Program: Conservation Enhancements for a Living Landscape

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2009 Conservation Activities

E.L. Rose Conservancy

2009 Overview

In 2009, the cooperative conservation and monitoring effort involving the Cornell Conservation Education Program, E.L. Rose Conservancy members and volunteers, and Cornell's Arnot Forest Intern Program, continued to move forward. Over the course of the year, the team expanded efforts to document baseline biological conditions in the face of environmental change. We collaborated on joint educational outreach activities; we completed a 3-year frog call survey initiated in 2007; we conducted baseline biological surveys at Greenwood Sanctuary; and we also began establishing permanent forest inventory plots to serve as the foundation for long-term monitoring at Greenwood Preserve. Through outreach, research, and monitoring, our cooperative efforts, which are ongoing, continue to build the foundation for science-based conservation in the region.

Frog Call Surveys and Community Involvement

Survey Overview

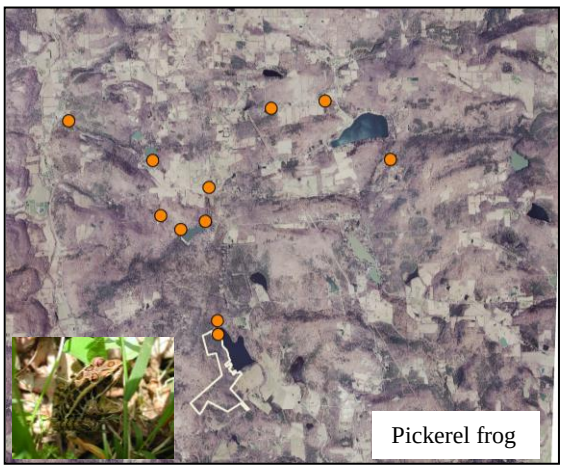
Trained volunteers collected data for the third year of the frog call survey. Four volunteers surveyed seven previously established sites from April to mid-June. Each time a site was visited the participant listened for a 3-minute period, and recorded all species seen or heard. Calling intensity and weather factors were also recorded. In all, five frog and toad species were detected including the green frog (*Lithobates clamitans*), pickerel frog (*Lithobates palustris*), spring peeper (*Pseudacris crucifer*), American toad (*Anaxyrus americanus*), and wood frog (*Lithobates sylvatica*).

Geographic Distribution of Species

The green frog is common and widespread throughout the Northeast and was the most widely detected species in the area over the three-year period. A habitat generalist, the green frog was heard at 17 of the 19 survey sites. Found in ponds, marshes, swamps, along the edge of lakes, and in tiny streams and banks of large rivers, the green frog is most often found in or near water. However, they do use terrestrial habitats to feed on rainy nights.


Green frog

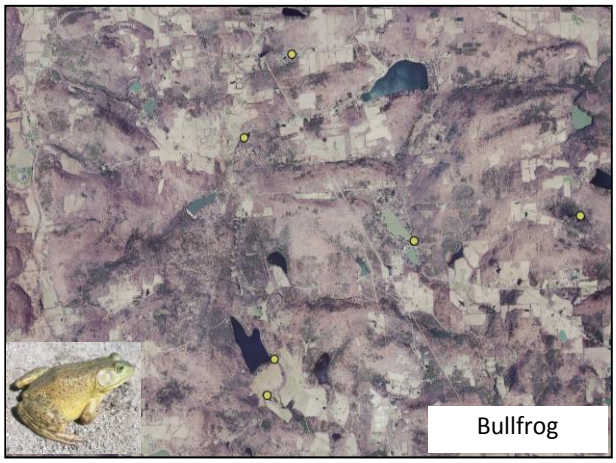
The spring peeper, also heard at 17 sites, was widely distributed throughout the study area. The peeper is the most common tree frog in the Northeast. With the aid of its large toe pads it often can be found climbing on shrubs and herbaceous vegetation. It inhabits deciduous woods and swamps with adjacent open meadows and marshy fields. It moves into open habitats during the breeding season, but spends most of the remainder of the year in wooded areas.

