Conservation Enhancements for a Living Landscape

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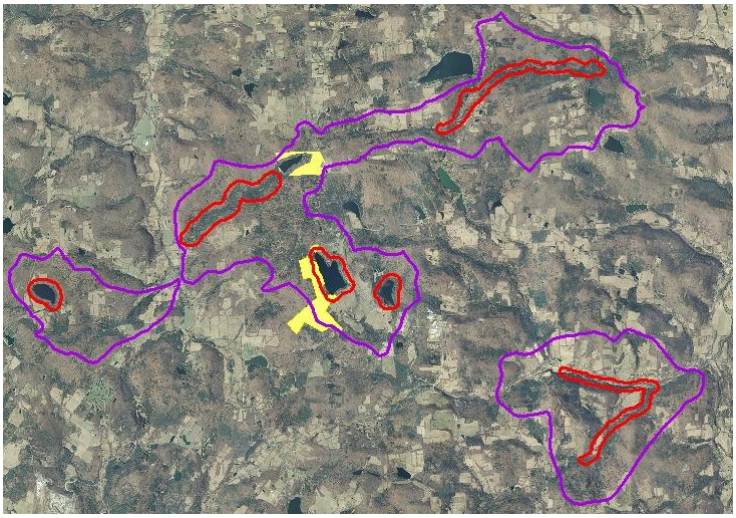
2011 Conservation Activities
E.L. Rose Conservancy



2011 Overview

In 2011, cooperative conservation and monitoring efforts involving the Cornell Conservation Education and Research Program and the E.L. Rose Conservancy focused on three overarching issues including: 1) developing Management Plans for the Conservancy's three fee-owned properties, 2) expanding biological monitoring and inventory efforts, and 3) formally incorporating Cornell undergraduate students into Conservancy-related activities and programs. The management plans provided an excellent opportunity to synthesize past conservation efforts by Cornell and others, and can serve as a foundation for expanding conservation planning and management activities moving forward. A variety of additional biological inventories were conducted, both to support plan development, and to elevate the level of knowledge of biological communities for each of the three properties. To further integrate activities of the Cornell Conservation Education Program and the E.L. Rose Conservancy, Cornell undergraduate students were incorporated into activities formally via a summer undergraduate internship co-funded by the Conservancy and the Arnot Forest Internship Program, a fall semester independent study course, and through an Applied Conservation Ecology class group project in the spring.

Property Management Plans

The Cornell Conservation Education and Research Program, along with a Cornell undergraduate intern, worked closely with the E.L. Rose Conservancy to develop baseline Land Management Plans for each of the Conservancy's three fee-owned properties. Management plans are required as part of the Conservancy's application for accreditation through the Land Trust Alliance. Each management plan includes a general introduction to the property, including its history and information about the surrounding area, a description of the local ecology and natural features, identification of important assets, potential threats to these assets, and future plans for the property. Each baseline plan provides a foundation that can be used a spring-board to developing more specific conservation and management goals and objectives for each property Each individual plan is based on the specific existing resources and potential resource threats of the property.

As part of the management planning effort, additional spatial data were collected and incorporated into Geographic Information Systems (GIS) maps using ArcGis. Using Global Positioning systems (GPS) and existing paper maps, property boundary layers were refined or created for each of the three fee-owned properties, which resulted in updated digitized property boundary maps. Other maps developed for each property included: a general location map showing property location within the township, a soils map, a topographic map, and a map showing the watershed(s) and streams in and around the property. In addition, trail maps and maps of Permanent Forest Inventory (PFI) plots were developed for Highpoint Preserve and Greenwood Sanctuary.

With an eye toward long-term planning, GIS maps were also developed to depict the biological significance of the Conservancy's three fee-owned properties within their surrounding landscapes. A portion of Highpoint Preserve is located within the Silver Lake core area of biological significance, as identified in the Susquehanna County Natural Areas Inventory (Figure 1). Much of the remaining portion of Highpoint Preserve, as well as the Longford Lake property, is located within the area delineated as supporting landscape for several important core areas. While Greenwood Sanctuary is not part of any designated core area or supporting landscape, it does fall between two areas and as such could serve as the beginning of a connecting corridor, or "stepping stone" (Figure 2).

