of the surveys for this inventory, were dense with amphibian egg masses. The abundance of egg masses indicates that these pools are important breeding sites and consistently hold water, at least in the spring. The lack of vegetation this year was probably due to higher than normal water levels in the summer months. Contiguous with these pools and also included in the **Breon Road Wetland BDA**, is a long band of saturated soils that are, in places, densely covered with sphagnum moss (*Sphagnum spp.*). Open areas of sedge (*Carex sp.*), grass and scattered silky dogwood (*Cornus amomum*) grade into more closed canopy areas containing highbush blueberry (*Vaccinium corymbosum*), cinnamon fern (*Osmunda cinnamomea*) and rhododendron (*Rhododendron maximum*). The trees in this area include red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), white ash (*Fraxinus americana*), eastern hemlock (*Tsuga canadensis*), and yellow birch (*Betula alleghaniensis*). Eventually, the wetland constricts to a meandering channel flowing through a hemlock forest and forming the drainage into Green Gap.

Generally, the Breon Road Wetland BDA has been recently undisturbed but some stumps indicate cutting in and around the wetland in the last 30-40 years. Some may have been related to road maintenance (Breon Road), some to stand improvement cuts, especially given that this site is within the Bald Eagle State Forest and is designated as commercial forest. Breon Road is within the immediate watershed of the wetland and passes very close to the natural pools at the west end of the site. Channels plowed at angles to the road to provide drainage to the road may be impacting the pools by providing water they would not normally receive. It is recommended that maintenance of the road be done keeping the possible impacts to the wetland in mind and that drainage cuts favor the opposite (north) side of the road. Those present near the pools should be moved to avoid feeding water directly toward the pools. No cutting should take place within the Breon Road Wetlands BDA, nor should spraying for gypsy moths.

Green gap drains a portion of the Breon Road BDA and channels water into Fishing Creek east of Eastville, PA. Dropping about 400 feet in elevation from 1700 to 1300 feet, Green Gap funnels cooling air from the ridge into the valley and remains relatively cool and moist throughout the year, in contrast to the dry ridges and slopes of Nittany Mountain. Rather than the dry forests of mixed oak and birch, the gap supports a forest of eastern hemlock and white pine (*Pinus strobus*). A good example of a hemlock (white pine) forest community (previously listed as Northern Conifer Forest

Community NC002 following Smith 1991) sits in the central part of the gap and extends along the stream. An understory of rhododendron with scattered patches of wood aster (*Aster acuminatus*) and clear weed (*Pilea sp.*) grow near the stream, but largely, the understory is open and herbs are few under the shade of the conifers. Named simply **Green Gap BDA**, this second growth forest is on its way toward maturity. A plantation of red pine (*Pinus resinosa*) exists below this site and an old logging road (now a foot trail) runs through the site. As part of commercial forest within the Bald Eagle State Forest, this site receives no special protection. It is recommended that this area be removed from commercial forest designation and that timber sales not occur within the BDA.

Northeast of the town of Eastville, north of Fishing Creek, is a cave known as Eastville Cave, a Solution Cave Terrestrial Community, that stretches over 250 feet through solutional tunnels in the limestone bedding of Sugar Valley. This is the largest cave in Clinton County but is not considered large by Pennsylvania standards. Reports from the 1950's mention the presence of significant bat populations but recent explorations have found only a few individuals. However, these included a species listed as rare in Pennsylvania, the northern myotis (*Myotis septentrionalis*). Several pools of waist deep water within the cave provide the potential habitat for subterranean natural communities, however, the site will have to be further investigated to determine if conditions are suitable for this type of community and if any indicator species do indeed exist. Because of its size and uniqueness in Clinton County, this inventory has designated this as a BDA - **Eastville Cave BDA** - pending future determinations of its value to biodiversity.

General activity around the entrance to the cave, especially during the fall and winter months, may have discouraged and displaced bat populations. Disturbances within the cave during the months of November through March can be fatal to bats. Even relatively low levels of noise and light can rouse the bats out of hibernation, causing them to deplete their fat reserves such that they may starve before spring. For more information regarding management of bat habitat areas, please contact the Pennsylvania Game Commission. The entrance to the cave sits in a small woodlot and is littered with agricultural trash, including livestock carcasses. Trash around the entrance may actually constrict the entrance and heavy loads of decaying organic matter could severely affect the water quality within the aquatic portions of the cave. The landowner of this BDA should be alerted as to the significance of this site and be advised to limit activities within the BDA.

