Orange and Rockland Utilities, Inc.

Transmission Vegetation Management Plan

Approved By:_____
Glenn Meyers – Director, Electric Operations
Orange & Rockland Utilities

April 1, 2012

STATE OF NEW YORK DEPARTMENT OF PUBLIC SERVICE

THREE EMPIRE STATE PLAZA, ALBANY, NY 12223-1350

www.dps.state.ny.us

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April 16, 2012

Mr. Mark Beamish
Manager, Vegetation Management
Electric Operations
Orange and Rockland Utilities, Inc.
390 West Route 59
Spring Valley, New York 10977-5300

Re: Case 10-E-0155 – Proceeding on Motion of the Commission as to New York State's Electric Utility Transmission Right-of-way Management Practices.

Dear Mr. Beamish:

Pursuant to the Public Service Commission's Order Adopting Recommendations in the above- noted proceeding ("Order"), Orange and Rockland Utilities, Inc. (O&R or the Company) filed modifications to its Transmission Vegetation Management Plan ("Plan") on April 11, 2012 for staff acceptance as required by the Order.

This letter is to inform you that upon Staff review, we find that the filing satisfactorily meets the requirements of the Order and is therefore accepted. Please do not hesitate to contact me at 518-486-7322 should you have any questions.

Sincerely,

David S. Morrell
Utility Analyst III
(Environmental)

Reviewed: _____

Christina Palmero, Chief
Renewable Energy & Environmental
Compliance Section, (OEEE)

Approved: _____

Floyd E. Barwig, Director
Office of Energy Efficiency
and the Environment

cc: James Austin, NYSDPS
Guy Mazza, Esq. NYSDPS
David Warner, Esq. Consolidated Edison

TABLE OF CONTENTS

Orange and Rockland Utilities, Inc.

Transmission Vegetation Management Plan

1. Introduction

This document reflects the 2012 update to the Orange & Rockland Utilities (Orange and Rockland) Transmission Vegetation Management Plan (Plan). The primary purpose of this update is to present the latest revisions and updates to the existing Plan, as originally required by the New York State Public Service Commission (PSC) on December 15, 1980, in Case 27605. This Plan complies with Part 84 - Transmission Facilities Management, specifically Section 84.2 – Long-range right-of-way management plan for electric transmission systems and Section 84.3 - Transmission right-of-way maintenance programs and schedules.

A Plan was first submitted by Orange and Rockland to the PSC in 1982. This original Plan provided for environmentally and economically sound system-wide vegetation management designed to achieve reliable electric transmission, as well as the long-term development of relatively stable and compatible plant communities within the managed sections of right-of-way.

The Plan has been updated and revised several times following its original submittal, including a major revision submitted in 1989, and subsequent modifications as required. The Plan was fully revised again in 2003. Minor changes reflecting updates to Orange and Rockland's program as well as Department of Public Service (DPS) comments and suggestions were made in 2007. The 2007 update incorporated changes that were based on the requirements of the 2005 PSC Order Requiring Enhanced Transmission Right-of-Way Practices by Electric Utilities in case 04-E-0822 and NERC Standard FAC-003-1, Transmission Vegetation Management Program. The 2009 update was also a minor change. It includes relevant changes to keep the Plan current, as well as editorial changes that consolidate ideas and concepts and add clarity to the document. This 2012 update is to include new elements in case 10-E-0155, including customer and municipal notification, enhanced notification information of the work to be performed, High Density area work plans, the Orange and Rockland Modified Plan, transmission ROW planting plans and criteria, and a description of noncompatible vegetation species to remain on the right-of-way.

In addition to serving as the central document for defining how vegetation is managed on transmission rights of way at Orange and Rockland this Plan serves the following purposes:

- Ensures compliance with NERC Standard FAC-003-1. This standard requires all Transmission Owners to prepare and keep current a formal Transmission Vegetation Management Program (TVMP) that shall include the objectives, practices, approved procedures and work specifications. This document is the major component of the TVMP and applies to all transmission lines covered under FAC-003-1 regardless of their location.

- Ensures compliance with the PSC Order Requiring Enhanced Transmission ROW Vegetation Management Practices by Electric Utilities. This Order was issued under case 04-E-0822 in June 2005.

- Ensures that transmission vegetation management practices take into account DPS staff requests for additional information beyond the Part 84 required reporting criteria such as endangered species considerations.

- Ensures compliance with the Order Adopting Recommendations in PSC case 10-E-0155, issued May 27, 2011.

2. Description of Orange and Rockland Utilities, Inc.

2.1. History and Service Territory

Orange and Rockland Utilities, Inc. started as the Rockland Light & Power Co. in Nyack, N.Y. in 1899, when S.R. Bradley combined several small local gas and electric companies. This approach of merging smaller, local branches into larger regional companies became the blueprint for growth over the next 100 years. In 1912, the Charles H. Tenney Company of Boston purchased the Rockland Light & Power Co. and began merging it with smaller local gas and electric companies. In 1926, Tenney purchased Orange County Public Service, one of the larger utilities in the region, and merged it into Rockland Light & Power Co. In 1958, Rockland Light & Power Co. merged with Orange and Rockland Electric Company, and took its name, becoming what we now know as Orange and Rockland Utilities. Orange and Rockland and its subsidiaries became a wholly owned subsidiary of Consolidated Edison Incorporated (CEI) in 1999.

Orange and Rockland serves an area totaling 1,350 square miles, with a population of more than 700,000 located throughout: seven counties in New York, northern New Jersey and northeastern Pennsylvania, Orange, Rockland and Sullivan Counties in New York State, a portion of Pike County in Pennsylvania, and portions of Bergen, Passaic and Sussex counties in New Jersey (with nearly 300,000 electric customers). The Company operates 573 circuit miles of high voltage transmission lines (34.5kV and above), with 379 right-of-way miles covering 4,461 acres. Approximately 300 right-of-way miles and 4,000 acres are located in New York State. The service territory is currently separated geographically into three operating Divisions, Eastern, Central and Western. Orange and Rockland headquarters is located at One Blue Hill Plaza, Pearl River, NY 10965.

Table 1 in Section 3.2 provides a listing of transmission line facilities for which Orange and Rockland manages the right-of-way vegetation, along with a description of each line in terms of its location (end points), extent, voltage and typical right-of-way widths.

2.2. Management Description

The Vice President of Operations has executive responsibility for planning, implementation and control of the program. The Transmission and Distribution Maintenance Section of the Electric Operations Department is responsible for the following items pertaining to the Orange and Rockland right-of way-vegetation management program:

- Establish yearly work plans
- Schedule work
- Conduct periodic surveys
- Prepare field estimates
- Property owner notification
- Prepare reports
- Supervise daily activities
- Conduct field inspections

The Environmental Services Department provides technical support and advice and obtains permits as required. The Real Estate, Community Relations, and Mapping Departments provide assistance as needed. The operating management structure of Orange and Rockland Transmission Right of Way Program by employee title is as follows:

- President of Orange and Rockland Utilities: William G. Longhi
- Vice President of Operations: Francis W. Peverly
- Director of Electric Operations: Glenn Meyers
- Section Manager, T&D Maintenance: Stephen T. Prall
- Manager, Vegetation Management: Mark J. Beamish
- Chief Construction Inspector, Vegetation: Keith J. Still
- Chief Construction Inspector, Vegetation: Ashley E. McDonald

The Manager, Vegetation Management is the primary individual responsible for implementing the Orange and Rockland Transmission Vegetation Management Plan. The Chief Construction Inspector (CCI) is responsible for the field inspection of on-going vegetation management activities and for ensuring completeness and quality of work performed in the field by vegetation management contractors.

2.3. Physical and Environmental Variations Within Orange and Rockland Service Territory

2.3.1 Transmission System Location With Respect to Land Forms and Physical Features

The Orange and Rockland service area and transmission system are located in a concentrated area residing on the western edges of the lower southern extremity of the Hudson River Valley, extending from these river plains inland to the more hilly terrain, and even some low-lying mountains. Although this represents a relatively small geographic area by some utility standards, the Orange and Rockland transmission system covers several physiographic regions that can dramatically influence the vegetation growth patterns and influence accessibility to the transmission system. The land forms range from relatively level plains in the Triassic Lowland areas along the Hudson River Valley and the Wallkill River Valley, to rounded mountains and hills in the Appalachian Uplands found in northwestern sections of the service territory. The New England Upland physiographic region is also located in the northern sections. Elevations within this territory range from a low of a few feet above sea level in the extreme southeastern section along the Hudson River, to approximately 1,500 feet in the Shawangunk Mountains.

2.3.2 Forest Tree Species

The dominant native tree species in the Orange and Rockland service territory include a variety of oaks (Quercus spp.), ashes (Fraxinus spp.), maples (Acer spp.) black locust (Robinia pseudoacacia), and the invasive non-native tree-of-heaven (Ailanthus altissima). Other common tree species found locally include the birches (Betula spp.), black cherry (Prunus serotina), eastern hemlock (Tsuga canadensis), eastern red cedar (Juniperus virginiana), and various poplars (Populus spp.). Associated tree species that occur occasionally include various pines (Pinus spp.), willows (Salix spp.), elms (Ulmus spp.), sycamore (Platanus occidentalis) and hickories (Carya spp.), along with some spruces (Picea spp.). Lower stature and understory trees include sumacs (Rhus spp.) and dogwoods (Cornus spp.).

2.3.3 Human Population

The Eastern Division encompasses large areas of sprawling suburbia and is densely populated, especially in the southeastern portion. However, there are still some rural areas in the western portion of this division. The Central and Western Divisions are predominantly rural with small urban centers scattered throughout. Except for the urban center of Middletown, the western portion is primarily rural in nature. Although, all of the Orange and Rockland service territory has been experiencing accelerated residential and commercial development in recent years, the greatest changes in land use affecting right-of-way vegetation management have occurred in the eastern sections of the service territory.

2.3.4 Forest Growth and Soil Productivity

The species distribution and growth rate of forest stands are influenced by many soil characteristics of physical, chemical and biological origins. Individual tree growth rates are strongly correlated with the combined and reciprocal influences of a myriad of all soil conditions. The soils are generally quite productive in the lowlands of the Eastern Division with some localized exceptions. In the highlands of the Western Division the soils are highly heterogeneous due to topographic variations and are generally shallower and hence less fertile than those of the lower lying flatland areas.

2.3.5 Climate

The heavier snowfalls and cooler temperatures common to the higher elevations of northwest portion of the Orange and Rockland service territory moderate considerably in the rolling hills and flatlands of the southern Hudson River Valley. The average annual rainfall ranges from around 38 inches to about 45 inches within this general region. The growing season throughout the Orange and Rockland service territory is one of the longest in New York State, commencing in the lower Hudson Valley in April and oftentimes extending into October.

Figure 1 plots variations in April precipitation for New York State from 1895 to 2004, with a range in annual precipitation from approximately two inches below to a little more than three inches above the long-term mean.

Figure 1. New York Statewide April Precipitation from 1895 to 2004

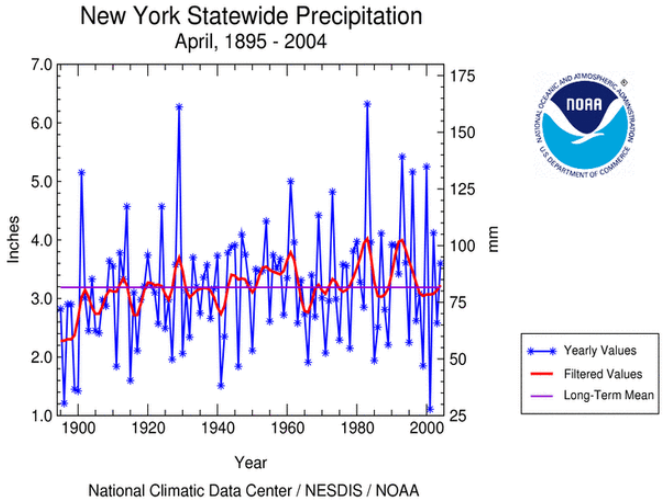
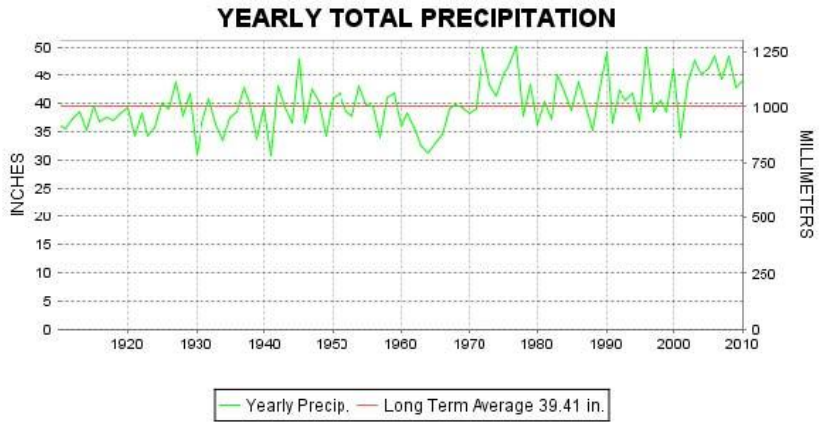


Figure 2, Compares actual annual precipitation in New York between 1974 and 2010 to the average annual precipitation and the trend in average annual precipitation.

Figure 2. Actual vs. Average Precipitation from 1974 to 2010



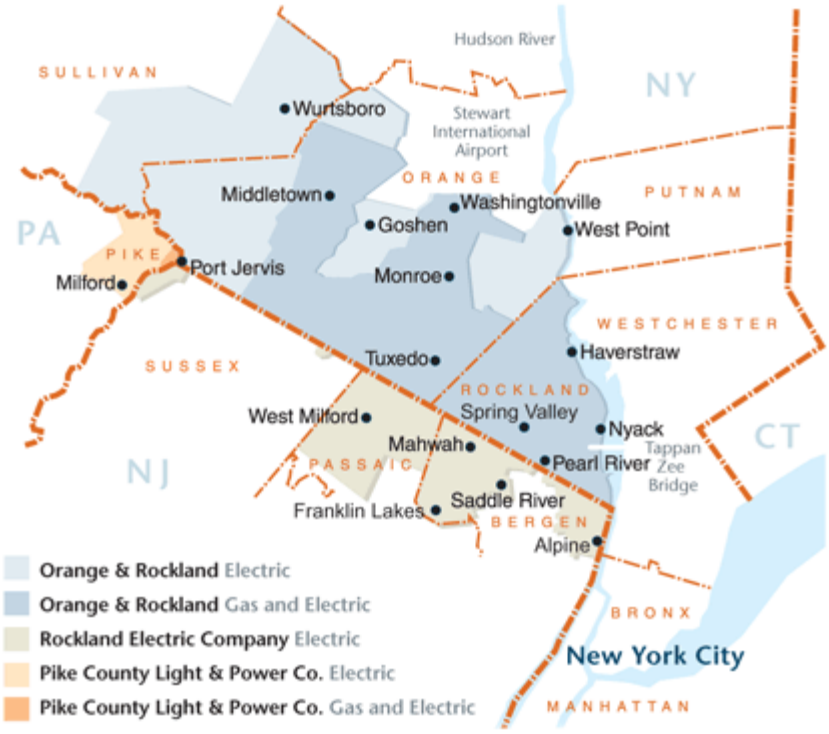
While there may be periods of significant short-term, seasonal drought, and areas with localized weather variations, short-term effects of drought are generally mitigated on an annual basis in the service territory. Additionally, most tree growth in the northeast occurs in spring and early summer, when available soil moisture is most readily obtainable. As a result, drought is not considered a significant factor in New York or the Orange and Rockland service territory that reduces tree growth enough to impact the annual schedule or budget process for transmission vegetation management. However, adequate (unusually abundant) amounts of available soil moisture during the later (mid to late summer) growing season can influence the growth of some tree species that are predisposed toward exhibiting such flush-type growth patterns.

Frequent, flexible inspection schedules and vegetation management work plans are developed based upon anticipated growth of vegetation on the right-of-way taken within the context of environmental factors such as those discussed above (species, soil productivity, and rainfall), as well as operational factors such as right-of-way width.

2.3.6 Environmental Concerns within the Orange and Rockland Service Area

Sections of Orange and Rockland service area are highly sensitive to environmental concerns, and considerable public sensitivities exist relating to aesthetics and land use. For instance, numerous easement restrictions involving the use of herbicides are common all through the Orange and Rockland transmission system, but particularly so throughout the more populated Eastern Division. Figure 3 illustrates the extent of the Orange and Rockland service territory.

Figure 3 - Map of Orange and Rockland Service Territory



3. The Orange and Rockland Electric Transmission System

3.1. Construction and Physical Features

Virtually all Orange and Rockland electric transmission rights-of-way exist on private property via legal easements. Typical operating voltages for the Orange and Rockland transmission system are 34.5kV, 69kV, and 138 kV. Orange and Rockland also performs vegetation management on five 345kV circuits which are jointly owned with Consolidated Edison Company of New York (CECONY), two 345kV circuits which are jointly owned with CECONY and Public Service Electric and Gas Company (PSEG), one 345kV circuit which is wholly owned by CECONY, and one 500kV circuit which is wholly owned by CECONY. A portion of the higher voltage rights-of-way are owned in fee although a significant portion of these rights-of-way exist via legal easements as well.

Some of the lines were constructed in the 1950s and 60s, on low-profile wooden H-frames or single pole construction. Conductor to ground clearance within these spans often approaches NESC minimum. These extensive areas of minimum line to ground clearances, along with anticipated growth rates of the fastest-growing vegetation in the area, reliable rainfall, and fertile soil conditions are taken into account when determining inspection frequencies and management cycles specified in the Plan. In addition species height and growth considerations are significant factors for determining which species are compatible within a particular transmission facility right-of-way, as well as influencing the determination for effective and reliable maintenance cycles.

Some portions of these lines are located on more restrictive easements A large portion (28 percent) of the Orange and Rockland transmission system has restrictions on the use of herbicides, primarily due to easement stipulations with landowners. While such easement restrictions exist throughout the system the majority occur in the heavily populated Eastern Division where approximately 40 percent of the right-of-way easements feature restrictions on the use of herbicides. When environmental and regulatory restrictions are included (i.e., wetlands, farm lands, residential, etc.), approximately 50 percent of the system features restrictions on herbicide use. The company is reviewing these areas and considering applying to DEC for a wetland application permit in areas where prohibitive easement restrictions do not exist. Orange and Rockland will continue to use regular aerial and ground patrols to monitor tree growth on these non-chemical sites, and promptly schedule any remedial work required to achieve system reliability.

3.2. The Extent of the System

Orange and Rockland's electric transmission system includes 90 separate transmission facilities that operate over 572 circuit miles of right-of-way covering approximately 4461 acres. Table 1 presents a listing of these facilities, including the miles and acres of each right-of-way.