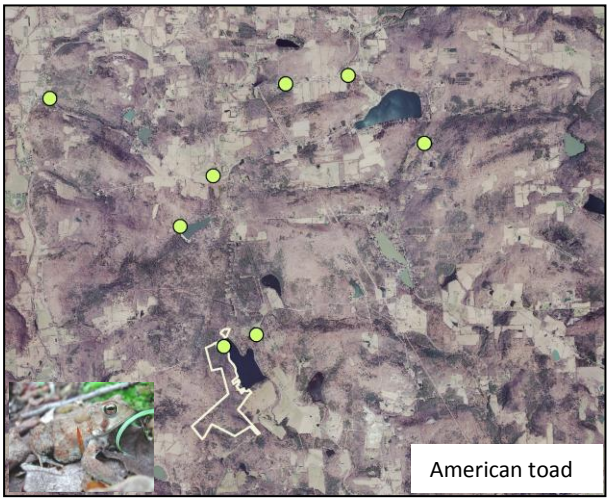


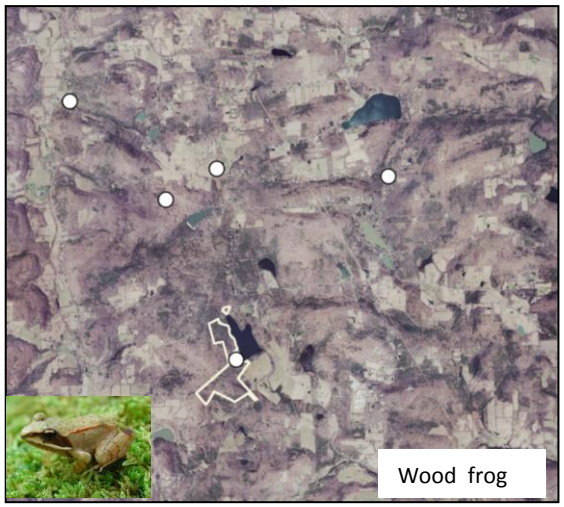
The pickerel frog was detected at 11 sites during our surveys. Pickerel frogs are semi-aquatic animals found near water during the breeding season, and often occur in moist, sunny, terrestrial openings during other times of the year. Their breeding habitat includes temporary pools and ponds, the borders of streams and rivers, and the shallow weedy areas of ponds and lakes. Interestingly, the pickerel frog produces a distasteful skin secretion thought to be toxic to other frog species. Green frogs and bullfrogs, however, are reportedly unaffected by the skin secretions. In our surveys, pickerel frogs were found mainly near openings and rarely co-occurred with bullfrogs.

The bullfrog was found at only six sites, and rarely overlapped with the occurrence of pickerel frogs. Bullfrogs are the largest and most aquatic of Pennsylvania frogs. They require permanent bodies of water such as farm ponds, lakes, and the margins of slow-moving creeks and rivers, to complete their life cycle. Within these habitats, they prefer patches containing emergent, floating, or submerged vegetation which provide cover. During 2009, volunteers concentrated their efforts during the early spring months. Because the bullfrog calls later in the summer, this species was not detected during 2009.

Surveyors detected the gray tree frog at eight sites. An arboreal species, the gray tree frog has mucous-secreting discs on the tips of its toes which help it cling to tree bark. Although preferred breeding areas include some open water with dense emergent and scrub shrub vegetation, often adjacent to woods, the tree frog is a habitat generalist. They may be found in pasture ponds, roadside ditches, and even in swimming pools. Although their loud calls are easily heard, their cryptic coloration makes them difficult to see, especially when they climb high into a tree. The gray treefrog begins calling late in May. Because of limited survey efforts during the summer months, this species was not detected in 2009.







During 2009, volunteers increased their survey efforts during April to increase the likelihood of detecting wood frogs. As a result, wood frogs were detected at three additional sites in 2009, for a total of five sites in all. It is still likely that wood frogs are more widely distributed than our results indicate. Wood frogs breed in shallow, often seasonal pools in or near woodlands.

The American toad was detected at one survey site in 2009, bringing the total number of sites with toads to eight. Toads are habitat generalists and do well in all but urban settings. They lay their eggs in shallow water that lasts 4-8 weeks, long enough for their eggs to hatch and metamorphose. This includes places like large puddles, ditches, and tire ruts, as well as lakes, ponds and wet meadows, which explains their ubiquity across the landscape. Outside of the breeding season, toads can be seen moving about in suburban backyards, in agricultural areas, or in the forest.