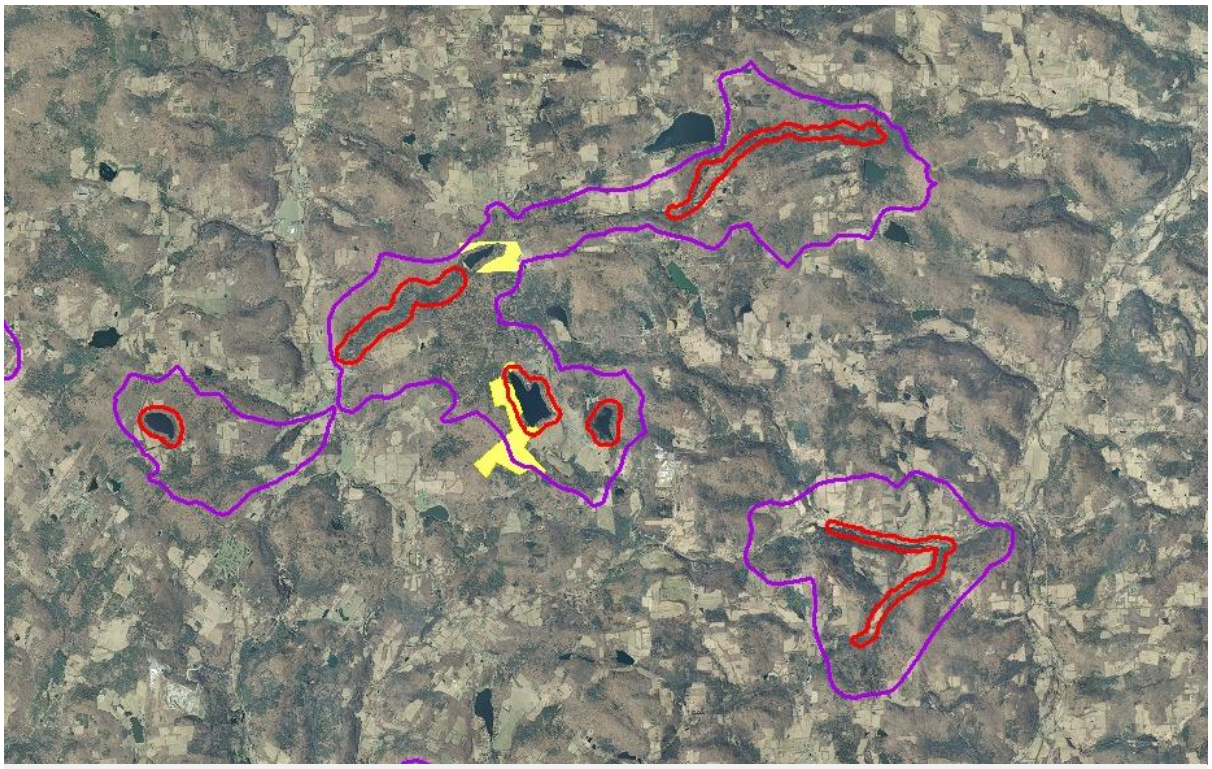


Figure 1. Highpoint Preserve is part of a designated core area (red) and both Highpoint Preserve and Longford Lake (depicted in yellow) are part of an important supporting landscape (purple) for several core areas of importance.

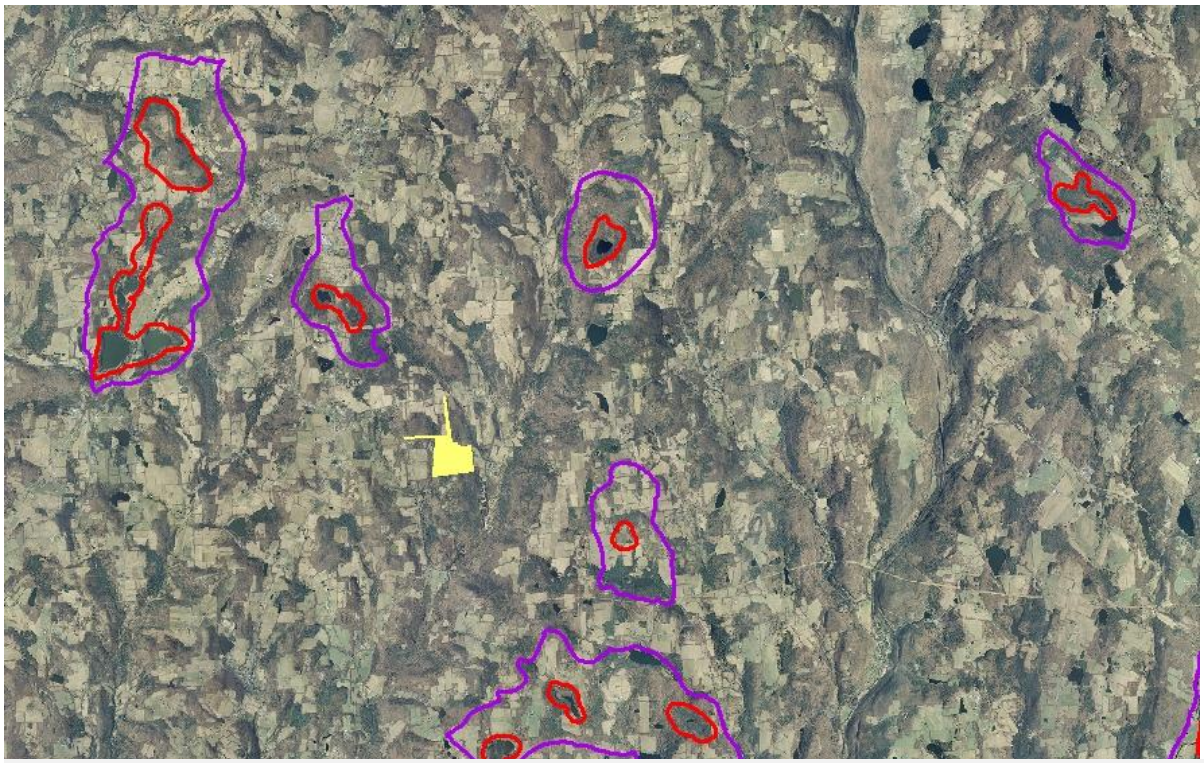


Figure 2. Greenwood Sanctuary (yellow) falls between two core areas does fall between two areas and as such could serve as the beginning of a connecting corridor, or “stepping stone” connecting these important elements.

Biological Inventories

Bat Monitoring

The VanZandbergen barn, where a small maternity colony was located in 2010 and re-surveyed in 2011.

Bats are excellent indicators of biodiversity and ecosystem health. Bat emergence counts can help establish baseline numbers of bats in a local area. By conducting annual counts at identified summer maternity roost sites, changes in bat colony size can be tracked over time. Although maternity colony size can vary for a number of reasons, a significant or prolonged decrease in one colony, or across several colonies in an area, can indicate a general environmental problem. If some colonies are declining while others remain stable, emergence counts also may provide clues about factors influencing susceptibility to white nose syndrome, a current threat to many species of bats in many regions. In addition, the locations of maternity colonies can be correlated with habitat features in the area and, as such, can inform habitat enhancement efforts and help direct the placement of bat boxes over time.

In 2011, Conservancy members once again volunteered their time to help with evening bat exit counts, re-surveying two sites where maternity colonies were located in 2010 (Figure 3). Eight people participated in monitoring efforts, and volunteers logged a total of 19 hours of time on this effort. The first site was located at Quaker Lake in an older house. Most of the individuals counted in 2010 at this location appeared to be little brown bats. The second site was located northwest of Quaker Lake, and appeared to support a smaller number of both little brown and big brown bats in 2010.