Table 1. TRANSMISSION SYSTEM DATA
Last Updated March 2009

LINE INFORMATION						
	LINE #	**FROM – TO**	**VOLTAGE (kV)**	**WIDTH (Feet)**	**LENGTH (Miles)**	**ACRES**
REDACTED						

LINE INFORMATION						
	LINE #	FROM – TO	VOLTAGE (kV)	WIDTH (Feet)	LENGTH (Miles)	ACRES

REDACTED

4. History of Right-of-Way Vegetation Management

4.1. Early History

Prior to the 1950s, Orange and Rockland maintained control of brush on its electric transmission right-of-way by hand cutting. While it was widely recognized that most deciduous species of trees and shrubs re-sprouted vigorously from the stump and roots when cut, particularly when in the younger sapling stages, there were no other effective control methods available. As a result of such repeated cutting regimes a multitude of smaller stems, often referred to as stump clumps, would soon appear from around the bases of the trees that were physically removed. These stump sprouts and root suckers were nourished by the plentiful energy reserves contained in the well-established root systems that remained undisturbed after decapitation of the above ground stem. They grew rapidly. Four to eight feet of growth per year was common after such cuttings. Re-clearing this resurgent brush at relatively short intervals was a constant struggle, and rising labor costs, worker safety concerns, and increasing tree stem densities made a strong case for more effective methods of control.

Orange and Rockland began using herbicides in the 1950s. In 1967 Orange and Rockland began using a selective approach, targeting for removal only those species whose growth characteristics could jeopardize line reliability. This initiative which involved removal of only the vegetation which at maturity could grow to a height that would interfere with the lines, was a major step forward in the development of a modern right-of-way vegetation management program. Prior to this date, all new right-of-way preparation efforts involved clear-cutting of all woody vegetation on the right-of-way. A few years later, in 1975 and continuing to the present, the methodology for maintaining all transmission line right-of-way vegetation was converted to selective removal. Implementation of this selective removal practice is carried out through a prescription process whereby a treatment method is selected on a site by site basis.

This practice is superior to clear-cutting in terms of safety, system reliability, environmental impact, and cost effectiveness. Low-growing compatible vegetation[1] is given a competitive advantage and encouraged to proliferate on the right-of-way. Eventually compatibles "naturally" succeed at significantly greater rates at the expense of incompatibles. As this process is implemented less extensive treatment is required on future cycles because fewer incompatibles exist. When managed in this fashion the right-of-way enhances the local ecosystem and provides a good environment for wildlife to flourish.

4.2. Development of Chemical Control Measures

Herbicides were introduced in the early 1950s, as utilities sought more effective ways to control vegetation on their electric transmission rights-of-way. As herbicide treatment methods developed and proved effective, Orange and Rockland also recognized the importance of developing a sound management plan that balanced environmental considerations with operational needs. By the mid-1970s, Orange and Rockland had developed its first right-of-way vegetation management plan. While the industry was perfecting broadcast herbicide applications in these early days, the Orange and Rockland

[1] Compatible vegetation is vegetation on the right-of-way which does not have the potential to grow to a point where it can jeopardize line reliability by falling or growing into the line or encroaching into a vegetation clearance zone. See Appendix A for lists of vegetation that is generally compatible and incompatible. Vegetation clearance zones are identified in Section 7.4.2 and other ORU specifications.

plan specifically required the selective removal of tall-growing species that were capable of affecting line reliability. This plan was also developed to satisfy four significant requirements for environmental stability and compatibility.

- Selective removal all of non-compatible target species while fostering the development and growth of compatible low-growing shrubs, herbaceous plants (forbs and grasses) and ferns, etc. to compete with the tall-growing incompatible species

- Promotion of the growth of compatible vegetation within the right-of-way, which would also support a variety of food and cover for all forms of wildlife

- Reduction in the impact of right-of-way on visual aesthetics through retention of low-growing vegetation on the right-of-way

- Preservation and development of dense ground cover to help prevent erosion

Vegetation maintenance methods evolved into a combination of hand cutting and stump treatment with herbicide, and basal treatment to the lower stem and exposed roots of tall-growing species where cutting was not required. These methods proved to be quite satisfactory at controlling growth at minimal cost.

4.3. Litigation

The Orange and Rockland right-of -way management planning process was first developed as a systematic program in 1975. Between 1975 and 1977, the Environmental Services Department performed a span-by-span ground survey of the transmission system that identified the land use along the right-of-way, inventoried the vegetation present, and prescribed treatments and timing for each identified right-of-way section. This information was used to schedule vegetation management activities on the transmission system on a "site-by-site" or line section basis as dictated by the need (existing tree height) for treatment. Although this "just in time" procedure (site specific as needed) of right-of-way vegetation management scheduling appeared to be both a sound economic and environmental approach at first, the program quickly encountered difficulties, and by 1980 the reliability of the transmission system was in jeopardy.

Orange and Rockland recognized the need for improving the right-of-way vegetation management program and implemented a plan to selectively treat all transmission rights-of-way within the next five years. All future vegetation management work would now be performed on a line-by-line basis, rather than scheduling individual line sections independently on a "just-in-time" basis as done in the past. The Plan emphasized the selective removal of non-compatible vegetation, while encouraging the development of relatively stable low-growing plant communities composed of woody shrubs, forbs, grasses, sedges, ferns, reeds, etc. that develop naturally with the removal of the over story tree canopy. The full implementation of this plan was blocked by landowner litigation challenging Orange and Rockland's rights to remove incompatible vegetation from the right-of-way which was established on their lands. During this extended period of litigation, vegetation management options were quite limited in many areas. Subsequent to the successful conclusion of this legal challenge (1985), a comprehensive vegetation management program was adopted, and in 1989, a revised management plan was prepared and approved. A recent 2010 court decision in Rockland County has also affirmed ORU's transmission vegetation management easement rights.

The Emerging Solution

Orange and Rockland's comprehensive program was implemented in a proactive manner and included removal of tall-growing trees and various herbicide treatments. Herbicide applications were phased in carefully and slowly due to continuing landowner concerns. However, favorable growing seasons continued to compound the problem of uncontrolled woody growth on portions of the system. With the help of consultants and the addition of a vegetation management professional to the Orange and Rockland staff an accelerated program for vegetation control was developed.

During the 1990s, the use of basal applications was curtailed due to the requirement for oil carriers, and the higher herbicide application rates needed for effective control. In their stead, low volume, backpack foliar methods were adopted that required very low herbicide rates and used only water as the carrier. This low volume foliar application proved to be highly efficacious as a new generation of herbicide products with more environmentally compatible labels emerged in the later 1980s. Also, a combination of treatments was added using first mechanical removal followed the next season by low volume foliar herbicide applications. This combination of techniques provided more effective control of dense stands of taller incompatible tree species than the traditional labor intensive hand cut and stump treatment.

In the Mid 1990s, Orange and Rockland's vegetation management philosophy moved toward the Integrated Vegetation Management (IVM) concept. IVM is based upon the traditional pest control Practice popularly known as Integrated Pest Management (IPM). This new management methodology still incorporated the highly selective removal of all non-compatible trees as one of its major tenets, but there was now a much greater emphasis on retaining and promoting lower growing compatible species, particularly the low growing tree species and woody shrubs.

While IVM practices have had a positive effect on the Orange and Rockland system some issues have been observed with a few of the retained "compatible" tree and shrub species. Some of these species have become too tall and in some instances, too dense as well, particularly at locations of maximum sag in spans with relatively low structures. The abundance of these, once thought to be "completely compatible" woody species, had affected the ability of personnel to easily locate and subsequently treat all the tall-growing target tree species and have also reduced access to portions of the right-of-way. If unaddressed this concealment of the target species and reduced access would negatively impact treatment efficacy by increasing the number of misses and skips, thereby increasing the number of trees with the potential to jeopardize the transmission lines. Tall and dense arrangements of these taller growing, otherwise generally compatible species can also negatively impact the ability to patrol, inspect and repair the transmission lines.

In order to address this issue as well as other issues concerning the environment Orange and Rockland has adopted a modified version of the wire zone / border zone concept.[1] This concept calls for the removal of taller woody (non-tree) vegetation as well as trees from the wire zone[2], particularly at those mid-span locations or other sites having minimal line to ground clearances. Under this concept smaller trees and taller woody (non tree) vegetation will generally remain in the border zone.[3]The resulting right-of-way vegetation cover will form a mosaic of habitats that provide for a wide range of plant species and an intermingling of various plant communities in a patchy manner along the relatively open right-of-way corridor.

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1 See Figures 4 and 5 in Section 7.4

2 The wire zone is the area of right-of-way between the vertical projection of the outboard conductors of a transmission line plus ten feet in each outboard direction.

3 The border zone is the area of right-of-way between the wire zone and the right-of-way boundary.

Under this concept the wire zone environment will generally consist of an herbaceous and smaller shrub community mix that will be compatible for the site, and be compatible with the height and reliability needs of the overhead conductors. This patchy plant community approach will attempt to achieve a maximum shrub density of 60 percent to 70 percent in the in the wire zone. A shrub composition density level/height limit of this type will have several positive effects, including better and easier access for the crews to the area under the conductors and increased treatment efficiency, while at the same time minimizing herbicide use, and increasing the habitat diversity of the right-of-way. However, it should be emphasized that there is no set standard for the shrub/herbaceous percent cover. Low ground clearance corridors may require a higher percentage of herbaceous cover, just as higher ground clearance corridors would allow for a greater percentage of shrubs. In cases where vegetation that is normally considered compatible, is impeding access, interfering with the ability of inspectors to visually assess right-of-way vegetation, or jeopardizing line reliability, it will be selectively removed.

4.4. Scheduling Right of Way Treatment Cycles

In 1985 a 5-year cyclic right-of-way treatment program was implemented that enabled Orange and Rockland to more effectively and efficiently manage the right-of-way, and implement the goals of the long-range plan. This defined cyclic approach is a well-accepted management practice, requiring that all sections of all lines be completely treated within a set time period. The establishment of a standardized treatment cycle enabled Orange and Rockland to improve its scheduling and budgetary processes, reduce public and environmental intrusion, and maximize contractor work efficiency. Most importantly in terms of reliability it eliminated the “just in time” treatment philosophy.

Over the years, Orange and Rockland has undertaken a number of different treatment cycle regimes with varying timeframes. While embarking on the first 5-year cycle attempt, it was determined that certain lines (because of conductor clearances and/or tree growth rates) actually needed a shorter treatment cycle to maintain line reliability, or alternatively required a significant amount of hot spot work during off cycle years. Accordingly, some of these lines were then put on a 3-year cycle. Subsequently, in order to schedule workloads somewhat more evenly from year to year and to reduce hot spot work, a 4-year cycle was instituted for the balance of the system.

Even more recently, due in large part to the wide variety of right-of-way conditions encountered, including incompatible species growth rates and environmental factors such as higher rainfall, longer growing seasons, and in some cases landowner constraints, a management treatment cycle of three years was implemented for the majority of the system. The three year cycle is currently in effect, with the flexibility to lengthen the cycle on some lines 138kv and under lines (non-NERC), to four years, depending on observed conditions.

The system wide three year treatment cycle is not intended to be an arbitrary scheduling requirement or a completely inflexible directive, but rather a strict guideline that has the flexibility to be adjusted for individual lines or sections of lines to address changing conditions based on assessments of field conditions stemming from vegetation management inspections, patrols and inventories, and taking into consideration anticipated growth rates of vegetation and all other environmental factors that may impact transmission line reliability. This results in vegetation management activities being scheduled on a defined cycle in order to achieve optimal control in the most cost effective, environmentally friendly manner. Inspections will be used to identify those isolated line segments where the re-growth exceeds the expectation. In such cases off-cycle management (i.e., hot spot work), to maintain system reliability will be performed.

5. Transmission Right of Way Vegetation Management Policy

Orange and Rockland's overall policy has been developed to manage vegetation in a cost effective, environmentally compatible manner that achieves the safe, reliable operation of the electric transmission system. The Transmission Vegetation Management Plan is designed to implement this policy through the judicious combination of:

- The application of sound Integrated Vegetation Management principles and practices
- The implementation of the most appropriate best management practices in a site specific approach
- Providing effective and responsible stewardship of the right-of-way environment

Consequently, the Plan is designed to achieve a vegetative cover on the right-of-way which consists of low-growing species that are compatible with the operation of the company's transmission system and which will require minimum maintenance in the long term.

Right of way vegetation is managed with the primary goal of preventing interruptions of the electric transmission system from vegetation either growing into or falling into electrical conductors. The right-of-way is maintained in an accessible condition in order to facilitate patrols, routine maintenance, and emergency operations. The condition of the right-of-way is monitored through regularly scheduled ground and aerial patrols. Assessments from such patrols are used for planning, and result in timely execution of appropriate vegetation management control techniques. These assessments are also used to evaluate treatment effectiveness and are used in conjunction with periodic vegetation surveys, and collaboration with applicable right-of-way vegetation research organizations to continuously improve the program. The right-of-way vegetation management program also incorporates good customer and public relations, and continually seeks sound practical measures to improve customer outreach, customer notification, public education and regulatory cooperation.

In 2008 Orange and Rockland incorporated into the Plan a vegetation management practice that can be used in densely populated sections of right-of-way. This option calls for pruning rather than removal, of incompatible vegetation located along the outer edge of the right-of-way whose branches have not yet entered the wire security zone on rights-of-way with transmission lines operating at voltages less than or equal to 138kV. This modification was developed in consultation with DPS staff and is incorporated into the appropriate area of Section 6.

6. Vegetation Management Goals, Objectives, and Practices

6.1. Goal A: Maintain the Integrity of the Transmission Facility

6.1.1 Objective 1:

Eliminate the risk of interruptions from on-right-of-way vegetation encroaching into the wire security zone or falling into the conductors.

Practice a. Apply a modified[1] wire zone–border zone IVM approach based upon the varying actual distance to the wire security zone. This will be accomplished by focusing attention on the wire zone area of the right-of-way particularly in areas of minimum clearances (e.g. mid-span), to eliminate tall-growing tree and even most taller shrub species. Those lines constructed with low profiles and ground clearances, should generally have wire zone right-of-way sections composed of grasses, herbaceous growth and low shrubs, while lines with higher profiles and greater ground clearances may include some taller-growing species within the wire zone. Under this concept incompatible vegetation in the border zones will be removed, however taller vegetation including small trees and large shrubs is typically considered compatible in the border zones because it cannot grow tall enough to jeopardize the transmission lines by growing or falling into them.

In densely populated areas of high sensitivity, incompatible trees located along the right-of-way edge may be pruned or topped rather than removed, on rights-of-way with lines operating at or below 138kV. As mentioned in the previous section this practice was developed by Orange and Rockland and DPS and will be used as a last resort after landowners in these areas refuse to have these trees removed. This is described further in Section 7.2.2 – The ORU Modified Plan.

Practice b. Mitigation Measures – When locations on the right-of-way where restrictions that prevent achieving the specified At Time of Vegetation Management clearances are identified, mitigation measures will be implemented to achieve sufficient clearances. Typically mitigation measures involve more frequent inspections of these areas and mid cycle treatments if required.

Practice c. Improve the database that lists each transmission section where easement and/or landowner restrictions exist that may prevent the full implementation of this modified wire zone approach.

[1] The concept of the modified wire zone/border zone model of vegetation management, as agreed to between NYSDPS and the New York investor-owned utilities incorporates the retention of many low-growing woody shrub species (less than 10 feet) within the midsection of the right-of-way known as the wire zone. In the customary application of the wire zone/border zone, no shrubs are allowed in the herbaceous-only wire zone. For more discussion of the wire security zone clearances and the modified wire zone border zone principles, see Section 7.4.

Practice d. Taller shrubs and some small mature trees will be acceptable within the border zone. In addition, denser shrub communities will be promoted along the right-of-way edges to maximize natural competition and reduce incompatible tree densities in the future.

Practice e. Complete all needed edge encroachment work in conjunction with the existing maintenance cycle and rectify all identified areas that have not been maintained to full allowable right-of-way width. This schedule of manual and mechanical pruning, clearing and widening to improve clearances between the transmission line and the forest edge will be accomplished in accordance with budget limitations and to the extent permitted by existing ownership and/or easement conditions.

6.1.2 Objective 2:

Reduce the risk of interruptions caused by trees falling into the lines from beyond the right-of-way edge.

Practice a. Utilize aerial and ground patrol, and other field assessments (e.g. surveys) to monitor and examine the adjacent forest edge conditions, and identify high risk (danger) trees. Orange and Rockland will schedule removal, topping and side pruning operations of the identified off-right-of-way danger trees as permitted by field conditions, budgets and easement and/or landowner constraints.

6.2. Goal B: Encourage the Natural Development of Low-Growing Relatively Stable Plant Communities Within the Right-of- Way by Systematically Removing Target Species

6.2.1 Objective 1:

Sustain the long-term stability of compatible plant communities within the right-of-way, and use natural plant competition, interference and herbivory to thwart the proliferation of tall growing, non-compatible species. Identify and use the most cost effective and long term efficacious vegetation management techniques commensurate with the environmental and public concerns and constraints for each site.

Once a sufficient level of control has been achieved in a particular section of right-of-way IVM activities will be performed in a manner that effectively controls re-growth, but uses lower amounts of herbicide. Treatment activities shall always attempt to minimize adverse impacts to adjacent, non-target compatible vegetation and prevent damage to environmentally sensitive resources.

Practice a. Continue to implement a field survey/inspection process that enables pre-planning of vegetation management work. Prescribe proven, effective control techniques tailored to the environmental and public constraints of each right-of-way section.

Practice b. Apply appropriate IVM tactics to selectively target and control incompatible species, while fostering and encouraging the development of relatively stable compatible plant communities composed of herbaceous and shrub species. Tall growing, incompatible vegetation that survive natural competition and

predation will be treated and maintained within the framework of the 3-year to 4-year routine maintenance cycle.

Practice c. Use the selective application of approved herbicide products whenever possible to effect full control and eradicate all re-growth from the stumps and root systems of tall-growing incompatible tree species.

Practice d. Utilize properly trained and certified right-of -way vegetation management personnel to manage and perform the application of herbicides and maintain appropriate work monitoring and auditing procedures.

6.2.2 Objective 2:

Improve the ability of vegetation management personnel to recognize the common local target tree species and identify other potential incompatible species within the region, with an emphasis on those taller shrub and short stature tree species in locations where they are capable of invading the wire security zone.

Practice a. Perform annual start-up training with contractor crews and supervisory personnel to carefully review and thoroughly acquaint field personnel with pertinent right-of-way management specifications, procedures and techniques required to successfully implement the goals, objectives and strategies of this Plan.

Practice b. Explain the modified wire zone-border zone concepts, clearance requirements and the effects of line sag and sway upon tree to conductor clearances to contractor crews as part of the above-referenced training.

Practice c. As part of the above referenced training, increase contractor crew knowledge of woody shrub identification and growth potential.

Practice d. As part of the above referenced training reinforce with contractor crews the importance of recognizing and identifying right-of- way areas where marginally compatible species such as tall shrubs and short stature tree species may jeopardize reliability, with special emphasis on mid-span locations. Review how to use IVM techniques to eliminate these localized incompatible species from these more susceptible portions of the right-of-way.

6.2.3 Objective 3:

Maintain existing access routes into and along the right-of- way to achieve prompt entry for routine and emergency vegetation management, and other transmission line maintenance operations and repairs.

