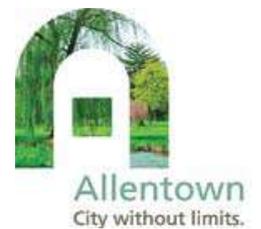




South Mountain Reservoir Forest Stewardship Plan

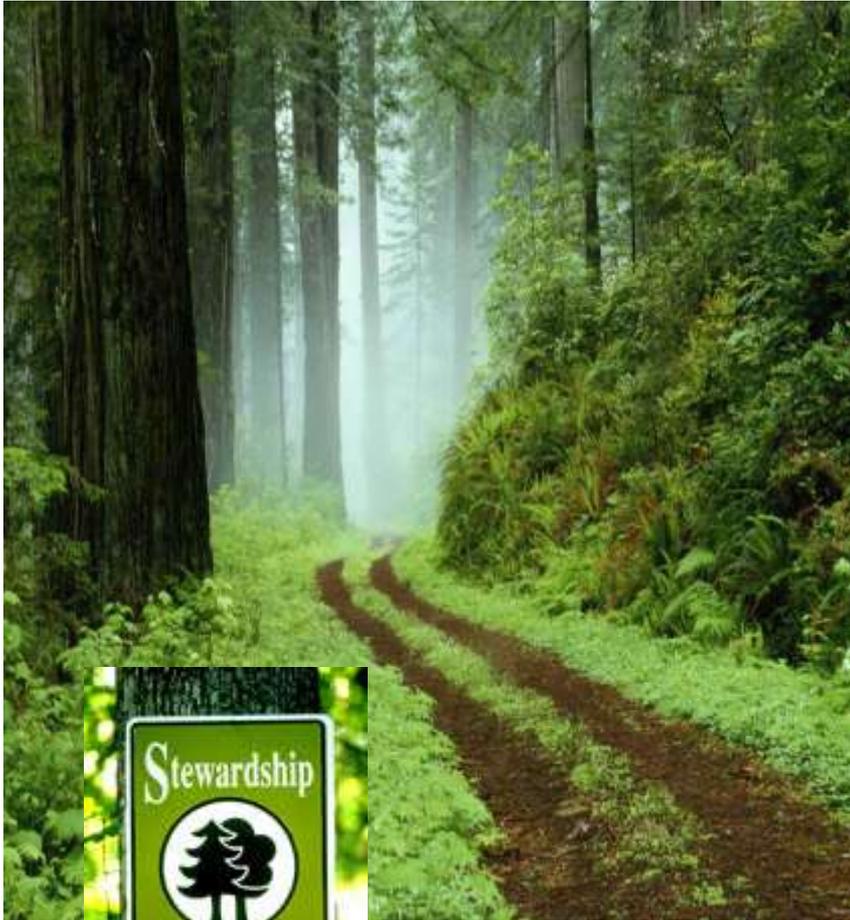


Remember this...

- **With proper management, South Mountain Reservoir can become an excellent example of a multiple use forest with increased opportunities for conservation, recreation, and environmental education.**



Tonight's Session



- Forest Stewardship Plan
- Goals & Objectives
- Summarize Initial Field Analysis to Date
- Short & Long Term Recommendations
- Questions & Comments



Did you know that two healthy trees can produce enough oxygen (through photosynthesis) needed for a person each year? (about 400 lbs)

South Mountain Reservoir Forest



- Forests Provide Multiple Benefits
 - Environmental
 - Social & Aesthetic
 - Recreational
 - Financial
- How do you achieve the best combination?
- Start by creating a Forest Stewardship Plan

What is a Forest Stewardship Plan?

Long Lake Township Forest Stewardship Plan



Completed: September of 2002

A cooperative effort between Long Lake Township in Grand Traverse County
and the Michigan Department of Natural Resources.



- First step
- Roadmap to responsible forestry
- Determines short and long-term objectives
- Multidimensional
- Plan is straight forward and easy to follow
- However, issues are complex and can be controversial

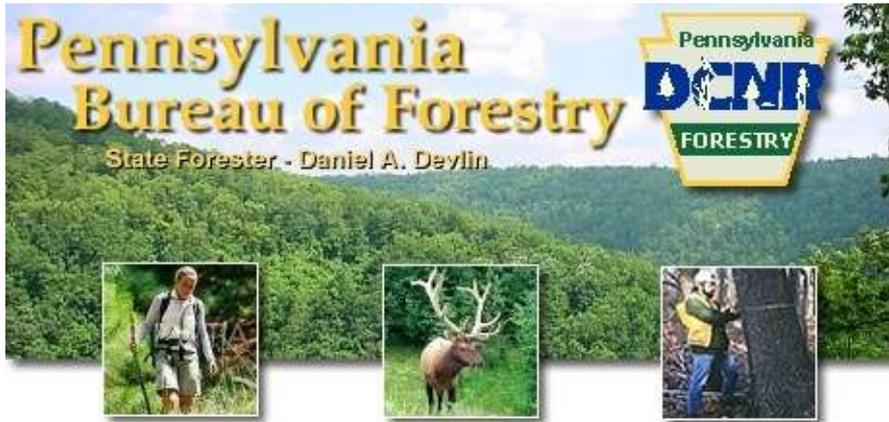
Five Basic Steps to Developing a Forest Stewardship Plan



- 1. Seek professional assistance
- 2. Determine goals and objectives
- 3. Inventory and evaluate forest resources
- 4. Formulate short and long term recommendations & activity schedule
- 5. Review and reevaluate plan annually



Planning the Future of the South Mountain Reservoir Forest



- City Arborists & DCNR Bureau of Forestry
- Determined Basic Goals and Objectives
- Hired Forester to Conduct Tree Inventory
- City, DCNR, Forester & Wildlands Conservancy Assisted in Developing Draft Stewardship Plan



South Mountain Reservoir



1 inch = 1,000 feet

0 750 1,500 3,000 Feet



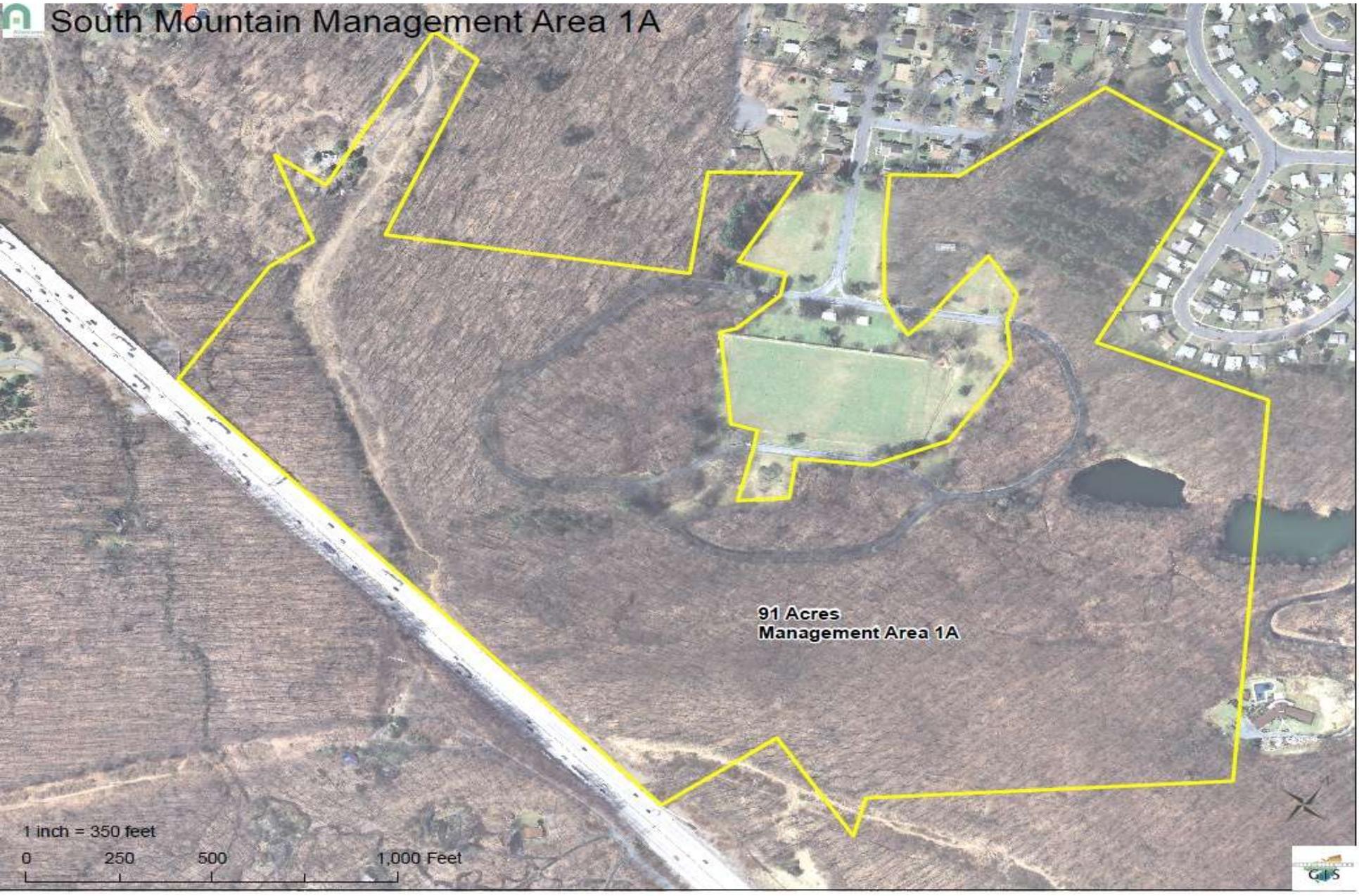
South Mountain Reservoir Forest Goals & Objectives



- The GOAL for the City of Allentown is to have a healthy sustainable forest.
- The 1st OBJECTIVE is to conduct a thorough inventory of the trees and vegetation within the forest to determine species and assist in efforts to improve wildlife habitat.
- The 2nd OBJECTIVE is to establish correct property lines, improve access for recreational and emergency purposes, and prevent unlawful uses within the park.

Establishing Management Areas

 South Mountain Management Area 1A



91 Acres
Management Area 1A

1 inch = 350 feet
0 250 500 1,000 Feet



South Mountain Management Area 2A



65 Acres
Management Area 2A

1 inch = 400 feet

0 250 500 1,000 Feet



Management Area 1A



- South 10th Street
- 91 Acres
- Water Reservoir
- Spicebush is dominant understory plant species
 - One (1) to eight (8) ft. tall
- Variety of invasive plants
 - Garlic mustard, wine berry, Autumn olive, Japanese stilt





Lookout to City of Allentown



Management Area 1A

Little to no ground cover



Trail system is heavily eroded



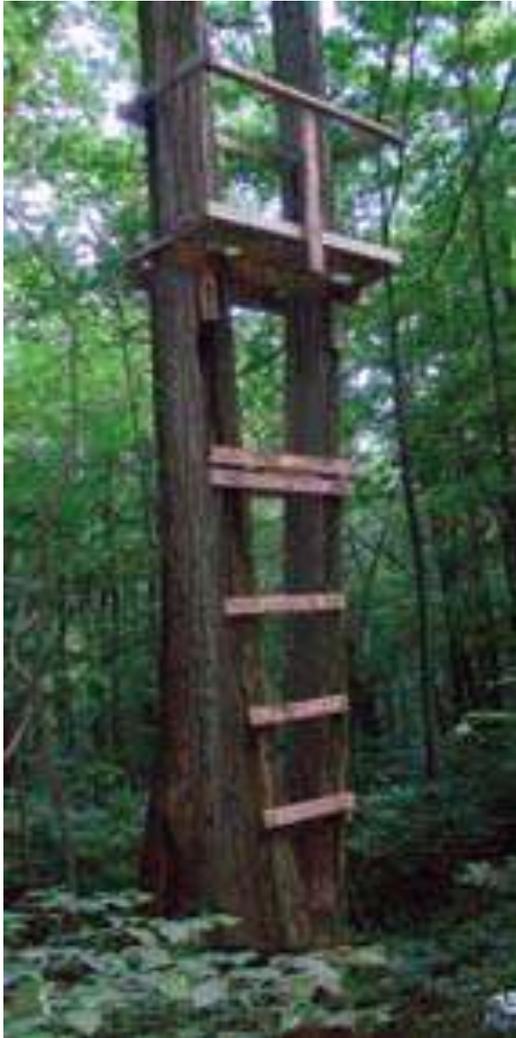
Management Area 2A



- South 28th Street
- 65 Acres
- Trout Creek
- PPL Power Line
- Borders Wildlands Conservancy Property
- Spicebush dominant
- Variety of invasive plants
 - Multi-flora rose, garlic mustard, wine berry, Autumn olive, Japanese stilt