At the Quaker Lake site, a count was conducted on two separate nights. Alarmingly, on the first night, no bats were detected, and on the second night, one bat (most likely a big brown bat) was detected. From 2010 to 2011, the number of bats roosting at this location has decreased dramatically, from 283 bats, to only 1. At the VanZandbergen site northwest of Quaker Lake, 35 bats were counted in 2011. The population at this site may be stable for now, with a count of 37 individuals in 2010.

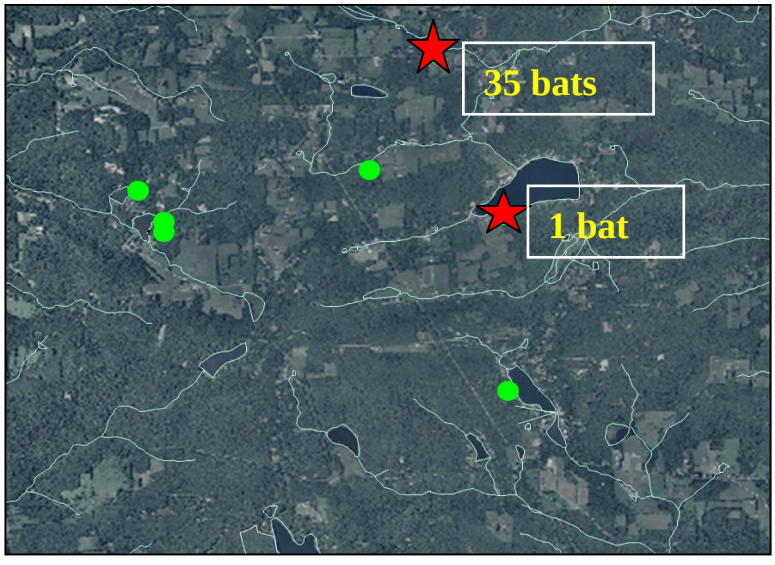


Figure 3. Two maternity colonies were re-surveyed in 2011. At one of the locations, the colony remained stable. However, at the Quaker Lake roost, the number of bats decreased substantially since 2010.

The loss of bats in the Quaker Lake maternity roost was not unexpected, in light of regional trends. As of winter 2011, white-nose syndrome had spread across the state of Pennsylvania and unfortunate high levels of bat mortality were reported. Many populations of little brown bats, like those present at the Quaker Lake site, have suffered massive losses. However, there is evidence that small, isolated populations of this animal continue to persist. On the other hand, big brown bats are still abundant and have not suffered the dramatic decline that other species have. This species is quickly replacing the little brown bat as the most common bat species in several states. The bats roosting at the VanZandbergen site may be big brown bats only, or big brown bats plus a small colony of little brown bats. Continued monitoring will be helpful in tracking the status of bats in the area.

In addition to maternity colony surveys, we visited newly erected bat boxes at Highpoint Preserve, Greenwood Sanctuary, and Longford Lake during the summer. Thus far, there was no sign of bat activity at the boxes at Highpoint and Greenwood. However, bat vocalizations were heard in the box at Longford Lake. In time, bat box use should increase as the boxes are discovered by other individual animals.

Permanent Forest Inventory Plots at Greenwood Sanctuary

Our natural environment is facing a many different pressures today, including climate change, invasive plants and insects, emerging diseases, fragmentation to name a few common threats. By establishing Permanent Forest Inventory (PFI) plots, valuable information can be gathered on species composition, species distribution, presence of invasive species, and forest health indicators, both for current analyses and for future comparisons.

Methodology

To enhance the level and quality of information about plant species composition and habitat condition at Greenwood, eight additional PFI plots were established and sampled in 2011, bringing the total number of plots at to 10 at that site (Figure 4). Plots were located at least 30 m from the property boundary and 100 m away from each other. Using GIS to project a 100-m interval grid onto a map of Greenwood, plots were selected to represent the various forest types and conditions across the property. The methodology (Appendix A) is based on protocols developed and implemented by us at Cornell University's Arnot Teaching and Research Forest. In addition to providing information on the current conditions, PFI plots will be used to monitor short- and long-term changes in forest health and composition.

Figure 4. Eight additional PFI plots were established at Greenwood Preserve in 2011, bringing the total number of sampled plots to 10 (completed plots shown in red).

At Greenwood, plots were inventoried in August, 2011. Each quarter-acre PFI plot consists of a circular central plot (58.9' radius) and two subplots (11.8'). The center of the plot was marked with white pvc pipe for visibility to act as a long-term marker. The pipe has a tag attached at the top with the plot number on it, which is also written on the pipe in permanent marker for easy identification. At the north and south ends of each plot there is a short wooden stake, with "N" and "S" in permanent marker and flagging; the subplots form a circle around the stakes. Within the central plot, all the living trees with a

diameter at breast height (dbh) of at least 4" were marked one foot off the ground with small, round aluminum tags and aluminum nails. These provide a permanent reference for future tree measurements. For these trees the species, dbh, presence/absence of cavities, and crown class were recorded. The subplots were used to sample the number of seedlings and saplings present, as well as other key understory characteristics. Additional information recorded for the PFI plots included: geography (elevation, aspect, etc.); measures of coarse woody debris; presence/absence of water, rocks and tree cavities; number of dead standing trees (snags); species and number of salamanders found; and signs of other wildlife (Appendix A).

Overstory Trees

In 2009 and 2011, 479 overstory trees were recorded, measured, classified and tagged in 10 plots. Nineteen tree species were identified within the plots, including American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), black birch (*Betula lenta*), black cherry (*Prunus serotina*), white pine (*Pinus strobus*), white ash (*Fraxinus americana*), American basswood (*Tilia americana*), northern red oak (*Quercus rubra*), eastern hophornbeam (*Ostraya virginiana*), northern white oak (*Quercus alba*), bitternut hickory (*Carya cordiformis*), ironwood (*Carpinus caroliniana*), quaking aspen (Populus tremuloides), shagbark hickory (*Carya ovata*), white birch (*Betula papyrifera*), and grey birch (*Betula populifolia*). Species comprising 30% or more of the trees in one or more plots included eastern hemlock (4 plots), black birch (2 plots), quaking aspen (1 plot), red maple (1 plot), and sugar maple (1 plot) (Table 1). The number of trees per ¼-acre plot ranged from 30 to 86. For each plot, we calculated the number of trees per acre, and mean dbh for each tree species (Table 2).