Practice a. Maintain existing right-of-way access routes and other required travel lanes in a cleared condition by selectively treating all woody growth, and keeping these access routes in a predominately grass cover. The access path that is free of woody vegetation may be up to 15 feet wide.

Practice b. Utilize herbicide treatment, or mowing and herbicide treatment to re-establish access routes that have become overgrown, or

to establish new travel lanes where required for routine or emergency operations.

Utilize portions of the wire zone as the travel lane to improve conductor-to-vegetation clearance under the lines whenever possible, in accordance with equipment clearance limits and other site conditions.

Practice c. Provide access and safe working areas around transmission structures by maintaining a minimum 15-foot perimeter around each pole and tower site that is free of entangling woody vegetation.

Practice d. Treat or remove all vines growing upon electric facilities at the time of routine maintenance.

Practice e. Repair damage to existing access roads where erosion threatens access and/or environmental quality. Maintain adequate functioning of drainage devices such as culverts, swales, and ditches to prevent water damage to access routes and transmission facilities.

6.2.4 Objective 4:

Reduce long term herbicide use requirements[1].

Practice a. Apply herbicides selectively to target incompatible species and minimize the zone of effect (i.e., overspray) on adjacent compatible non-target vegetation so that herbicide is used efficiently as well as effectively .

Practice b. Evaluate and test new herbicide products and mixtures, treatment methods and delivery systems to provide greater environmental compatibility, reduce environmental risks, and increase public and worker safety.

Practice c. Stay abreast of product advances and improvements in IVM methods and technology through R&D efforts and information exchange venues such as industry workshops, field studies, experimental test plots, and other relevant resources .

6.2.5 Objective 5:

Support vegetation management research designed to better understand the ecosystem dynamics of IVM, and the response of the compatible and non-compatible communities to various herbicide and mechanical methods and combinations thereof.

Practice a. Remain current with on-going right-of-way research into the environmental impacts and ecological consequences of various right-of-way management methods, including both herbicide and non-herbicidal alternatives.

Practice b. Seek other willing partners to participate in regional and statewide right-of-way research initiatives, and through such collaborations equitably share the economic burden and the benefits of such research.

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[1] While ORU is committed to a long-term pesticide reduction strategy, the reclamation requirements for some sections of the right-of-way may necessitate a near-term increase in herbicide use.

Practice c. Publish and disseminate any internally funded or conducted right-of-way research results and findings for peer review.

6.3. Goal C: Maintain Environmental Quality and Protect Sensitive Resources

6.3.1 Objective 1:

Foster and maintain visual screens of natural, low-growing species at public high visibility sites such as parks and major road crossings.

Practice a. Maintain a limited number of vegetative buffer zones consisting of primarily compatible, low-growing species, and manage the height of the vegetation in these buffers to achieve system reliability by maintaining appropriate clearances.

Practice b. Topping and pruning of taller-growing vegetation may occasionally be used to temporally satisfy reliability requirements when the presence of compatible species are insufficient or altogether absent within vegetative buffer zones. This is a short-term, temporary solution.

Practice c. Remove tall-growing, incompatible vegetation from all such designated vegetative buffer areas by the end of the next treatment cycle, up to the limits of the easement and/or special permitting requirements, and promote the conversion all existing tree buffers to those composed of naturally occurring, compatible species.

6.3.2 Objective 2:

Protect sensitive aquatic resources from adverse impact occurring due to management activities, such as herbicide contamination, erosion or physical degradation.

Practice a. Maintain thickly vegetated buffer zones composed of compatible, low-growing vegetation around sensitive aquatic sites, including streams, lakes and ponds. Conduct all treatment activities in a manner that minimizes the disturbance of these compatible shrub and herbaceous buffer zone communities, and reduces or eliminates the risk of soil erosion and sediment runoff.

Practice b. Selectively use herbicide treatments and products that are specifically approved for ditch bank, stream bank, wetland or other aquatic uses. Establish the following minimum buffer zone distances for non-aquatic herbicide applications. See Section 7.5.1.

Practice c. Maintain a minimum 5-foot, no-treatment-zone immediately adjacent to any stream, pond or lake.

Practice d. In the future obtain permits from the NYSDEC as required for herbicide application in state-regulated wetlands and their attendant 100-foot buffer zones. Maintain regular communication with the appropriate DEC Regional offices and personnel to communicate treatment schedules and facilitate these permitted field activities.

Practice e. When drinking water wells are identified on or immediately adjacent to the right-of-way, the establishment of 100 foot buffer zones should be made for herbicide treatment.

6.3.3 Objective 3:

Work with the appropriate state, federal, private agencies and knowledgeable individuals to identify and develop protective measures for known populations of endangered and threatened species. Endeavor to determine and understand any potential direct impacts to these species or their critical habitats associated with planned right-of-way vegetation management activities, and work with the various entities to minimize risk and avert incidental take or inadvertent habitat damage.

Practice a. Utilize the DEC Natural Heritage Program reporting process to communicate routine vegetation maintenance schedules to DEC, together with suitable maps that identify line locations.

Practice b. Use the information provided by the DEC and the Natural Heritage Program and other reliable sources to identify known locations of threatened and endangered species in proximity to scheduled vegetation management or other impacting transmission maintenance activities.

Practice c. Act as a good steward of right-of-way resources by collaborating with the DEC Endangered Species Unit, Natural Heritage Program to assess and understand the risks and benefits to be derived from right-of-way vegetation management activities on existing populations of threatened or endangered species or their critical habitats.

Practice d. Communicate any special adjustments to treatments required and/or particular timing to field supervision and crews, and provide any necessary oversight and direct supervision so as to implement reasonable and prudent measures necessary to protect these species of concern or other identified sensitive ecological resources.

6.4. Goal D. Manage Appropriate Compatible Use of the Right-of-Way

6.4.1 Objective 1:

Minimize and discourage incompatible uses of the right-of-way to the extent practicable.

Practice a. Identify those uses that are inherently incompatible with the safe operation of the line through routine patrols and field inspections, including any building or structure encroachments within the right-of- way, and other adjacent activities such as construction and logging that may impact system reliability or public safety.

Practice b. Work with the underlying fee owners of easements to discourage unauthorized vehicular and ATV activity that may

threaten environmental integrity by damaging roads, culverts, stream fords, fences, gates and compatible vegetation.

Practice c. Notify Security, Environmental Services, Transmission Engineering, and Real Estate when any unauthorized uses such illegal dumping or encroachments are identified on the right-of-way. Coordinate with these departments as required to determine the proper course of action.

Practice d. Employ reasonable means to notify and inform right-of-way users about the risks and impacts of unauthorized adverse use. Seek prosecution of known or suspected repeat violators.

7. Transmission Right of Way Procedures

7.1. Right of Way Included in the Plan

This plan covers all Orange and Rockland electric transmission lines between 34.5kV and 500kV where vegetation management is the responsibility of Orange and Rockland[1].

7.2. Vegetation Management Procedures

The vegetation management procedures described below may be used individually or in combination to control vegetation on the right-of-way at the discretion of the Manager of Vegetation Management. They represent the procedures which have proven to be most effective on the Orange and Rockland system as well as industry-recognized best management practices. Specific procedures support two major concepts which have been outlined earlier in this document and which will be further described in this sections 7.3 and 7.4 - Integrated Vegetation Management and Modified Wire Zone–Border Zone.

7.2.1 High Density Area Work Plans

In application of this TVMP, NYSPSC Order 10-E-0155 has determined the entire Rockland County area and the seven lower towns in Orange County including the Towns of Blooming Grove, Chester, Highlands, Monroe, Tuxedo, Warwick, and Woodbury, to be a High Density area. However, within the described High Density area are considerable areas that have low to no population. Orange and Rockland defines the High Density areas to be within the location determined in Order 10-E-0155, and further refined as having a maintained and/or landscaped property that is also part of the transmission ROW area.

In these high density areas, Orange and Rockland will utilize increased customer outreach and education. Customer communication and notification will be completed door to door with information packages left for customers not at home. In all cases an attempt will be made to personally meet with each customer that is encumbered by a ROW easement to discuss the vegetation management work required, the applicable easement documents, the physical boundaries of the work, the methods and extent of the proposed work, provisions for clean up, and ROW restoration, and the expected dates of commencement and completion. Following any face to face meetings, the Customer Communication Record will be completed with the details of the vegetation work provided to the customer. Contact information including phone numbers will be provided to the customer and will be included on all related literature. Following the required notification timeframe, the work will proceed. Clean up and debris removal will be performed in an expedited fashion and will typically be accomplished within one week of the work being completed.

7.2.2 The ORU Modified Plan

Orange and Rockland will employ the Modified Plan in specific locations within the service territory for individual circumstances such as specific highway buffers, unusually wide right-of-ways, or other specific circumstance as determined by the Company. It is the intention of Orange and Rockland to assure safety and reliability through the review and application of individual easement rights in all cases along the transmission rights-of-way throughout the entire Orange and Rockland Service

[1] 34.5kV distribution lines are not covered under this plan.

territory. Within these specific, localized, High Density areas, the Orange and Rockland Modified Plan has the potential to be implemented. As a general practice, it is ORU's intention to fully remove all noncompatible vegetation rooted on the rights-of-way. However, where the easement ROW property is either maintained or landscaped, and safety and reliability criteria can be maintained, full right-of-way maintenance may be phased in, and the Modified Plan may be used in the following manner:

The Orange and Rockland Modified Plan will be used on non-NERC designated lines only. Non-NERC lines generally are transmission lines under 200kV. All vegetation that encroaches into the priority zone will be completely removed to ground in accordance with the Order 04-E-0822. It is Orange and Rockland's general procedure and ROW management practice to remove all noncompatible vegetation from the full width of the right-of-way during the maintenance cycle. In all cases, noncompatible vegetation rooted in the Wire Zone, regardless of whether it encroaches on the priority zone or not, will be completely removed to ground. Fruit bearing trees may be topped instead of removed.

Other noncompatible vegetation within the Border Zones of the right-of-way will be side trimmed to the "At Time of Management" clearances specified in the Plan (138kV – 41' lateral; 69kV - 35' lateral; 34.5kV – 15' lateral), and reduced in height to such a point that the remaining vegetation cannot contact the line if it were to fall.

Noncompatible vegetation beyond the "At Time of Management" lateral clearance and with no fall over potential will be removed over successive maintenance cycles, but not to exceed three (3) maintenance cycles beginning in 2011.

All right-of-way vegetation will be evaluated at the time of management and any dead, declining, or diseased vegetation will be removed to ground.

This Modified Plan will allow the phase in of areas of significant transmission vegetation management work with the longer range intention of all current noncompatibles being removed no later than the end of 2020.

7.2.3 Noncompatible Vegetation Species to Remain on the Right-Of-Way

Orange and Rockland is committed to the encouragement and retention of compatible vegetation on the transmission right-of-ways. Compatible vegetation is vegetation rooted on the right-of-way that will not become a reliability threat to the overhead transmission system. Any vegetation that requires maintenance (pruning), except for fruit bearing trees, is deemed noncompatible and will be removed.

Noncompatible vegetation may remain on the right-of-way in very specific situations. Such conditions may include unusually wide right-of-ways, areas of high conductor height (i.e. over deep valleys) where the noncompatible vegetation poses no reliability threat or in cases of the Modified Plan where removal on the noncompatible species is to be phased in by 2020. This information will be captured during the customer notification and communication process. Annual training of contractor personnel will address identification of both compatible and noncompatible species to better manage the ROW in a responsible stewardship manner.

7.2.4 Transmission ROW Planting

Orange and Rockland has a policy of planting vegetation in cases of work error, in compensation for removals completed off the right-of way where requested and justified, and in cases of public trees properly removed as part of transmission vegetation management work (i.e.: in a public park situation). Re-planting may also be

performed in selected instances of buffer removal to high density roadways. Orange and Rockland does not plant vegetation where the underlying easement does not require planting as easement language describes the company rights in eliminating and/or maintaining current vegetation.

The majority of the Orange and Rockland ROW is pursuant to easements over private property. In other areas, (i.e. municipal or Company owned), municipalities may propose to the Company planting programs on these sections of the ROW. The municipality will be responsible for the costs of planting and maintenance of compatible species. Municipalities will be required to enter into a land use/access agreement with the Company for the establishment and ongoing maintenance of compatible vegetation on these sections of the ROW.

7.3. Integrated Vegetation Management – IVM

In summary IVM, requires that incompatible species be selectively targeted for removal using mechanical and herbicide controls. This provides a competitive advantage to compatible species which are encouraged to proliferate thereby making it more difficult for incompatible species to succeed, essentially providing biological control of the incompatibles. Additional cultural controls such as agriculture are also deployed to control incompatibles.

The roots of IVM in New York can be traced to the adoption of vegetation management strategies in the 1970s that were designed to selectively treat and control tall-growing tree species, while fostering and encouraging the retention and development of stable, compatible plant communities. This meant compatible shrub communities for the most part. Since then, through research we have come to recognize the important ecological role herbaceous (forbs, grasses, sedges, ferns, etc.) plant communities play in tree seedling predation, competition, long-term right-of-way stability, accessibility and system reliability. Today's right-of-way vegetation management practices are based on sound science, and have been developed over time with experience and substantial regulatory oversight.

The New York investor-owned utilities have collectively been at the forefront of right-of- way vegetation management research since the early 1970s. They developed the term "Integrated Vegetation Management" from the more generic term "Integrated Pest Management" (IPM) to help better define right-of-way vegetation management. Subsequently, this expression evolved into a position paper for the then eight-member systems of the New York Power Pool in the 1990s, and more recently of the Environmental Energy Alliance of New York (EEANY) transmission members in the 2000s. A copy of that paper, titled "*Applications of Integrated Pest Management to Electric Utility right-of-way Vegetation in New York State"* is included in Appendix B.

The EEANY paper defines IVM as a system or resource (vegetation) management that minimizes interaction between pests (tall-growing trees) and the management system (safe and reliable electric service) through the integrated use of cultural (mechanical and manual methods that physically remove tree stems), biological (low-growing plants and herbivory), and chemical (herbicides) controls. Preventive cultural measures most often involve the multiple use activities of others that keep the right-of-way in a compatible condition. Examples are active crop production, grazing, orchards, Christmas tree plantations, and other managed landscapes. Biologic controls incorporate the natural competition of low-growing plant communities, as well as seed predation and herbivory by mammals, and perhaps some naturally occurring biochemical interactions among plants known as allelopathy. Physical controls relate to mechanical and manual methods for removing incompatible vegetation, while chemical methods include all herbicide related activities.

More than a quarter of a century of continuous right-of-way vegetation management research in New York State has been instrumental in providing the electric utility industry with a better understanding of vegetation dynamics within the right-of-way. It is now understood how a naturally created but management-induced variety of compatible plant community assemblages can effectively inhibit and substantially reduce invasion by non-compatible tree species. It is also understood however, that once incompatible tree stems gain a foothold, selective herbicide treatment is the most effective means of minimizing re-growth. Effective right-of-way IVM combines preventive measures and promoting biological control processes to minimize re-growth and re-invasion of non-compatible species, helping to keep their densities low at the time of routine, cyclical vegetation management. It incorporates selective, stem-specific applications of approved herbicide products in a judicious manner to eliminate tree stems that become established. Environmental intrusion and disruption to the compatible plant communities on the right-of-way are minimized and long term herbicide use is reduced because of the increased effectiveness of the biologic and cultural elements of IVM, cyclical scheduling, prescriptive techniques, and the use of highly selective stem-specific treatments which only target incompatible vegetation.

7.4. The Modified Wire Zone–Border Zone (WZ-BZ)

The WZ-BZ concept, developed and promoted by Drs. Bramble and Byrnes more than 20 years ago, has been identified as a best management practice for many top performing electric utilities nationwide. As confirmed through the FERC fact finding process pursuant to the August 14, 2003 Northeast blackout, the WZ-BZ is now an internationally recognized model for electric transmission vegetation management which helps achieve system reliability from the on-right-of-way vegetation management perspective.

The WZ-BZ concept developed by Bramble and Burns requires that the wire zone be maintained exclusively in a grass/herbaceous condition, while all shrubs and other low-growing woody species are completely removed and permitted to grow only in the adjacent border zones. The Orange and Rockland plan is based on a variation of the Bramble and Burns concept and is referred to as a "modified WZ-BZ" because it encourages the retention of shrubs in the wire zone[1]. This is consistent with the selective right-of-way vegetation management model adopted by the NYS Department of Public Service, and the then 8-member systems of New York Power Pool in the early 1980s.

While most of these otherwise compatible woody species will never grow high enough to jeopardize line reliability some of these "compatible" woody shrub species have the potential to grow tall enough to present a threat in terms of clearance zone encroachment or by having the effect of concealing the tall-growing tree species that might be slowly growing within dense shrub communities. Experience has shown and research has documented that once these tall-growing tree species emerge into the full sunlight and are released from the competition of the shrub canopy, they can rapidly grow into the minimum clearance zone, where they present a serious threat to reliability. Therefore this plan requires that any shrubs which have the potential to jeopardize a transmission line in this fashion be considered incompatible at that specific location, and be removed.

This modified WZ-BZ approach achieves line reliability by providing greater clearances, better visibility for inspections, and improved access along the right-of-way. It should be noted that not all shrubs are removed from the wire zone, as many diminutive woody shrubs can remain, e.g., spireas, some dogwoods, and viburnums, rubus and many other shrubs maturing at heights of less than 10 feet. It further recognizes the need to establish clearances between vegetation and the conductors at the time of vegetation management.

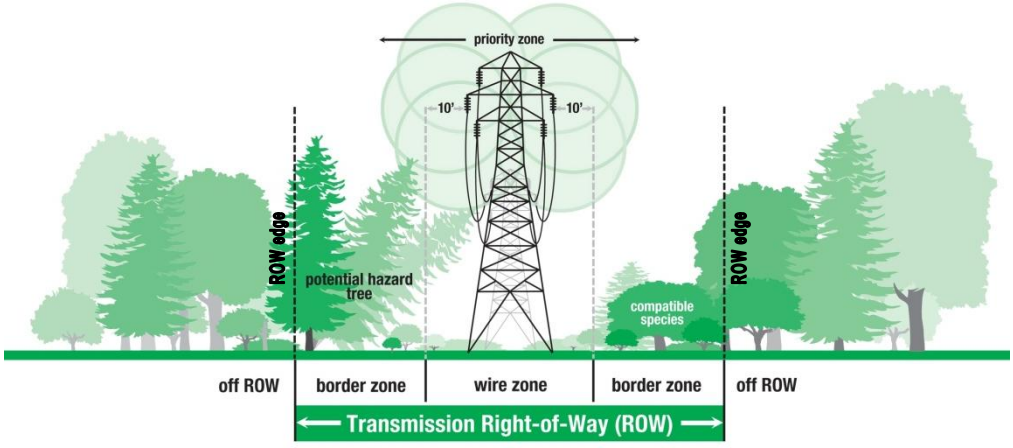
[1] See Figures 4 and 5 in this section.

When properly implemented, the modified WZ-BZ approach provides for a significant insulating air space between the conductor and vegetation that can be readily detected when performing routine aerial or ground patrols, inspections and surveys.