Illegal Tree Stands, Dumping & Cutting



Heavy ATV Use



Summary of Initial Fieldwork

Overall Forest Health

Management Areas 1A & 2A



Species of Special Concern



Western Hairy Rock Cress

- Pennsylvania Natural Diversity (PNDI) Index search was completed
- Special concern species located at or around the site
- Western Hairy Rock Cress
- Wildands Property
 - Five species indentified

Tree Inventory



- 100% inventory using Prism Cruise method was completed
- Tallied by species, volume, volume by tree, number of trees, price/value
- Increment borers
- Timber production not an objective

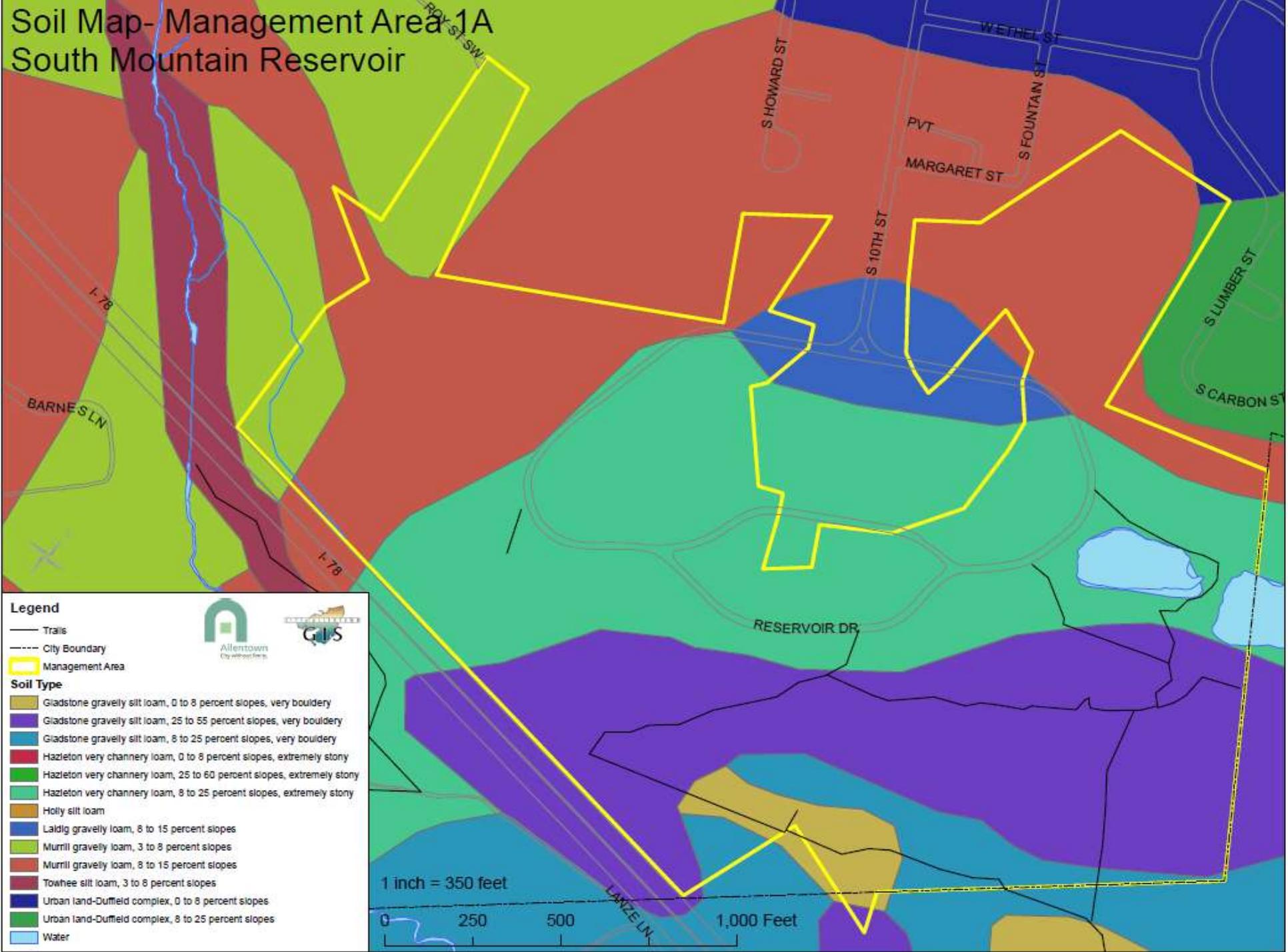


Tree Inventory



- Over 4,000 different trees were tallied in the two Management Areas.
- Eleven different species indentified
- Dominant species is Yellow Poplar with over 1,000 trees tallied
- Black Oak (985), Red Oak (889), Black Birch (508)

Soil Map- Management Area 1A South Mountain Reservoir



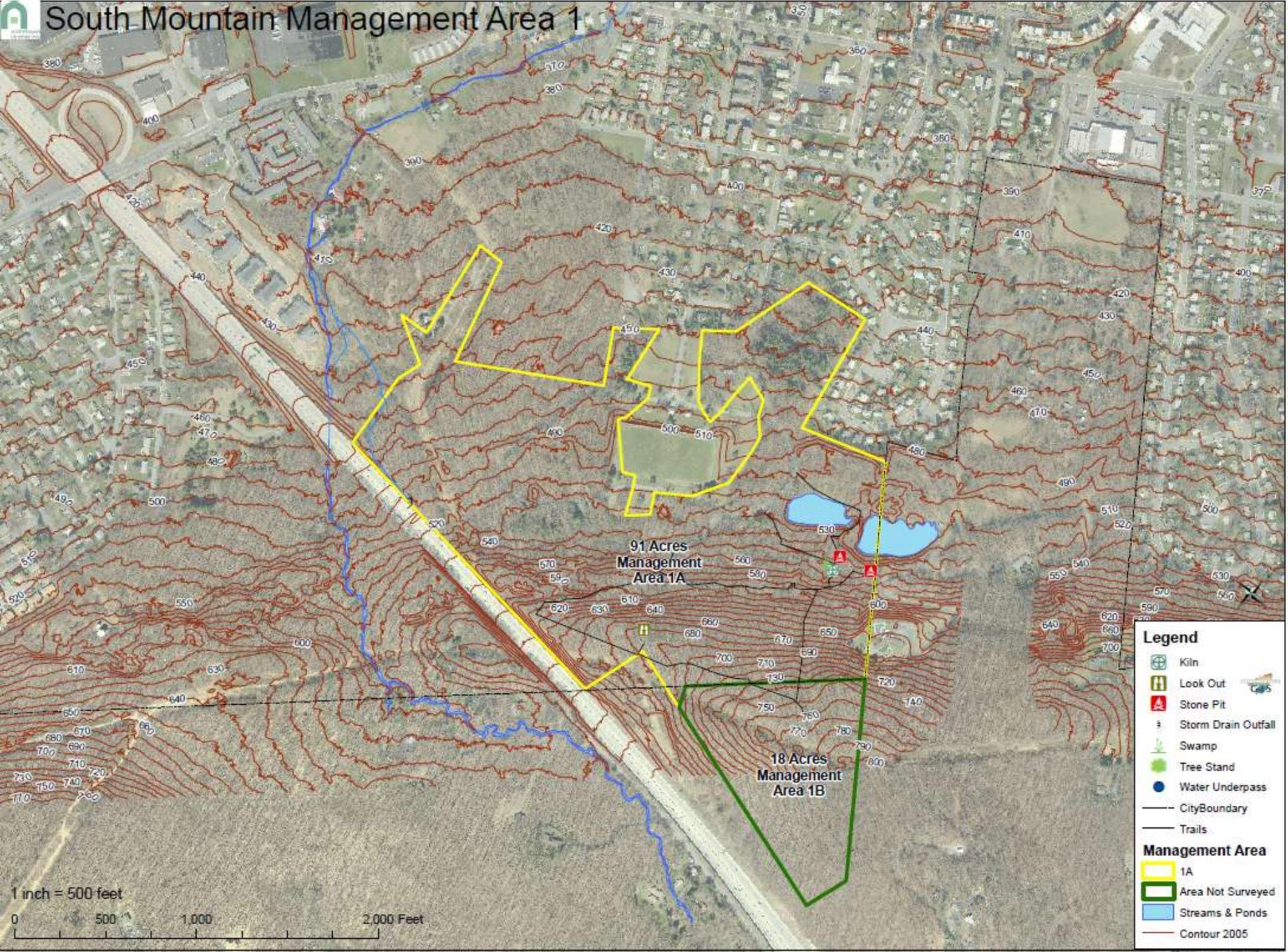
Legend

- Trails
- - - City Boundary
- ▭ Management Area

Soil Type

- ▭ Gladstone gravelly silt loam, 0 to 8 percent slopes, very bouldery
- ▭ Gladstone gravelly silt loam, 25 to 55 percent slopes, very bouldery
- ▭ Gladstone gravelly silt loam, 8 to 25 percent slopes, very bouldery
- ▭ Hazleton very channery loam, 0 to 8 percent slopes, extremely stony
- ▭ Hazleton very channery loam, 25 to 60 percent slopes, extremely stony
- ▭ Hazleton very channery loam, 8 to 25 percent slopes, extremely stony
- ▭ Holly silt loam
- ▭ Laidig gravelly loam, 8 to 15 percent slopes
- ▭ Murrill gravelly loam, 3 to 8 percent slopes
- ▭ Murrill gravelly loam, 8 to 15 percent slopes
- ▭ Towhee silt loam, 3 to 6 percent slopes
- ▭ Urban land-Duffield complex, 0 to 8 percent slopes
- ▭ Urban land-Duffield complex, 8 to 25 percent slopes
- ▭ Water