Overall, seven species of frogs were detected through our cooperative survey efforts at 19 different sites from 2007-2009. The survey expanded our knowledge of the distribution of frog species in the study area (Table 1). Eight Conservancy members participated in the survey and six others participated in the trainings and refresher course. Thus, the survey had both educational and scientific benefits to the region.

Species	# of Sites 2007	# of Sites 2008	# of Sites 2009	Total # of Sites (2007-2009)
Green frog	12	12	1	17
Spring peeper	10	13	7	17
Pickerel frog	7	7	1	11
Gray treefrog	6	5	na	8
American toad	5	3	1	8
Bullfrog	3	4	na	6
Wood frog	1	1	3	5

Table 1. Number of survey sites at which each species was detected from 2007-2009.

Frog Calling Phenology

Using survey data from 2007- 2009, we plotted the calling intensity for each species by date (Figure 1). From these data, we finalized a frog call phenology timeline for Susquehanna County, which can guide optimal survey time for individual species in the future. In addition, these data will establish a baseline for calling phenology for this area and help guide long-term monitoring of amphibians into the future. Researchers in New York State compared frog calling data from the early 1900's to those collected during the New York Herpetological Atlas from 1990-1999. They found that the average first calling dates for four species - the wood frog, spring peeper, bullfrog and gray tree frog - were 10-13 days earlier than at the beginning of the century. This suggests that warm spring temperatures are occurring earlier in the season in central New York relative to the last century and calling phenology has been affected. Amphibians can be a sensitive indicator of climate change. These baseline surveys in the Silver Lake area will help track and document shifts in phenology in the area.