Several tall-growing shrub and short stature tree species have subsequently been removed from the list of nominally compatible species generally found suitable for under wire conditions, due to their potential to grow into the wire security zone as well as conceal incompatible tall-growing tree species. Generally, these taller shrub and small tree species will continue to be retained on the right-of-way within the border zone and in other right-of-way locations (e.g., near towers) where conductor clearances are greater, and where their existence on the right-of-way provides competition for taller growing species, an important biological control in the context of IVM.

As presently adopted, the modified WZ-BZ model will encourage a blend of herbaceous and small shrub species in the wire zone, and even taller shrubs where permitted by the line catenary and actual conductor-to-ground clearances. The extent of compatible shrub densities within the right-of-way may average into the 50-70 percent range. However, shrub densities may be lighter within the wire zone and higher in the border zone to achieve this average. This modified WZ-BZ approach is expected to improve habitat diversity while reducing long term herbicide usage. Lower profile lines, such as the typical wood pole H-frame lines, will have wire zones predominated by herbaceous growth and only the smallest growing shrubs. Lines that are constructed on taller poles and towers may feature some taller-growing shrubs within the conventional wire zone when ample conductor-to-ground clearances exist.

A listing of compatible and incompatible species is provided in Appendix A.



Orange & Rockland Utilities

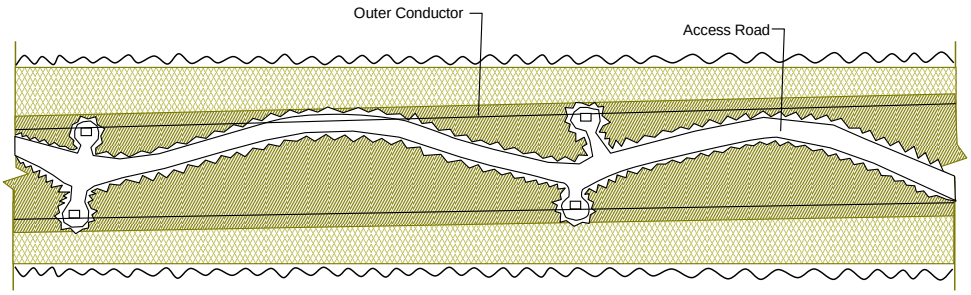


Figure 5 – Wire Zone Border Zone Typical Plan

LEGEND **NOT TO SCALE**

- Tree Line
- Transmission Tower
- Transmission Lines
- Border Zone (Low trees, Shrubs)
- Wire Zone (Shrubs)

7.4.1 Cyclical Work Plans

As previously discussed the treatment cycle for transmission lines is generally 3 or 4 years. More frequent treatment is performed as necessary to maintain clearances and address fall over issues. Frequent inspections and assessments of vegetation facilitate the prompt discovery of changing or unanticipated conditions that can impact reliability. This allows the annual work plan (aka annual plan) to be adjusted in order to address such conditions with appropriate consideration given to anticipated growth of vegetation and all other environmental factors that may have an impact on reliability of the transmission lines. For example if a stand of ailanthus which jeopardizes reliability is discovered in the wire zone on a line in an off-cycle year, adjustments will be made to remove the ailanthus prior to the normal treatment cycle. Ailanthus is the fastest-growing tree species in the region and has the potential to grow more than fifteen feet in a season. Conversely if a stand of oak trees of the same height were discovered in the same location the decision might be made to wait for the normally scheduled treatment cycle to remove the trees because oaks in this region grow approximately three feet in a season, and do not present the same threat to line reliability. This flexibility is essential to addressing unanticipated conditions that may arise which jeopardize reliability.

7.4.2 Clearance Standards

Vegetation clearances are established in the following tables. The clearances are used in conjunction with the modified the wire zone-border zone (WZ-BZ) concept. Clearances were developed based upon relevant system criteria such as circuit voltage, effects of ambient temperature and line loading on conductor sag, and effects of wind loading on conductor sway/blow out, right-of-way width, typical conductor to ground clearance, as well as expected vegetation growth rates and treatment cycle lengths.

TABLE 2 - Orange and Rockland Transmission Line Vegetation Clearances

Table 2A. Clearance at Structure Between Trees and Conductors

Voltage (KV)	Lateral (Cs) (Feet)	Vertical (As) (Feet)	Clearance Classification
500	25	25	At Time Of Vegetation Management
	20	20	Action Threshold
	15	15	Minimum Clearance
345	21	21	At Time Of Vegetation Management
	15	15	Action Threshold
	10	10	Minimum Clearance
138	17	17	At Time Of Vegetation Management
	10	10	Action Threshold
	5	5	Minimum Clearance
69	15	15	At Time Of Vegetation Management
	8	8	Action Threshold
	4	4	Minimum Clearance
34.5	15	15	At Time Of Vegetation Management
	8	8	Action Threshold
	4	4	Minimum Clearance

Table 2B. - Clearance Within Span Between Trees and Conductors

Voltage (KV)	Lateral (Cs) (Feet)	Vertical (As) (Feet)	Clearance Classification
500	51	31	At Time Of Vegetation Management
	20	20	Action Threshold
	15	15	Minimum Clearance
345	44	26	At Time Of Vegetation Management
	15	15	Action Threshold
	10	10	Minimum Clearance
138	41	23	At Time Of Vegetation Management
	10	10	Action Threshold
	5	5	Minimum Clearance
69	35	22	At Time Of Vegetation Management
	8	8	Action Threshold
	4	4	Minimum Clearance
34.5	20	20	At Time Of Vegetation Management
	8	8	Action Threshold
	4	4	Minimum Clearance

Notes:

1. At Time Of Vegetation Management Clearance - Clearance to be achieved at time of vegetation management. Equivalent to NERC FAC-003 Clearance 1.
2. Action Threshold Clearance - Clearance greater than Minimum Clearance, but less than the clearance at Time of Vegetation Management. If found during growing season monitor every seven days until cleared, otherwise clear prior to next growing season.
3. Minimum Clearance - Minimum radial clearance around conductor under all operating conditions. Equivalent to NERC FAC-003 Clearance 2. These clearances were developed from IEEE-516, Guide for Maintenance Methods on Energized Power Lines, without using altitude correction factors, which are not required because the elevations

of the transmission system are below the 900 meter threshold that would require the use of such factors.

4. In cases where "At Time Of Vegetation Management" or "Action Threshold" clearances cannot be attained because of right-of-way width limitation, trees shall be trimmed to the property line.
5. "Clearance at Structure" as defined in Table 2A applies to 50 feet measured in either longitudinal direction from the centerline of the structure. "Clearance Within Span" applies within the entire span except at the structure.
6. For vee string construction reduce "Action Threshold" lateral clearance by 4 feet for 345KV and 2 feet for 138KV.

7.4.2.1. The Wire Security Zone

The primary wire security zone is defined as a continuously open, vegetation-free area around the conductor that should be achieved at all times to prevent flashovers or line to ground faults via the vegetation that could ultimately trip the line out of service, thus causing a line outage. The primary wire security zone is achieved by maintaining the Minimum Clearances shown in table 2 at all times. The Action Threshold clearances are greater than the Minimum Clearances and thereby provide a trigger for pre-emptive action to be taken to avoid encroaching into the primary wire security zone.

The secondary wire security zone is established when the At Time of Vegetation Management clearances are achieved during the normal treatment cycle. It is acknowledged that easement and/or other constraints will often limit Orange and Rockland's ability to achieve the At Time of Vegetation Management clearances. On a site-by-site basis, restrictions such as specific easement language or other legal constraints may limit the actual clearances that can be attained at the time vegetation management operations are performed. Easement restrictions may include factors such as right-of-way width, removal versus pruning only rights, off-right-of-way danger tree rights, etc.

When the clearances for the secondary WSZ cannot be fully implemented on 345kV and 500kV lines due to these restrictions Orange and Rockland will implement suitable mitigation measures such as more frequent inspections and off-cycle treatments if required. A listing of these locations is maintained by the Manager, Vegetation Management. Additionally, it is Orange and Rockland's intent to remove all non-compatible elements in all buffer areas[1].

7.4.2.2. Danger Trees

Trees located in the border zone, which in falling could cause a flash-over, are identified during regular right-of-way evaluations and are removed or topped as part of the periodic treatment cycle to achieve system safety and reliability. Off right-of-way trees on private property along 345 & 500 kV lines will be evaluated approximately every three years; all other Orange and Rockland transmission lines covered under this Plan will be evaluated approximately every six years. If evaluation indicates that an unacceptable risk of fall-over exists, such as excessive lean or serious decay, action is taken to remove or top the tree. Trees which meet these criteria are called danger trees. Owner permission is obtained before removal or topping of trees on private property. In some cases, Orange and Rockland may offer to replace a private property tree with a lower growing plant species. If the property owner will not permit the removal or topping of a danger tree, the issue will be referred to the Law Department for further action. The budget for this program will be sufficient to complete the danger tree work volume.

[1] In sensitive residential areas on sub-138kV lines some buffer zone vegetation will be topped or pruned in accordance with Section 6.3.

7.4.3 Field Land Use and Vegetative Conditions Surveys (Inventories)

Periodic surveys using a uniform data collection process will bring the following benefits to the vegetation management program.

- Ability to assess overall program effectiveness
- Uniform record keeping and reporting
- Improved contract management and cost controls
- Better identification of the compatible shrub and non-compatible tree densities, treatment areas, treatment methods and work completions

Orange and Rockland developed and implemented a right-of-way field survey process and program for the preparation of routine right-of -way management activities beginning as early as 1975. Between 1975 and 1977, the Environmental Services Department performed a span-by-span ground survey for the entire transmission system to identify the land use along the right-of-way, characterized the vegetation present, and recommended prescribed treatments for each right-of-way section. This information was used to schedule vegetation management on the transmission system on a section-by-section basis. Orange and Rockland has repeated this field survey effort over the years on a number of occasions, and has refined and adjusted the data collection process. The latest field survey was conducted in 2008.

7.5. Transmission Line Inspections

Both aerial and ground patrols are conducted frequently in comparison to the industry in general. The frequency of these patrols ensures that the transmission system is patrolled often enough to identify vegetation clearance issues that may develop based on the anticipated growth of the fastest growing incompatible vegetation in the region (ailanthus altissima) or any other environmental or operational factors that could impact transmission line reliability. The patrol schedules provide flexibility to allow adjustments to be made in order to address such conditions before they result in problems.

7.5.1 Aerial Patrols

Aerial Patrols are performed on 345KV and 500KV lines on a monthly basis. They are conducted on lower voltage transmission lines every other month. The purpose of these patrols is to identify vegetation conditions, right-of-way encroachments, damaged structural or electrical components, and other conditions that could affect line reliability. Specifically personnel look for vegetation clearance issues, danger tree conditions along the edge of the right-of-way, and unauthorized use or unusual conditions (e.g. severe erosion). All abnormal conditions are logged on the Patrol Report, and reported to the appropriate Orange and Rockland personnel as required. Vegetation management problems are reported to the Manager, Vegetation Management or the Chief Construction Inspector responsible for transmission vegetation management. In addition to the scheduled aerial patrols mentioned above, emergency patrols may be performed in response to breaker operations or other system conditions.

7.5.2 Ground Patrols

Ground patrols are performed on 345KV and 500KV lines twice per year. They are conducted on lower voltage lines once per year. The ground patrols are conducted for the same purpose as the aerial patrols; however they provide a different perspective. This is often necessary in order to identify conditions that can affect reliability. In

addition to the scheduled ground patrols mentioned above, patrols may be performed in areas where mitigation measures are required and emergency patrols may be performed in response to breaker operations.

7.5.3 Classification of Conditions

Conditions that are identified during patrols are classified into one of four priority levels which are described below. All Priority 1 conditions shall be reported to the EHV Supervisor and the Senior System Operator immediately upon discovery in accordance with the appropriate inspection procedures so that action can be taken to alleviate conditions which pose an imminent threat to a transmission line. Lower priority conditions are reported to the EHV Supervisor via paper forms or are electronically downloaded into a database if electronic data collection methods are used. The EHV Supervisor reports all priority 1 and 2 vegetation conditions to the Company's Vegetation Manager upon being made aware of them.

Priority 1 – Repair as soon as possible. A priority 1 condition is a deficiency that poses an actual or imminent safety hazard to the public or poses a serious and imminent threat of a transmission line outage. Priority 1 conditions require action to eliminate the threat (i.e. de-energization, or de-loading), and correction as soon as possible. Examples of vegetation-related Priority 1 conditions are vegetation that has encroached beyond the Minimum Clearance as identified in Table 2 in Section 7.4.2 of this document and large uprooted trees that are likely to fall into a transmission line in the very near term.

Priority 2 – Repair within one year. A priority 2 condition is a deficiency that is not likely to fail prior to the next inspection, but is likely to fail within several years after discovery and would represent a threat to safety and/or reliability should a failure occur prior to repair. An example of a vegetation-related Priority 2 condition is vegetation that has grown beyond the Action Threshold Clearance, but not beyond the Minimum Clearance and would not grow beyond the Minimum Clearance within the next year.

Priority 3 – Repair within 3 years. A priority 3 condition does not present immediate safety or operational concerns and would likely have minimum impact on the safe and reliable delivery of power if it does fail prior to repair. An example of a vegetation related Priority 3 condition is vegetation that has grown beyond the At Time of Vegetation Management clearance, but not beyond the Action Threshold clearance, and would not grow beyond the Minimum Clearance prior to the next treatment cycle.

Priority 4 – Monitor Classification – Conditions found but repairs not needed at this time. Priority 4 is used to track atypical conditions that do not require repair within a five year timeframe. This priority should be used for future monitoring purposes and planning proactive maintenance activities.

7.6. The Scheduling and Budget Approval Process

The Manger, Vegetation Management, maintains the schedule and historical data for electric right-of-way treatment cycles based upon the cyclical program first adopted in 2003. The Manager maintains records of actual vegetation management work performed, including any off-right-of-way danger tree removal and edge work completed in past years. These records are reviewed and updated annually.

7.6.1 Budget Approval and Annual Plan

The budget is typically reviewed in the third quarter timeframe, and finalized by the fourth quarter. All necessary permitting activities, information sharing and notification commence after the annual plan and budgets are finalized in order to secure necessary approvals which may be required in a timely manner, such as permissions or permits from landowners or regulatory authorities.

The annual plan identifies the lines to be treated and the treatment methods that will be used during the cycle for a particular year. The process is flexible in order to allow for modification or adjustments to the annual plan. Adjustments to the annual plan can be made at any time to address changing field conditions that can impact reliability (i.e. unanticipated growth or other environmental factors).

Adjustments to the annual plan which involve 345KV and 500KV transmission lines must be documented when the decision to make the adjustment is made. While such adjustments do not occur often, the documentation would typically consist of an e mail or other written notification from the Vegetation Manager to the Section Manager, T&D Maintenance and/or the Compliance Manager. These adjustments must also be documented in the year end report that is submitted to the NYS PSC. For lower voltage lines documentation of such adjustments is only required in the year-end NYS PSC report.

7.7. Vegetation Management Methods: Selection Criteria and Descriptions

Orange and Rockland currently utilizes five basic treatment methods for removing incompatible vegetation growing within the right-of-way. A description of each method and the site conditions under which a particular technique (or combination) is most appropriate are discussed in this section. The methods include:

- Hydraulic foliar
- Low volume foliar
- Basal
- Hand cutting
- Mechanical clearing

The first four treatment methods are applied selectively. Mechanical mowing is the only non-selective method, although the section of right-of-way to be mowed is specifically selected.

Site and species conditions may vary considerably over the length of a right-of-way as numerous environmental/ecological gradients are transected by these linear facilities. The following guidelines have been adopted to tailor treatment prescriptions to site conditions in a cost-effective manner that balances system reliability, cycle length, and public and environmental constraints. The basis of an IVM program is the clear recognition that each technique is suited to a certain range of site conditions and that, given the wide variation in field conditions, land uses, and environmental gradients, no single technique is suitable for all sites.

7.7.1 Buffer Zones For Herbicide Application

Orange and Rockland has established the following minimum buffer zones for treatment with herbicides adjacent to aquatic resources such as lakes, ponds, rivers, streams with flowing water, or non-jurisdictional wetlands with standing water.

- High volume hydraulic foliar – no closer than 50 feet
- Low volume hydraulic foliar – no closer than 25 feet
- Low volume backpack – no closer than 15 feet
- Basal – no closer than 15 feet
- Cut, stump treatment – no closer than 5 feet

Herbicides shall not be used within 100 feet of any potable water supply or DEC-regulated wetland, unless otherwise allowed by permit, rule or regulation. The location of known wells, water supplies and wetlands will be identified in the field survey data and/or transmission line drawings, and will be provided to contractor treatment crews.

Buffer zones and no treat zones may also be utilized as appropriate around active residences, businesses, croplands, orchards, registered organic farms, schools, active parks and public recreation areas including golf courses and athletic fields. ***Note that no work may be completed on the property of a public or private school, or a registered day care facility without advance pre-notification of the facility under NYS DEC pesticide notification regulations.***

The Manager, Vegetation Management may increase the buffer zone distances to address specific site sensitivities, including aesthetic, public or environmental concerns identified during the field inventory process or by other input. The Manager may also consider additional site-specific features such as slope, rock outcrops, soil conditions, vegetation densities, wire security zone clearances, natural buffers and barriers, off-right-of -way sensitivity, and any other factors that may influence buffer zone distances.

7.7.2 Environmental Impacts

This Long Range Right-of-Way Vegetation Management Plan is designed to identify, assess, and minimize adverse environmental impacts associated with vegetation management activities. Adverse impacts to adjacent land, water resources, and non target vegetation can be minimized or even completely avoided using prescriptive techniques, proper buffer zone distances, attentive supervision and oversight, and responsible, judicious herbicide applications performed in a careful, professional manner.

7.7.2.1. Off-Site Herbicide Movement

Off-site herbicide movement primarily occurs in one of four ways: overland flow, leaching, drift, and volatility.

ESEERCO conducted two major research projects on *Herbicide Mobility and Persistence.* This research included literature searches and field studies involving commonly used right-of-way herbicides in routine treatments; their persistence in soils, and their movement from overland flow, soil leaching and drift.

These studies found that the linear extent of herbicide movement within the right-of-way was minimal, and when it occurred, herbicide degradation was rapid. Following application, there was no indication that off-right-of-way overland flow was occurring. Instead, the trend was toward degradation to undetectable levels. Entry into streams was highly unlikely when appropriate buffer zones were established adjacent to such water resources.

These studies also found that movement into wells or ground water through leaching is highly unlikely. Leaching to a maximum depth of 10 inches to 15 inches in treated sites was rare. The circumstances for leaching were: (1) rainfall immediately after treatment and before the product had fully dried, (2) heavy rainfall within a day following application, and (3) basal applications using high volumes of conventional oil based products to treat high densities of incompatible vegetation.

Off-site drift did not occur during the study because non-volatile products were used, and they were carefully applied using proper techniques to control drift. It should be noted that the use of low-pressure, low-volume foliar techniques greatly reduces or eliminates the risk of drift. In addition drift control additives provide an effective means of controlling drift when high volume foliar applications are made.