South Mountain Management Area 1



91 Acres
Management
Area 1A

18 Acres
Management
Area 1B

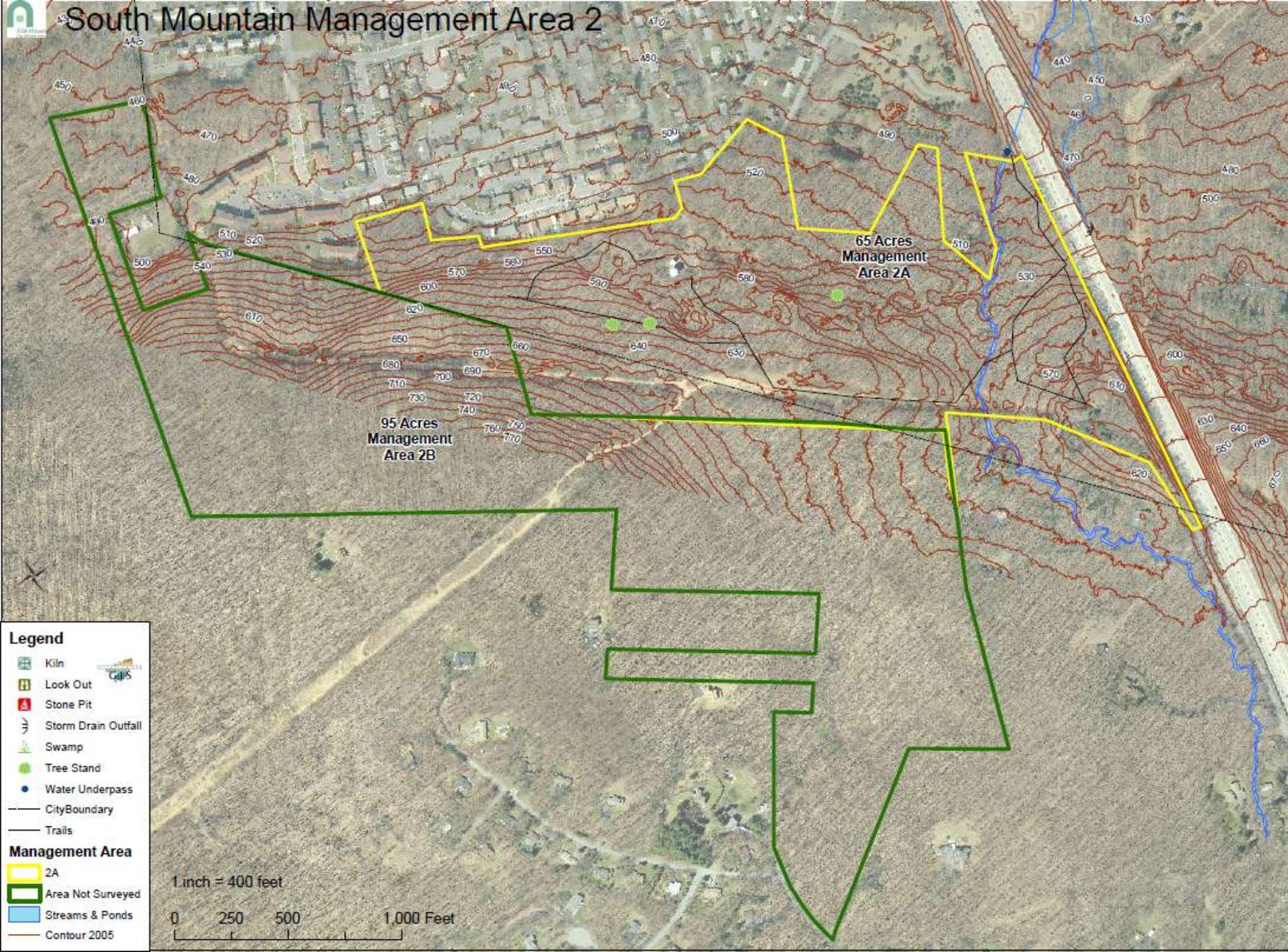
Legend

- Kiln
- Look Out
- Stone Pit
- Storm Drain Outfall
- Swamp
- Tree Stand
- Water Underpass
- City Boundary
- Trails
- Management Area**
- 1A
- Area Not Surveyed
- Streams & Ponds
- Contour 2005

1 inch = 500 feet

0 500 1,000 2,000 Feet

South Mountain Management Area 2



65 Acres
Management
Area 2A

95 Acres
Management
Area 2B

Legend

- Kiln
- Look Out
- Stone Pit
- Storm Drain Outfall
- Swamp
- Tree Stand
- Water Underpass
- City Boundary
- Trails

Management Area

- 2A
- Area Not Surveyed
- Streams & Ponds
- Contour 2005

1 inch = 400 feet

0 250 500 1,000 Feet

General Recommendations



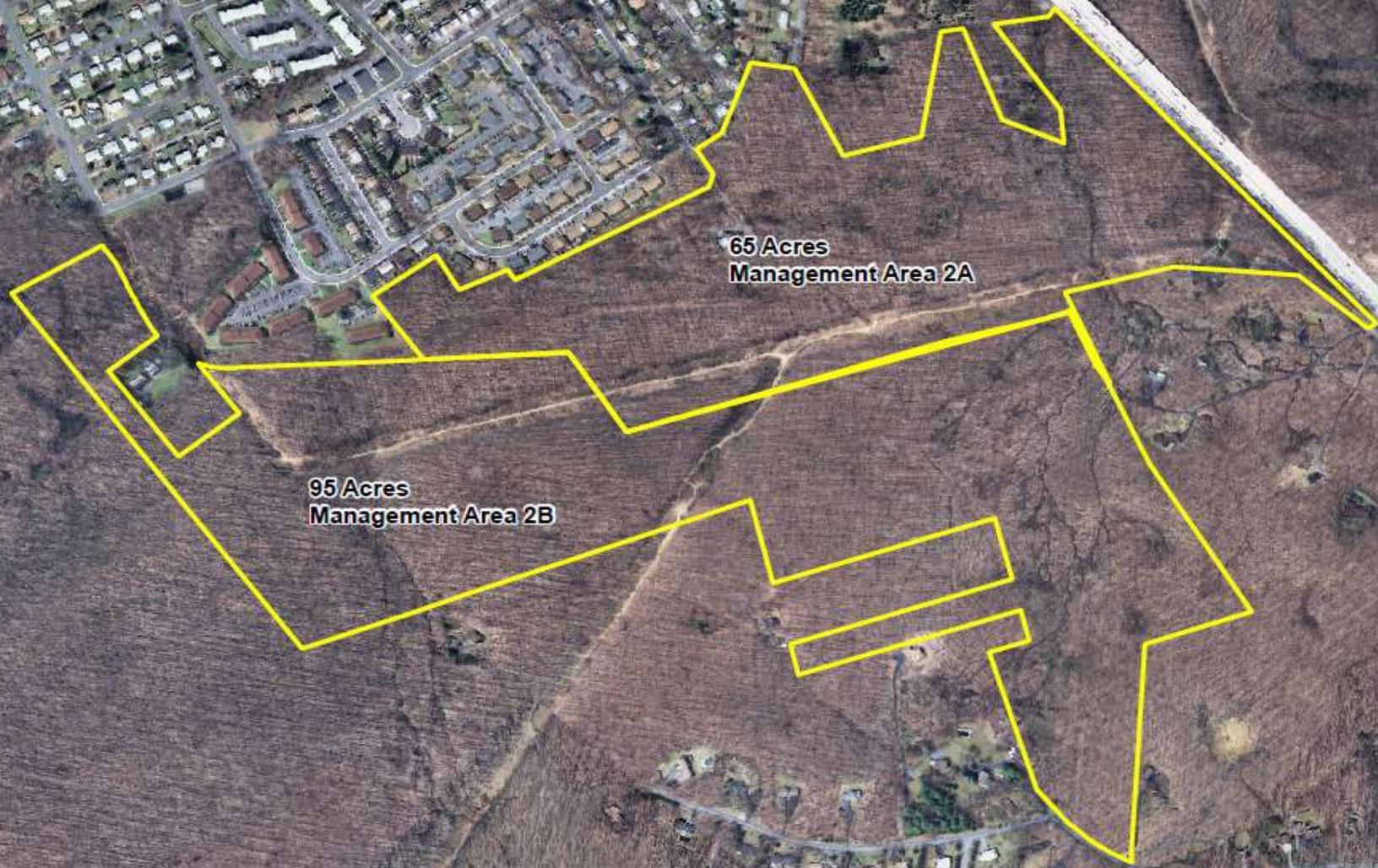
- **A First Step** towards promoting forest stewardship
- **Form a South Mountain Management Committee**
 - Natural Resource Professionals, Foresters, Wildlife, Soils, Geology, Ecology, Parks & Recreation, Environmental Education Specialists
- Review plans, establish & recommend objectives, assist in implementation & educational efforts

Complete Remaining Inventory



- Management Area 1B
18 acres
- Management Area 2B
95 acres
- Additional inventory of
trees, plants, wildlife
- Develop general land
use classifications
 - Natural areas,
biodiversity
management areas, etc.

South Mountain Management Area 2



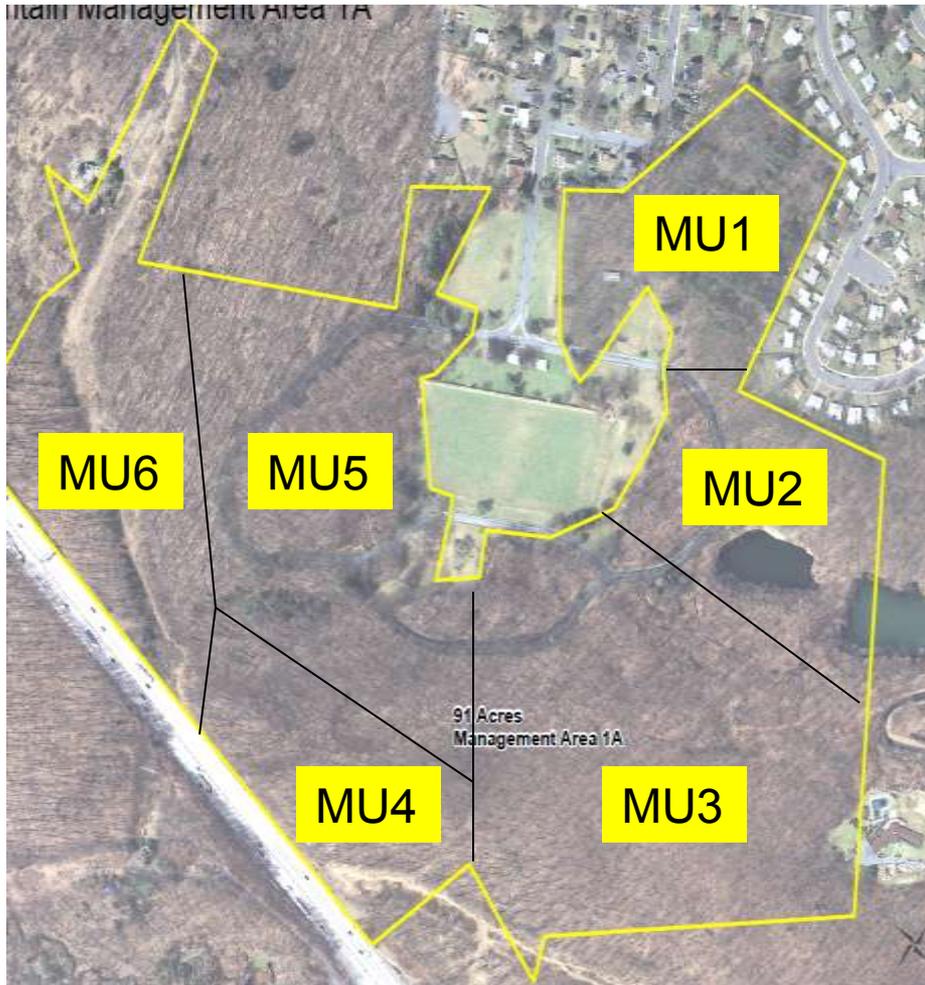
65 Acres
Management Area 2A

95 Acres
Management Area 2B

1 Inch = 625 feet
0 500 1,000 2,000 Feet



Develop Management Units



- Separate Management Areas into smaller plots or Management Units
- Develop specific classifications and recommendations
- Units are developed by topography, forest conditions, threats, uses, and other variables

Conduct Detailed Survey



- Establish & Post Accurate Property Lines
- Prevent Encroachment
- Better Access and Utilization
- Improved Enforcement

Conduct Under Story Improvement Project



- A Research Endeavor
 - Process & Price
- Very little young growth of desirable species
- Regeneration Factors
 - Light on the Forest Floor
 - Competing Vegetation
 - Deer Browsing
- Conduct Pilot Project

Conduct Fence Enclosure Project



- DCNR recommends fencing 40 acres
- Highly Visible Site
- Natural Laboratory
- Deters deer browsing
- Control invasive and undesirable understory plants
 - Mechanical vs. Chemical
- Consider planting saplings





Deer Browse Line



4 ft.



Monmouth County, NJ Park System Study



With repeated browsing the natural regeneration of shrubs is compromised. Only older shoots that are above the deer survive.



Monmouth County Park System

As the older branches die off, new shoots will not be available and the whole shrub will eventually perish.