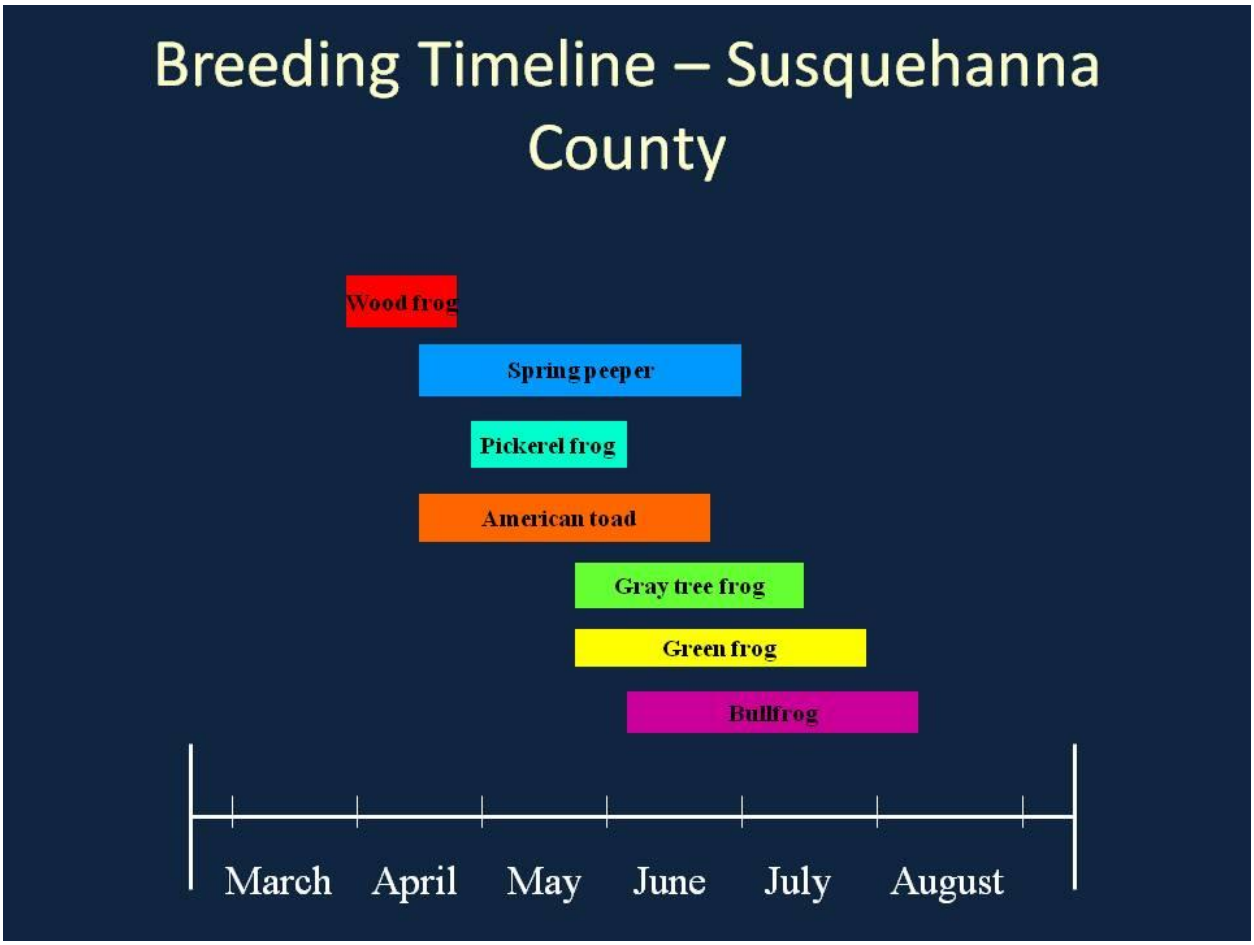


Figure 1. Frog calling timeline for Susquehanna County, Pennsylvania.

Results from the three years of our study indicate that wood frogs, which were most active in April, were the earliest callers. Spring peepers and the American toad followed, and were most likely to call between mid-April and late June. Pickerel frogs also began calling in late April. However, pickerel frogs called for a shorter time period, and calling ended in mid-June. Gray

tree frogs and green frogs began calling in mid-late May and into July. Bullfrogs are the latest breeders of the group, and were most vocal from mid-June to late July. The American toad called sporadically from mid-April through June, and preliminary results indicate that toads may call in response to rainfall events.

Cursory Biological Inventory of Greenwood Preserve

We conducted a cursory biological inventory of Greenwood Preserve beginning in spring and ending in August. Each time we visited the preserve, we recorded any species seen or heard on the property (Table 2). The property contains a diversity of habitat types, including open meadows, a pond, a large wetland resulting from beaver activity, a small stream, mature forest, and some smaller areas of shrubland and early successional forest. The species found on the property are representative of these habitat types.

Common Name	**Scientific Name**
Plants	
Eastern hemlock	*Tsuga canadensis*
Shagbark hickory	*Carya ovata*
Yellow birch	*Betula alleghaniensis*
American hornbeam	*Carpinus caroliniana*
Hop hornbeam	*Ostrya virginiana*
White ash	*Fraxinus americana*
American beech	*Fagus grandifolia*
Northern red oak	*Quercus rubra*
Eastern black oak	*Quercus velutina*
Black cherry	*Prunus serotina*
Red maple	*Acer rubrum*
Sugar maple	*Acer saccharum*
Striped maple	*Acer pensylvanicum*
Maple-leaf viburnum	*Viburnum acerifolium*
American witch hazel	*Hamamelis virginiana*
Virginia creeper	*Parthenocissus quinquefolia*
May apple	*Podophyllum peltatum*
Multiflora rose	*Rosa* sp.
Wild grape	*Vitis* sp.
Barberry	*Berberis* sp.
Poison ivy	*Toxicodendron radicans*
Blackberry	*Rubus spp.*
Wild columbine	*Aquilegia canadensis*

Fish	
Bluegill	*Lepomis macrochirus*
Amphibians	
Bullfrog	*Lithobates catesbeiana*
Eastern red-backed salamander	*Plethodon cinereus*
Eastern newt	*Notopthalamus viridescens*
Allegheny mountain dusky salamander	*Desmognathus ochrophaeus*
Northern two-lined salamander	*Eurycea bislineata*
Slimy Salamander	*Plethodon glutinosus*
American toad	*Anaxyrus americanus*
Bullfrog	*Lithobates catesbeiana*
Reptiles	
Painted Turtle	*Chrysemis picta*
Northern redbelly snake	*Storeria occipitomaculata*
Birds	
Goldfinch	*Carduelis tristis*
Red-tailed hawk	*Buteo jamaicensis*
Eastern wild turkey	*Meleagris gallopavo*
Song Sparrow	*Melospiza melodia*
Turkey vulture	*Cathartes aura*
Red-eyed vireo	*Vireo olivaceus*
Black-throated green warbler	*Dendroica virens*
Common yellowthroat	*Geothylpis trichas*
Wood thrush	*Hylocichla mustelina*
Eastern wood pewee	*Contopus virens*
Chestnut-sided warbler	*Dendroica pensylvanica*
Mammals	
Raccoon	*Procyon lotor*
Meadow Vole	*Microtus pennsylvanicus*
Eastern Chipmunk	*Tamias striatus*
White-tailed Deer	*Odocoileus virginianus*

Table 2. Species recorded at Greenwood Preserve through cursory survey in 2009.

