Report on the 6th year of monitoring vegetative succession along the Volney-Marcy South power line right of way in Greenwoods Conservancy, summer 2004

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ABSTRACT

This report summarizes the 6th continuous year of research on two belt transects that cross the Volney-Marcy South power line Right Of Way (ROW) located in the Greenwoods Conservancy in Burlington, NY. The ROW is owned and operated by the Power Authority of the State of New York and has been monitored since 1999 by the Biological Field Station based in Cooperstown, NY. Each year, a survey of vascular plants was performed along with a determination of cover by each species. This year, transect A was found to have 57 species with a total cover of 188%. Rosaceae dominated, having 87% cover. Transect A has not been managed since the establishment of the ROW in 1988. Transect B was found to have 80 species with a total cover of 132%, with the predominance of cover from Asteraceae and Rosaceae, having a combined cover of 49%. Transect B was managed using Integrated Vegetation Management (IVM) methods in 1998. Herbicide spot treatments were applied in early summer, 2004.

INTRODUCTION

The Volney-Marcy South Right of Way power line stretches 200 miles from Marcy to East Fishkill, New York. These large lines are un-insulated and carry 345 Kv of electricity. The Right of Way (ROW) is owned and maintained by the Power Authority of the State of New York (PASNY). The lines pass through the Greenwoods Conservancy from the southwest to northeast corner. This conservancy, which is protected by a conservation easement through the Otsego Land Trust, consists of over 1,100 acres traversing, forests, fields and wetlands.

PASNY is responsible for maintaining the ROW in order to provide unimpeded access for maintenance purposes. It is also critical that the ROW be cleared of all trees and tall shrubs that have the potential to grow too close to the un-insulated transmission lines. These lines hang as low as 30 feet above the ground in some places. Line-to-ground faults, or "flashovers", can occur when vegetation grows to close to the power lines allowing electricity to jump from the line through the vegetation to the ground (Fickbohm 2001). On August 14, 2003 a line-to-ground fault shorted out a power line starting a chain of events that left 50 million people in the northeastern United States without power (Walters 2003). Since that blackout, the Federal Energy Regulatory

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Commission (FERC) surveyed all major power companies recording what management programs have been in place, if any. If the power company was negligent in management, the FERC issued a directive to rectify the situation. Security zones (the area within 15 feet of the transmission line) have been established. Any tree or tall shrub species having the ability to grow more than 20 ft tall is considered undesirable and is subject to removal by PASNY.

Since the 1950s ROW maintenance has consisted of clear-cutting and the application of non-selective herbicides every few years (Tedesco 2002). Since 1980, the goal of ROW maintenance is not to eliminate all undesirable species but rather to promote the growth of grasses and shorter shrubs in hopes to limit the growth of undesirable species. Promoting the growth of dense layers of low growing species, such as red raspberry (*Rubus idaeus*) and blackberry (*R. allegheniensis*), can shade out and prevent successful germination of taller, undesirable species.

Since the ROW was created in 1988, the management of vegetative has been classified as "Integrated Vegetative Management" (IVM). IVM is the combination of mechanical, chemical, biological and cultural means used to manage vegetation. The techniques most often used are mechanical (cutting with chainsaw or brush hog) and chemical (application of herbicide on trees stumps or low volume spraying). Biological management can also used, via herbivory and allelopathy. Cultural means are employed but are much less common (snowmobile trials, grazing lands, agricultural uses, or even parking lots). Maintaining the ROW vegetation can cost billions of dollars and has to be done every few years (ESF 2002). The cost for maintaining a ROW is, on average, $600-$700 an acre; clearing large trees along the edge can cost as much as $2,000 an acre (Paine 2004) With IVM, the goal is to encourage dense, low growing vegetation to control growth of undesirable trees in order to make it easier to maintain the ROW mechanically and chemically, in short to save money (Paine 2004).

When the ROW was first created, the land was clear-cut for its full length. The area encompassing transect A has not been managed since the ROW establishment 16 years ago. Transect B was treated in 1998 using IVM practices that included hand cutting undesirable vegetation as well as spot applications of herbicide on tree stumps. The herbicide is a combination of core concentrate and arsenol (Paine 2004). Arsenol is a non-selective herbicide which prevents seed germination for up to 10 years (Basin Advisory Committee 2003).

METHODS

Two belt transects were created in 1999, with each site being monitored annually to document vegetative succession along the Volney-Marcy South ROW. Both transects extend perpendicularly across the ROW, 40-50 meters long by 10 meters wide. In both cases the study quadrats start with quadrat 1 on the northwest border of the ROW and extended to quadrat 17 on the southeast border (Titus 2003). Transect A is located 100 meters southwest of Zachow Road and has a west facing 25% slope. Transect A is

divided into 17 quadrats each 3m X 10m and has not been treated since the development of the ROW. Transect B is located 300 meters southwest of Zachow Road and has an east facing 20% slope (Tedesco 2002). Transect B is divided the same way as A and was treated in 1998 using IVM techniques. Figure 1 is a map of Greenwoods Conservancy showing where transects A and B are located.