Monmouth County Park System

Plots are evaluated both within and outside of these permanent exclosures. The percent cover and species diversity is dramatically different as is evident by the photo record.



Thompson Park Inside June 8, 2007



Thompson Park Outside June 8, 2007

These studies also show that the regeneration of forest structure is possible if deer populations can be reduced to and maintained at tolerable levels. When a walk in the woods is amongst a carpet of herbaceous and woody plants the health of the forest has returned.



Monmouth County Park System

Consider Quality Deer Management Program



Develop New Food Plots



Current



Proposed

Plant with different types of vegetation that wildlife can utilize at different times of year.

Other Recommendations

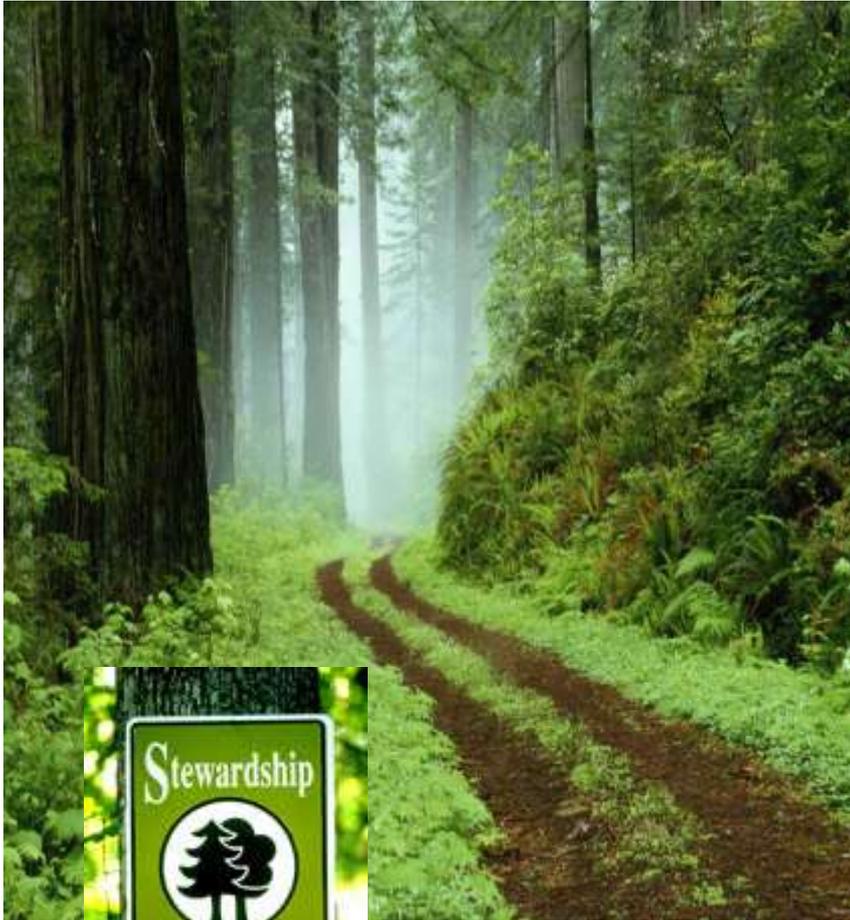


- Retirement of current trail system
 - Seed with rye grass, clover and tree foil
- Design official trail system
- Plant, promote and protect trees and bushes that produce fruits & berries
- Improve access for emergency personnel

Questions & Comments?



Tonight's Session



- Draft Forest Stewardship Plan
- Goals & Objectives
- Summarize Initial Field Analysis to Date
- Short & Long Term Recommendations

Remember this...

- **With proper management, South Mountain Reservoir can become an excellent example of a multiple use forest with increased opportunities for conservation, recreation, and environmental education.**



South Mountain Reservoir Forest Stewardship Plan

2010



CITY OF ALLENTOWN

Department of Parks and Recreation
3000 Parkway Blvd., Allentown, PA 18104
(610) 437-7750 www.allentownpa.org

Prepared in Cooperation with:

CC FORESTRY SERVICES

P.O. Box 482, Muncy, PA 17756
(570) 772-8405 ccforestry@windstream.net

PA DEPARTMENT OF CONSERVATION & NATURAL RESOURCES

DCNR Bureau of Forestry
Bureau of Forestry, William Penn Forest District
845 Park Road, Elverson, PA 19520

South Mountain Reservoir

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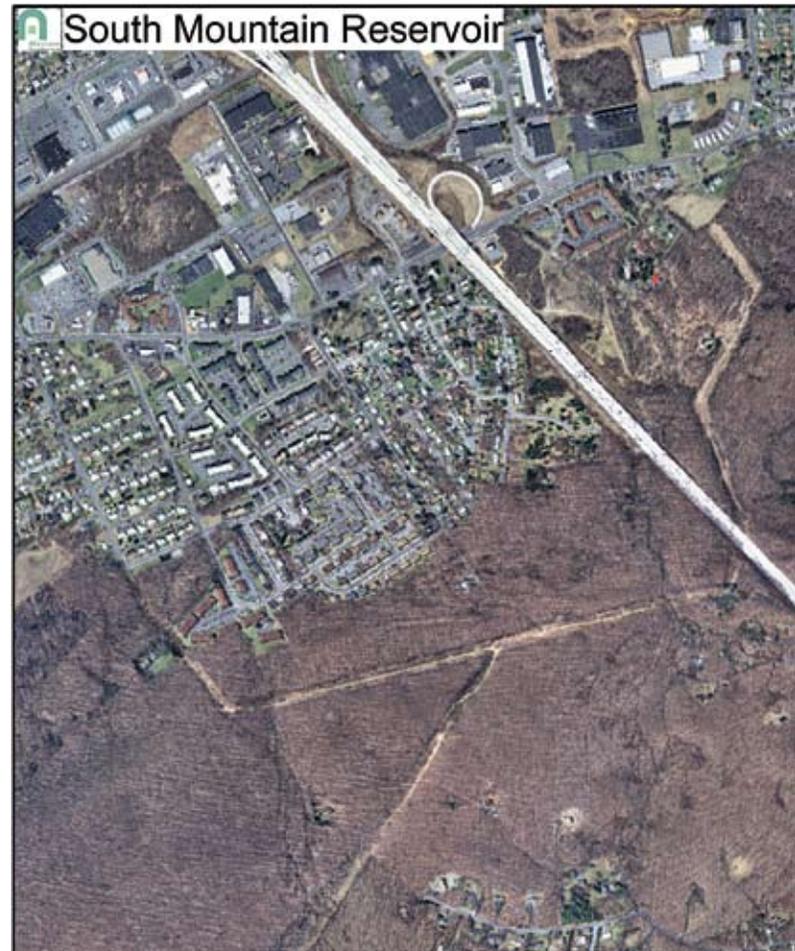
South Mountain Reservoir Park

(166.43 Acres)

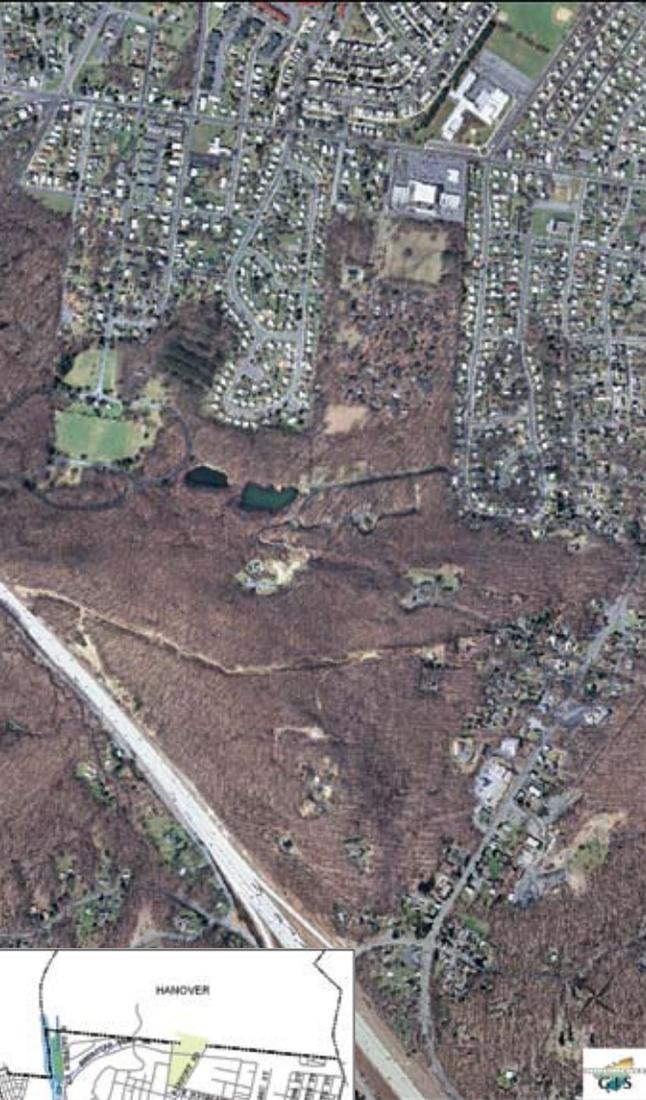
South Mountain Reservoir Park was established by condemnation in September of 1936 and is a natural resource area that serves not only the Roosevelt Park and South Mountain neighborhoods of Allentown, but also Salisbury, Emmaus, Upper Milford and Lower Macungie.

The park area has two pavilions and a walking trail network. Although not perceivable from the ground, almost half of the land included in this park is located on the south side of I-78, which bisects the park. As the name implies, the site also serves as a reservoir for the water supply within the city.

The site is primarily wooded, but there are a few open lawn areas located near the main entrance and over the cap area of the reservoir facility. The topography is generally sloped with steep sloped areas (>20%) occurring frequently.



Forest Stewardship Plan



Planning the Future of the South Mountain Reservoir Forest

What is Forest Stewardship?

Forest stewardship is the wise management and use of forest resources to ensure the health of the forest. Actively managed forests provide improved wildlife habitat, watershed protection, recreational opportunities and many other benefits for landowners and society.

What is the Purpose of a Forest Stewardship Plan?

The purpose of a Forest Stewardship Plan is to assist forest landowners in more actively managing their forest and related resources to keep these lands in a productive and healthy condition.

Forest Stewardship plans lay out strategies for achieving landowner objectives and help to guide the landowner towards responsible forestry; provide an inventory of the natural resources within the forest, evaluates alternatives, and recommends the best options for achieving forest health so the social, environmental and economic benefits of the lands will be sustained for future generations.

City of Allentown's Goals & Objectives

The goal for the City of Allentown is to have a healthy sustainable forest. The first objective is to conduct a thorough inventory of the trees and vegetation within the forest to determine species and assist in efforts to improve habitat. The second objective is to establish correct property lines, improve access for recreational and emergency purposes, and prevent unlawful uses within the park.

Establishing Management Areas

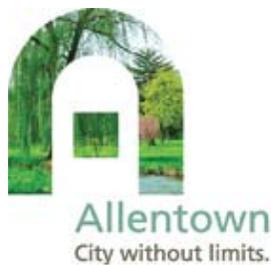
This plan separates the South Mountain Reservoir Park property into two (2) Management Areas. Management Area 1A consists of 91 acres and Management Area 2A consists of 65 acres.

In addition, two additional Management Areas (1B, 2B) consisting of 113 acres, are identified but not included in this present inventory. In the future, all four Management Areas need to be further separated into smaller Management Units based on topography, forest conditions, usages and other factors.

Directions to Management Areas 1A and 2A, property within the landscape, forest descriptions, overall forest health, species of special concern, a summary of initial fieldwork, soils, maps, wildlife and general management recommendations are provided.



Aerial photo of South Mountain Reservoir



South Mountain Reservoir within the City of Allentown



South Mountain Management Area 1A



91 Acres
Managemer

1 inch = 350 feet

0 250 500 1,000 Feet



Management Area 1A

**Emmaus Avenue &
South 10th Street
91 Acres**

Directions to Property

From Interstate 78 take the Lehigh Street exit, Exit 57; take Lehigh Street North Ramp, merge onto Lehigh Street continue about .6 miles and turn right onto Downyflake Lane. Downyflake Lane becomes Devonshire Road, turn right onto South 10th Street. Property is located at the end of 10th Street.