The development of highly selective, low-volume backpack foliar methods has almost eliminated the need for high volume foliar applications and has likewise replaced most basal treatments today. Orange and Rockland primarily uses low volume foliar techniques on the transmission right-of-way.

The *Study of Environmental Fates of Herbicides in Wetlands on Electric Utility Right of Way in Massachusetts over the Short Term,* conducted by University of Massachusetts in 1994, investigated the fate of triclopyr and glyphosate herbicides when applied in wetlands. That study found low-volume foliar treatments with glyphosate to be the treatment of choice for controlling targeted trees in wetlands. It also found there was no lateral movement of glyphosate in the soil, nor was there any herbicide accumulation in the soil. Since that study, triclopyr has received aquatic labeling consistent with the glyphosate label.

The NYS DEC approved the use of glyphosate and imazapyr in both the low-volume foliar, as well as cut and treat applications in seasonally dry regulated wetlands. The *Herbicide Handbook, Weed Science Society of America, Eighth Edition, 2002* identifies that imazapyr, and another common right-of-way herbicide fosamine have little to no mobility in soil following application.

7.7.2.2. Soils

The impacts to soils most commonly found occurring as a result of right-of-way vegetation management activities include rutting and compaction caused by some types of maintenance equipment. The persistence of herbicides within soils is another consideration.

The *Herbicide Mobility Studies* also found that foliar applied mixtures with triclopyr, picloram, and/or 2,4-D did not persist for more than 10 weeks in the soil, while basal applied formulations of triclopyr persisted for up to 18 weeks. Typically, these are not significant or lengthy adverse impacts when weighed against the vegetation management alternatives and long-range management goals. Also, unlike many other typical pesticide applications that are performed annually (or even more frequently) herbicides are applied to right-of-way only every few years.

Another ESEERCO study titled *Cost Comparison of right-of-way Treatment Methods* found that soil compaction from typical wheeled vehicular vegetation maintenance equipment routinely occurs. However, the extent of such soil compaction is often minor and considered inconsequential due to the relatively infrequent nature of vegetation maintenance operations.

Rutting occurs when heavy equipment traverses the right-of-way under saturated ground conditions. The risk of rutting is greater during wet spring and fall timeframes and usually less common during summer periods. Typically, wetlands have a much higher risk of rutting while well-drained and/or upland sites are considered a much lower risk. However, the risk for rutting is usually higher with mowing in that it routinely entails many passes back and forth along the entire right-of-way, and also often requires shorter cycles to control the rapid tree re-growth. Other treatments that rely on heavier mechanical clearing or treatment equipment also have a higher risk for rutting to occur than methods that rely on lighter, smaller or low ground pressure units designed specifically for soft soil conditions. Methods such as low-volume backpack or cut and stump treatment that rely on crews entering the site on foot have virtually no risk for rutting or soil compaction.

7.7.2.3. Wildlife

The research of Drs. Bramble and Byrnes on the Gamelands 33 Project in Central Pennsylvania in the 1950s was one of the first studies specifically designed to investigate the effects of electric utility right-of- way herbicide use on wildlife. From their work and that of many others over the years, it has become increasingly clear that a wide range of wildlife species use right-of-way habitat for breeding, nesting, food, bedding and cover. While it may be nearly impossible to meet the full complement of habitat requirements of every species within a right-of- way, it has also become progressively more obvious that a soundly and consistently applied IVM program greatly increases and maintains overall wildlife habitat values for the widest range of species.

As extensively discussed in earlier sections of this Plan, the wire-zone – border zone model fosters the development of compatible shrub communities along the edge of the right-of-way. This not only increases competition with taller growing trees, it improves a phenomenon known as edge effect. Edge effect is a term used to describe the transition (ecotone) zone between two distinctly different habitats (e.g., field and forest) that is often favored by many wildlife species. The benefits of the numerous miles of right-of-way edge are enhanced even further when these otherwise “hard” transition zones (from forest to field) are ameliorated or softened by the retention and fostering of compatible shrub communities along the forested edge of the right-of-way. In turn, this softer right-of-way edge greatly increases wildlife habitat and cover values when compared to a right-of -way with sharply transitioned ecotones.

Research has also demonstrated that, instead of having a significant adverse impact, selective vegetation management techniques generally increase the abundance and diversity of many plants, mammals, birds, and other species along the right-of-way. In fact, a number of studies in New York have found that threatened or endangered species such as the Karner Blue butterfly may have continued to exist and even flourished within these rights-of-way because of past herbicide activities. Likewise, numerous species of concern, such as those listed as endangered and threatened or otherwise rare and unique species, have been found to exist in rights-of- way with a long history of herbicide work. In cases such as these, vegetation management treatments may have produced habitat

conditions (e.g., early successional sun-loving plant communities) that replicated essential disturbance regimes, making survival of these species possible only within the right-of-way, while natural plant succession "choked" them out in untreated off-right-of-way areas. This underscores the benefits of working with wildlife agencies, such as DEC to aid in the identification of sensitive right-of- way habitats, understand ways in which selective IVM may have helped create such conditions favorable to these species residing in whole or part within the right-of-way and, how future vegetation management can continue these past successful trends.

In contrast, mowing is known to cause an immediate loss of cover, and substantially reduce or even eliminate many food sources and critical cover for smaller mammals and birds. While the loss of cover values may be short term, it is certainly far more disruptive than a selective herbicide method that retains much of the right-of-way plant cover intact.

A research study by the SUNY College of Environmental Science and Forestry, titled *Effects of Vegetation Management on the Avian Community of a Power Line Right of Way,* investigated the side effects of vegetation management on songbird communities. This study found increased predation of nests as shrub densities became too light, and began to suggest a lower limit for shrub densities of 25 percent for shrub-nesting species. As shrub densities increase in the right-of-way, the opportunity for field-nesting species also declines, and an optimum upper limit of around 70 percent is suggested. The study found that once established, the permanence of the plant community that is produced through selective herbicide application is much preferred for relatively short-lived bird species than the routine cyclic destruction of habitat caused by a regular mowing regime.

Clearly, the modified WZ-BZ model that encourages a rich, diverse blend of grasses and forbs (herbs), small compatible shrub species within the wire zone, and the development of taller shrubs and even short stature trees in the buffer zone (and elsewhere on the right-of- way as allowed by the WSZ), creates the optimum vegetation arrangement for reliability, right-of- way plant community stability and overall wildlife habitat enhancements.

7.7.3 Description of Methods

7.7.3.1. Hydraulic Foliar

The term "hydraulic foliar" actually refers to the type of equipment used to complete a high-volume foliar treatment of incompatible vegetation on the right-of-way. Typically, this method uses all-terrain type equipment that is rubber tired or tracked, mounted with a hydraulically operated pump with an attached 100 to 1,000 gallon mix tank. Applicators may either ride on the spray unit treating downward or walk beside the unit and pull spray hoses out to reach the targeted vegetation.

Orange and Rockland has not used the larger hydraulic spray units to accomplish high-volume foliar treatments since the early 1990s, when the low-volume backpack applications were implemented.

This method however is highly effective when treating sites with medium to high densities of taller growing, incompatible vegetation, and actually may require less herbicide per acre than backpack methods to control these high stem density conditions. In addition, historic high volume methods have been modified to incorporate some of the low volume principles to this hydraulic unit. This method is

therefore considered to be effective in a limited niche on the Orange and Rockland system.

7.7.3.2. High Volume Hydraulic (Selective Stem Foliar)

High-volume foliar applications made from a hydraulic unit are effective for sites with higher densities of incompatible target vegetation. The higher pressure helps provide adequate plant coverage on these sites, while the dilute mixtures help reduce the quantities of herbicide concentrate needed to provide effective control. While high volume foliar applications remain a cost effective tool to control higher density sites, the incompatible densities normally associated with this method are now encountered less frequently, and the method is not required as often as in the past.

Conventional high volume applications use operating pressures of 100 to 150 psi at the nozzle, to apply an average of 60 to 120 gallons per acre of herbicide mixture. Rates of 300 to 400 mix gallons per acre have been used to treat tall, dense stands of incompatible tree species in the past.

While application rates are higher, the herbicide mixture rate for high volume treatments is very dilute. Typically, the mix rate is about one gallon of concentrate per hundred gallons of mix (1 percent solution). As a result, the actual herbicide application rates may sometimes be lower with this method than for low volume methods when measured in terms of herbicide concentrate used per acre, rather than total mix gallons per acre. Low volume methods most often require mixes with a much higher herbicide concentration.

The spray mixture includes surfactants to reduce surface tension between the water and the leaf after application, and improve movement of the herbicide into the plant. It also must include a drift control agent designed to thicken the mix and reduce or eliminate drift.

The herbicide mixture is directed at the target vegetation to wet all leaves, branches and stems to the point of runoff. The spray unit should travel up and down the right-of-way, with the applicator treating stems that are within 10-15 feet of either side of the unit. When treating right-of-way with considerable shrub cover, it is often more effective for the applicator to ride upon the unit. In this elevated position the nozzle operators can better see and treat stems that are located down inside the shrub cover, as well as better treat those stems that have emerged from the dense shrub layer.

The higher pressures associated with this method also result in a spray pattern that penetrates the canopy of dense clumps to provide full coverage. By comparison, low-volume backpack methods do not provide enough pressure to achieve full coverage in such dense clumps, and smaller stems that are subsumed within the shadow of taller, denser stems may escape adequate treatment and require follow-up in order to achieve effective control.

Site Conditions: The technique is most effective when the treated portion of the right-of-way consists of:

- A right-of-way with medium to high incompatible densities (50 percent to 100 percent) where low volume hydraulic or low volume back pack applications would require high herbicide use rates and the more dilute, high volume mix would result in lower application rates **or**

- Sites with medium to high incompatible densities (50 percent to 100 percent), where the height and density of the compatible shrub layer require treatment from an elevated position in order to effectively control taller incompatible stems emerging above the shrub layer. Hydraulic foliar applications may be used to treat target vegetation up to an average of 12 feet to 15 feet in height, **or**

- The site is accessible to ground equipment, and is sufficiently removed from environmentally sensitive sites so as to minimize potential adverse impacts.

Environmental Considerations: High volume applications have the greatest risk for drift due to the higher operating pressures. Mix additives, including surfactants and drift control agents, are required to keep small droplets from forming as the mixture comes out of the spray nozzle, preventing drift from the outset. Restricting crews from treating stems more than 10 to 15 feet from the unit and limiting treatment height also help prevent the crews from boosting pressure to reach more distant stems. Allowing applicators to ride the unit and treat from an elevated platform also helps eliminate the problems of crews spraying up into the air to control taller stems from the ground. Typically, Orange and Rockland strives to schedule and treat right-of-way vegetation before it reaches a height of 10 feet. Applicators working from the unit will be permitted to occasionally treat stems up to 15 feet tall with this technique, provided the unit is close to the target stem and the spray pattern directed so as to keep it within the right-of-way limits.

The short term visual effect associated with this technique is the variable brownout condition caused by dead and dying foliage. The preservation of compatible, non-target vegetation that remains green within the site may help mitigate the overall effect of brownout. A longer term visual impact associated with this technique is the presence of dead tree stems within the site for a few years after treatment.

The following buffer zones distances should be applied when prescribing high volume foliar applications by hydraulic equipment. While these buffer zones are recommended minimums, the Manager, Vegetation Management may elect to increase buffer zone distances based on site-specific conditions and other considerations:

- 50 feet from streams, ponds, lakes and unregulated wetlands with standing or flowing water

- 100 feet from potable water supplies or wells

- 100 feet from regulated wetlands unless otherwise allowed by permit. Low-volume foliar methods will be preferred in and around wetland to high volume methods.

- 100 feet from schools and athletic fields

- 100 feet from active residences, businesses or ornamental/landscape plantings

- 50 feet from active croplands, orchards, etc.

- 100 feet from active public parks

7.7.3.3. Low-Volume Hydraulic (Selective Foliar)

Low volume foliar applications from the hydraulic unit are especially cost effective for controlling larger areas of remote or wide rights-of-way, where backpack applications become inefficient or difficult, or the compatible communities become too dense or too tall for the applicator to locate and treat incompatible stems that are scattered throughout or emerging above these communities.

Selective foliar applications, including high and low volume hydraulic and low volume backpack, are the most effective means of controlling non-compatible deciduous tree and shrub growth in the right-of-way. Foliar applications accomplish this by treating target vegetation with water-borne mixtures during the active growing season, when the plants, water-based transport systems are working at maximum efficiency. These methods are typically the least cost alternative, most efficacious and often require the least amount of herbicide concentrate for effective control.)

Low volume foliar applications have been made possible by adapting the hydraulic spray unit with the special two way, low volume nozzles developed for backpack operations. Operating pressures must be kept at 50 psi or less, at the nozzle, and the nozzle opening should be regulated to provide a coarse spray pattern of large droplets. The reduced pressures require the applicator to be within 10 feet or closer to the target stem for effective coverage.

The herbicide mixture is directed at the target vegetation to lightly wet the leaves and all growing tip areas, and across the terminal leader area of the treated stems.

This technique should not be used to treat sites with high densities of non-compatible species because the lower pressures and light wetting could result in less than 100 percent coverage. The higher mixture rates associated with low volume treatments may increase the rate of herbicide concentrate per acre beyond those experienced with conventional high volume foliar applications, when this method is used to treat sites of consistently high tree stem density.

This herbicide mixture usually contains a 1 percent to 2 percent solution, and is applied at an average of 15 to 30 mix gallons per acre, depending upon incompatible densities. The mixture includes surfactants to reduce surface tension between the water-borne mixture and the leaf surface, and improve herbicide movement into the leaf. Drift control agents are often used even in these lower pressure hydraulic applications.

Site Conditions: The technique is most effective for controlling incompatible vegetation when the right-of- way is:

- A wide right-of-way (150 feet or more) with medium incompatible densities where low volume backpack foliar may be inefficient and result in high miss or skip rates, **or**

- Sites with light to medium incompatible densities (up to 70 percent), where the height and density of the compatible shrub layer require treatment from an elevated position in order to effectively control taller incompatible stems emerging above the shrub layer. (Hydraulic foliar applications may be used to treat target vegetation up to an average of 12 feet to 15 feet in height, **and**

- The site is accessible to ground equipment, **and**

- The site is sufficiently removed from environmentally sensitive sites to minimize potential impacts.

Environmental Considerations: Drift is effectively minimized with the low volume hydraulic method by reducing pressures and controlling the nozzle openings to create large, coarse droplets. Crews must not increase nozzle pressure to extend their reach, or the risk of drift and unnecessary herbicide use will increase. Drift control agents are also recommended with this hydraulic method to further reduce any chance of inadvertent drifting.

The lower pressures and light wetting associated with low volume methods greatly reduce the zone of effect when compared to high volume methods. The "zone of effect" is a term that has been used to describe the spray pattern that falls on any compatible vegetation adjacent to the target tree stem being treated.

The zone of effect varies with operating pressures, treatment rates and the distance of the applicator from target stems. As treatments have become more selective over the past 20 years, the zone of effect has decreased as well. Research completed by SUNY College of Environmental Science and Forestry for National Grid Transmission on its Volney to Marcy Project examined this phenomenon, and found that most of the spray pattern for low volume applications was intercepted first by the targeted foliage and then by the adjacent under story vegetation, with very little herbicide ever reaching the soil. The effect on most underlying herbaceous communities varies with herbicide mixtures, but is usually quite transient. Most sites begin to recover their understory later in the same growing season, and are once again fully re-vegetated by the next growing season.

Additionally, one of the primary objectives of the program is the cost effective control of all incompatible growth and this incidental minimal treatment of adjacent vegetation within the right-of-way is not considered a drift problem, nor does it cause significant adverse impacts.

The short-term visual effects are the result of brownout of the treated vegetation. However, the high selectivity and greater retention of green, non-target vegetation for this method, reduces the extent of brownout when compared to high-volume foliar methods.

The following buffer zones should be observed when prescribing low-volume foliar applications with a hydraulic application unit. While these buffer zone distances are recommended minimums, the Manager, Vegetation Management may elect to increase this expanse based on site-specific considerations.

- 25 feet from streams, ponds, lakes, and unregulated wetlands with standing or flowing water
- 100 feet from potable water supplies, or wells
- 100 feet from regulated wetlands unless otherwise allowed by permit. 100 feet from schools or athletic fields
- 100 feet from active residences, businesses or ornamental/landscape plantings
- 50 feet from active croplands, orchards, etc.

- 100 feet from active public parks

7.7.3.4. Low-Volume Backpack Foliar

Description: Low-volume backpack foliar applications have been the preferred treatment method on right-of-way sections at Orange and Rockland since the early to mid-1990s. Backpack applications are particularly efficient on narrow rights-of-way with light target tree densities, where compatible shrub densities and heights are low enough to allow crews to traverse along the right-of-way on foot, easily locate and then treat incompatible stems without undue difficulty. The technique is also preferred for treatment in sensitive buffer areas, and is especially effective for seasonally dry regulated wetlands (with the appropriate permits). As previously discussed, research by SUNY College of Environmental Science and Forestry has shown that less herbicide reaches the soil surface when using low volume backpack than even the other most selective stem specific method, the cut and stump treatment.

Low volume foliar applications by backpack are highly effective at selectively controlling incompatible woody species, at the lowest cost. In addition, the high selectivity and absence of large application equipment result in far less environmental or public intrusion than many other effective control measures.

A 4x4 pickup truck is often used to transport workers and their equipment to the right-of-way, where small, two to three person crews can then traverse the right-of-way on foot. Application equipment usually consists of a 3-gallon backpack with a hand pump, a spray wand and a two-way nozzle. The backpack produces very low pressures, generally between 15 and 30 psi at the nozzle, which requires the applicator to be very close to the target tree stem at the time of treatment.

The herbicide mixture is directed at foliage on individual target stems to lightly wet the leaf surface, especially in the area of growing tips and the terminal leader. One nozzle of the spray head produces a wide-angle cone pattern that enables the applicator to work very close to smaller stems and quickly treat the leaf surface. The other nozzle provides a stream pattern that allows the applicator to reach the tops of taller stems, up to approximately 10 feet in height. Due to the low delivery pressures of this system, 12 feet is about the maximum height for effective coverage on most species. Orange and Rockland has selected the 3-4-year treatment cycle to ensure that treatment densities remain relatively light, and tree heights will generally be found below the maximum 10 to 12 feet upper limit for this treatment at the time of routine vegetation management.

The herbicide mix for low volume backpack is typically a 4 percent to 6 percent, water-borne solution that is applied at an average of 3 to 6 mix gallons per acre in light target stem densities. Ultra-low applications can be made using a 5 percent to 10 percent solution in a carrier known as Thinvert, rather than water. Surfactants are added to conventional water-borne mixtures to reduce surface tension between the water-borne mixture and the leaf surface, and improve herbicide movement into the leaf. However, additional surfactants are not required when the Thinvert carrier is substituted for water in ultra low-volume mixtures, since the Thinvert carrier already contains a surfactant. For low volume foliar with low-pressure backpacks, no drift control agents are necessary.