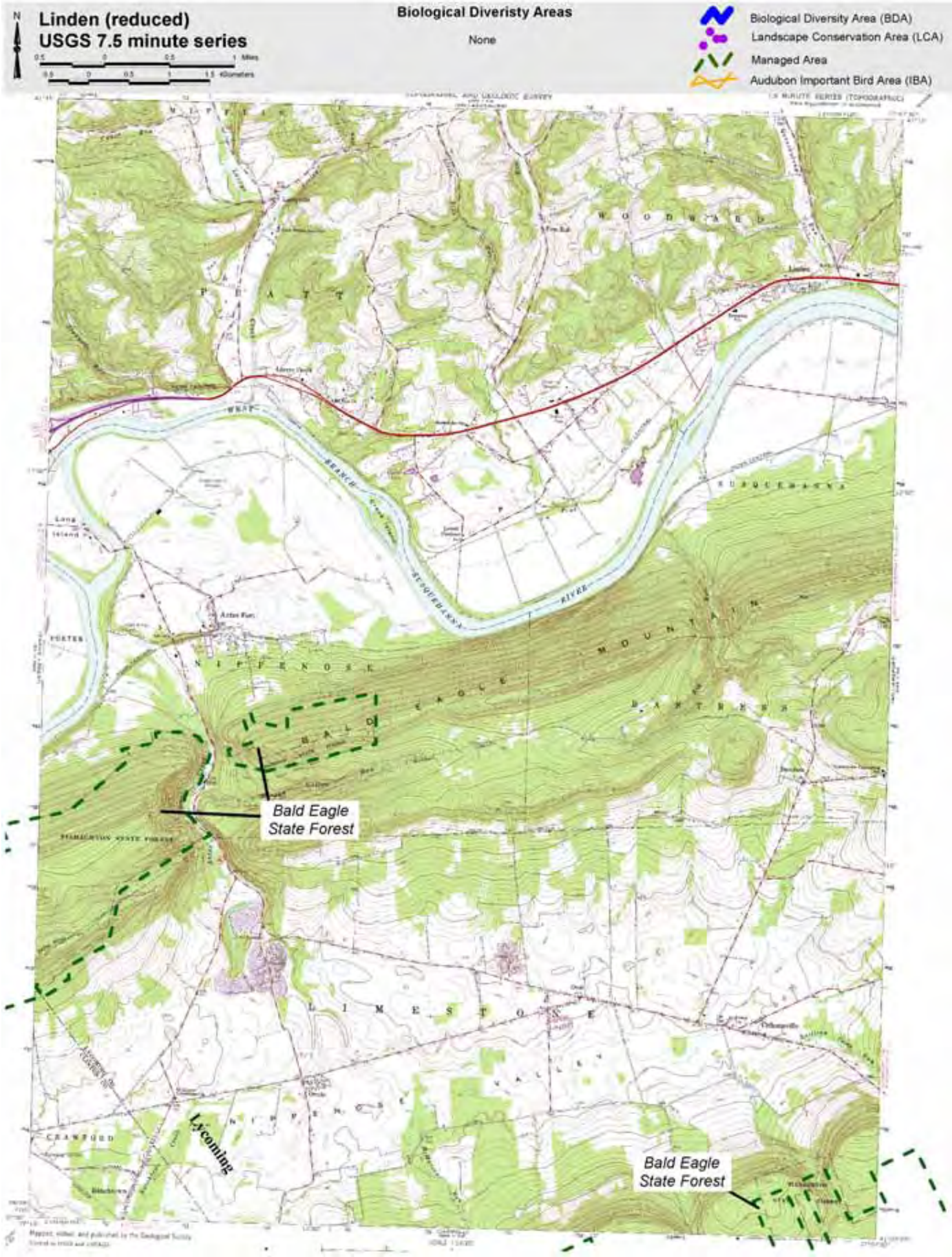
North of Carroll, Rauchtown Creek drains sections of the Bald Eagle Ridge, flowing eventually into Nippenose Valley where it sinks under the limestone bedding of the valley floor. Route 880 runs along the creek and passes through the Castle Rocks area south of Ravensburg State Park. Castle Rocks are towers of Ordovician conglomerate rising above the eroding slope of the Rauchtown drainage. Castle Rocks are recognized as an outstanding scenic geologic feature in Pennsylvania by Geyer and Bolles (1979, 1987). In this same area, a population of wild lupine (*Lupinus perennis*)— a plant of special concern— grows on the exposed slope cut through by Route 880. This plant requires open areas like those naturally occurring after fire or acute erosion (rock slides). Normally associated with dry, sandy soils, the exposed soils and strata along Route 880 provide the habitat necessary for the growth and survival of this plant. Maintenance of the road (cutting of trees, shrubs, branches, etc.) may have helped to maintain the population of this plant. Competition from woody vegetation is one of biggest threats to the plant and standard trimming and cutting along the road may be sufficient management. However, trampling or spraying of herbicide would be very detrimental to this population. The Bureau of State Forests and PennDOT should contact the Western PA Conservancy for more information and