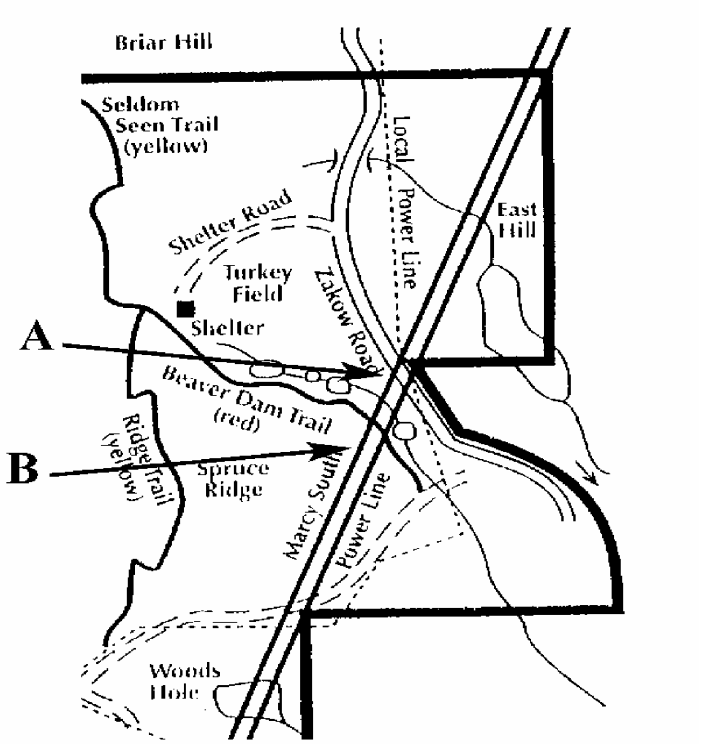

Figure 1. Map of Greenwoods Conservancy showing locations of transects A and B.

Between the second week in June and the second week in August a survey of vascular plants was performed for each quadrat of both transects. Posts at the corners of each quadrat delineated the study areas. Species diversity was recorded by identifying each plant species present in the quadrat. Species that were not identified in the field were tagged and brought back to the lab for identification. Each species was placed in a cover class in order to determine its percent cover for each transect. Methodology for determining cover classes was adapted from Mueller-Dombois (Titus 2003). In past years, the percent cover was difficult to interpret due to overlapping covers and differing heights. This year a stratified percent cover approach was adopted. Stratifying the percent cover will give a better representation of the vegetation present on each transect. The strata were dependent on heights of plants. Three height classes were used; herbaceous (0-1m), shrub (1-3m), and canopy (3+m). Walking each quadrat and assigning each species an estimated percentage and a height class determined percent cover. Using the estimated percentage each species was placed in a cover class and the midpoint was taken. For example if *Rubus idaeus* were present at approximately 30% cover at 4 feet, it was classified in cover class 3 with a midpoint of 37.5 (according to Table 1) at the height class of shrub. Accounting for stratified vegetation can become a

problem since some plants grow throughout their lives, i.e., they are transgressive (they can grow from one height class to another). For the purpose of this study, it was not necessary to define every plant that grew through the height layers as transgressives; it is not as important to consider that plants can grow from the grass layer to the shrub layer as it is that plants that can grow into the canopy layer, or become "undesirable". Therefore, in this study transgressive species are those plants that can grow into the canopy layer but at the time of classification are only in the grass or shrub layers. In all, there are five different height classes consisting of herbaceous (H), shrub (S), herbaceous transgressive (H-T), shrub transgressive (S-T), and canopy (C). Plants contributed to the percent cover if they hung over into the plots, but were not counted in overall species diversity if their stems were not located inside the transect (Titus 2003).

The actual cover of a species can appear exaggerated or suppressed when the Mueller-Dombois approach is used to determine percent cover. For example, a plant species having a very small percent cover (<1%) using the midpoint table, that species will be labeled as having 2.5% cover. This situation, as well as overlapping of species, can sometimes make the percent cover for a quadrat over 100%.

Class	Cover Range %	Mid-point
1	0-5	2.5
2	5-25	15
3	25-50	37.5
4	50-75	62.5
5	75-95	85
6	95-100	97.5

Table 1. Cover class, ranges, and midpoints (Mueller-Dombois 1974).