Site Conditions: The technique is most effective for controlling incompatible vegetation when the right-of-way is:

- Light (up to 30 percent) densities for incompatible stems with an average height of 10 feet or less, and light to medium (up to 70 percent) incompatible species densities that have not become overgrown. The right-of-way needs to be easily covered by applicators on foot in order to efficiently locate and treat the non-compatible stems that are mixed in among the compatible shrub communities. As shrub communities become overgrown, they tend to conceal scattered tall growing tree stems until after they emerge above the shrub canopy layer.

- The site consists of any density of non-compatible species where the only available access to the section of right-of-way is on foot.

- The right-of-way segment to be treated is sufficiently removed from environmentally sensitive resources to minimize potential impacts. The method is the preferred method for treatment of DEC regulated wetlands and the surrounding 100 foot buffer areas, due to the relatively low herbicide application rates and the very low rates of product that actually reach the soil.

Environmental Considerations: The very low pressures and coarse spray patterns of the backpack technique effectively eliminate drift, negating the need for adding drift control agents. In fact, without the constant mechanical agitation, the addition of drift control agents can cause these hand pumped backpack spray units to clog and malfunction.

The reduced pressures and light wetting, together with the applicator working in close proximity to the target stem, all combine to greatly reduce the zone of effect when compared to other herbicide treatment methods. Nearly all of the over-spray that is inadvertently deposited on the understory is intercepted by the surrounding shrub or herbaceous layer. While there may be some temporary dieback, re-vegetation by herbaceous under story species usually begins within the same growing season and is often completed by the following growing season. Very little herbicide actually reaches the soil beneath the target stem in most low volume backpack foliar situations as the profuse vegetative cover mostly intercepts it.

The short term visual effect for this treatment is brownout of the treated foliage. However, the high selectivity of this technique preserves the greatest amount of compatible vegetation to minimize this impact. Also, if the treatments are performed near the end of the growing season (after mid- to late-August), the appearance of brownout can be significantly minimized or even completely avoided.

The technique should be curtailed when possible in tall, dense conditions where the low pressures and light applications will typically result in less than complete coverage. Herbicide use also increases significantly when this technique is used to treat dense conditions, and alternate methods should be considered to minimize the amount of herbicide concentrate that is required to achieve complete control.

The following buffer zones should be observed when prescribing low volume foliar applications with backpacks. While these buffer zones are the recommended minimum distances, the Manager, Vegetation Management may elect to increase these distances based on other site-specific considerations.

- 15 feet from streams, ponds, lakes, and unregulated wetlands with standing or flowing water

- 100 feet from potable public water supplies, or private wells
- 100 feet from regulated wetlands unless otherwise allowed by permit
- 100 feet from active residences, businesses or ornamental/landscape plantings
- 100 feet from schools, athletic fields, golf courses and active parks
- No buffer zone is usually required next to crops fields or orchards when the treatment spray can be directed away from the crop area

7.7.3.5. Basal

Description: Basal applications use highly selective, stem-specific treatments to target incompatible, tall growing stems while preserving nearly all adjacent, compatible shrub species. In the early days of selective treatments, basal applications along with cut and stump treatments were the preferred methods of many utilities to control vegetation in sensitive buffer areas where high selectivity was required. Today, most basal applications have been replaced by low volume backpack foliar methods.

Basal applications have evolved over the last 30 years. In the 1970s and 1980s, conventional basal applications used 1 percent to 4 percent mixtures of herbicides diluted in a fuel oil carrier. They were applied to the entire lower 12 to 18 inches of the stem, thoroughly wetting the base of the stem and all exposed roots to the point of runoff and puddling at the base of the stem, around the root collar zone.

Oil-based mixtures are required for basal-applied products to penetrate waxy substances in the bark of the tree, and carry the herbicide into the underlying cambium area. However, once the mixture penetrates the bark, polarity differences arise between the oil-borne herbicide and the water-based transport systems of the plant that tends to reduce herbicide movement from the treatment site into the crown and roots. The stem is controlled primarily by girdling the cambium in the stem at the point of contact and shutting down the nutrient supply from the roots to the leaves. Hence, the low solubility and lack of adequate translocation often result in poor control of many root-suckering species.

Basal applications also require precise application to avoid spotty control of most other tree species. For example, if the applicator failed to treat a small portion of the backside of the stem, the herbicide would not penetrate in this section of stem. It would not shut down the cambium layer around the entire stem circumference, leaving an uncontrolled green streak. This would effectively allow the continued movement of some nutrients between the roots and the leaves. Additionally, even the best crews are likely to have misses and skips when trying to locate and treat every single stem in high-density sites resulting in costly follow-up re-treatment operations.

Unlike the foliar treatments, basal applications can be made any time of year except when snow covers the lower stem, and can be used to extend the time available for treatments (spray season) well beyond the normal growing period, and into the dormant season. Nevertheless, they are most effective from April to October, during the plant's active growing season. Trees treated in the dormant season often begin to leaf out the following year because the buds were already formed, and then soon wilt and die once their energy reserves are consumed.

In the mid to late 1980s, basal applications using specially formulated bark penetrants were developed. Today, they include both pre-mixed and ready-to-use formulations that are applied as a fine mist to lightly wet the bark and exposed roots, eliminating the need for wetting to the point of rundown and puddling at the root collar. While low-volume basal methods reduce the amount of material applied, the herbicide concentration is increased.

Mix rates vary from 10 percent to 50 percent dependent upon the formulation, with 1 gallon of concentrated basal mix replacing approximately 10 gallons of conventional basal. The new mixtures penetrate the bark better and are also more mobile within the plant, thus increasing their range of control and reducing the problem with green streaks.

A two- to three-person crew is typically used for basal applications. Larger sites may be treated with 1- to 5-gallon backpacks, while isolated stems or small areas may be treated with small, handheld squirt bottles. Low pressures using a solid cone or flat fan nozzle are used to treat the lower 12 to 15 inches. The treatment is effective on stems up to six inches in diameter at the base. Larger stems should be cut and stump treated.

Site Conditions: The basal technique is most effective for controlling incompatible vegetation when the right-of-way is:

- A relatively small area, such as a hedgerow, road crossing, or similar buffer zone, where both compatible and incompatible densities are light. The crew should be able to easily move through the site, to identify, locate and treat target stems dispersed between the compatible shrub and herbaceous communities.

- When applications need to be done in the dormant season

Environmental Considerations: The low pressures and applications done close to the ground eliminate drift and greatly reduce the zone of effect on adjacent compatible vegetation. However, the zone of effect is still higher for these basal applications than the cut and stump treatments due to higher application rates. The amount of herbicide concentrate that reaches the soil is also higher for basal applications than all other treatments, since more material is required to effectively treat the target stems in close proximity to the soil than any other method. This results in the greatest prospect for inadvertent soil contact. This, in turn, creates the greatest opportunity for movement in the soil and the potential for leaching.

The short term visual effects are brownout associated with growing season treatments, as well as some more limited brownout during the next growing season when treatments are made during the dormant season. A longer visual impact may be the dead stems that remain standing within the right-of-way for one to two seasons after treatment. However, the high selectivity and high retention of compatible lower growing vegetation helps to minimize this visual impact.

Highly selective basal techniques may be used within or immediately adjacent to croplands and orchards. It may be used right up to the edge of active pastures, but not within the pasture unless the particular herbicides used are specifically permitted by label grazing requirements. It may also be used to treat within or immediately adjacent to buffer areas for residential and commercial sites; and athletic fields, golf courses, schools, and active parks in accordance with DEC pre-notification requirements.

The following buffer zones should be observed when prescribing basal applications. While these buffer zones are recommended minimums, the Manager, Vegetation Management may elect to increase the distances based on site-specific considerations.

- 15 feet from streams, ponds, lakes, and unregulated wetlands with standing or flowing water
- 100 feet from potable public water supplies, or private wells
- 100 feet from regulated wetlands unless otherwise allowed by permit (Note: this method has not been approved by DEC for treating seasonally dry wetlands or the regulated 100-foot wetland adjacent area through the DEC wetland permitting process)

7.7.3.6. Hand Cutting

Hand cutting is primarily used to clear incompatible species in areas of high sensitivity, such as residential and commercial sites, near schools, athletic fields, golf courses and active parks where foliar and other herbicide methods cannot be used. It may also be used in buffer zones for roads, streams, ponds, lakes and wetlands. Small, two to three person crews typically use chain saws or brush saws to cut and remove incompatible stems, while not clearing compatible stems. The slash or debris from cutting is disposed of in a variety of ways, dependent upon site conditions, including lopping it up and leaving it lay where it falls, hand piling or windrowing slash material from the site.

Hand cutting over the long term is one of the most costly means of controlling right-of-way vegetation, but may be required in highly sensitive areas. Costs increase as the need to hand pile, or chip and remove debris from the site increases. Repeated hand cutting of all broad-leaved tree species results in profuse stem regeneration from the cut stumps, and for some species the root system as well. The growth rates are likewise accelerated due to the food reserves in the undisturbed root systems. The net result is more tree stems growing faster. However, since all conifer species found in the Northeast do not have this vegetative regenerative capacity (stump sprouts and root suckering), hand cutting is quite effective on pines, spruces, cedars, firs, hemlock, and larch.

7.7.3.7. Cut with Stump Treatment

While most conifers do not re-sprout from the stump after cutting, deciduous trees and shrubs re-grow prolifically from the stump and/or roots following stem removal. Herbicides are the only cost effective method available to prevent this re-growth once an incompatible tree stem has survived the natural processes of competition and herbivory, and begins to emerge above the compatible herb-shrub canopy layer. Stump treatment is the preferred method to achieve effective control when hand cutting performed.

There are two different methods for mixing and applying stump treatments. The most common method is to apply a water-borne mixture directly to the cut surface of the stump immediately after cutting. The herbicide may be pre-mixed from the manufacturer or herbicide supplier, or it may be field mixed by the application crew. The mix rates are typically around 50 percent solutions, and they are applied to the outer growth rings (the cambium layer) of the freshly cut stump. The application equipment is usually a small hand-held squirt bottle or small capacity (1 gallon) hand sprayers.

The advantage of water-borne application is that they are readily absorbed into the exposed water system of the stump. However, if the application is delayed even more than a few minutes, drying occurs when air bubbles form in the cambium's xylem and phloem vessels at the cut surface. This blocks any movement of the herbicide into the plants' water/nutrient systems, and prevents the necessary transfer into the root system. Also, the effectiveness of some water-borne treatments decreases as the plants' active growth systems cease as they move into winter dormancy. Conversely, during spring sap flow the herbicide can be washed off the cut stem surface. Such stem specific water-borne applications also commonly allow treatment of tall growing vegetation near water and in wetlands using aquatically approved herbicides.

The other method of stump treatment utilizes the oil-borne mixtures of low-volume basal to lightly wet the exposed bark and roots on stumps at any time following cutting. Oil-borne applications are especially effective to treat stems that may have been cut during periods of winter snow cover, or during spring sap flow. The application of oil-borne products can actually occur days or months after cutting.

While stump treatments can be used to lengthen the treatment season into the dormant season, the effectiveness of dormant season applications can be unreliable at times. Seasonal differences in plant physiology, together with a slowing and shutdown of the plants transport systems during fall, all winter, and into spring can dramatically affect performance of various products. Human error can further reduce the effectiveness of stump treatment when skips and misses occur.

Some water-borne applications have recently been shown to be even more effective just after the growing season, well into late November. When temperatures dipping below 32 degrees are encountered during these post dormancy applications, an anti-freeze fluid should be added to the mix. When treatments are scheduled during full dormancy in mid-winter conditions, crews should consider shifting to oil-borne mixes, or returning in the spring to treat with oil-borne mixes if there is snow cover. However, during late winter and early spring, pulses of sap issuing from the freshly cut stumps may actually flush the herbicide application away resulting in poor control.

Site Conditions: Cut and stump treatment is most effective when the site is:

- Within the shut off area or buffer zone for the foliar methods, (up to 5 feet from streams or lakes)

- An area of high visual sensitivity, such as heavily used highways or active parks, where tall growing, incompatible stems require removal

- An area immediately adjacent to residential, commercial or other high use public sites where, due to intense land use practices, hand cutting is warranted over foliar to preserve site quality and aesthetics

- The area is within the limits of a public water supply or immediately adjacent to a domestic water supply, and an approved aquatic herbicide can be prescribed for use

- The area is within a regulated DEC wetland, including either the immediate wetland and the regulated adjacent area, and aquatic products are approved in the wetlands permitting process

- Within a foliar site where individual stems are too tall for foliar treatment

Environmental Considerations: Drift is almost nonexistent due to the low pressures and the fact that treatments are made at ground level.

There is virtually no damage to non-target shrub species unless they are so close to the treated stem that exposed stems or roots are incidentally treated with an oil-borne herbicide as the target stump is treated. Off-target herbicide movement may occur when using water-borne products on root suckering, clone-type species such as black locust or poplar, or where root grafting between individual trees of the same species has occurred.

The zone of effect for stump treatment ranges from a few inches up to two feet in rare instances. It is caused when the herbicide mixture splashes off the stump surface during squirt bottle applications, or when the light mist from oil-borne applications falls on herbaceous under story next to the stump. Once again, the impact zone is minimum and temporary, with re-vegetation commencing later in the same growing season or early in the next season, depending upon when the treatment is made.

The application rates of herbicide concentrate per acre are nearly the same for water-borne stump treatments and low-volume backpack foliar treatments. However, stump treatments apply a more concentrated solution, close to the soil level, while backpack foliar applies a more dilute mixture that is largely intercepted by the herbaceous under story vegetation, as discussed earlier. While neither method creates a significant environmental risk, there may be a slight advantage for using low-volume backpack foliar application in wetlands where there is concern for applying herbicide at the ground level.

Hand cutting and stump treatment create the lowest visual impact, since incompatible stems are cut down, reducing or eliminating the problem of brownout.

Stump treatment applications will not be made within five feet of streams, ponds or lakes.

7.7.3.8. Cut without Stump Treat

Hand cutting without herbicides is used to temporarily clear incompatible tree species in areas with:

- Very high public sensitivity, such as lawns, parks, and schools or
- Immediately adjacent to streams, ponds and lakes or
- In the required buffer zones adjacent to registered organic farm fields or
- Other buffer zones as deemed necessary by the Manager, Vegetation Management

It is reserved for sites with deep public concern about herbicides, or where easement or regulatory constraints prevent the use of herbicides.

A variation of the hand cutting method further limits the clearing activity to just topping or pruning incompatible tall growing species, instead of completely removing them. The decision to top or prune trees within a site should only be considered after evaluating the conductor-to-ground clearance, density and height

of compatible vegetation, easement and regulatory restrictions, public attitudes, and reliability requirements.

Hand cutting is very labor intensive. The lack of herbicide treatment to control re-growth greatly reduces the long term effectiveness by increasing stem density over time. The problem is compounded when topping and pruning of tall-growing trees within the right-of-way is performed to maintain the required clearance. These methods should be considered as a last resort when other, more effective IVM methods cannot be used.

The heavy resurgence of stump sprouts and root suckers, combined with competition and shading by these taller-growing species may also adversely affect the survival of compatible shrub and herbaceous species from hand cut and/or trim sites where herbicide use is restricted.

The visual impacts may be an accumulation of brush and debris within the site, forcing more expensive chipping, cleanup and woody debris disposal costs on some sites.

7.7.3.9. Mowing

Mowing is a non-selective, mechanical method of cutting all vegetation within the right-of-way, using large all-terrain vehicles equipped with specialized mowing attachments. Mowers may range in size from Bobcat mounted mower heads, 4x4 farm tractors with rear mounted, 6 to 8 foot bush-hog type mowers that will cut and mulch small diameter trees and shrubs, up to large heavy duty equipment with front mounted, 8 to 10 foot cutter heads such as a hydro-ax that will cut and mulch trees up to 10 inches in diameter.

While the operator may be able to avoid an occasional clump of small vegetation, this is not practical on a large scale. Selectivity down to the plant level that can be achieved with other IVM methods is simply not possible with mowing. The frequent maneuvering, stopping, turning, and backing up required to work around and retain patches of compatible species add significant cost, and most often far outweigh the benefits of trying to retain compatibles. The problem also exists when mowing is performed in close proximity to poles, towers, guy wires, fences and other obstructions.

Mowing is limited to generally flat, gently rolling to moderate terrain, with dry soil conditions that will support the equipment without significant rutting. It should not be used in the spring or fall under wet soil conditions, or in wetlands where serious rutting would occur. Mowing cannot be used during periods of significant snow cover either.

The site must be free of large boulders and rock outcrops, logs and large stumps, and mowing should be closely monitored or even curtailed in the vicinity of homes and buildings, and along highways where the risk of flying debris (which can travel many hundreds of feet) could cause personal injury or property damage. Pastures require special attention to ensure cherry species are not mowed and left in the pasture during the growing season, and to avoid damaging fences. The stubble from cut stems and the amount of slash generated can sometimes pose a problem as well.

Site Conditions: Mowing becomes most cost-effective when:

- The site has an easement or regulatory restriction, or public concerns exist that make the site too sensitive for even highly selective herbicide methods. At the same time, hand cutting without stump treatment would be more expensive than mowing and the site is accessible to mowing equipment.

- Reclamation of upland sites on the electric transmission right-of-way that have become overgrown with dense, incompatible woody vegetation due to lack of past herbicide application, and although the site can now be treated, mowing will help reduce herbicide use requirements.

- Reclaiming sites that have become overgrown with tall growing shrubs in the wire zone, and although the site can be treated to prevent re-growth, mowing will help reduce herbicide use requirements.

- Establishing, widening or reclaiming an access path within the right-of-way that has become overgrown with woody vegetation and the site will be provided a follow-up treatment to prevent re-growth.

Environmental Considerations: Mowing equipment should not be used in sensitive wetland or stream areas where significant rutting could occur.

Work buffer areas should be maintained when working along highways and other high-use public sites to maintain public safety from flying debris.

Mowing can create sharply defined right-of-way edges by eliminating the smaller shrubs and herbaceous growth, as well as all taller growing stems from the border zones. The shredded brush, large woody debris and the cut stubble remaining on the site sometimes create visual problems and access impediments for landowners as well.

Mowing can dramatically alter short term vegetation conditions and thereby significantly affect wildlife habitat by completely eliminating nesting cover and forage plants. Other, more selective IVM methods can control these target stems while retaining nesting sites through the current nesting season, thereby reducing the overall impacts when compared to the short term dramatic habitat destruction associated with mowing activities. While the adverse habitat impacts from mowing are not usually long lasting, they create a distinct disadvantage for mowing from a wildlife perspective during the year following vegetation management. Limiting mowing activities to only a portion of the right-of-way wherever possible, such as around towers and along the access roads and routes, can minimize such effects.

Mowing equipment increases the risk of soil compaction from repeated traffic by heavy equipment. It also increases risk of erosion on moderate to steep slopes with light herbaceous cover. The mower may also scuff the soil surface removing protective litter and duff layers, temporarily exposing soils to erosion. Rutting and compaction can be minimized if mowing is done when the site is dry and more stable. However, this usually means mowing during the drier summer months when nesting of songbirds and small mammals may be at its peak.

Mowing equipment also presents a significant risk of oil spills and leaks from hydraulic lines and fittings due to the constant intense vibrations in the equipment. These lines and fittings should be regularly maintained and closely monitored to guard against rupture.