Table 1. *Overstory tree composition of PFI plots; species comprising 30 percent or more of overstory trees in the plot are highlighted.*

	Plot Number									
Overstory Tree Species	**1**	**2**	**8**	**10**	**16**	**26**	**28**	**42**	**44**	**46**
American beech	6.7	4.8	3.3	5.6	7.9		20.0			
American basswood		1.6								
Black birch	35.0	1.1	3.3		23.8		3.3	8.1	73.7	
Black cherry						5.7		2.7		
Bitternut hickory						25.7	6.7		3.5	
Eastern hemlock	45.0	69.4	88.3		28.6		43.3	2.7	1.8	
Eastern hop hornbeam	1.7			25.0		2.9				
Grey birch										7.9
Ironwood								10.8		
Northern red oak	1.7			2.8	3.2	11.4		10.8		
Northern white oak						2.9				
Quaking aspen	1.7				3.2			2.7	1.8	92.1
Red maple	5.0	6.5	1.7	19.4	12.7			32.4	3.5	
Shagbark hickory					3.2	17.1				
Sugar maple		3.2		30.6		5.7	16.7	8.1	5.3	
White ash	1.7			16.7	15.9	17.1	10.0	18.9	7.0	
White birch									3.5	
White pine								2.7		
Yellow birch	1.7	3.2	3.3		1.6					

Table 2. *Overstory plot characteristics including number of trees per acre, and average diameter at breast height (dbh, 4.5 ft).*

Plot	# Trees/Acre	Mean DBH of Overstory Trees
1	240	10.8
2	248	11.0
8	240	10.2
10	144	10.6
16	252	8.5
26	140	10.1
28	120	11.1
42	344	7.6
44	228	8.0
46	152	6.8

Forest understory

Within the understory subplots in the 10 PFI plots, 16 different tree and shrub species were recorded (Table 3). Thirteen of the 16 species growing in the understory were also observed growing in the overstory. American beech and white ash were most prevalent in the understory, and were each found in 9 of the 10 plots. Bitternut hickory, hop hornbeam, northern red oak, red maple, and sugar maple were also common and were documented in at least half of the plots. The number of seedlings present in the plots varied, and very few have grown to sapling size in the plots sampled. Although quite a few seedlings were present in some of the plots, only 36

Table 3. *Understory plot characteristics including number of seedlings and saplings by species documented in each plot.*

Plot	American basswood	American beech	Bitternut hickory	Black birch	Black cherry	Dogwood sp.	Eastern hemlock	Eastern hop hornbeam	Ironwood	Maple-leaved viburnum	Northern red oak	Red maple	Sugar maple	Shagbark hickory	White ash
1	0	6	0	0	0	0	1	0	0	0	1	0	0	0	2
2	0	30	0	0	0	0	1	0	0	0	0	0	0	0	0
8	0	6	0	27	0	0	0	0	0	0	1	32	0	0	15
10	2	3	1	0	3	0	0	22	0	0	0	5	8	0	3
16	0	3	0	5	0	0	0	4	0	20	0	0	0	0	21
26	4	4	20	0	0	0	0	74	0	0	16	4	36	5	4
28	0	4	16	0	0	0	0	20	0	0	4	0	80	0	24
42	0	6	21	0	0	4	0	46	0	0	0	13	0	15	8
44	0	9	28	0	0	8	0	0	8	0	0	0	24	0	15
46	0	0	0	0	0	0	0	0	18	0	0	0	8	4	38

saplings were documented in the plots sampled. With relatively little sunlight reaching the forest floor due to a closed forest canopy, it is not surprising that the understory is not well-developed. Several herbaceous species of note were found in the understory plots including maidenhair fern, Christmas fern, trillium, blue cohosh, and jack-in-the-pulpit. American ginseng was also found within plot 10, though it was outside the understory plot boundaries. American ginseng was also seen at one other location within the sanctuary.

Longford Lake Biological Inventory

We conducted a cursory biological inventory of the tree species at the Longford Lake property on December, 2011 (Table 4). The list should not be considered a complete list of all species on the property, but rather a subset. The property contains a diversity of habitat types, including open meadows, a small emergent wetland, mature forest, gas and powerline rights of way, and several areas of young, early successional forest. The species found on the property are representative of these habitat types.

Table 4. *Plants documented at the Longford Lake property.*

Common Name	**Scientific Name**
American beech	*Fagus grandifolia*
Basswood	*Tilia americana*
Big-toothed aspen	*Populus dentata*
Black cherry	*Prunus serotina*
Blueberry	*Vaccinium sp.*
Common cattail	*Typha latifolia*
Eastern hemlock	*Tsuga Canadensis*
Hickory sp.	*Cary sp.*
Hop hornbeam	*Ostrya virginiana*
Japanese barberry	*Berberis thunbergii*
Red maple	*Acer rubrum*
Striped maple	*Acer pensylvanicum*
Sugar maple	*Acer saccharum*
Sweet birch/Black birch	*Betula lenta*
White ash	*Fraxinus Americana*
White pine	*Pinus strobus*
Yellow birch	*Betula alleghaniensis*
Yellow poplar	*Liriodendron tulipifera*

Water Quality Monitoring

Students from Cornell's Applied Conservation Ecology class participated in the Conservancy's Water Monitoring Workshop.

In an effort to integrate Cornell undergraduate students into Conservancy activities and provide students with real-world conservation experience, a group of students from Cornell's Applied Conservation Ecology class was invited to participate in the Conservancy's Water Quality Monitoring Workshop. The group subsequently developed a class project focused on prioritizing watersheds for water quality monitoring based upon the level of Marcellus natural gas drilling activity. Using GIS, students assembled a number of different spatial data layers. The layers included streams, watersheds, a digital elevation model, roads and bridges, and active and permitted gas wells. Each well location was buffered to create a potential zone of influence for each well. Each watershed was then assigned a level of risk based on the number of wells located or permitted within. The highest-risk watersheds were then assigned the highest priority for water quality monitoring (Figure 5). Bridge locations were used to designate potential sampling sites within each watershed. This process can be repeated over time as new wells are permitted and the risks shift to other watersheds within the county.