advice as to the long-term management of this species. For now, the **Castle Rocks BDA** should not be disturbed without further information.

Ravensburg State Park sits just north of Castle Rocks along Route 880. A small park straddling Rauchtown Creek, it features the creek and a tributary, sections of a typical scree slope, and patches of eastern hemlock forest. A secluded and lightly used park, Ravensburg has a tent camping only facility, a footpath running along the creek, a picnic area and is within walking distance of the Castle Rocks formation.

USGS QUADRANGLE **LINDEN**

	PNDI Rank		Legal Status		Last
	Global	State	Fed.	State	Seen


Linden (reduced)
USGS 7.5 minute series
Biological Diveristy Areas
None
Biological Diversity Area (BDA)
Landscape Conservation Area (LCA)
Managed Area
Audubon Important Bird Area (IBA)
Bald Eagle State Forest
Bald Eagle State Forest
Lycoming

LINDEN

bold = mapped natural heritage areas
underline = PBS species/communities of concern

The southwestern corner of the Linden quadrangle catches Clinton County just above Rauchtown where Rauchtown Creek begins it descent into Nippenose Valley, south of Jersey Shore. There are no known areas of Natural Heritage significance in this quadrangle nor are there any managed lands.

ALLEGHENY WOODRAT OVERVIEW

The Allegheny woodrat (*Neotoma magister*) inhabits rocky cliffs and outcroppings. Historically it is known from a fairly large range in the eastern U.S., from New York to Alabama and west to Indiana and Tennessee, but it is extirpated or declining over about 35% of the range. While it is still common in some areas, the decline has been rapid and the cause is not yet fully understood. Allegheny woodrats eat leaves, twigs, fruits, and seeds from many plants, but acorns may form a substantial component in their diet.

Several different studies provide evidence that there may be a variety of factors contributing to the observed declines in populations of this animal in different parts of its range. Some populations appear to have suffered heavy mortality from the raccoon roundworm. Raccoons are habitat generalists that tolerate or even benefit from habitat fragmentation and disturbance. Since raccoon populations increase in areas where human settlement patterns have greatly increased the level of fragmentation and disturbance, these landscape changes may have created conditions that increase the exposure of the Allegheny woodrat to the raccoon roundworm parasite. The Pennsylvania Game Commission has documented that woodrat habitat areas are not occupied by active populations where agricultural or developed land occurs within 2 km, suggesting that these animals require a large unfragmented area. Woodrat population declines are also correlated with gypsy moth infestations of oak trees, and with exceptionally severe winter conditions. Work in Pennsylvania suggests that acorns are a major food source, and in the event of widespread oak mortality resulting from a severe gypsy moth infestation, the decline in acorn production might create significant limitations in food supply for this animal.

Forest cover is important in maintaining the microhabitats and various food sources available to these animals. Oak trees are especially important and should be allowed to remain within the boundary of this BDA. Fragmentation and disturbance should be avoided within the area designated, and it is also recommended that a 2 km buffer area extending beyond the designated areas be left intact. This buffer area does not need to extend across large waterways, as these waterways are barriers to woodrat migration.

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APPENDIX I

FEDERAL AND STATE ENDANGERED SPECIES CATEGORIES, GLOBAL AND STATE ELEMENT RANKS

Several federal and state legislative acts have provided the authority and means for the designation of endangered, threatened, rare, etc. species lists. Those acts and status summaries follow. However, not all of the species or natural communities considered by conservation biologists (e.g., Pennsylvania Biological Survey) as "special concern resources" are included on the state or federal lists. In this county inventory report, "N" denotes those special concern species that are not officially recognized by state or federal agencies. Therefore: N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.

FEDERAL STATUS

All Plants and Animals: Legislative Authority: U.S. Endangered Species Act (1973), U.S. Fish and Wildlife Service, February 21, 1990, Federal Register.