7.7.3.10. Mowing Without Herbicide Treatment

Mowing operations will typically result in dense, prolific re-sprouting from stumps and roots of all deciduous tree species unless the site is treated with herbicide, or the mowing is performed frequently enough to finally diminish root reserves and starve the plants into submission. Mowing without herbicide treatment becomes very cost prohibitive for most electric transmission rights-of-way.

7.7.3.11. Mowing with Follow-Up Foliar Treatment

There are currently two effective methods for completing a follow up herbicide treatment after mowing. The first uses follow-up foliar methods, including conventional high volume hydraulic on high density sites, and low volume hydraulic or low volume backpack on lower density sites. The preferred method of follow up foliar at Orange and Rockland is low volume backpack.

The choice between conventional high volume and low volume methods is based on site densities. High volume methods, using higher pressures to apply more dilute mixtures, will achieve proper coverage of all stems, while using less concentrate per acre than low volume treatments of more concentrated mixes.

Treatments are generally made one growing season after mowing, once the stems have had time to re-sprout and become woody. If they are treated too soon after sprouting (while the stems are fleshy and insufficiently developed), there is a risk that inadequate amounts of the herbicide will translocate into the root system resulting in a decreased rate of control.

7.7.3.12. Mowing With Cut Stubble

One method of applying herbicide after mowing is to use low volume basal methods and mixtures to treat the cut stubble after mowing. Applications can be made any time after mowing, including during the dormant season, making this method effective in sites with higher sensitivity to the brownout associated with low-volume foliar treatments.

This method includes all the benefits and concerns for basal operations, including higher overall application rates with oil-borne products, and application to the ground immediately adjacent to the target stem and exposed roots.

The development of a mower known as the Brown Brush Monitor is enabling treatment of the freshly cut stubble with 4 percent to 6 percent water-borne mixtures, and the mixture is applied at 15 to 30 gallons per acre. The mower attaches behind a heavy-duty 4X4 farm tractor, and contains a special herbicide treatment chamber located directly behind the mowing compartment. This unique piece of machinery allows the area to be mowed and treated with a single pass of the equipment.

The stubble is scarified with special knives that scratch the surface of the stem as it passes through the treatment chamber just after being mowed. A small quantity of a water-borne mixture is immediately wiped onto the stem and cut surface of the stubble, helping to reduce the over-spray onto the ground common with basal applications. The unit can mow brush up to approximately three inches in diameter. It is especially effective for controlling incompatible woody growth on gas rights-of-way, in access routes, and around structures, for converting low profile mid-span wire zone sites to compatible herbaceous communities, and for eliminating costly follow-up basal or foliar treatments in other areas where mowing is required.

Environmental Considerations: A buffer zone of 25 feet should be observed when using the Brown Brush Monitor adjacent to sensitive aquatic resources. This buffer should be increased in moderate to steep terrain to achieve adequate separation from water resources and minimize the risk of overland movement if there is a sudden rainfall immediately after treatment and before the material can dry on the plant surface.

7.7.3.13. Ultralow Volume Foliar (UVF) Thinvert ®

The UVF treatment has not yet been used operationally by Orange and Rockland but is now being considered. The UVF treatment method consists of the Thinvert ®[1] Application System. This distinctive proprietary system merges an exclusive patented series of spray nozzles together with a patented thin invert emulsion spray mixture by Waldrum Specialties, Inc. that collectively allows extremely low treatment rates in a highly efficacious manner. The principal functioning agents in the Thinvert® spray carrier is a combination of a paraffinic oil blend (about 95%) and an emulsifier/surfactant blend (about 5%). A variety of commonly used right-of-way vegetation management herbicides have been tested and are now being used operationally with this unique Thinvert ® spray carrier. This patented fluid is then used in conjunction with specialized nozzles designed specifically for this unique material to produce uniformly sized (300 to 500 microns) droplets. This droplet size is designed purposefully to enhance the rate of effective coverage while permitting virtually no spray drift to occur due to the inherent characteristics of the Thinvert ® spray carrier.

The Thinvert ® spray carrier part of the integrated system is actually a thin, low viscosity, oil-in-water emulsion[2]. Thinvert ® carriers are usually only slightly more viscous than typical basal oil carriers. For proprietary reasons it is not allowable to specify which specific fluids are utilized, nor the exact properties of a particular fluid which affect performance. However, these fluids allow formulation of low viscosity invert emulsions[3] with surface tension appropriate for generation of the desired droplet size spectrum, and that the volatility of these fluids is low enough to assist in maintaining acceptable droplet size while in-flight water evaporation is decreasing droplet size.

The Thinvert ® spray carrier is purposefully intended to be nonspecific. Waldrum Specialties does not provide any active ingredients, but rather provides a unique herbicide delivery system for the application of appropriately selected active ingredients. Thinvert® carrier is compatible with a variety of herbicides including those that are emulsifiable concentrates (e.g., Tordon K), water-based concentrates (e.g., Garlon 3A), and even certain solid concentrates (e.g., Escort). Hence, the Thinvert ® fluid could in simplest terms be considered just a substitute for spray tank water. Thinvert ® spray carrier fluids are much more expensive than water and thus all applications for the Thinvert® system are intended for situations where the total application rate, carrier plus end-use product, is in the low or ultra low volume category (i.e., only a few gallons/acre).

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1 The Thinvert ® Application System is protected by U.S. Patent Number 5,248,086. Thinvert® is a registered trademark of Waldrum Specialties.

2 A suspension of small globules of one liquid in a second liquid with which the first will not mix. Usually a colloid in which both phases are liquids (eg. an oil-in-water emulsion).

3 A dispersion of droplets of water in oil produced when a small quantity of water is mixed with a relatively large quantity of oil.

UVF General Discussion: The Ultra Low Volume Foliar (UVF) application as here proposed utilizes the entire Thinvert Treatment System® via a backpack application to be applied in a solely selective manner to the target tree species. Thinvert is a patented application system introduced by Waldrum Specialties Inc. that consists of a combination of specially designed ultra low volume nozzles and a thin invert emulsion carrier. Thinvert is a combination of phyto-bland paraffinic oil, surfactants, emulsifiers and water, blended to form a thin invert emulsion with a mayonnaise type consistency. Thinvert is then mixed with herbicides at the specified rate and applied in a selective manner in close (5 feet) proximity to the target species. This UVF treatment system produces quite uniform small white colored spray droplets that should be deposited on about 90% of the leaves. This ultralow volume Thinvert system inherently controls spray drift as well as provides leaf penetration and thus no other adjuvants; surfactants, dyes or drift control agents, need be added.

7.7.3.14. Other Transmission Maintenance Equipment and Methods

In addition to the methods described, Orange and Rockland also employs additional mechanical clearing methods. These include the use of off-road bucket trucks, skidder bucket trucks, and other aerial clearing devices (Jaraff-type). Mechanical equipment of this type can be used for on-right-of-way vegetation maintenance, off-right-of-way vegetation maintenance, danger tree mitigation, and edge work.

7.7.4 Regulatory Approval and Permits

Orange and Rockland policy requires compliance with all applicable federal, state and local laws, rules, and regulations. This requirement is included in the terms, conditions, and specifications for all contracts. Specifically, several state and federal agencies have regulations that govern or affect wetlands, threatened and endangered species, pesticide notification and public health.

The program further incorporates the specific environmental and vegetation management requirements of Article VII electric projects into the management goals and objectives of the Transmission Vegetation Management Plan. In addition, Orange and Rockland will strive to uniformly and consistently apply industry best management practices for environmental and vegetation management to all transmission line rights-of-way.

The Environmental Services Department is responsible for submitting environmental permit applications. Generally permits from landowners on the Orange and Rockland transmission system are not required because treatment rights are defined in easement documents. In some cases however landowners must be notified of impending work as per easement stipulations or herbicide notification requirements, as described later in this section. Permits, such as those required to apply herbicides in wetlands regulated by the NYS DEC are required for certain herbicide applications. Orange and Rockland has thus far not applied herbicides in DEC-regulated wetlands, but anticipates procuring a DEC wetland application permit in the future. Work plans and methods will be adjusted accordingly and plans will include consideration the time required to receive approval as well as schedule stipulations that may be required by the permit.

The NYS DEC also requires a General Activities Permit for other minor construction or maintenance activities in or adjacent to streams, lakes, wetlands and other waterways. The regulations include up to 44 separate activities, including construction or maintenance of stream-crossing devices, excavation or fill activities, and other site disturbances beyond the special requirements for herbicide activities.

The NYS DEC requires a Temporary Revocable Permit (TRP) for the removal of trees from state lands under the jurisdiction of the Division of Lands and Forests. On state lands where Orange and Rockland maintains a valid easement, no TRP is required for routine vegetation management within the right-of-way. For work outside the right-of-way (i.e., danger tree removal), Orange and Rockland will apply for a TRP where required through the appropriate Regional DEC office.

The New York investor-owned utilities have agreed to prepare a voluntary, annual submittal to the NYS DEC Natural Heritage Program, to provide them with the annual schedule and an electronic GIS or equivalent map file that identifies the line route, road crossings, and other pertinent land features. The submittal shall be sent to DEC at the same time as its wetland permit application, but no later than March 31 of each year. The Natural Heritage Program will use this information to identify known populations of rare, threatened or endangered species that may be found within 150 feet of the right-of-way and communicate those locations to the utilities.

Orange and Rockland Environmental Services Department and the Manager, Vegetation Management shall then work collaboratively with the DEC Endangered Species Unit when necessary to determine risks as well as any potential benefits to be derived from the vegetation management activities occurring within the right-of-way, and to the extent practicable, strive to schedule proposed vegetation management at a time when it might pose the least risk to the individuals or the population. The program is committed to a philosophy that most right-of-way management activities will either have a positive impact, or can be modified slightly to protect these critical species of concern, avoiding any impacts.

Once a plan of action has been agreed upon, it is the responsibility of the Manager, Vegetation Management to communicate and supervise contractor activities to implement the action plan. Orange and Rockland acknowledges its role as a good steward of the right-of-way resources it manages. However, it has been agreed through discussions with the NYS PSC and various other groups that under the conditions of this Plan, it is not the responsibility of each utility to perform searches for unknown populations on behalf of the state as a stipulation for any permitting or condition for allowing vegetation management activities to occur.

7.7.4.1. NYS DEC Public Notification and Posting for Herbicide Use

The New York State Code of Rules and Regulations (NYSCRR), parts 325 and 326, pertain to herbicide application for right-of-way management activities. This program and its specifications require compliance with all DEC pesticide notification, posting, and annual reporting requirements, together with requirements for business registration by commercial pesticide application contractors and the certification of various levels of individual pesticide applicators.

The Manager, Vegetation Management and appropriate contractor supervision as defined in the project specification shall be NYS DEC Certified Pesticide Applicators in Category 6. In addition, all other application personnel are required to be qualified at the apprentice, technician or fully certified applicator levels, as required by NYS DEC pesticide regulations. The contractor performing the vegetation management will provide all DEC required advance notifications to the underlying fee owners and/or occupants of dwellings located on a parcel of land crossed by a right-of-way easement upon which herbicides will be applied.

7.8. Notification and Communication

While most of Orange and Rockland's transmission right-of-way system is acquired through easements, a small portion belonging to Consolidated Edison but managed by Orange and Rockland is owned in fee. The easements typically grant the right to conduct routine maintenance activities, including vegetation management, danger tree removal, and ingress and egress. All easement and fee ownership agreements are documented and retained by the Real Estate Department. These documents are made available to property owners upon request.

The company strives to maintain good public relations with all underlying and adjacent landowners, to the extent practicable. The contractor is required to make reasonable attempts to contact and/or notify nearby residents of forthcoming crew or equipment movements, or any work operations that could directly impact them.

Orange and Rockland requires vegetation management contractors to comply with NYSCRR part 325 relating to the notification and posting requirements for the application of herbicides on the right-of-way. In addition, Orange and Rockland is continuing to develop a list of landowners that object to any herbicide use activities and/or request separate pre-notification prior to treatment. This database will also be used to identify activities that may require special herbicide use considerations, such as potable water supplies or the location of organic farming activities.

Orange and Rockland Utilities strongly believe that open, and comprehensive communication and notification is essential to the success of the transmission vegetation management program. To that end, ORU has in place a communication and notification plan that includes advance work notice to municipalities and appropriate local elected officials, state agencies, easement encumbered landowners, and abutting landowners.

7.8.1 Municipal and State Agency Notification

At least thirty (30) but not more than 180 days prior to the start of the cyclic ROW vegetation management work, a letter will be mailed or emailed to the appropriate local elected officials for the municipalities and area where the cyclical work will be taking place. This notification shall include a detailed description of the project area by listing the roads the transmission ROW parallels or crosses, anticipated start dates and estimated duration, and a basic description and explanation of the transmission vegetation management work to be complete. Any appropriate state agencies (i.e. NYSDEC, etc) affected by the ROW vegetation management work will also be contacted and notified in compliance with the established notification timelines.

7.8.2 Easement Encumbered Notification

Easement encumbered landowners will be contacted not less than (30) but not more than 180 days prior to the start of the cyclic ROW vegetation management. The notification and communication process will be in a door to door manner in an effort to directly reach each customer to hold a face to face meeting. The objective of this personal outreach to each customer will be to discuss the vegetation management work required, review the particular easement documents, the physical boundaries of the work, the methods and extent of the proposed work, provisions for clean up, and ROW restoration, and the expected dates of commencement and completion. Following a requested face to face meeting, the Customer Communication Record will be completed with the details of the vegetation work described and provided to the customer. Contact information including phone numbers will be provided to the customer and will be included on all related literature. Following the required notification timeframe, the work will proceed.

7.8.3 Abutting Landowner Notification

Abutting landowners to a transmission ROW undergoing cyclical transmission vegetation management work will also be contacted no less than (30) days and not more than 180 days prior to work taking place adjacent to their property. This notification will be in a door to door manner with information left, including contact phone numbers, should the abutting landowner have any questions to be answered. Information provided to the abutting landowner will include a general description of the transmission vegetation work to be completed, physical boundaries of the work, methods and extent of the work, clean up, and approximate commencement and completion dates.

7.9. Program Implementation and Monitoring

7.9.1 Determining Work Force

Transmission right-of-way vegetation management work is performed by contractors that are qualified to perform this work. Contractors are qualified through Purchasing Department protocol. In turn contractors are required to employ union personnel that meet the contractor's qualifications to perform this work. Personnel are qualified based upon training received from the contractors and unions, as well as work experience. Qualified contractors are awarded work based upon competitive bid. Copies of work specifications, and maps are provided to bidders during the bid process to assist them in locating and assessing the extent of work. Contracts are awarded in accordance with corporate purchasing procedures. Since most work is released to contract on a firm price or unit price basis, the contractor determines the actual staffing levels necessary to complete the work to specification and within the time limits of the contract.

7.9.2 Training

Orange and Rockland requires annual training sessions for contractor crews working on the system to review changes to the specifications, application methods, herbicide mixtures, criteria for treatment, species identification and all other pertinent and applicable information. This training emphasizes special areas of concern such as buffer zones, sensitive customers or right-of-way areas, environmental matters or permitting conditions, areas of high visual sensitivity, etc. It may also cover areas of concern from previous years' vegetation management activities. When necessary, if new herbicide products are to be used additional training will be performed by bringing in herbicide manufacturing company representatives to offer further instruction on how to best handle these new products.

As also described in Section 6.2.2, training also includes wire security zone clearance requirements, minimum vegetation clearance standards, inspection criteria, fall-over threats, steps to successfully implement the modified wire zone – border zone concepts, as well as how to identify compatible and noncompatible species located on the ROW This training will be required on an annual basis for the Orange and Rockland EHV lineman, supervisors, contractor inspectors, vegetation contractors, or any other personnel who perform right-of-way inspections, patrols, or vegetation maintenance. The training is designed to bring Orange and Rockland employees, contractors, contractor supervision, and field personnel who are directly involved in the design and implementation of this Plan, up to date on the goals, objectives and practices of the Plan, as well as achieve the successful implementation of the Plan. It is the only training required for contract employees engaged in transmission vegetation management activities.

In addition, Orange and Rockland encourages but does not require certified contractor personnel to participate in the annual Category 6 Pesticide Training Workshops held each autumn in central New York. The Manager, Vegetation Management or Chief Construction Inspector, Vegetation also regularly participates in these annual workshops to remain current with regulatory issues and concerns, and to stay abreast of the latest developments and best management practices.

7.9.3 Contract Specifications

The contract specifications are the mechanism for communicating the work plan, scope of work, and other relevant information regarding the performance of the work, much of which is contained in this Plan, to the contractor. A copy of the 2009 specification is included in Appendix C. Specifications are periodically revised to reflect ongoing program enhancements. Changes are communicated to the contractor through the bid process, and explained at the crew level through the training sessions described above. Both company and consulting personnel closely monitor operations to ensure that field activities are conducted in compliance with the specifications.

7.9.4 Supervision

The roles and responsibilities of the various levels of key Orange and Rockland supervision involved in the design and implementation of this Plan are discussed below.

7.9.4.1. Section Manager, Transmission & Distribution Maintenance

The Section Manager, Transmission and Distribution Maintenance is responsible for development of the vegetation management policies and procedures defined in this Transmission Vegetation Management Plan. Detailed position requirements can be found in the Position Description for this position.

7.9.4.2. Manager, Vegetation Management

The Manager, Vegetation Management is responsible for implementation of the policies, procedures and practices of this Transmission Vegetation Management Plan, together with on-going field monitoring of crew activities and performance to achieve compliance. The Manager, Vegetation Management is also responsible for implementing the training described in paragraph 7.9.2.

The Manager, Vegetation Management provides input to the Section Manager for short and long term scheduling and budget requirements, and along with the Chief Construction Inspector, Vegetation is the primary point of communication with the contractor's supervision and work force.

This position requires a BA or BS in Environmental Science, Forestry, or other related field, or equivalent work experience as accepted by the Section Manager, T and D Maintenance, and at least five years work experience in Utility Vegetation Management. Additional qualifications include International Society of Arboriculture Certified Arborist (within 18 months of accepting this position), International Society of Arboriculture Utility Specialist certifications (within 24 months of accepting this position), and New York State Department of Environmental Conservation Certified Pesticide Applicator license, or Pesticide Applicator Technician status (within 18 months of accepting this position). Detailed position requirements can be found in the Position Description for this position.

7.9.4.3. Chief Construction Inspector, Vegetation (CCI)

The Chief Construction Inspector, Vegetation, will assist the Manager, Vegetation Management in the field application of the Transmission Vegetation Management Plan. This will include assisting the Manager, Vegetation Management with annual work planning, contractor work crew direction, quality assurance audits, inspection of work adherence to contract specifications, and act as a liaison to local, county and State municipalities, and with the customers.

This position will require an Associates degree in Environmental Science, Forestry, or related field, or equivalent work experience as accepted by the Section Manager, T&D Maintenance, and minimum two years supervisory experience. Additional qualifications will include International Society or Arboriculture Certified Arborist (within 18 months of accepting this position), and New York State department of Environmental Conservation Certified Pesticide Applicator license, or Pesticide Applicator Technician status (within 18 months of accepting this position). Detailed position requirements can be found in the Position Description for this position.