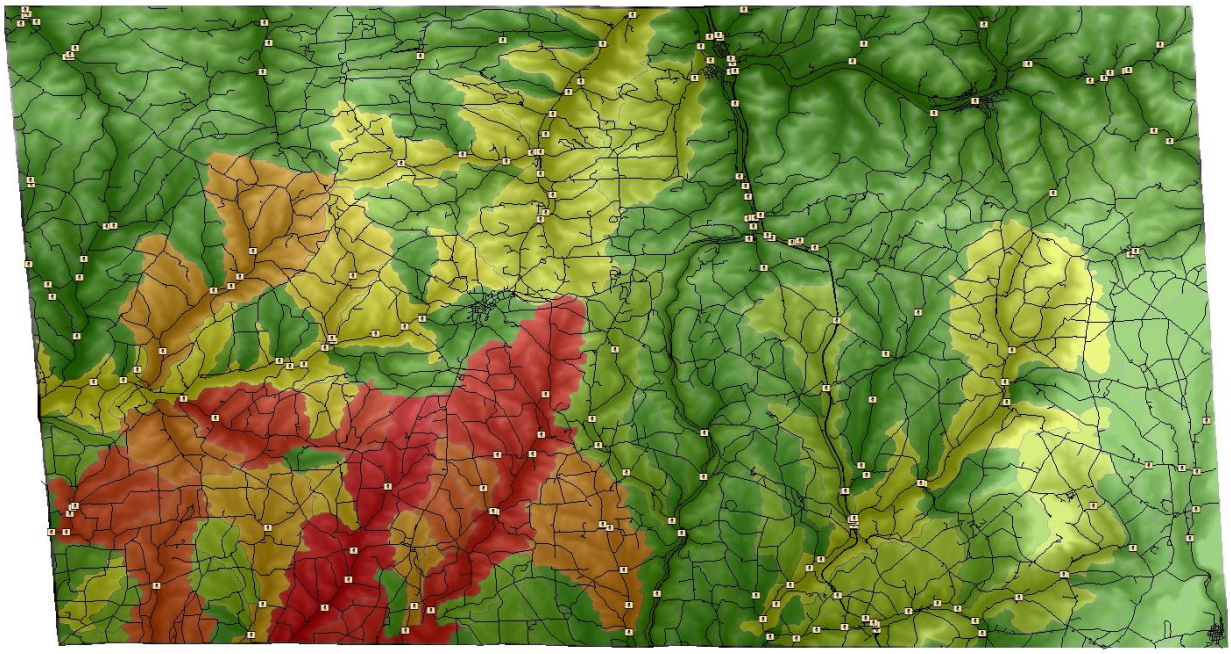


Figure 5. Watersheds shown in red and orange have the greatest number of existing and permitted gas wells as of April 2011, and therefore the greatest risk for water quality degradation.

Summary and Future Plans

Through our collaborative efforts in 2011, we continued to expand and enhance our collective knowledge about the ecology of the three fee-owned properties, as well as their respective roles within the overall landscape. We initiated planning for these properties in order to safeguard them for the future. On a broader geographic scale, we continued to monitor bat populations in the area, and became engaged with water quality monitoring efforts. We incorporated Cornell undergraduate students into all aspects of our work with the Conservancy, in an effort both to provide them with hands-on experience and to bring their skills and knowledge to bear on Conservancy-related issues.

Potential activities for collaboration in 2012 broadly include furthering planning efforts, expanding biological survey, inventory and monitoring efforts, and continuing to incorporate undergraduate students in various aspects of our work. Specifically, our efforts may include:

Advanced Planning

A. **Management Plans** - Provide technical expertise and participate in planning and advancing conservation goals, as outlined in baseline Land Management Plans developed for fee-owned properties.

B. **GIS Mapping** – Create property boundary shapefiles for all easement properties and add to the map showing the proximity of Conservancy owned/protected lands to core areas and supporting landscapes as identified in the Susquehanna County Natural Areas Inventory. This map would provide a big picture view of how current Conservancy protected lands fit into the overall landscape, and help focus future land purchase/easement and land management efforts to achieve the greatest ecological benefits possible.

Biological Survey, Inventory, and Monitoring

A. **Water Quality Monitoring Support** - Involve subset of students from Cornell Applied Conservation Ecology class in group projects focused on spatial analysis of potential water quality monitoring sites.

B. **Continue Bat Monitoring Efforts** - Re-survey the two bat maternity colonies found in 2010 and report findings back to the PA Game Commission's ongoing program. Monitor the success of the bat boxes erected in 2010.

C. **Permanent Forest Inventory Plots** - Establish at least five PFI plots as a baseline for Longford Lake property, and establish at least five additional plots at Highpoint as a supplement and for comparison to original plots.

D. **Skoloff Farm** - Conduct preliminary site visit to Skoloff Farm and initial biological inventory, and assess agroforestry potential.

E. **Longford Lake Property** - Conduct biological inventory of wildlife and plant species on the property, collect updated data for deer exclosure project.

F. **Establish Bird Monitoring Points at Greenwood Sanctuary -** Establish sampling points and conduct songbird survey at Greenwood that parallels efforts at Highpoint Preserve.

Education and Outreach

A. **Public Program (indoor/outdoor)** – Wildlife topic of interest

B. **Forest landowner workshop** – Landowner workshop focused on landowners in specific target areas of conservation interest.