LE = Listed Endangered - Taxa in danger of extinction throughout all or a significant portion of their ranges.

LT = Listed Threatened - Taxa that are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges.

PE = Proposed Endangered - Taxa already proposed to be listed as endangered.

PT = Proposed Threatened - Taxa already proposed to be listed as threatened.

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Ib

PENNSYLVANIA STATUS

Native Plant Species: Legislative Authority: Title 25 Chapter 82, Conservation of Native Wild Plants, January 1, 1988; Pennsylvania Department of Environmental Resources.

PE = Pennsylvania Endangered - Plant species which are in danger of extinction throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that are classified as Pennsylvania Extirpated, but which subsequently are found to exist in this Commonwealth.

PT = Pennsylvania Threatened - Plant species which may become endangered throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained to prevent their future decline, or if the species is greatly exploited by man.

PR = Pennsylvania Rare - Plant species which are uncommon within this Commonwealth because they may be found in restricted geographic areas or in low numbers throughout this Commonwealth.

PX = Pennsylvania Extirpated - Plant species believed by the Department to be extinct within this Commonwealth. These plants may or may not be in existence outside the Commonwealth.

PV = Pennsylvania Vulnerable - Plant species which are in danger of population decline within this Commonwealth because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.

TU = Tentatively Undetermined - A classification of plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification due to taxonomic uncertainties, limited evidence within historical records, or insufficient data.

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Ib (CONT.)

Wild Birds and Mammals - Legislative Authority: Title 34 Chapter 133, Game and Wildlife Code, revised Dec. 1, 1990 Pennsylvania Game Commission.

PE = Pennsylvania Endangered - Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate. These are: 1) species whose numbers have already been reduced to a critically low level or whose habitat is so drastically reduced or degraded that immediate action is required to prevent their extirpation from the Commonwealth; or 2) species whose extreme rarity or peripherality places them in potential danger of precipitous declines or sudden extirpation throughout their range in Pennsylvania; or 3) species that are classified as "Pennsylvania Extirpated", but which are subsequently found to exist in Pennsylvania as long as the above conditions 1 or 2 are met; or 4) species determined to be "Endangered" pursuant to the Endangered Species Act of 1973, Public Law 93-205 (87 Stat. 884), as amended.

PT = Pennsylvania Threatened - Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated. These are: 1) species whose population within the Commonwealth are decreasing or are heavily depleted by adverse factors and while not actually endangered, are still in critical condition; 2) species whose populations may be relatively abundant in the Commonwealth but are under severe threat from serious adverse factors that are identified and documented; or 3) species whose populations are rare or peripheral and in possible danger of severe decline throughout their range in Pennsylvania; or 4) species determined to be "Threatened" pursuant to the Endangered Species Act of 1973, Public Law 93-205 (87 Stat. 884), as amended, that are not listed as "Pennsylvania Endangered".

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Ib (CONT.)

Fish, Amphibians, Reptiles, and Aquatic Organisms - Legislative Authority: Title 30 Chapter 75, Fish and Boat Code, revised February 9, 1991; Pennsylvania Fish and Boat Commission

PE = Pennsylvania Endangered - All species declared by: 1) the Secretary of the United States Department of the Interior to be threatened with extinction and appear on the Endangered Species List or the Native Endangered Species List published in the Federal Register; or 2) are declared by the Pennsylvania Fish and Boat Commission, Executive Director to be threatened with extinction and appear on the Pennsylvania Endangered Species List published by the Pennsylvania Bulletin.

PT = Pennsylvania Threatened - All species declared by: 1) the Secretary of the United States Department of the Interior to be in such small numbers throughout their range that they may become endangered if their environment worsens, and appear on a Threatened Species List published in the Federal Register; or 2) are declared by the Pennsylvania Fish and Boat Commission Executive Director to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on the Pennsylvania Threatened Species List published in the Pennsylvania Bulletin.

Internal Fish and Boat Commission Status Category:

PC = Pennsylvania Candidate - Species that exhibit the potential to become Endangered or Threatened in the future. Pennsylvania populations of these taxa are: 1) "rare" due to their decline, distribution, restricted habitat, etc.; 2) are "at risk" due to aspects of their biology, certain types of human exploitation, or environmental modification; or, 3) are considered "undetermined" because adequate data is not available to assign an accurate status.