Property within the Landscape

South Mountain Reservoir is located on the south side of the City of Allentown. Management Area 1A is surrounded to the northeast by urban housing and the southeast by residential housing with larger plots of land.

From the southwest, the property is bordered by I-78 Interstate. Northwest is bordered by one large residential property, urban housing and another parcel of land owned by the Allentown School District. The property is mostly wooded. The property does have a road system that goes around the reservoir. The reservoir itself and land lying northwest have grassy areas. There are also two bodies of water. There are no agricultural areas bordering this property.

**Management
Area 1A Aerial photo**

Management Area 1A

General Forest Description

When first entering the woodlot, the topography is flat and the elevation is approximately 470-540 feet and the majority of the trees are tulip poplar with a variety of oak species including black oak, red oak and white oak intermixed amongst this section of the woodlot. There is also white ash, black cherry and walnut trees in the lower elevation. In the very northeast corner, there is a stand of evergreens.

In this area there is also a very dense under-story with plants such as jack in the pulpit, black cohosh, maple leaved viburnum, Virginia creeper, white snake root, naked-flowered tick trefoil, false Solomon's seal, assorted violets, poison ivy, sensitive fern and cinquefoil, however, the area is mainly dominated by spicebush ranging in heights from one (1) to over eight (8) feet tall. Also amongst the under-story are invasive plants such as garlic mustard and Japanese stilt grass.



Spicebush is the dominant understory plant species on the South Mountain Reservoir.

As you proceed into the woodlot the elevation changes gradually to approximately 580-650 feet, in this section of the woodlot the majority of the trees are oak of different species such as black, red, white and chestnut, with a few poplar, hickory and black birch trees intermixed.

The area has less under-story than the first section, but with a more diverse mixture of plant species both shrub and herbaceous such as hay scented fern, false Solomon's seal, aster, sarsaparilla, poison ivy, Virginia creeper, Christmas fern, common buckthorn, may apple, naked-flowered tick trefoil, striped pipsisewa, blueberry, mountain laurel, and maple-leaved viburnum.

Also amongst the under-story are invasive plants such as garlic mustard, wine berry, bush honeysuckle, burning bush, privet, Japanese barberry, Autumn olive, Oriental bittersweet, mulitflora rose, and Japanese stilt.

Poison ivy growing on tree



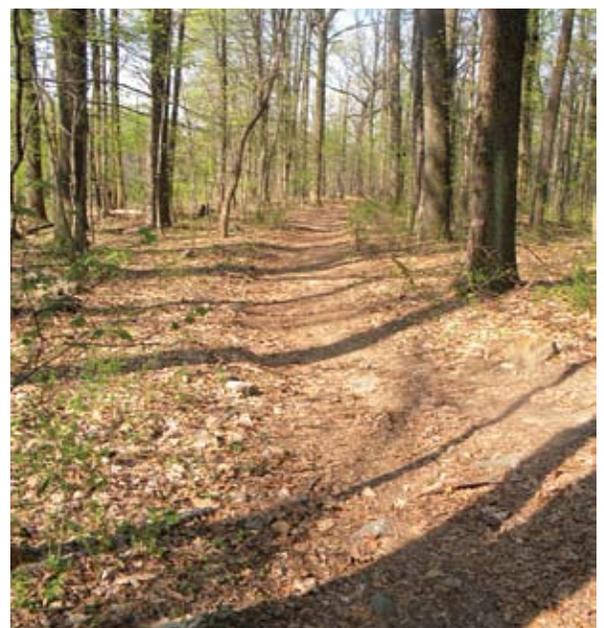
Lookout to City of Allentown directly southeast of entrance at 680 feet.

At the top of this incline there is one area that was built to overlook the City of Allentown, however, due to the maturity of the woodlot the view is minimal when foliage is on the trees.

At this point, the property flattens out and stays at between 630-730 feet in elevation for the remainder of the parcel. In this area the mixture of trees is about equal between poplar and oak and the under-story has the least amount of ground cover because of heavy browsing by deer. A power line runs through this section of the property. There are some trails that have been created through the woodlot by people walking, biking, and use of ATV's within the park system.



Least amount of ground cover due to heavy deer browsing



Trail system that has been created by the public



South Mountain Management Area 2A

**65 Acres
Management Area 2A**

1 inch = 400 feet

0 250 500 1,000 Feet



Management Area 2A

28th Street SouthWest
65 Acres

Directions to Property

From Interstate 78 take the Lehigh Street exit, Exit 57; take Lehigh Street South Ramp, merge onto Lehigh Street continue about .3 miles and turn left onto 31st Street SW continue .3 miles and turn left onto W. Emmaus Avenue continue .4 miles and turn right onto 28th Street SW property is located at the end of 28th Street SW.

Property within the Landscape

South Mountain Reservoir is located on the south side of the City of Allentown. The management area is surrounded to the northeast by Interstate 78; southeast is surrounded by residential housing with larger plots of land. From the southwest, the property is bordered by the Wildland's Conservancy owned forest. Northwest is bordered by urban housing and Trout Creek runs through the property at this site. There are no agricultural areas bordering this mostly wooded property.

Management Area 2A Aerial photo

Management Area 2A

General Forest Description

When first entering this mature woodlot at 28th street, the topography is semi-flat, the elevation is approximately 520-590 feet at the water tower. The majority of the trees are tulip poplar with a variety of species of oak trees such as black oak, red oak and white oak, intermixed amongst this section of the woodlot. There are also black cherry and white ash trees in this section.

There is a very dense under-story with plants such as jack in the pulpit, black cohosh, maple leaved viburnum, Virginia creeper, white snake root, naked-flowered tick trefoil, false Solomon's seal, assorted violets, poison ivy, sensitive fern and cinquefoil, but is dominated mainly by spicebush ranging in heights from one (1) foot to over eight (8) feet tall. Also amongst the under-story are invasive plants such as garlic mustard and Japanese stilt grass.

As you proceed to the east toward Interstate 78, the elevation gradually declines to 510 feet. Trout Creek flows north into a drainage that goes under route 78 at 480 feet. Because of the high level of moisture in this section of the woodlot, the majority of the trees are tulip poplar with red, black and white oak trees intermixed. There is also black birch in this section. There is no change in the under-story from first entering.

Proceeding southwest the elevation changes gradually to approximately 610' at this elevation the majority of trees are oak trees with tulip poplar intermixed. The oak tree is dominant due to the composition and drainage of soils. The under-story starts to thin but with a more diverse mixture of plant species including both shrub and herbaceous such as: hay scented fern, false Solomon's seal, aster, sarsaparilla, poison ivy, Virginia creeper, Christmas fern, common buckthorn, may apple, naked-flowered tick trefoil, striped pipsisewa, blueberry, mountain laurel, and maple-leaved viburnum.

Also amongst the under-story are invasive plants such as garlic mustard, wine berry, bush honeysuckle, burning bush, privet, Japanese barberry, Autumn olive, Oriental bittersweet, multi-flora rose and Japanese stilt grass.

Proceeding southwest the elevation gradually changes from 610-740 feet in this rsection and the oak and tulip poplar are equal and there is a very dense under-story as when you first enter the woodlot. A power line runs through this section of the property. There are some trails that have been created through the woodlot by people walking, biking, and use of ATV's within the park system.



Invasive species Garlic Mustard (above) and Japanese stilt grass (below).



Multi-flora rose is another invasive specie growing within the woodlot.



ATV use within park system.

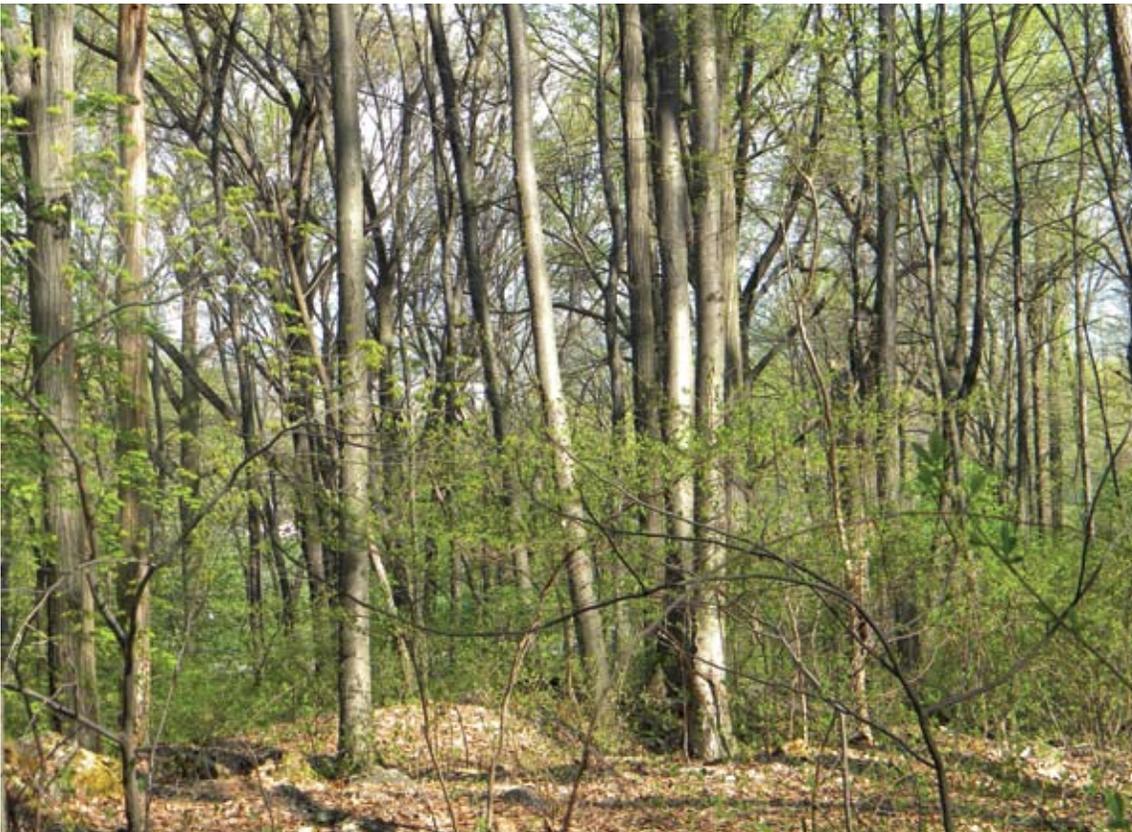


Management Areas 1A & 2A

The majority of trees in these areas are approximately 100+ years old. The trees range from 14-40 inch diameter at breast height (dbh). The regeneration of this woodlot is very limited due to the amount of under-story present and the lack of light hitting the forest floor due to the fullness of the canopy. This is also causing a lack of diversity and sustainability in the woodlot.

The trees within the under-story consist of birch and maple trees. Most of these species are growing under the canopy of the mature timber.

Fullness of canopy



Birch trees growing in under-story.

Overall Forest Health

The stand is a mature, overstocked forest which is limiting regeneration and sustainability. An overstocked forest has a higher basal area, number of trees, and volume per acre as compared to a desired level for balanced growth. There is also dieback from natural mortality due to the maturity of the forest. The forest also has problems with grapevine and poison ivy growing up the trees causing crown collapse. This means that the vines will eventually grow into the canopy competing with the trees for sunlight causing the tree to eventually die.



Grapevine growing in trees (left) Natural mortality causing the tree to fall on trail system (last two photos).

There is no sign of any detrimental insect infestation to the woodlot that would cause a catastrophic event. There are signs of Ash Yellows, which is a bacteria-like organism that live and survive in the food-conducting tissue of an infected tree, which has caused dieback in the White Ash species. A contributing factor to this disease could possibly be the drought of 2002. The control for this disease is to remove the trees that are infected or have signs of the infection.