Permanent Forest Inventory Plots at Greenwood Preserve

Methodology

To gather more complete information about plant species composition and habitat condition, two permanent forest inventory (PFI) plots were established and sampled in 2009 (Figure 2). Plots were located at least 30 m from the property boundary and 100 m away from one another. The PFI plots will be used to monitor short- and long-term changes in forest health and composition. The methodology (Appendix A) is based on protocols developed and implemented at Cornell University's Arnot Teaching and Research Forest.

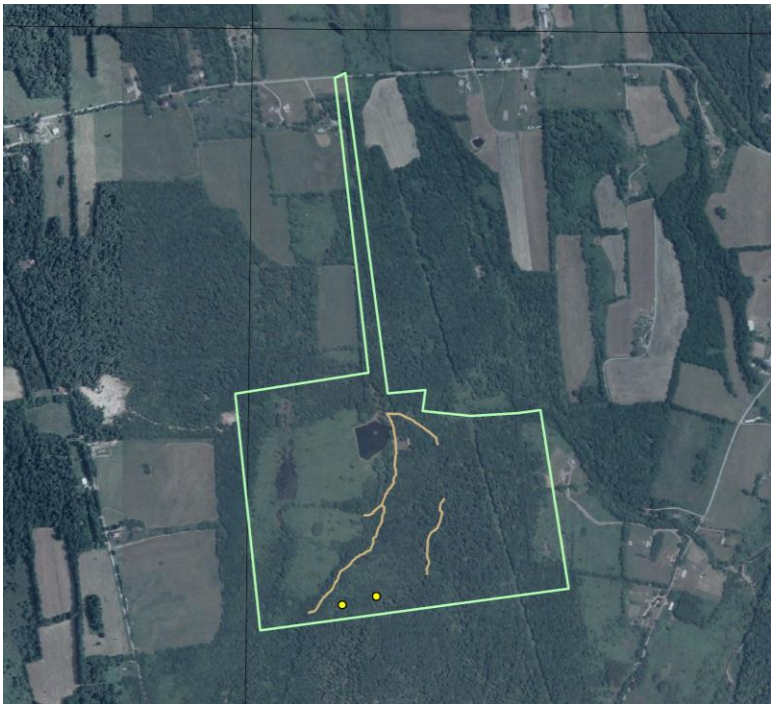
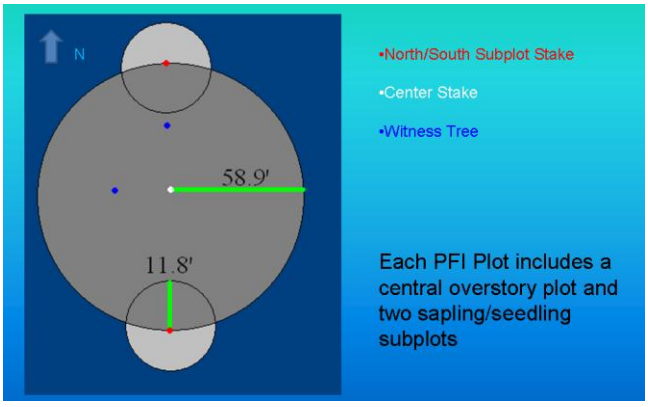


Figure 2. Two Permanent Forest Inventory (PFI) plots were at Greenwood Preserve were completed (yellow) in 2009.