RESULTS

Table 2 shows the presence of those tree species considered undesirable, as defined by PASNY (Tedesco 2002), which have been documented between 2002 and 2004 in both transects A and B.

The proportion of cover for each height class in both of the study transects is shown in Figure 2. The herbaceous and shrub height level dominate both transects A and B, while the canopy layer comprises the smallest proportion.

Genus and Species	Common Name	Transect A			Transect B		
		2002	2003	2004	2002	2003	2004
Acer rubrum	Red Maple	X	X	X	X	X	X
Acer saccharum	Sugar Maple	X	X		X	X	X
Alnus incana	Speckled Alder	X	X	X	X		
Amelanchier sp.	Shadbush	X	X	X	X	X	X
Betula allegheniensis	Yellow Birch				X	X	
Fagus grandifolia	Beech	X		X	X	X	X
Fraxinus americana	White Ash	X	X	X	X	X	X
Malus sp.	Apple	X	X	X			
Picea rubens	Red spruce	X	X		X	X	X
Pinus strobus	White Pine	X	X	X	X		X
Populus tremuloides	Quaking Aspen	X	X	X	X	X	X
Prunus serotina	Black Cherry	X	X	X	X	X	X
Prunus virginiana	Choke Cherry	X	X	X	X	X	X
Quercus rubra	Red Oak	X	X	X	X	X	X
Sorbus americana	Mountain Ash	X				X	X
Number of transects present:		14	12	11	13	12	12

Table 2. Presence of undesirable tree species at the Volney-Marcy South ROW in the Greenwoods Conservancy (2002-2004)

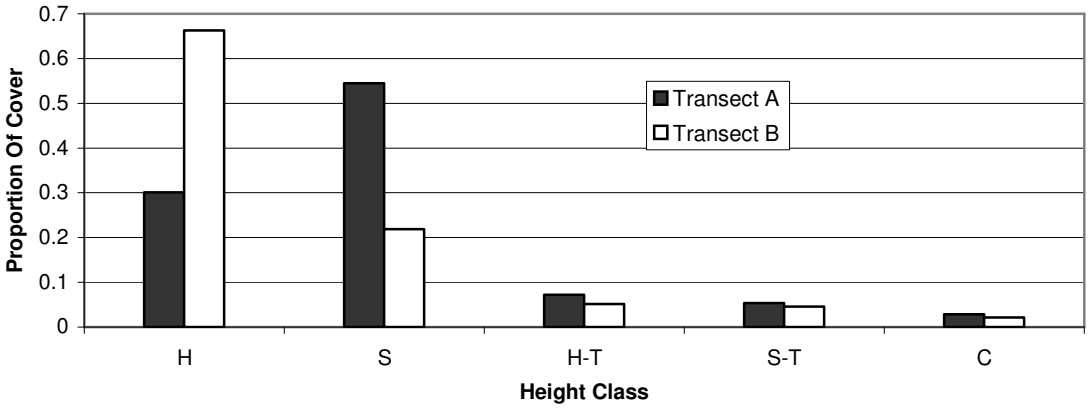

Figure 2. Proportion of cover divided into each height class for each. transect at Greenwoods Conservancy, summer 2004.

The proportion of total cover of Asteraceae and Rosaceae for both transect A and B since 2000 are located in Figure 3. Transect A declined in the number of overall plant species, from 65 in 2003 to 57 in 2004, but the percent cover has increased from 123% to 188%. Transect A was dominated by the Rosaceae family, comprising 87% of the total percent cover. Arrowwood (*Viburnum dentatum,* Caprfoliaceae) made up the most percent cover for any one species at 43%. Blackberry accounted for 28% cover. Meadow sweet (*Spirea latifolia*) contributed 20% cover, red raspberry 18% and nannyberry (*Viburnum lentago*) 10%.