Hairy Rock Cress (*Arabis hirsuta*)



PHOTO BY JOHN CRELLIN

Species of Special Concern

A Pennsylvania Natural Diversity Index (PNDI) search has been conducted for both Management Areas 1A and 2A. PNDI search determines whether there are any potential impacts to special concern species and resources located at or around the site. This resource tool is made available by Pennsylvania Natural Heritage Program. The PNDI search has stated there is a plant species that may be present on the property and also two (2) resources Northern Appalachian circumneutral seep community and erosional remnant. The plants common name is Western Hairy Rock-cress, scientific name is *Arabis hirsuta*. This plant is an endangered species. Before any future projects in these management areas are begun, the Pennsylvania Department of Conservation and Natural Resources would need to be contacted to perform a site analysis.

Summary of Initial Fieldwork

Fieldwork was done on both management areas that included a 100% inventory of trees by prism cruise and increment borers were collected on numerous species.

The inventory was performed on trees 14 inch diameter and larger and were tallied by species, volume, volume by tree, number of trees and average price per thousand board feet. Form Class 80 was selected due to the diameter and height of the majority of trees in the woodlot.

The prism cruise was performed with a 10 basal area prism. The way a prism works is to hold the prism arm at a fixed position at the center of the plot, while rotating 360 degrees. When looking at the trees through the prism if the tree is touching in the prism, the tree is tallied. If the tree is not touching in the prism, there is no tally. If the tree is a borderline tree, the distance must be measured from the plot center to the tree and dbh to determine if the tree should be tallied or not. If the tree was less than 14" in diameter, the tree was tallied as pull wood. Pull wood are trees that have no merchantable value.

Increment borer samples were also taken from tulip poplar, red oak, black oak, chestnut oak and birch trees. The increment borer samples are core samples of trees taken throughout the woodlot to determine growth rate. The growth rate is calculated by taking

Gross volume of tree, Form Class 80, Scribner log rule

Tree diameter (inches)	VOLUME (board feet)					BY NUMBER OF USABLE 16-FOOT LOGS					
	1	1½	2	2½	3	3½	4	4½	5	5½	6
10	30	38	47	52	57						
11	40	52	64	72	80						
12	50	65	80	91	102	108	115				
13	62	82	101	116	130	139	148				
14	74	98	122	140	158	170	181				
15	88	117	146	169	192	208	223				
16	101	136	170	198	226	246	265				
17	116	156	197	230	264	288	312				
18	131	178	224	263	302	330	359				
19	148	202	256	300	345	378	411				
20	166	226	287	338	388	426	463	492	522		
21	185	254	322	379	436	480	523	558	594		
22	204	280	357	420	484	534	583	624	666		
23	226	311	396	468	540	594	648	697	746		
24	248	342	435	515	595	654	712	770	827		
25	272	376	479	568	656	722	788	852	917		
26	296	410	523	620	716	790	865	936	1,007		
27	322	446	570	677	784	865	946	1,025	1,104		
28	348	482	617	734	851	940	1,028	1,114	1,200	1,278	1,357
29	376	522	667	794	921	1,017	1,113	1,210	1,306	1,396	1,487
30	403	560	717	854	991	1,094	1,198	1,306	1,413	1,515	1,617

The inventory was performed on trees 14 inch dbh and larger; this is broken down by species, volume, volume by tree and number of trees. Form Class 80 was selected due to the diameter and height of the majority of trees in this woodlot.



Increment borer sample

RATE OF GROWTH (GROWTH FACTOR TABLE)

DBH	Rings Per Inch											
	4	5	6	7	8	9	10	11	12	13	14	15
4"	.282	.225	.188	.161	.141	.125	.113	.102	.094	.087	.080	.075
5"	.220	.177	.147	.126	.110	.098	.088	.080	.073	.068	.063	.059
6"	.181	.145	.121	.103	.091	.080	.072	.065	.060	.056	.052	.048
7"	.153	.123	.103	.088	.077	.068	.061	.056	.051	.047	.044	.041
8"	.133	.106	.089	.076	.067	.059	.053	.048	.044	.041	.038	.035
9"	.116	.093	.078	.067	.058	.052	.047	.042	.039	.036	.033	.031
10"	.105	.084	.070	.060	.053	.047	.042	.038	.035	.032	.030	.028
11"	.095	.076	.063	.054	.047	.042	.038	.034	.032	.029	.027	.025
12"	.087	.070	.058	.050	.044	.039	.035	.032	.029	.027	.025	.023
13"	.080	.064	.053	.046	.040	.035	.032	.029	.027	.025	.023	.021
14"	.074	.059	.049	.042	.037	.033	.030	.027	.025	.024	.021	.020
15"	.069	.055	.046	.039	.034	.031	.028	.025	.023	.021	.020	.018
16"	.064	.052	.043	.037	.032	.029	.026	.023	.021	.020	.018	.017
17"	.061	.048	.040	.035	.030	.027	.024	.022	.020	.019	.017	.016
18"	.057	.046	.038	.033	.029	.025	.023	.021	.019	.018	.016	.015
19"	.054	.043	.036	.031	.027	.024	.022	.020	.018	.017	.015	.014
20"	.051	.041	.034	.029	.025	.023	.020	.019	.017	.016	.015	.014
21"	.049	.039	.033	.028	.024	.022	.020	.018	.016	.015	.014	.013
22"	.046	.037	.031	.027	.023	.021	.019	.017	.015	.014	.013	.012

the diameter of the tree and counting the third inch of the core samples, the first two inches consist of bark and core which will not give an accurate reading. The tulip poplar trees were growing at a slow rate of about 2% a year and the oak and birch trees were growing at similar rate of about 1.5% a year or less. Rate, as is true for size, is influenced by numerous variables such as soil, drainage, water, fertility, light and exposure. The designation "slow" means the tree grows 12" or less per year; medium refers to 13 to 24" of growth per year; and fast to 25" or greater.



Black Birch (above)



Yellow Poplar tree structure and mature bark



Tree Inventory

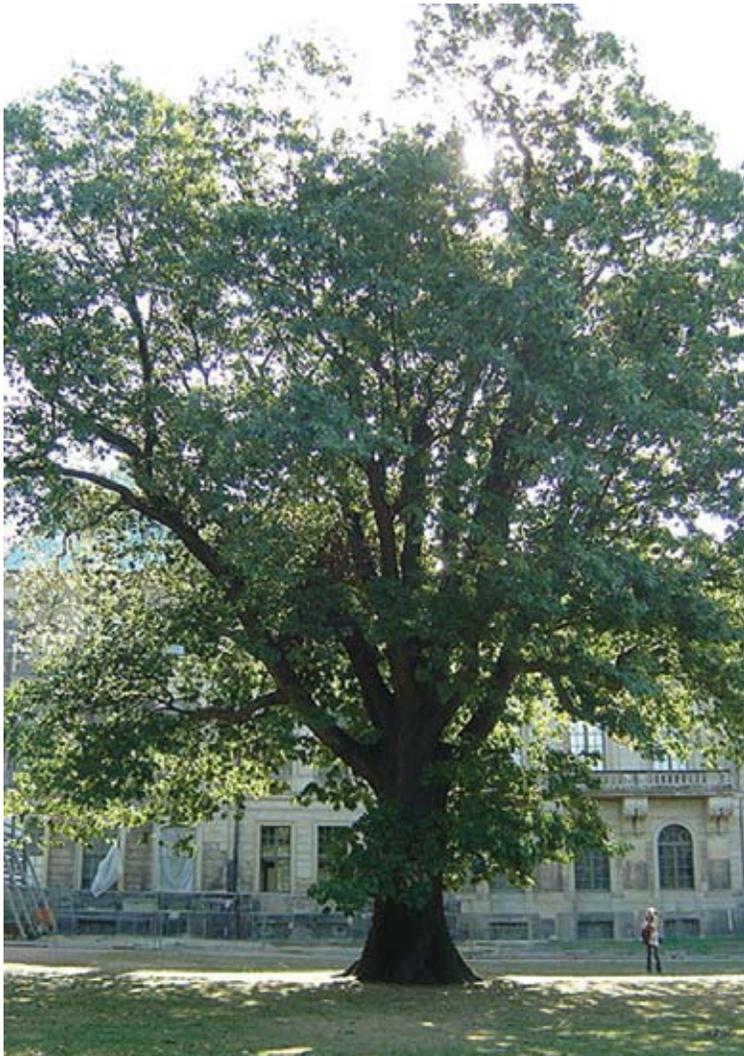
Over 4,000 different trees were tallied in the two Management Areas. The inventory on both Management Areas indicated the dominant species as Tulip Poplar with over 1,000 trees tallied.

In Management Area 1A, the second dominant species was Black Oak with 435 trees tallied, then Red Oak (347), Black Birch (277) and Chestnut Oak (176). In addition, there were six (6) other species of trees identified and tallied.

In Management Area 2A, Red Oak (542), Black Oak (550), Black Birch (231), and Chestnut Oak (186) were the dominant species tallied. In addition, there were (5) other species of trees identified and tallied in this area.

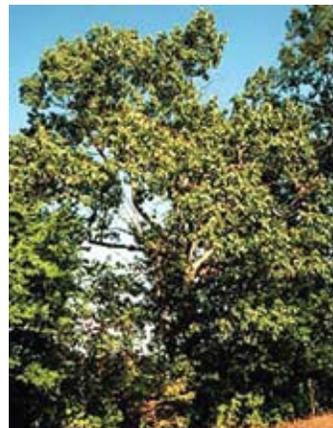
South Mountain Reservoir Management Area 1A

Species	Volume	Volume/Tree	# of Trees
Yellow Poplar	313254	557	562
Black Oak	145003	333	435
Red Oak	104076	300	347
Black Birch	37073	134	277
Chestnut Oak	36475	207	176
White Oak	22227	318	70
White Ash	17605	210	84
Hickory	3770	222	17
Red Maple	2893	181	16
Black Walnut	1259	210	6
Black Cherry	732	183	4
Totals	684367		1994



“Nothing is more beautiful than the loveliness of the woods before sunrise.”