This category is unofficial and has no basis in any law (i. e., Chapter 75, Fish and Boat Code), as do the Endangered and Threatened categories.

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Ib (CONT.)

Invertebrates - Pennsylvania Status: No state agency is assigned to develop regulations to protect terrestrial invertebrates, although a federal status may exist for some species. Aquatic invertebrates are regulated by the Pennsylvania Fish And Boat Commission, but have not been listed to date.

Although no invertebrate species are presently state listed, conservation biologists unofficially assign numerous state status and/or state rank designations. NOTE: Invertebrate species are regularly considered under the U.S. Endangered Species Act for federal status assignments.

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Ic

GLOBAL AND STATE RANKING

Global and State Ranking is a system utilized by the network of 50 state natural heritage programs in the United States. Although similar to the federal and state status designations, the ranking scheme allows the use of one comparative system to "rank" all species in a relative format. Unlike state or federal status designation guidelines, the heritage ranking procedures are also applied to natural community resources. Global ranks consider the imperilment of a species or community throughout its range, while state ranks provide the same assessment within each state. Although there is only one global rank used by the heritage network, state ranks are developed by each state and allow a "one-system" comparison of a species or communities imperilment state by state. For more information, contact the Pennsylvania Natural Diversity Inventory.

Global Element Ranks

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres)or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered (e.g., Bachman's Warbler).

GU = Possibly in peril range-wide but status uncertain; need more information.

GX = Believed to be extinct throughout its range (e.g., Passenger Pigeon) with virtually no likelihood that it will be rediscovered.

APPENDIX Ic (CONT.)

G? = Not ranked to date.

NOTE: The study of naturally occurring biological communities is complex and natural community classification is unresolved both regionally and within Pennsylvania. The Global and State Ranking of natural communities also remains difficult and incomplete. Although many natural community types are clearly identifiable and are ranked, others are still under review and appear as G? and/or S?.

APPENDIX Id
STATE ELEMENT RANKS

S1 = Critically imperiled in state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.

S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation from the state.

S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).

S4 = Apparently secure in state, with many occurrences.

S5 = Demonstrably secure in state and essentially ineradicable under present conditions.

SA = Accidental (occurring only once or a few times) or casual (occurring more regularly But not every year) in state, including species which only sporadically breed in the state.

SE = An exotic established in state; may be native elsewhere in North America (e.g., house finch or catalpa in eastern states).

SH = Of historical occurrence in the state, perhaps having not been verified in the past 20 years, and suspected to be still extant.

SN = Regularly occurring, usually migratory and typically nonbreeding species for which no significant or effective habitat conservation measures can be taken in the state.

SR = Reported from the state, but without persuasive documentation which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.

SU = Possibly in peril in state but status uncertain; need more information.

SX = Apparently extirpated from the state.

SZ= Not of significant conservation concern in the state, invariably because there are no (zero) definable element occurrences in the state, although the taxon is native and appears regularly in the state.

S? = Not ranked to date.

NOTE: The study of naturally occurring biological communities is complex and natural community classification is unresolved both regionally and within Pennsylvania. The Global and State Ranking of natural communities also remains difficult and incomplete. Although many natural community types are clearly identifiable and are ranked, others are still under review and appear as G? and/or S?

APPENDIX II

COUNTY SIGNIFICANCE RANKS

The natural heritage sites that have qualified for inclusion in this report have been classified regarding their significance as areas of importance to the biological diversity and ecological integrity of the county. Included in this evaluation is also the level of state and/or national significance. These ranks have been used to prioritize the significance of all identified sites and suggest the relative attention that sites should receive for the amount, degree and rate of protection.

Significance Rank	Explanation
EXCEPTIONAL	Outstanding county significance. Sites that represent areas of great importance for the biological diversity and ecological integrity of the county, state and/or region. One or more occurrences of state or national species of special concern, a rare natural community type, a relatively undisturbed natural area, or high quality biological diversity area, is present at the site. Sites of high county significance merit quick, strong and complete protection.
HIGH	Important county significance. Sites that represent vital areas of the county's biological and ecosystem resources and have not been overly disturbed by human activities. Also occasionally included are sites that have less important occurrences of state or nationally imperiled species and/or natural communities. These sites represent notable areas harboring important natural resources that merit complete protection in the near future.
NOTABLE	General county significance. Sites that harbor many of the flora, fauna and natural community resources in the county, and although somewhat disturbed by human activities, still represent areas that provide habitat, open space, educational lands and general landscape and/or watershed protection. These sites will be increasingly important to the future quality of the county's overall environment, and merit the attention of planners and conservationists so that their present condition can be maintained.