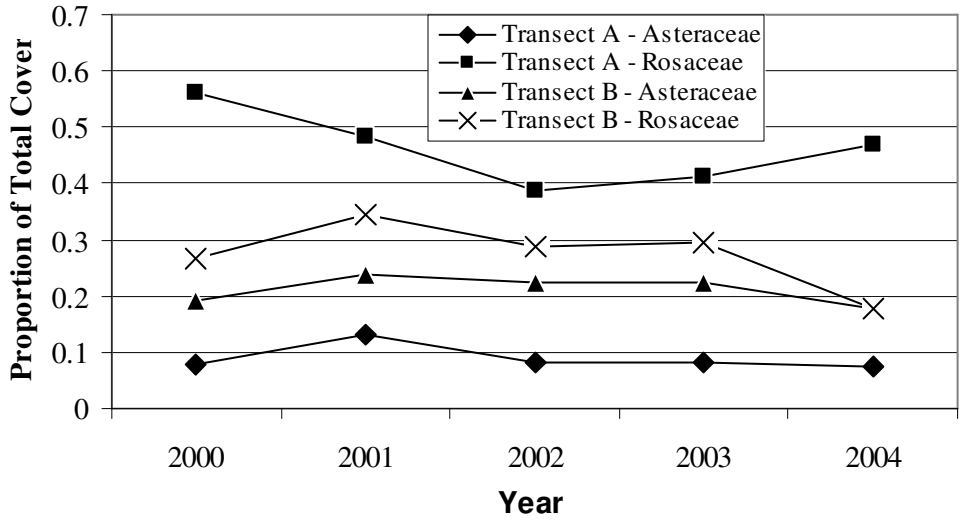

Figure 3. Asteraceae and Rosaceae cover on transects A and B, Greenwoods Conservancy, 2000-2004.

Transect B declined in the number of species from 84 species in 2003 to 80 in 2004. The total percent cover for the transect declined from last year from 158% to 132%. The dominant families in this transect were Asteraceae and Rosaceae, combining for a total percent cover of 49% cover. The largest percent cover for any one species was jewel weed (*Impatiens capensis*) at 25 %. Arrowwood and nannyberry had percent cover of 10% and 8% respectively. Perhaps most notable, blackberry and red raspberry declined from 14% to 5% and 14% to 7%, respectively, in just one year. It is visually evident that parts of quadrats 14, 15, and 16 were treated during the spring of 2004 (described in Discussion) and this may have resulted in the decline of the blackberry and red raspberry. The increase in jewel weed cover could be due to the wet summer and to the presence of suitable habitat due to the IVM practices performed on the plot in 1998.

Figure 4 illustrates a substantial decline in the proportion of total cover for undesirable vegetation, which is most likely due to the inclusion of nannyberry and arrowwood in 2003 as undesirable species. Because these species do not generally reach 20' in height, they were not treated as being "undesirable" in the current study. This situation would have an appreciable effect on the proportion of undesirables because these two species constituted a considerable proportion of total cover.

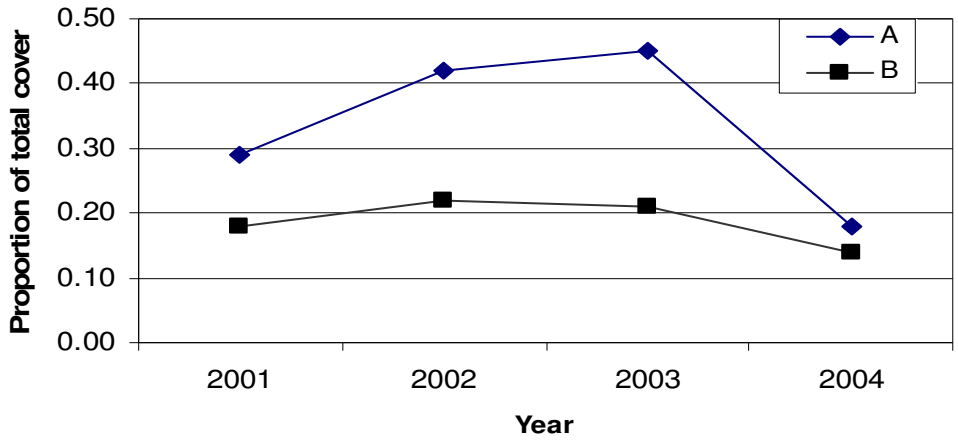

Figure 4. Undesirable vegetation cover for transects A and B from 2001-2004.

DISCUSSION

Traversing Transect B this summer it was evident that PASNY performed selective vegetative management during the spring of 2004 on parts of quadrats 14, 15, and 16. This management involved cutting down undesirable trees and stump treatment with herbicides to control future growth of those species. Unfortunately, many untargeted species were also killed, specifically blackberries and red raspberries, resulting in the drastic decline in percent cover of these species in those quadrats. The killing of low growing shade producing shrubs is harmful to the purpose of IVM and the impacts of this action might be counter to the intentions of the program.

CONCLUSIONS

As Transect A has not been managed since the establishment of the ROW 16 years ago, a later successional stage is evident in that trees such as black cherry (*Prunus serotina*) red maple (*Acer rubrum*) are established. There is still a strong shrub community present but is giving way to climax tree communities. Transect B, having been managed only 6 years ago, is still in early successional stages being dominated by goldenrods (S*olidago* spp.), jewel weed and smaller shrubs like red raspberry and blackberry. Transect B has a higher diversity of plants, likely due to the presence of open spaces for plants to establish and grow. Herbaceous and shrub level species comprise the greatest proportion of cover in both transects A and B.

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