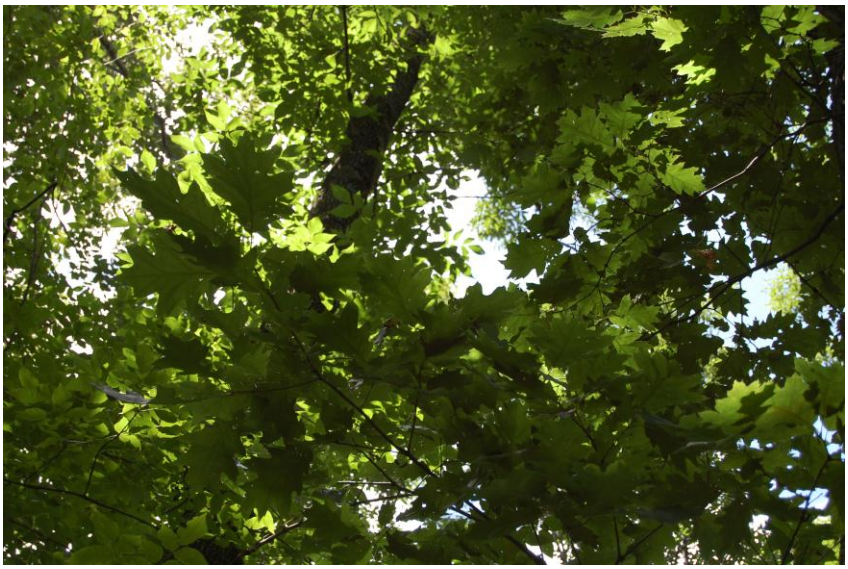
Plots were inventoried in August, 2009. Each quarter-acre PFI plot consists of a circular central plot (58.9' radius) and two subplots (11.8'). The center of the plot was marked with white pvc pipe painted blue at the top for visibility and longevity. The pipe has a tag attached at the top with the plot number on it, which is also written on the pipe in permanent marker. 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 at least 4" were marked one foot off the ground with small, round aluminum tags and aluminum nails. For these trees the species, dbh (diameter at breast height), presence/absence of cavities, and crown class was recorded. The subplots were used to evaluate the number of seedlings and saplings present, as well as other 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 wildlife. For many of the plots, pictures were taken and placed on CD to potentially be used for photo-monitoring in the future.



Results

Overstory trees

In 2009, 122 overstory trees were recorded, measured, classified and tagged in two plots. Eleven tree species were identified within the plots, including American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), aspen (*Populus sp*.), red maple (*Acer rubrum*), black birch (*Betula lenta*), American basswood (*Tilia americana*), eastern hophornbeam (*Ostraya virginiana*), northern red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), yellow birch (Betula *alleghaniensis*), and white ash (*Fraxinus americanus*). Species comprising 30% or more of the trees in one or more plots included hemlock, and black birch (Table 3). Red maple and beech were significant components in plots that also supported a high percentage of hemlock trees.



Forest understory

Within the understory subplots in the two PFI plots, four different tree species were recorded (Table 4). Each of the species growing in the understory, including American beech, eastern hemlock, white ash, and northern red oak, was also observed growing in the overstory. The number of seedlings present in the plots varied, and very few have grown to sapling size in the plots sampled. With relatively little sunlight reaching the forest floor due to a closed forest canopy in this area of the preserve, it is not surprising that the understory is not well-developed. Additional plots are planned across the spectrum of different habitat types in 2010.

	American beech		White ash		Oak sp.		Eastern hemlock	
	Seedling	**Sapling**	**Seedling**	**Sapling**	**Seedling**	**Sapling**	**Seedling**	**Sapling**
1N	1	1	2	0	1	2	0	0
1S	4	0	0	0	0	0	0	1
2N	0	0	0	0	0	0	0	1
2S	30	0	0	0	0	0	0	0

Table 4. Understory seedlings and saplings recorded in the PFI plots.

Invasive species

Japanese barberry and multiflora rose were two invasive plant species noted during the cursory survey of Greenwood Preserve. During the surveys, we also looked for signs of emerging forest pest issues, notably the emerald ash borer, hemlock woolly adelgid, and beech bark disease. We did not see any signs of emerald ash borer during the cursory survey in 2009. Ash is a component of the forest stands in Greenwood Preserve, however, and emerald ash borer could have an impact on the forest in the future.