APPENDIX III
CLINTON COUNTY NATURAL HERITAGE INVENTORY
SITE SURVEY FORM

Site Name:
County: Clinton Municipality:
Quad Name:_____ Quad Code:_____ 10,10:
Reference:
Land Owners (include best method of contact, date contacted, and method of permission):

Directions to Site:
Site Elevation:_____ Site Size:_____ Aspect:
Aerial Photo Int. Air Photo #:_____ Photo Type:_____Comments from Aerial Photo Interpretation:

Aerial Reconnaissance Date:_____ Team:
Comments from Aerial Survey:

Ground Survey Date:_____ Team:
Community(s) Type:
Setting of Community(s):
Conditions:
Description of site (quality, vegetation, significant species, aquatic features, notable landforms, natural hazards, age, etc.):
Evidence of Disturbance (logging, grazing, mining, past agriculture, erosion, sedimentation, filling, draining, exotic flora, etc.):

APPENDIX III (CONT.)
CLINTON COUNTY NATURAL HERITAGE INVENTORY
SITE SURVEY FORM (CONT.)

Recovery Potential:
Surrounding Land Use:
Threats to Site and Management/Protection:
Previously Identified EO's:

Species:
****
Accepted for inclusion in report: _____ Rejected: _____ Date:
Reason:

APPENDIX IV

NATURAL HERITAGE SITE RECOMMENDATION FORM

Your Name:_____ Phone: _____Address:

A natural heritage site is an important biotic (living) resource such as an exemplary natural area (e.g. an old-growth forest community, habitat for endangered, threatened or rare plants or animals) or areas that are important for open space, wildlife habitat, or educational/scientific purposes.

Site Name and Ownership:_____Exact Location of Site (please be specific and include a map or sketch):

Size of Site (approximate acres):_____ Date of Observation: _____ Site Type:

___ Mature Forest
___ Forested Swamp
___ Shrub Swamp
___ Marsh
___ Bog
___ Natural Pond or Lake
___ High Quality Stream
___ Habitat for Rare Species
___ Rock Outcrop or Cliff
___ Cave
___ Other

Written Description of Site: Try to convey a mental image of the sites features by including vegetation, significant plants and animals, aquatic features, land forms, geologic features, etc.:

Evidence of Disturbance (logging, mining, erosion, sedimentation, filling, draining, grazing, etc.):

Please attach any additional information, species list, maps, etc.. Send completed report forms to Jeff Wagner, Western Pennsylvania Conservancy, 316 Fourth Ave., Pittsburgh, PA 15222, (412)288-2777. Additional forms may be obtained from this office. Thank you for your contribution to the Clinton County Natural Heritage Inventory.

APPENDIX V

CLASSIFICATION OF NATURAL COMMUNITIES IN PENNSYLVANIA

CNHIs and the status of natural community classification in Pennsylvania:

Terrestrial & Palustrine Plant Communities of Pennsylvania (Fike 1999) is the most current community classification system for Pennsylvania's palustrine and terrestrial plant communities. This report was developed by the Pennsylvania Natural Diversity Inventory (PNDI) to update and refine Smith's 1991 report Classification of natural communities in Pennsylvania (draft), the first effort dedicated specifically to the classification of natural communities in Pennsylvania. Work is ongoing to improve the current classification system. Future editions may define new community types or alter currently defined types. Aquatic communities (lakes, streams, and rivers), communities where vegetation is absent or not a definitive characteristic (caves, scree slopes), and communities resulting from extensive human disturbance (early stages of forest regrowth, old agricultural fields, manmade wetlands, etc.), are not addressed in this classification. Until more extensive classification work can be completed to define these types of communities and incorporate them into a single state-wide framework, the County Natural Heritage Inventory reports will provisionally refer to features of ecological interest that fall outside the Fike 1999 system using categories described in Smith 1991.

Community Ranks

As with species that are of concern, ranks (see appendix I) have been assigned to rate the rarity of each natural community type identified for Pennsylvania. In most cases, the global extent of these communities has yet to be fully evaluated, and no global rarity rank has been assigned. Work is ongoing to refine these ranks and to further develop the ranking system to rate the relative quality of communities within a type.