Appendix A. Permanent Forest Inventory Plot Methodology and Additional Results for Greenwood Sanctuary

Permanent Forest Inventory Plot Methodology

(Adapted in 2008 from methodology developed for Cornell's Arnot Forest)

Objective: Establish permanent plot samples throughout the forest to measure the change in various forest characteristics through time. Be able to describe changes in forest species composition, structure, health and habitat availability that result from natural forest dynamics and management practices.
Assumptions/Constraints: Plots will be established annually. Each point will be re-sampled every 5 to 8 years and allow an analysis of change through time. Some plots may be sampled more frequently to assess short-term forest dynamics.
Methods: Establish 10-15 plots per year, distributed among properties owned or managed by the E.L. Rose Conservancy in Susquehanna County, Pennsylvania. Plots will be numbered sequentially. Plot center is marked with a white 2.5" PVC pipe 5' long. A GPS unit will be used to record UTM coordinates. A "Permanent Plot Location Sheet" will be completed for each plot. This sheet will include written directions/map to the plot, a general description, and information about deer impact. Each plot will include:

- A fixed radius overstory plot (0.25 acres, 58.9 ft. radius) where all live trees $\geq$ 4" dbh will be tagged with aluminum numbered tags and aluminum nails at 12" above ground, and tallied by species, dbh, presence of cavities > 1" diameter, and crown class. DBH will be measured to the nearest 0.1 inch using a diameter tape located at the top of a 3.5' stick placed on the nail. Nails should face plot center. All dead trees will be tallied and diameter will be recorded.
- Within each overstory plot record elevation, aspect, % slope, slope shape, percent fern cover, and presence or absence of grass, seeps or wet areas, trails or roads, logs in water, perches, soft or hard mast species, rock piles, rock crevices, caves, and cavities in living or dead trees. Also make note of the presence or absence of accumulate litter on the forest floor, and note the presence or absence of forest pests including beech blight, hemlock woolly adelgid, and emerald ash borer.
- Within each plot, N/S and E/W lines transecting the diameter of the plot will be established to record the percent cover of coarse woody debris > 3" diameter at the point of their intersection with the transect. Record diameter at the intersection, condition, and whether bark is present.
- At the north and south cardinal directions on the edge of the overstory plot, establish sapling/ground layer plots having an 11.8' radius to equal 0.01 acres each. Subplot centers should be marked with a 30" wooden stake and flagged. Record the number of woody stems by species in the ground layer (height of 4" – 54") and sapling/shrub layer (height > 54" up to 3.99" dbh) using decadal increments (1-10 by one; 11 to 100 by tens; 101+ by hundreds).
- Within each sapling subplot (11.8' radius), record presence or absence of the following herbs: sensitive fern, maiden-hair fern, Christmas fern, true ginseng,

dwarf ginseng, blue cohosh, jack-in-the-pulpit, or trillium. Also record presence or absence of invasive species including garlic mustard, barberry, multi-flora rose, honeysuckle, or autumn olive, and the percent of inhibiting fern cover, percent of other fern cover, and percent grass and sedge cover.

List of Equipment Needed

1. PVC Pipe: preferably white 2.5" PVC pipe 5' long
2. Short wooden stakes
3. Blue spray paint (for the top of the PVC)
4. Tags for the pipe (the soft etch-able aluminum one work)
5. Round aluminum tree tags from Forestry Suppliers Co.
6. Multiple tape measures
7. Data sheets, pencils, and permanent marker
8. DBH tape
9. Hammer
10. Aluminum nails (aluminum makes it safe for loggers)
11. Small sledge hammer (to pound in stakes)
12. Flagging
13. Field guides if necessary

Definitions of Variables Recorded at Permanent Forest Inventory (PFI) Plots at Greenwood

Deer Impact: An estimate of the browsing pressure that deer are having on tree seedlings in the area of the sample plot. Code is as follows:
1= low pressure; 2= low/medium; 3= medium; 4=medium/high; 5= high
Travel Description: A narrative description of travel from the nearest permanent location or landmark.
Map: A hand sketch of the travel description.
Overstory Plot Size: The length of the plot's radius in feet. Typically 58.9' unless otherwise noted.
Sapling Plot Size: The length of the subplot's radius in feet. Typically 11.8' unless otherwise noted.
Seedling Plot Size: The length of the subplot's radius in feet. Typically 11.8' unless otherwise noted.
Aspect: The direction of the downward slope coded as: North, Northeast, East, Southeast, South, Southwest, West, or Northwest.
Slope: The calculated percent slope. Can be calculated in the field or from a topographic map.
Slope Shape: An visual estimation coded as: 1=convex; 2=linear; 3=concave

Topographic Position: Coded as: 1=Upland Plateau; 2=Upland Bottom; 3=Ridge Top; 4=Upper Slope or Shoulder; 5=Mid-slope; 6=Bench; 7=Lower Slope; 8=Bottomland/Flatland.
Riparian %: The percentage of the plot that characterized by stream channels, wetlands, floodplains, and immediately adjacent terrestrial ecosystems.
Seep: Enter either "present" or "absent" as to the presence of seeps or springs within or adjacent to the plot. A seep is a source of surface ground water without a well-defined point of origin. A spring has a well-defined point of origin. Seeps and springs may or may not have vegetation around them.
Streams: Enter "present" if perennial streams are within the stand or immediately adjacent to the stand.
Temporary Ponds: Enter "present" if any temporary or vernal pools are within or adjacent to the plot. Temporary ponds must be greater than 6 inches deep and greater than 1 square yard; water must be present for at least two months during the growing season. The exact month differs for each species that uses temporary ponds. Areas covered by a fine layer of silt and depressions filled with blackened leaves me serve as dry season indicators of temporary ponds.
Permanent Ponds: Enter "present" if any permanent ponds of lakes are within or adjacent to the plot. Permanent ponds are any size of depth, but larger is generally better; water must be present year-round, although the top layer can freeze.
Logs in water: Enter "present" if any downed logs are partially or wholly in a permanent water source.
High Perch: Enter "present" if any high exposed perches occur in the plot. A high perch is any live or dead tree that clearly towers above the canopy such as a supracanopy white pine, or a single tree or group of trees standing above ground vegetation such as a lone elm in a pasture or a snag in a clearcut.
Hard mast: Enter "present" if there are any plant species in or near the plot that provide hard mast such as acorns or hickory.
Loose soils: Enter "present" if there is soil that can be easily burrowed into.
Rock Piles: Enter "present" if there are any natural or man-made piles (rock walls), as long as they provide hiding places for small mammals, amphibians, or reptiles.
Rock crevices: Enter "present" if there are openings in the rocks that lead below the frost line.
Caves: Enter "present" if there are any caves or larger rock openings that lead below the frost line.
Live cavities: Enter "present" if there are any live trees in or near the plot with cavities at least 1" in diameter. This is collected in the overstory plot and may be determined from field data.
Dead cavities: Enter "present" if there are any dead trees in or near the plot with cavities at least 1" in diameter. This is collected in the overstory plot and may be determined from field data.