The hemlock woolly adelgid is a serious pest of eastern hemlock in the northeastern states. Although we did not detect hemlock woolly adelgid at the preserve in 2009, the mature hemlock stand along the steep slope of the southwestern portion of the forest should continue to be monitored for this pest. This area of forest is dominated by a hemlock overstory but also contains some mature beech infected by beech bark disease. Beech bark disease is caused by an interaction between the beech scale (a non-native insect) and either one of two native *Nectria* fungi. Beech scale is causing heavy mortality of mature beech trees in the stand. Severely affected trees lose vigor, grow slowly, and then die. Following mortality of the mature trees, thick stands of small trees typically sprout from the roots. These thick stands can inhibit the growth of other seedlings by blocking light from the forest floor, leading to a decrease in the diversity of species in the affected area. Currently, heavy shading by the mature hemlock trees appears to be limiting the amount of beech sprouting. However, should the stand become infested with hemlock woolly adelgid leading to hemlock decline or mortality, the beech present in the overstory could sprout profusely. Close monitoring of this stand can help inform future management decisions to minimize the long-term effects of these pests. In the short-term, manual or chemical treatment to reduce beech sprouts could help to encourage plant species diversity in the stand.

Amphibians and Other Wildlife

The presence and abundance of salamanders in the forest can indicate forest condition. The eastern red-backed salamander, for example, is the most abundant vertebrate in northeast deciduous forests and plays a key role in ecosystem functioning. Red-backed salamanders reach their greatest abundance in mature forests with a closed canopy, and are less abundant in young forests, or forests with open canopies.

Three species of salamander were found during our plot searches at Greenwood Preserve, including the red-backed salamander (*Plethodon cinereus*), eastern newt (*Notophthalmus viridescens*), and slimy salamander (*Plethodon glutinosus*). In addition, one American toad was found. Red-backed salamanders occurred in both plots, averaging 16 animals per ¼-acre plot. Nine eastern newts were found in Plot 1, and three slimy salamanders were found in Plot 2. Both red-backed salamanders and slimy salamanders appear to be quite abundant at

Greenwood Preserve, based on both the PFI plot data and cursory survey information. The number and distribution of red-backed salamanders at Greenwood Preserve is indicative of a mature forest with a closed canopy. The red-backed salamander is a generalist salamander of northeast forests, tolerating a wide range of conditions, but faring best in the cool, moist conditions created when the forest floor is shaded by overstory vegetation. As such, the Greenwood Preserve is highly favorable for the species. The slimy salamander likewise prefers mature woodlands with abundant rocks and logs for cover, and will retreat underground during periods of drought. Abundant rocks at this site create ideal conditions for this animal.

All tolled, we found 0.29 salamanders per cover object overturned at Greenwood Preserve. During a similar survey at the Arnot Forest in July, 2008, we counted 0.25 salamanders per cover object, and at Highpoint Preserve we counted 0.19 salamanders per cover object. These numbers are fairly comparable however, Greenwood Preserve may serve as excellent salamander habitat with a diversity of water resources as well as mature forest and abundant cover objects.

Outreach Activites 2009

Throughout 2009, we came together with Conservancy members and the public around a number of important conservation issues. The first was a presentation focused on Minimizing the Effects of Energy Development on Wildlife and Forest Habitats. We highlighted the potential direct and cumulative effect that new emerging energy technologies and infrastructure – including woody biomass, wind energy, and natural gas development – can have on wildlife and wildlife habitats. These impacts may include direct loss of habitat, direct mortality to bats and birds, water quality and quantity issues, habitat fragmentation, and loss of habitat complexity. The second outreach activity was a presentation at the Conservancy's annual meeting synthesizing several years of work, including an analysis of deer browse impacts at Long Pond, frog call surveys in the Highpoint Preserve region, and establishing permanent forest inventory plots for long-term monitoring. These events provided the opportunity to share the results of our on-the-ground activities, but perhaps more importantly they enable us to receive valuable input and engage the local community.

Appendix A – Permanent Forest Inventory Plot Methodology (for 2009) and Data Sheets

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

_____

_____

_____

_____

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_____

_____

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 Samples

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

Trees > 4” dbh

PFI Plot Number ________________________ Tally Date _____/ _____/ ________

Tallied By ____ Page ___________ of ____________

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

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

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 Greenwood
Permanent Forest Inventory (PFI) Plots

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:

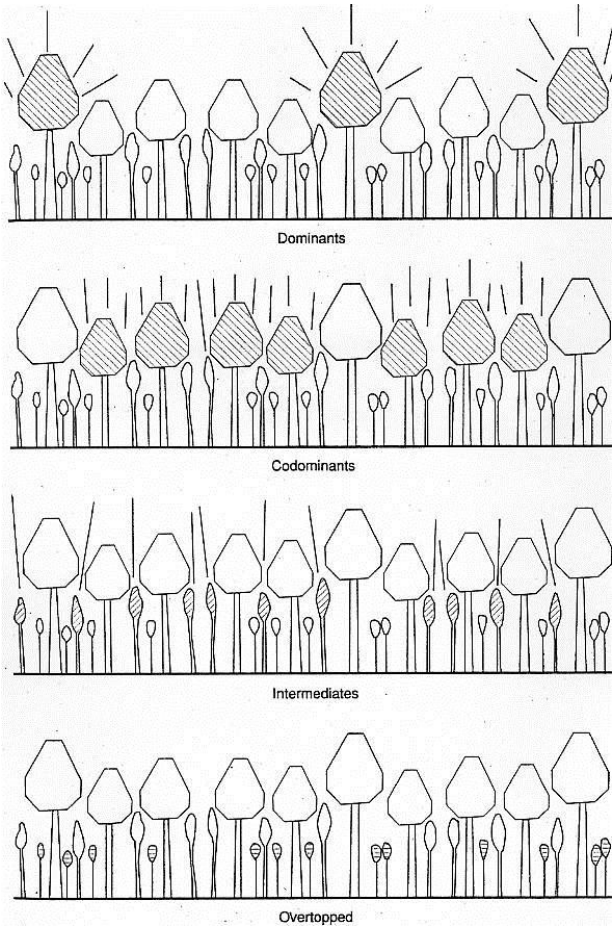
1= open grown- a tree that is free of competition and receives light on top and all sides of the crown as a result of a very heavy thinning or being in an isolated, open-grown position.

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.



Appendix C – Permanent Forest Inventory Plot Results

Permanent Forest Inventory Plot Descriptions

Plot	Central plot radius (ft)	Subplot radius (ft)	Elevation (m)	Aspect	Slope Shape	Topo Position	UTM Coordinates
1	58.9	11.8	518	NE	Concave	Lower slope	18T 0420686; 4643179
5	58.9	11.8	560	E	Convex	Upper slope	18T 0420399; 4643111
10	58.9	11.8	583	E	Linear	Hillside	18T 0420601; 4643002
15	58.9	11.8	576	N	Concave	N/A	18T 0420693; 4642916
20	58.9	11.8	540	E	Concave	N/A	18T 0420861; 4642770
25	55.9	8.8	579	E	Convex	Mid-slope	18T 0420797; 4642403
30	58.9	11.8	546	W	Concave	N/A	18T 0420817; 4642277
35	58.9	11.8	589	W	Concave	N/A	18T 0420706; 4642195
40	55.9	8.8	566	ESE	Linear	Mid-slope	18T 0420802; 4642100
45	58.9	11.8	600	SW	Convex	N/A	18T 0420603; 4641984
50	55.9	8.8	581	W	Convex	Ridgetop	?
55	55.9	8.8	577	E	Convex	Ridgetop	?

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)
1	y	0	0	y	a	a	a	a	a	p	p	a	p	a	a	a	p	p	4	p	p	a	a
5	n	0	0	n	a	a	a	a	a	a	p	a	a	a	a	a	a	p	40	p	p	a	a
10	n	0	0	n	p	p	a	a	p	a	p	a	a	a	a	a	p	p	10	p	p	a	a
15	n	0	40	n	p	p	a	a	p	p	p	a	p	p	p	p	p	p	14	a	p	a	a
20	y	0	0	y	a	a	a	a	a	a	p	a	a	a	a	a	p	p	22	p	p	a	a
25	n	0	0	n	a	a	a	a	a	p	p	a	p	a	a	a	p	p	6	p	p	a	a
30	n	0	0	n	a	a	a	a	a	p	p	a	p	p	p	p	p	p	11	p	p	a	a
35	n	0	0	n	a	a	a	a	a	p	p	a	p	p	p	p	p	p	26	a	p	a	a
40	n	0	0	n	a	a	a	a	a	a	p	a	p	p	a	a	a	a	5	p	p	a	a
45	y	0	0	n	a	a	a	a	a	p	p	a	p	p	p	p	p	p	N/A	p	p	a	a
50	n	0	0	n	a	a	a	a	a	p	p	a	a	p	a	a	p	a	20	p	a	a	a
55	y	0	0	n	a	a	a	a	a	a	p	p	p	p	a	a	a	p	17	p	p	a	a