FIKE 1999 TYPES

COMMUNITY NAME	GLOBAL RANK	STATE RANK
TERRESTRIAL FORESTS		
Hemlock (white pine) forest	G5	S4
Serpentine pitch pine – oak forest	G2	S1
Serpentine Virginia pine – oak forest	G2	S1
Pitch Pine – mixed oak forest	G?	S4
Virginia pine – mixed hardwood forest	G?	S5
Dry white pine (hemlock) – oak forest	G?	S4
Hemlock (white pine) – northern hardwood forest	G?	S5
Hemlock (white pine) – red oak – mixed hardwood forest	G?	S4

APPENDIX V (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
Hemlock – tuliptree – birch forest	G?	S4
Rich hemlock – mesic hardwoods forest	G?	S2S3
Dry oak –heath forest	G?	S4S5
Dry oak – mixed hardwood forest	G?	S3
Red oak – mixed hardwood forest	G?	S5
Northern hardwood forest	G?	S4
Black cherry – northern hardwood forest	G?	S4
Tuliptree – beech – maple forest	G?	S4
Sugar maple – basswood forest	G?	S4
Mixed mesophytic forest	G?	S1S2
Sweet gum – oak coastal plain forest	G?	S1
Red maple (terrestrial) forest	G?	S5
Black-gum ridgetop forest	G?	S3
Aspen/gray (paper) birch forest	G?	S?
Black locust forest	G?	SW
PALUSTRINE FORESTS		
Black Spruce- tamarack peatland forest	G?	S3
Red Spruce palustrine forest	G?	S3
Hemlock palustrine forest	G5	S3
Hemlock – mixed hardwood palustrine forest	G?	S3S4
Red spruce – mixed hardwood palustrine forest	G?	S3
Bottomland oak – hardwood palustrine forest	G5	S2
Red maple – black-gum palustrine forest	G5	S3S4
Red maple – black ash palustrine forest	G?	S2S3
Red maple – magnolia Coastal Plain palustrine forest	G?	S1
Great Lakes Region lakeplain palustrine forest	G?	S1
Sycamore – (river birch)- box elder floodplain forest	G?	S3
Silver maple floodplain forest	G?	S3
Red maple – elm – willow floodplain swamp	G?	S2
TERRESTRIAL WOODLANDS		
Pitch pine – heath woodland	G4	S2
Pitch pine – scrub oak woodland	G4	S2
Red spruce rocky summit	G?	S1
Pitch pine – rhodora – scrub oak woodland	G?	S1
Pitch pine – mixed hardwood woodland	G4	S2S3
Virginia pine – mixed hardwood shale woodland	G?	S2

APPENDIX V (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
Red-cedar – mixed hardwood rich shale woodland	G?	S1S2
Dry oak – heath woodland	G4	S3
Birch (black-gum) rocky slope woodland	G?	S2
Yellow oak – redbud woodland	G?	S2
Great Lakes Region scarp woodland	G?	S1S2
Great Lakes Region bayberry – cottonwood community	G?	S1
PALUSTRINE WOODLANDS		
Pitch pine – leatherleaf woodland	G?	S2
Black spruce – tamarack palustrine woodland	G?	S2
Red spruce palustrine woodland	G?	S2S3
Red maple – highbush blueberry palustrine woodland	G5	S4
Red maple – sedge palustrine woodland	G5	S4
Red maple – mixed shrub palustrine woodland	G?	S4
TERRESTRIAL SHRUBLANDS		
Red-cedar – prickly pear shale shrubland	G?	S2
Red-cedar – pine serpentine shrubland	G2	S1
Red-cedar – redbud shrubland	G?	S2
Low heath shrubland	G4	S1
Low heath – mountain ash shrubland	G?	S2
Scrub oak shrubland	G4	S3
Rhodora – mixed heath – scrub oak shrubland	G?	S1
PALUSTRINE SHRUBLANDS		
Buttonbush wetland	G?	S4
Alder – ninebark wetland	G?	S3
Alder – sphagnum wetland	G5	S4
Highbush blueberry – meadow-sweet wetland	G5	S5
Highbush blueberry – sphagnum wetland	G?	S5
Leatherleaf – sedge wetland	G?	S3
Leatherleaf – bog rosemary	G?	S2
Leatherleaf – cranberry peatland	G?	S2S3
Water-willow (*Decodon verticillatus*) shrub wetland	G?	S3
River birch – sycamore floodplain scrub	G?	S4
Poison sumac – red-cedar – bayberry fen	G2	S1
Buckthorn – sedge (*Carex interior*) – golden ragwort fen	G2G3	S1