Coarse Woody Debris: Any fallen logs or trees that are longer than three feet and greater than three inches in diameter.

Condition: Coded as: 1=solid/good; 2=rotten/ poor

Species: For every tallied tree, enter the tree species using either the 3-digit forest survey code or the mnemonic abbreviation.

DBH: The diameter at breast height (typically four feet above the ground).

Crown Class: Determine the position of the tree crown using the following codes:

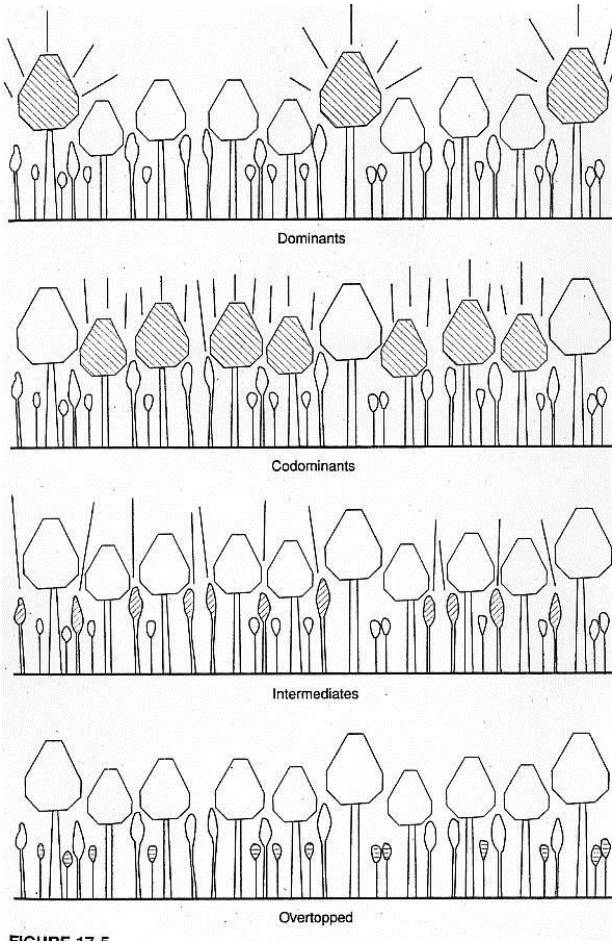
1= open grown- a tree that is free of competition and receives light on top and all sides of the crown as a result of a very heavy thinning or being in an isolated, open-grown position.

2= dominant- a tree with the crown extending above the general level of the main crown canopy and receiving full light from above and partly from the sides.

3=codominant-a tree with a crown forming the general level of the main canopy, receiving full light from above but little from the sides.

4=intermediate- a tree with a crown extending into the lower portions of the main crown canopy, but shorter than the codominants and receiving little direct light from above and none from the sides.

5=suppressed- a tree whose crown is entirely below the general level of the canopy and receives no direct light from either above or the sides.



Data Sheets for Permanent Forest Inventory (PFI) Plots
-PFI Plot Features

Tally date _____/ _____/ _____ Page _____ of _____

PFI Plot Number _____ Tallied by_____

Overstory Plot Size (radius, ft)	58.9
Sapling/ Seedling Plot Size (radius, ft)	11.8

Elevation	
Aspect	
Slope	
Slope Shape	
Topo Position	
UTM Coordinates:	

Trail on Road (y/n)	
Riparian %	
Wetland %	
Adjacent water(y/n)	
Seep (p/a)	
Stream (p/a)	
Temp. Pond (p/a)	
Perm. Pond (p/a)	

Logs in water (p/a)	
High Perch (p/a)	
Low Perch (p/a)	
Soft Mast (p/a)	
Hard Mast (p/a)	
Rock Pile (p/a)	
Rock Crevice (p/a)	
Cave (p/a)	
Live Cavity (p/a)	
Dead Cavity (p/a)	
# of Snags	
Accumulate litter (p/a)	

Comments:

_____

_____

_____

_____

_____

Sapling/Seedling Plot Features

Indicator Species	North	South
Ginseng (p/a)		
Dwarf ginseng (p/a)		
Sensitive fern (p/a)		
Maiden-hair fern (p/a)		
Christmas fern (p/a)		
Trillium (p/a)		
Blue cohosh (p/a)		
Jack-n-the-pulpit (p/a)		
Invasive Exotics		
Garlic mustard (p/a)		
Barberry (p/a)		
Multi-flora rose (p/a)		
Honeysuckle (p/a)		
Autumn Olive (p/a)		
Inhibiting Fern Cover (%)		
Other Fern Cover (%)		
Grass and Sedge Cover (%)		
Soggy Ground (%)		
Surface Stone > 50% (y/n)		

Forest Health

Beech blight (p/a)	
Hemlock woolly adelgid (p/a)	
Emerald ash borer (p/a)	
Other:	

Coarse Woody Material

N-S Transect (117.8ft)			E-W Transect (117.8ft)		
Diam. (ft.)	**Cond. (1/2)**	**Bark (y/n)**	**Diam. (ft.)**	**Cond. (1/2)**	**Bark (y/n)**

-PFI Herp Search Data and Wildlife Sign

PFI Plot Number _____ Tally Date _____/ _____/ _____
Tallied By _____ Page _____ of _____

Time of day	
Days since significant rain	
Litter moisture rating	Dry Moist Wet
Number of turn-overs (minimum 10)	

Species Name	**Number Found**
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____