—George Washington Carver



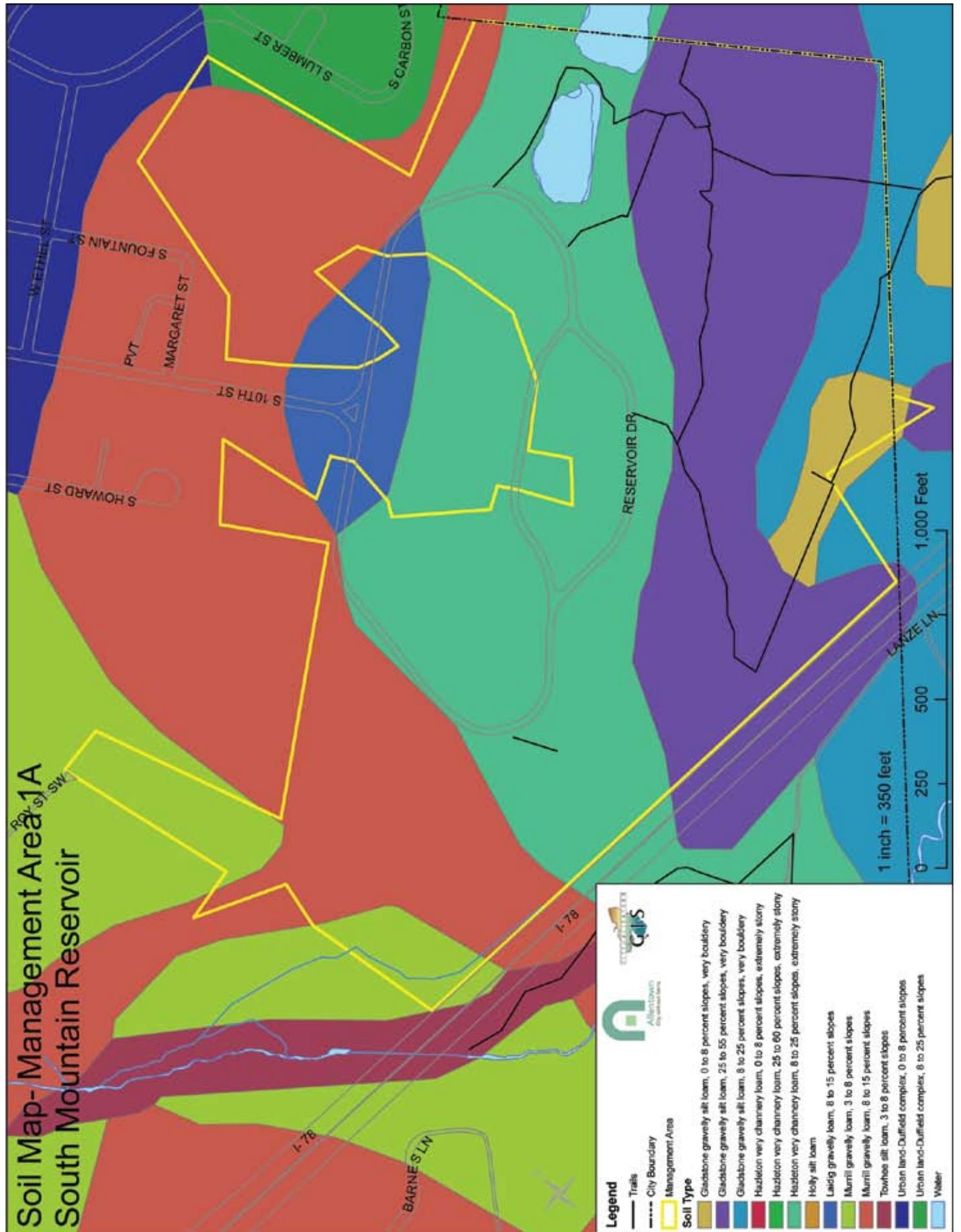
Black Oak

Northern Red Oak

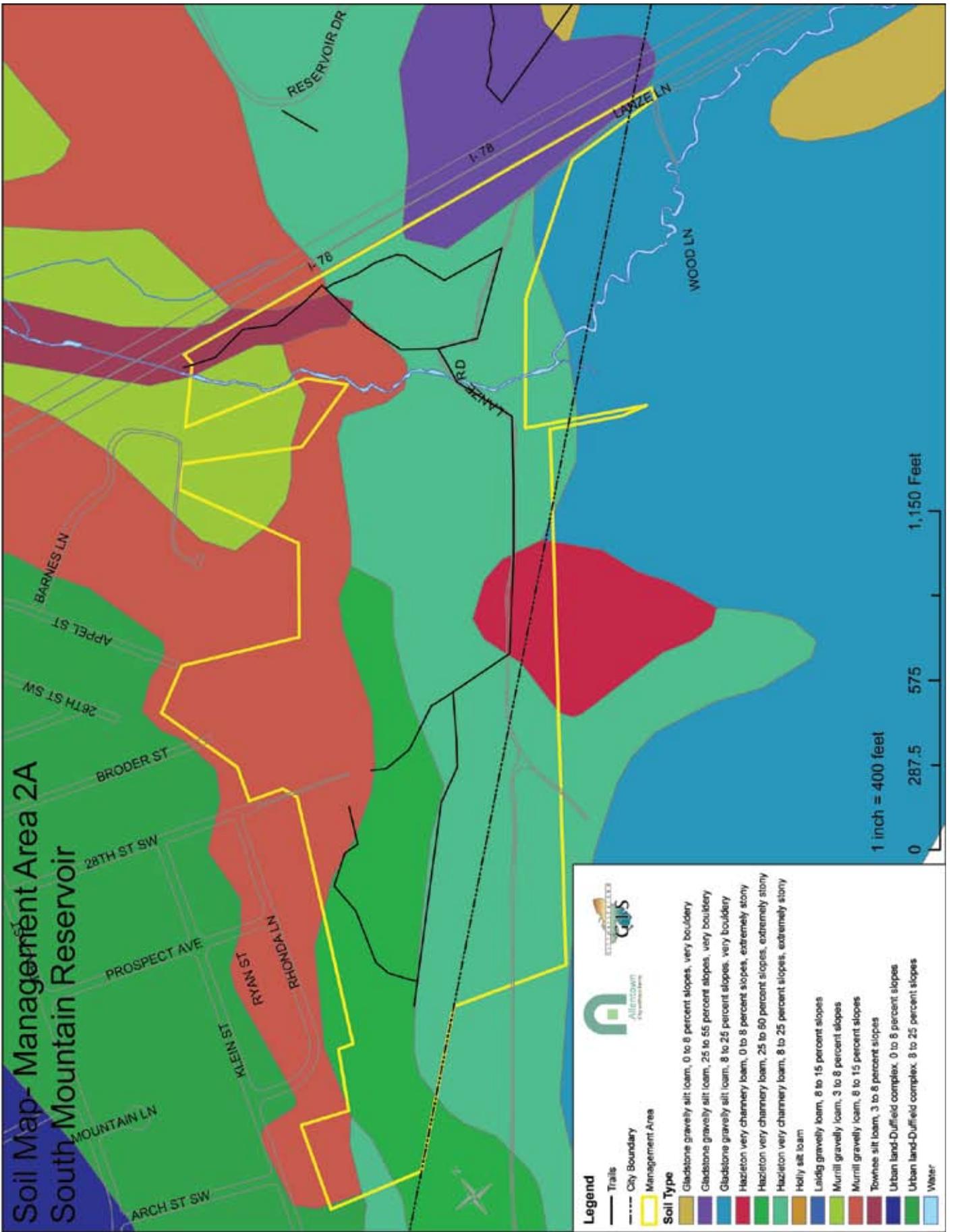
South Mountain Reservoir Management Area 2A

Species	Volume	Volume/Tree	# of Trees
Yellow Poplar	266163	508	524
Red Oak	150788	278	542
Black Oak	148482	270	550
Black Birch	26433	114	231
Chestnut Oak	40794	219	186
Red Maple	4119	229	18
White Oak	2103	263	8
White Ash	2076	260	8
Hickory	234	117	2
Black Cherry	131	131	1
Totals	641323		2070

SOILS



Soil Map- Management Area 2A South Mountain Reservoir



Legend

- Trails
- City Boundary
- Management Area

Soil Type

- Gladstone gravelly silt loam, 0 to 8 percent slopes, very bouldery
- Gladstone gravelly silt loam, 25 to 55 percent slopes, very bouldery
- Gladstone gravelly silt loam, 8 to 25 percent slopes, very bouldery
- Hazleton very channery loam, 0 to 8 percent slopes, extremely stony
- Hazleton very channery loam, 25 to 50 percent slopes, extremely stony
- Hazleton very channery loam, 8 to 25 percent slopes, extremely stony
- Holly silt loam
- Laidig gravelly loam, 8 to 15 percent slopes
- Murrill gravelly loam, 3 to 8 percent slopes
- Murrill gravelly loam, 8 to 15 percent slopes
- Townhee silt loam, 3 to 8 percent slopes
- Urban land-Duffield complex, 0 to 8 percent slopes
- Urban land-Duffield complex, 8 to 25 percent slopes
- Water

South Mountain Management Area 1

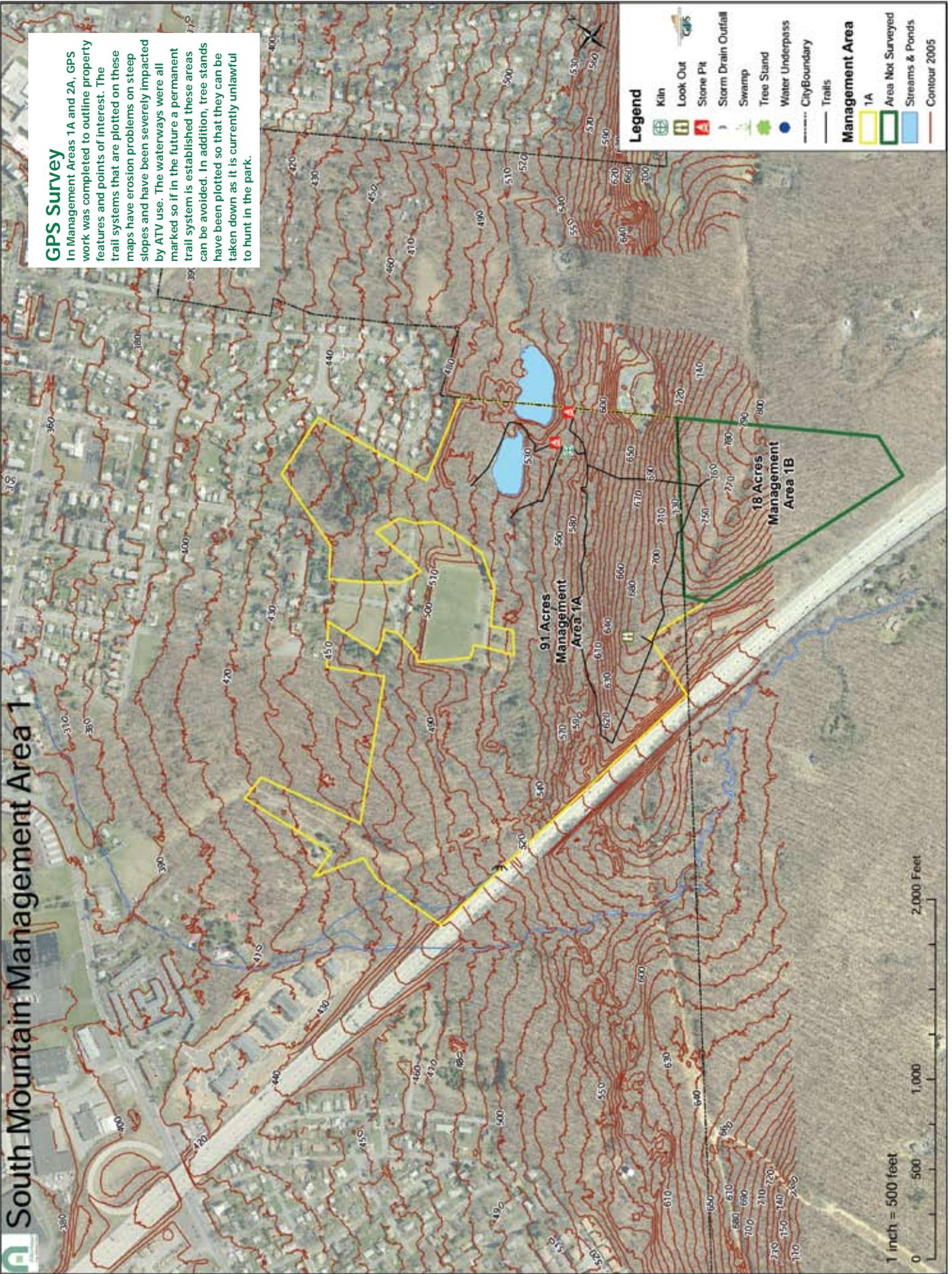
GPS Survey
 In Management Areas 1A and 2A, GPS work was completed to outline property features and points of interest. The trail systems that are plotted on these maps have erosion problems on steep slopes and have been severely impacted by ATV use. The waterways were all marked so if in the future a permanent trail system is established these areas can be avoided. In addition, tree stands have been plotted so that they can be taken down as it is currently unlawful to hunt in the park.