APPENDIX V (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
Great Lakes Region scarp seep	G?	S1
Great Lakes Region bayberry – mixed shrub palustrine shrubland	G?	S1
TERRESTRIAL HERBACEOUS OPENINGS		
Side-oats gramma calcareous grassland	G2	S1
Calcareous opening/cliff	G?	S2
Serpentine grassland	G?	S1
Serpentine gravel forb community	G?	S1
Great Lakes Region dry sandplain	G?	S1
HERBACEOUS WETLANDS		
Bluejoint – reed canary grass marsh	G?	S5
Cat-tail marsh	G?	S5
Tussock sedge marsh	G?	S3
Mixed forb marsh	G3G4	S3
Herbaceous vernal pond	G?	S3S4
Wet meadow	G?	S5
Bulrush marsh	G?	S3
Great Lakes Region palustrine sandplain	G?	S1
Prairie sedge – spotted joe – pye – weed marsh	G?	S1S2
Open sedge (*Carex stricta, C. prairea, C. lacustris*) fen	G?	S1
Golden Saxifrage – sedge rich seep	G?	S2
Skunk cabbage – golden saxifrage forest seep	G?	S4S5
Serpentine seepage wetland	G?	S1
Golden saxifrage – Pennsylvania bitter-cress spring run	G?	S3S4
Sphagnum – beaked rush peatland	G?	S3
Many fruited sedge – bladderwort peatland	G?	S2
Water-willow (*Justicia americana*) – smartweed riverbed community	G?	S4
Riverside ice scour community	G?	S1S2
Big bluestem – Indian grass river grassland	G?	S3
Pickerel-weed – arrow-arum – arrowhead wetland	G3G4	S4
Spatterdock – water lily wetland	G?	S4
COMMUNITY COMPLEXES	Complexes not ranked	
Acidic Glacial Peatland Complex		
Great Lakes Region Scarp Complex		
Erie Lakeshore Beach-Dune-Sandplain Complex		

APPENDIX V (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
Mesic Till Barrens Complex		
Serpentine Barrens Complex		
Ridgetop Acidic Barrens Complex		
River Bed-Bank-Floodplain Complex		
SMITH 1991 TYPES		
SUBTERRANEAN COMMUNITIES		
Solution Cave Terrestrial Community	G?	S3
Solution Cave Aquatic Community	G?	S3
Tectonic Cave Community	G?	S3S4
Talus Cave Community	G?	S2S4
DISTURBED COMMUNITIES		
Bare Soil	G?	S?
Meadow/Pastureland	G?	S?
Cultivated Land	G?	S?
Successional Field	G?	S?
Young Miscellaneous Forest	G?	S?
Conifer Plantation	G?	S?
ESTUARINE COMMUNITIES		
Deepwater Subtidal Community	G?	S1
Shallow-Water Subtidal Community	G?	S1
Freshwater Intertidal Mudflat	G3G4	S1
Freshwater Intertidal Marsh	G3G4	S1
RIVERINE COMMUNITIES		
Low-Gradient Ephemeral/Intermittent Creek	G?	S5
Low-Gradient Clearwater Creek	G?	S3S4
Low-Gradient Clearwater River	G?	S2S3
Low-Gradient Brownwater Creek	G?	S2S3
Medium-Gradient Ephemeral/Intermittent Creek	G?	S5
Medium-Gradient Clearwater Creek	G?	S3
Medium-Gradient Clearwater River	G?	S?
Medium-Gradient Brownwater Creek	G?	S3

APPENDIX V (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
Smith 1991 Types (cont.)		
High-Gradient Ephemeral /Intermittent Creek	G?	S5
High-Gradient Clearwater Creek	G?	S3
High-Gradient Clearwater River	G?	S?
High-Gradient Brownwater Creek	G?	S?
Waterfall and Plungepool	G?	S3S4
Spring Community	G?	S1S2
Spring Run Community	G?	S1S2
<u>LACUSTRINE COMMUNITIES</u>		
Glacial Lake	G?	S1
Nonglacial Lake	G?	S2
Artificial Lake		
Natural Pond	G?	S2S3
Artificial Pond		
Stable Natural Pool	G?	S?
Ephemeral/Fluctuating Natural Pool	G?	S1
Artificial Pool		
Ephemeral/Fluctuating Limestone Sinkhole	G?	S1