Wildlife Sign / Special Features

_____
_____
_____
_____
_____
_____
_____
_____

-Greenwood Preserve Permanent Plot Location Sheet

PFI Plot Number _____ Tally date: ____/ ____/ _____
Tallied by _____ Page _____ of _____

Pictures _____ -_____

Plot Habitat Description	
Deer Impact	

Comments/ Travel Description:
_____
_____
_____
_____

Map / Directions

-PFI Seedling-Sapling Sample Data Sheet

PFI Plot Number _____ Tally Date _____/ _____/ _____
Tallied by _____ Page _____ of _____

Subplot : 11.8′ radius
Seedlings: 4″-- 54″ tall
Saplings: 54.1″ tall -- 3.99″ dbh

North Subplot		
SPP	**#SDL**	**#SPL**

North (cont.)		
SPP	**#SDL**	**#SPL**

South Subplot		
SPP	**#SDL**	**#SPL**

South (cont.)		
SPP	**#SDL**	**#SPL**

-PFI Overstory Tree Sample Data Sheet

PFI Plot Number _____ Tally Date _____/ _____/ _____

Tallied By _____

Tree #	Species	dbh	Cavity (y/n)	Crown class

Tree #	Species	dbh	Cavity (y/n)	Crown class

Plot Descriptions

Plot	Central plot radius (ft)	Subplot radius (ft)	Elevation (m)	Aspect	Slope Shape	Longitude	Latitude
01	58.9	11.8	426	NW	convex		
02	58.9	11.8	451	NW	linear		
08	58.9	11.8	442	NW	linear	75.87068274	41.73606260
10	58.9	11.8	475	NE	linear	75.86843153	41.73617550
16	58.9	11.8	455	NW	concave	75.86958538	41.73705627
26	58.9	11.8	443	NE	convex	75.86821418	41.73769564
28	58.9	11.8	410	E	linear	75.86586289	41.73785297
42	58.9	11.8	420	NE	concave	75.86840051	41.73931436
44	58.9	11.8	392	E	concave	75.86589147	41.73936976
46	58.9	11.8	428	NE	linear	75.87193407	41.74044415

Plot Features (a=absent, p=present)

Plot	Trail or road (y/n)	Riparian %	Wetland %	Adjacent water (y/n)	Seep (p/a)	Stream (p/a)	Temp. pond (p/a)	Perm. Pond (p/a)	Logs in water (p/a)	High Perch (p/a)	Low Perch (p/a)	Soft mast (p/a)	Hard mast (p/a)	Rock pile (p/a)	Rock crevice (p/a)	Cave (p/a)	Live cavity (p/a)	Dead cavity (p/a)	Number snags	Accumulate litter (p/a)	Beech blight (p/a)	Hemlock Woolly Adelgid (p/a)	Emerald Ash Borer (p/a)
01	y	0	0	n	a	a	a	a	a	a	p	a	p	p	a	a	p	p		p	p	a	a
02	n	0	0	n	a	a	a	a	a	p	p	a	p	a	a	a	p	p		a	p	a	a
08	n	0	0	n	a	a	a	a	a	p	p	a	a	a	a	a	a	p	6	p	p	a	a
10	n	0	0	n	a	a	a	a	a	a	p	p	p	a	a	a	a	p	2	p	a	a	a
16	n	0	0	n	a	a	a	a	a	a	p	a	p	a	p	a	a	p	4	p	a	a	a
26	y	0	0	n	a	a	a	a	a	a	a	p	p	a	a	a	a	a	1	p	a	a	a
28	n	0	0	n	a	a	a	a															
42	y	0	0	n	a	a	a	a	a	a	p	p	p	a	a	a	a	a	3	p	a	a	a
44	y	0	0	n	a	a	a	a															
46	n	0	0	n	a	a	a	a	a	a	p	p	p	a	a	a	a	a	4	a	a	a	a

Understory Plot

Indicator Species and Invasive Species

Plot	Subplot (north or south)	Ginseng	Dwarf Ginseng	Sensitive Fern	Maiden-hair fern	Christmas fern	Trillium	Blue cohosh	Jack-in-the-pulpit	Total number of indicator species	Garlic Mustard	Barberry	Multi-flora Rose	Honeysuckle	Autumn Olive	Total number of invasive species
01	N	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
01	S	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
02	N	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
02	S	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
08	N	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
08	S	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
10	N	a	a	a	a	p	a	a	a	1	a	a	a	a	a	0
10	S	a	a	a	a	p	a	a	a	1	a	a	a	a	a	0
16	N	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
16	S	a	a	a	a	a	a	p	a	1	p	a	a	a	a	1
26	N	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
26	S	a	a	a	a	a	a	p	a	1	a	a	a	a	a	0
28	N	a	a	a	p	p	p	a	p	4	a	a	a	a	a	0
28	S	a	a	a	p	p	p	a	p	4	a	a	p	a	a	1
42	N	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
42	S	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
44	N	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
44	S	a	a	a	a	p	p	a	a	2	a	a	a	a	a	0
46	N	a	a	a	a	a	a	a	a	0	a	a	a	a	a	0
46	S	a	a	p	a	a	a	a	a	1	a	a	p	a	a	1

Amphibians and Reptiles Counted in Plots

Plot	Date	Eastern Red-backed Salamander	Eastern Newt	American Toad	Red Eft	Dusky Salamander	Slimy Salamander	Total # of Salamanders	Ringneck snake	Garter Snake
01	7/30/2009	21	9	0	0	0	0	30	0	0
02	7/30/2009	11	0	1	0	0	3	14	0	0
08	8/8/2011	9	0	2	9	0	0	18	0	0
10	8/8/2011	3	0	5	7	0	0	10	1	2
16	8/8/2011	11	0	2	6	0	1	18	0	0
26	8/9/2011	11	0	2	5	0	0	16	0	0
28	8/9/2011	9	0	2	0	1	0	10	0	0
42	8/9/2011	0	3	0	0	0	0	3	0	0
44	8/9/2011	5	11	2	0	0	1	17	0	0
46	8/9/2011	0	0	0	0	0	0	0	0	0