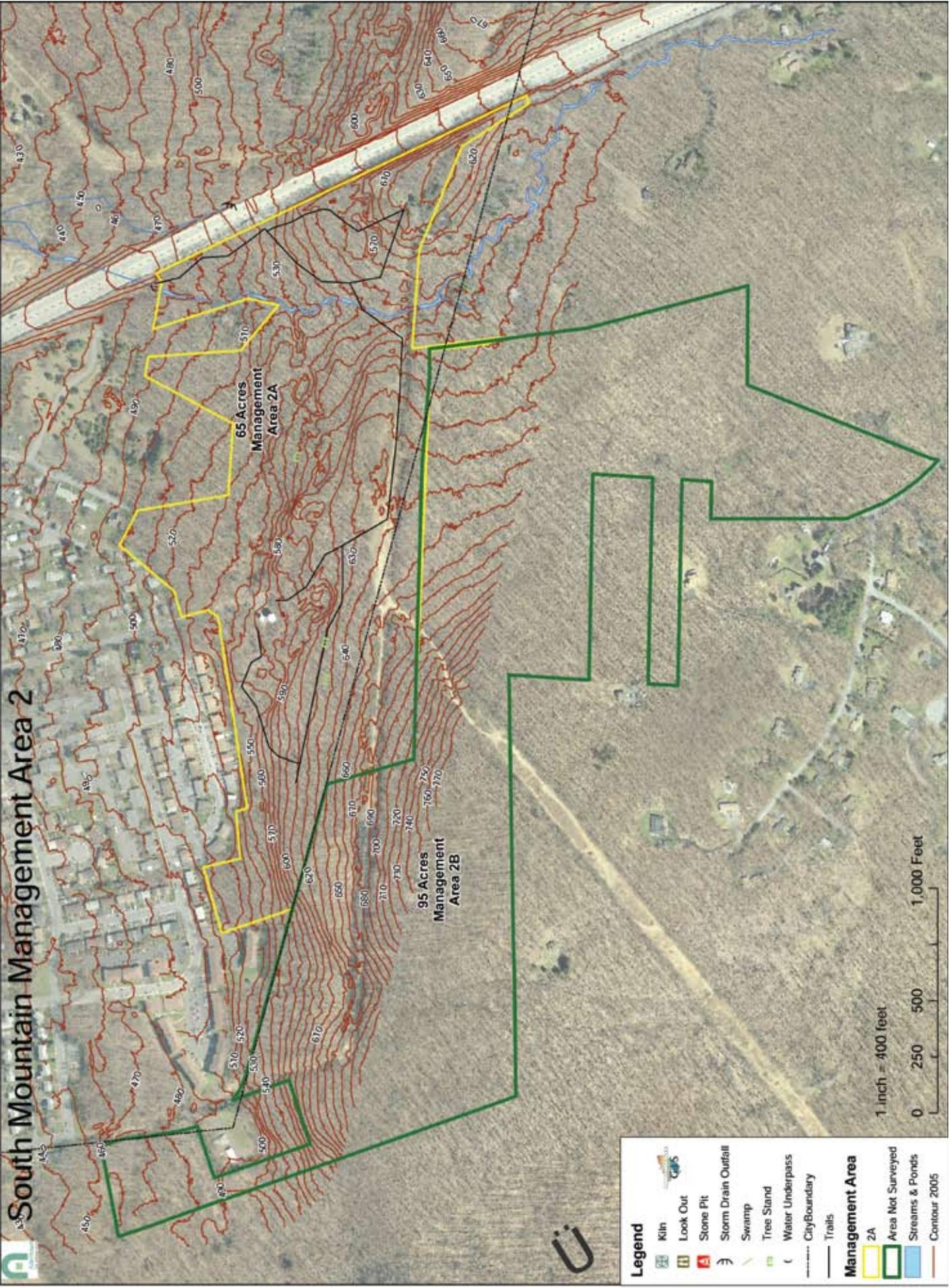
Legend

- Kiln
- Look Out
- Stone Pit
- Storm Drain Outfall
- Swamp
- Tree Stand
- Water Underpass
- City Boundary
- Trails

Management Area

- 1A
- Area Not Surveyed
- Streams & Ponds
- Contour 2005





General Management Area Recommendations

The City of Allentown has made the first step towards promoting forest stewardship on the South Mountain Reservoir. These general recommendations are just the starting point.

After completing the remainder of the inventory of the city owned land that borders the South Mountain Reservoir, these Management Areas need to be divided into smaller Management Units and specific recommendations need to be based on topography, forest conditions, threats, uses and other variables.

1. Form a South Mountain Management Committee.

- a. Recognizing that any type of forest management philosophy, practice or policy may be controversial, the City of Allentown should develop a committee of natural resource professionals with expertise in various disciplines including but not limited to forestry, wildlife, soils, parks & recreation, environmental education, geology, horticulture, ect. to establish and recommend written objectives, review plans and provide informational and educational programs to inform the public and elected officials on the benefits of forest stewardship on South Mountain.

2. Complete inventory on remainder of City property that borders South Mountain Reservoir park property. Develop and divide each Management Area (1A, 2A, 1B, 2B) into specific Management Units.

- a. In Management Area 1B there is approximately 18 acres.
- b. In Management Area 2B there is approximately 95 acres.
- c. Complete a 100% tally of 14" trees and larger by prism cruise, complete increment borer samples to determine growth rate in each parcel. There should be samples done for dominant species such as oak and poplar. There should also be samples taken from shade tolerant trees such as red maple and black birch. The samples should be taken from multiple areas of the property so that a true growth rate can be determined.
- d. Inventory of native and invasive plant species as well as wildlife should continue.
- e. Conduct PNDI search on additional property.
- f. All trail systems, potential erosion hazards, waterways and points of interest should be established on property maps.
- g. Cultural, geological and vegetative features should be noted.
- i. Development of general land use classifications for each Management Unit including but not limited to: natural areas, natural environment areas, biodiversity management areas, and private areas.
- j. Once inventory is complete, a summary and specific recommendations for each Management Unit should be developed along with an activity schedule for the next ten years.



Private signage improperly used on the City's property.

3. Conduct a detailed survey to establish and post accurate property lines.

- a. Accurate property lines prevent adjoining landowners from encroaching on land owned by the City of Allentown.
- b. This will allow for better utilization of access points to the park system which will assist in enforcement of park rules and regulations.
- c. Accurate property lines will also aid in designing a trail system.

4. Under-story improvements pilot project should be performed under guidance of PA Department of Conservation and Natural Resources Bureau of Forestry.

- a. In order to have successful regeneration of desirable species, the first step is to analyze the current condition of the under-story in specific Management Units.
- b. Currently, there is a very dense cover of spicebush in a majority of the Management Areas that is inhibiting any light from hitting the forest floor even if the canopy was opened. This should be controlled within the forest to promote tree regeneration.
- c. In general and depending on costs and labor, the City may utilize mechanical or chemicals to control undesirable under-story plants and invasive species.
- d. After canopy has been opened this should help to release the seed bed that has been established by the existing trees.
- e. There are also native species that have been established on the forest floor which may be affected by these improvements to the under-story but will eventually regenerate once conditions become optimal for growth.



Property line markers define the City limits.



This is an example of an under-story in need of the improvement project.

5. Timber Stand Improvement pilot project should be performed by fencing and monitoring of one specific Management Unit.

- a. The most desirable area for timber stand improvement would be in Management Unit 1A. The pilot project should be approximately forty (40) acres and located close to the road system so that the public can observe the progression.
- b. The City of Allentown should consider fencing the area to monitor the growth



impacted by wildlife. If it is determined that the wildlife is harming the sustainability of the forest, a plan could be implemented to control the damage.

- c. Another area to consider fencing would be food plots. This will allow food plots to grow to full potential before animal browsing.

Results from Monmouth County Park System (above) permanent fence shows percentage of cover dramatically increases inside enclosure when deer browsing is controlled.



Example of a fence enclosure in Elk County Pennsylvania

6. Retirement of current trail system where feasible and establishing food plots.

- a. The trail system should be seeded down with a perennial rye grass, clover and tree foil. This will help stabilize trails to prevent erosion as well as provide wildlife an alternative food source.
- b. The City of Allentown should also plant other trees and bushes along the trails that would produce fruits and berries that would help to support wildlife in the park system and visibility of the animals by people utilizing the trails.



ATV use within the park system"

- c. There is also a need for food plots. The power-lines that run through each management unit could be utilized for food plots.
- d. These food plots should be planted with different types of vegetation that will be utilized at different times of the year. Vegetation such as clover, tree foil and chicory are predominately summer foods. Also, vegetation such as; turnips and brassica could be planted for fall feed.



Current



Proposed

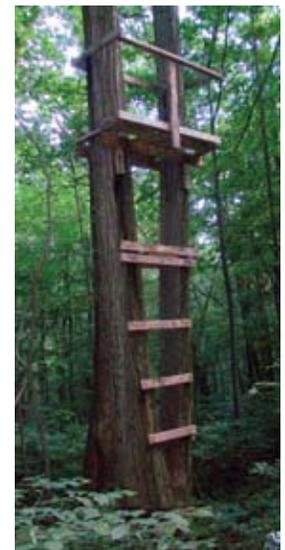
Proposed area for possible food plots

7. Design a trail system so that a plan for forest sustainability can be implemented.

- a. An "official" trail system should be developed that connects all parcels within the park boundaries and utilization of all access points.
- b. The trail system should allow for patrolling the park for unlawful acts such as loitering, hunting, and ATV use and emergency personnel.
- c. The trail system should be promoted to the public for various activities that could be held within the park.

8. Managing deer population to promote hardwood forest regeneration.

- a. There are signs of heavy deer browsing throughout the forest.
- b. The City of Allentown should work with the Pennsylvania Game Commission to determine the amount of deer on South Mountain.
- c. If numbers of deer are beyond threshold established by the Pennsylvania Game Commission, the City should consider establishing a deer management program.



Tree stand built on City of Allentown's property

References:

Forest Stewardship Program, National Standards and Guidelines
 DCNR Forest Stewardship Manual
 City of Allentown Parks & Recreation Master Plan
 Understory species provided by Tim Dugan, DCNR
 USDA Forest Service <http://www.fs.fed.us/>
 Maps and surveys provided by City of Allentown, GSI Center Brian Borzak and Scott Rawhouser
 Ash Yellow's disease information provided by Randy Fey, City of Allentown
 Form Class 80 Table~ timberquote.com
 Pictures of invasive species and wildlife from internet research
 Growth Rate Table~ Timber Management Field Book (2008) US Department of Agriculture (Forest Service)
 Manual of Woody Landscape Plants, by Michael Dirr.
 Wildlands Conservancy Forest Stewardship Plan, South Mountain Preserve

South Mountain Reservoir Wildlife

South Mountain Reservoir is home to a myriad of wildlife. Many mammals including deer, fox, raccoon, squirrels, turkey and chipmunks call South Mountain home. There are also a variety of bird species, amphibians and reptiles that can be found.

For more information on South Mountain and other parks in Allentown, please visit www.allentownpa.org.

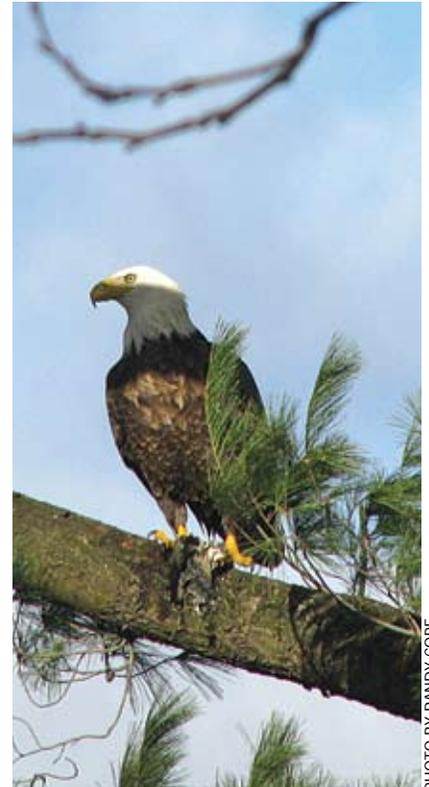


PHOTO BY RANDY COPE



WILDLIFE PHOTOS COURTESY OF TOM GETTINGS, WILDLANDS CONSERVANCY





If you would like to assist the City by serving on the South Mountain Management Committee, please contact the Department of Parks & Recreation at 610-437-7750 or by going to www.allentownpa.gov.