The CCI is required to attend the annual training as required in Section 7.9.2.

7.10. Customer Inquiry and Complaint Resolution

Formal customer inquiries and landowner complaints concerning vegetation management are usually initially received through the Orange and Rockland call center, and then forwarded to the Manager, Vegetation Management for prompt resolution. More urgent concerns are often handled via telephone from one of the customer service representatives directly with the Manager, Vegetation Management or the CCI supervisor. The Manager, Vegetation Management, the CCI, and contractor crews are equipped with cell phones to assure timely communication at all levels. In addition, a dedicated transmission vegetation management line (1-866-458-3079) has been established and is printed on all Orange and Rockland transmission vegetation management materials that are provided to any customer. The dedicated transmission vegetation management line is manned by a Company representative during normal working hours or any time cyclical vegetation management work is being performed.

Once a call is received, the Manager, Vegetation Management or CCI contacts the customer to assess the nature and urgency of the concern, and schedules a site visit by the Foremen or other appropriate contractor personnel. When an inquiry is referred to the contractor for resolution, the Manager, Vegetation Management ensures that the customer's concerns are promptly, properly and courteously handled.

Most inquires and concerns, including minor property damage, are quickly resolved in the field through this process. However, when a customer concern or problem cannot be resolved in this manner, or the complaint involves significant property damage and/or personal injury, a field investigation is completed and a claim report is forwarded to a Claims Adjuster in the Legal Department. The contractor is also contacted to coordinate assessment and resolution with the customer, the Claims Adjuster, and the Manager, Vegetation Management. If the complaint involves regulatory agencies, the Manager, Vegetation Management notifies the Environmental Services Department, which then functions as the lead department and point of contact between the company and the regulatory agency. Complaints or problems with unauthorized dumping along the right-of-way are referred to the Security Department as required.

7.11. Field Completion and Reporting

Contractor work completions are reported to the Chief Construction Inspector, Vegetation for field review and audit prior to submittal of payment invoices. The CCI reviews the work in the field on a span by span basis. Work that is completed in accordance with the specifications and plans is approved for payment. Work which is not completed in accordance with the specifications and plans is returned to the contractor for reworking. After payment is approved invoices are prepared and further reviewed by the Manager, Vegetation Management and processed in accordance with corporate payment protocol.

Site-by-site completion data is reported via timesheets and chemical reports when herbicides are applied. This information includes date of work, treatment method and herbicide used. The crew foreman also records the actual man hours spent on each prescribed treatment as well as the equipment used and method of brush disposal. Costs are charged to a unique authorization number associated with each specific transmission corridor. This data is archived and is available for analysis, including determination of the cost per acre for each treatment.

The computerization of this information allows Orange and Rockland to track work completions, automate the year-end PSC reporting process, develop accurate baseline data, monitor future effectiveness of vegetation management activities and develop herbicide use trends. The system will also provide a hierarchy of reports that summarize information pertinent to the program from the right-of-way level up to total system reports.

Orange and Rockland will submit annual reports to the PSC, in the required format by March 31 of each year. The reports shall include the following:

- A summary of acres scheduled for each year, and the actual acres treated by line
- A summary of acres treated by technique
- A summary of cost per acre by technique
- A summary of herbicide use for each technique that identifies both mix gallons per acre and concentrate gallons per acre
- A summary of danger tree work and off-cycle hot spot activities by line
- A summary of environmental restoration and access road activities by line

7.12. Testing of New Materials and Mixtures and Research

Orange and Rockland is committed to only use federal and state approved herbicide products in a manner consistent with labeled directions and in a prudent, economically sound and environmentally conscious manner. Orange and Rockland is further committed to the continuous improvement and refinement of IVM techniques. This includes the proper storage, handling and application of herbicide products in accordance with label directives, and ongoing evaluation of treatment methods and mixtures in order to achieve reliable, cost-effective electric transmission while striving to achieve a long-term pesticide use reduction strategy.

Orange and Rockland will review and analyze technological improvements and product advances that may reduce herbicide use requirements and/or environmental risk while maintaining or improving efficiencies and effectiveness. As new products, equipment or treatment innovations become available, Orange and Rockland will first utilize small test

plots in a demonstration that will allow a complete evaluate of their field performance. Those products, mixtures or methods that show promise at the test plot level would then be further evaluated on more of an operational basis to assess their performance on larger sites, and over a broader range of species before being fully introduced into the Orange and Rockland right-of-way Vegetation management program. Orange and Rockland will cooperate with chemical suppliers, right-of-way vegetation researchers, and others to design, apply and evaluate these comprehensive field trials.

Orange and Rockland has a long history of partnership and participation in IVM research in New York State which began with the first ESEERCO right-of-way research study in 1973. The Company will continue to stay abreast of regional and national research developments by participating in local, regional, and national workshops such as Category 6, the Utility Arborist Association, the International Arborist Association, and periodic right-of-way management symposiums. Where gaps in vegetation management knowledge and data exist that could improve long-term program performance, Orange and Rockland will seek strategic partners or join with ongoing partnerships to share and equitably distribute the benefits and economic burdens of research.

7.13. Program Review

The performance, effectiveness and benefits of the entire right-of-way Vegetation Management Program are constantly under review to ascertain opportunities for improvement and risk reduction. Orange and Rockland will review this Plan in the context of assessing past performance, and reexamining goals and strategies at least once every six years. Areas of assessment will include reliability, cost, accessibility, vegetation heights and density conditions, herbicide use trends and customer concerns.

Any proposed changes to the plan will be brought to the attention of the PSC Staff. Minor changes to the plan will be those having no significant adverse impact to the reliability or to the environment (including public health). Minor changes to the plan will be referred to the Commission secretary by the PSC Staff. All other proposed changes would be considered major and will be referred to the Commission for action pursuant to the State Administrative Procedure's Act.

Revisions

Revision	Description
2007	Incorporated updates to practices and updates resulting from PSC Order 04-E-0822 and NERC Standard FAC-003-1.
2009	Incorporated updates to practices and consolidated ideas and concepts to add clarity.
2012	Incorporated requirements of PSC Order 10-E-0155.

8. Appendices

Appendix A - Species Listing

Appendix B – Application of Integrated Pest Management to Electric Utility Rights-of- Way in New York State

Appendix C – O&R Specification VM-01-09, Revision 2, Transmission Vegetation Management

APPENDIX A – SPECIES LISTING

Incompatible Tall-Growing Species

Table A1 lists tall-growing species are considered incompatible with most right-of-way situations, and should be removed wherever practicable, to the extent permitted by fee ownership, easement, public or environmental constraints. A primary goal of the Long-Range Right of Way Vegetation Management Plan is to effectively remove these species from the floor of the right-of-way, and prevent or minimize their re-growth and reinvasion.

Table A1 - Incompatible Tall-Growing Species

Sumac,, Poplar,	
Ailanthus/Tree-of-Heaven	Butternut
Apple	Cottonwood
Ash	Cucumber Tree
Aspens/Poplars	Elms
Balsam Fir	Hackberry
Basswood	Hemlock
Beech	Hickories
Birches	Hop hornbeam
Black Gum/Tupelo	Maples
Black Locust	Mountain Ash
Walnuts	Oaks
Box elder	Pines
Gum	Red Mulberry
Catalpa	Sassafras
Cedar	Spruces
Cherry, Black	Sycamore
Cherry, Choke	Tamarack/Larch
Cherry, Domestic	Tulip
Cherry, Pin	Willows (Trees)
Chestnut	Mulberry

Tall Shrubs and Small to Medium Trees

Table A2 lists taller shrubs and short stature trees that may be compatible along the edge of the right-of-way within the border zone or other portions of the right-of-way with sufficient clearances, except on narrow or consistently low profile lines. They will be removed from the wire zone in most cases, unless their mature height would **not** overtly invade the secondary wire security zone. They are only compatible in a wire zone location when the conductor-to-ground clearance is sufficient to allow them to reach maturity, and still have nearly the entire secondary wire security zone clearance at the time cyclic vegetation management occurs. Any tree or tall shrub that has the capacity to grow tall enough to invade the primary wire security zone always is a candidate for removal from the right-of-way -- no matter where it is located. The typical mature height for each species is included in the list below, together with their maximum known height.

These short stature tree species and taller shrubs are also to be preferred for retention in road screens, buffers areas and other sensitive sites, rather than any taller-growing tree species. However, the ultimate goal is stable, low-growing compatible species at all locations, and Orange and Rockland will strive to remove all non-compatible species over time, and eventually convert each site to compatible low-growing compatible vegetation.

Table A2 - Small to Medium Height Trees and Tall Shrubs

Species	Typical (Max)	Species	Typical (Max)
Apple	20 - 30' (50')	Hawthorne	10 - 30' (40')
Alder, Speckled	10 - 15' (35')	Juniper (Red Cedar)	15 - 35 (60')
Alder, Smooth	10 - 20' (40')	Mountain/Striped Maple	10 - 20' (35')
Buckthorn, Common	10 - 15' (25')	Olive, Russian	20 - 35' (46')
Buckthorn, European	10 - 15' (23')	Pear	20 - 35' (50')
Dogwood, Alternate Leaf	10 - 25' (35')	Shadbush/Serviceberry	15 - 30' (50')
Dogwood, Flowering	10 - 30' (40')	Shrub Willow	6 - 20 (35')
Cedar, White	30 - 50' (90')	Sumac	8 - 20' (35')
Holly, American	15 - 40' (100')	Witch Hazel	8 - 20' (35')
Hornbeam, American ("Ironwood")	20 - 35 (50')		

Woody Shrub Species

Table A3 lists shrub species commonly found on right-of-way in the southeastern portion of New York State. While they are nearly always compatible in the border zone, several may grow tall enough to invade well into the secondary wire security zone, and thus conceal other tall-growing species growing within their foliage structure. The typical mature height is listed for each species; together with the maximum know height as identified in the recently published *Northeastern Shrub and Short Tree Identification* book (Ballard 2004) that is specifically devoted to shrubs in right-of-way vegetation management.

The conductor-to-ground clearance, wire security zone requirements, and the mature height of each species are key factors in determining which shrubs may be retained in the wire zone, and which shrubs are mainly compatible in just the border zone. For example, a 345 kV line on steel poles may have mid-span conductor-to-ground clearances of 38 feet, while a 345 kV line on wood pole H-frame structures may have mid-span ground clearances of just 28 feet. With a secondary wire security zone standard of 25 feet for 345 kV, shrubs with a mature height in the 15-foot range could remain in the wire zone on the steel pole line, while only the smallest shrubs (around 5 feet tall) could be kept under the wires at mid-span on the wood pole line.

Any vegetation that grows tall enough to invade the primary WSZ should be removed. Those plants that can invade the secondary WSZ should likewise be removed, except that no more than 30 percent of the shrub cover may be removed from a span in any treatment cycle. Shrubs that are closest to the primary WSZ will be targeted first for removal. If total shrub densities become dense along and within the right-of-way access routes within the wire zone, even the smaller shrubs will be targeted in order to keep these access routes open.

Table A3. Wood Shrub Species

Woody Shrubs

Autumn Olive	8 - 12' (16')	Laurel, Sheep	1.5 - 3.5'
Azalea, Swamp	4 - 10' (15')	Leather leaf	2 - 4'
Barberry, Common	10'	New Jersey Tea	2 - 3' (4')
Chokeberry, Black	4 - 6.5' (10')	Northern Prickly Ash	4 - 10' (35')
Chokeberry, Red	10 - 12' (20')	Shrub Oak/Bear Oak	4 - 10' (26')
Blueberry, High bush	3 - 10' (13')	Privet	5 - 15'
Button Bush	6 - 8' (18')	Rhododendron	3 - 9' (12')
Dewberry	1 - 3'	Rose, Multiflora	6 - 12' (15')
Dogwood, Red Osier	3 - 10' (12')	Rubus sop.	3 - 6' (10')
Dogwood, Grey/Stiff	3 - 10' (16')	Snowberry	2 - 3' (6')
Dogwood, Silky	3 - 10' (16')	Spicebush, Common	8 - 12' (16')
Dogwood, Round leaf	3 - 10' (12')	Spirea, Meadowsweet	2 - 5' (6.5')
Elderberry	5 - 10' (12')	Spirea, Steeple Bush	2 - 4' (6')
Gooseberry	3- - 5' (10')	Sweet fern	2 - 3' (5')
Hazelnut, American	5 - 10' (12')	Sweet Gale/Meadow fern	2 - 5'
Hazelnut, Beaked	5 - 12' (14')	Viburnum, Arrow wood	6 - 12' (16')
Hemlock, Ground/Yew	2 - 3' (6')	Viburnum, High bush Cranberry	5 - 15'
Holly Mountain	4 - 10' (22')	Viburnum, Maple leaf	3 - 6'
Honeysuckle	5 - 10'	Viburnum, Nannyberry	8 - 15' (33')
Huckleberry	2 - 4' (6')	Viburnum, Northern Wild Raisin	6 - 12' (16')
Juniper, Creeping/Trailing	<1' (3')	Viburnum, Hobblebush	3 - 6' (10')
Juniper, Ground	1 - 5' (30')	Winterberry Holly	6 - 10' (25')
Laurel, Mountain	5 - 15' (32')		

Climbing Vines

Bittersweet
Grape
Virginia Creeper

Appendix B

APPLICATIONS OF INTEGRATED PEST MANAGEMENT TO ELECTRIC UTILITY RIGHTS-OF-WAY VEGETATION MANAGEMENT IN NEW YORK STATE

Environmental Energy Alliance of New York
Land Use Subcommittee Committee
Position Paper

The Environmental Energy Alliance of New York is an association of electric and gas Transmission and Distribution (T&D) companies and electric generating companies that provide energy services in the State of New York. This position paper was prepared by the Land Use Subcommittee of the T&D Committee, which currently represents the following members: Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Long Island Power Authority, New York Power Authority, New York State Electric & Gas Corporation, Niagara Mohawk, Orange & Rockland Utilities, and Rochester Gas & Electric Corporation. For more information about this Position Paper please contact Kevin T. McLoughlin, the System Forester for the New York Power Authority at P.O. Box 200, Gilboa, New York 12076. Tel. (607) 588-6061 ext. 6903, Fax (607) 588-9826 or e-mail Kevin.Mcloughlin@nypa.gov.

Executive Summary

As a matter of public safety and system reliability, electric utility rights-of-way (ROW) vegetation managers have a continuing need to preclude the establishment and subsequent growth of tree and tall woody shrub species that are capable of growing up into or even close to overhead electric lines. The members systems of the Environmental Energy Alliance of New York (EEANY) Transmission & Distribution (T&D) Committee employ the process of Integrated Pest Management (IPM) to ensure that tall growing trees and woody shrubs do not interfere with these critically important electric power transmission facilities. IPM balances the use of cultural, biological, physical and chemical procedures for controlling undesirable tall growing woody species on utility ROW. These IPM procedures, as practiced by the New York State electric utility industry, can be more appropriately referred to as an Integrated Vegetation Management (IVM) strategy. One of the important components of the IPM/IVM process is the selective use of herbicides to curtail the growth of undesirable tall growing species while preserving, to the extent practical, the lower growing vegetation on the ROW to act as a biological deterrent to the future re-establishment of trees.

The EEANY Land Use Subcommittee members have been practicing IVM policies and programs for well over two decades on those portions of the approximately fifteen thousand circuit miles encompassing over one hundred thirty thousand acres of overhead transmission line ROW that require the vegetation to be managed. IVM is an environmentally compatible activity that is cost effective and has all the elements of a conscientiously applied IPM strategy. This paper discusses the application of IPM to contemporary electric utility ROW vegetation management practices in New York State today as a truly ecologically based approach to pest management.

APPLICATION OF INTEGRATED PEST MANAGEMENT TO ELECTRIC UTILITY RIGHTS-OF-WAY VEGETATION MANAGEMENT

Integrated Pest Management (IPM) is a process that balances the use of cultural, biological, physical and chemical procedures for reducing pest populations to tolerable levels. Rather than relying solely on chemicals (or eliminating chemicals completely) IPM seeks to produce a combination of pest control options that are compatible with the environment, economically feasible and socially tolerable. The control of vegetation, i.e., the contemporary management of vegetation, on electric utility line rights-of-way (ROW)[1] readily accommodates itself to an IPM process. This paper describes how the member electric systems of EEANY T&D Committee have been actually practicing an IPM strategy for about two decades. However, that strategy can be more appropriately referred to as an Integrated Vegetation Management (IVM) strategy.

BACKGROUND

In New York State after a forested landscape is cleared, or when a cultivated field is abandoned, the natural vegetation type that will ultimately re-occupy the site and dominate the area will be tall growing trees. When the cleared area is an electric utility ROW, these resurgent trees can grow too close to the overhead electric lines. When this occurs, there is the potential for an electrical discharge from the electric line through the air to the tree and then to the ground. This is known as a "line to ground fault" or "flash-over." The result of a line to ground fault is an instantaneous break in electric service and a potentially very dangerous situation on the ground in the immediate vicinity of the high voltage discharge. Therefore, as a matter of public safety and system reliability, utility ROW vegetation managers have a continuing need to preclude the establishment and subsequent growth of those tree species including some tall growing woody shrubs that are capable of growing into or even close to the electrical lines.[2] Utilities ensure that tall growing species do not interfere with electric lines by committing to a long-term ROW vegetation management program.

INTEGRATED VEGETATION MANAGEMENT AS AN IPM STRATEGY

IPM has been described as a system of resource management that attempts to minimize the interaction between the pest and the management system through the integrated use of cultural, biological, physical and chemical controls. Implementation of an IVM program utilizing modern ROW vegetation management techniques meets this definition completely; IVM is a system of resource (vegetation) management that minimizes interaction between the pest (tall growing trees) and the management- system (safe and reliable electric service) through the integrated use of cultural (mechanical and manual methods that physically remove tree stems), biological (low growing plants and herbivory), and chemical (herbicides) controls.

Utilities use three general routine procedures for removing tall growing trees from the ROW: (1) mechanical methods such as mowing with large machines and hand cutting with chainsaws, (2) chemical treatments, i.e., the selective application of herbicides and (3) combinations of both mechanical and chemical methods.

Mechanical methods of tree removal alone will clear the ROW of tree stems temporarily. However, employment of these mechanical methods allows trees to physiologically respond by regenerating quickly from the energy reserves contained in their undisturbed root systems. This tree regrowth occurs through such mechanisms as "stump sprouting" and/or in some species "root suckering." This regenerative capacity is characteristic of virtually all hardwoods,[3] e.g., maple, beech, birch, aspen, oak, ash, cherry, etc. and is

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1 Electric utility ROW are strips of land, from 30 yards to over 300 yards in width that are used by electric utilities as corridors for the transmission of electric energy.

2 The electrical facilities being discussed herein are for the most part high voltage transmission lines and only those lower voltage distribution lines that have a discernible cleared ROW. There are more than 15,000 circuit miles of overhead transmission lines at or above 34.5kV belonging to the member systems of EEANY. ROW vegetation management under these electric transmission facilities is quite distinct from roadside tree trimming around distribution lines and these street tree-pruning operations are not the subject of this paper.

3 Hardwood is a conventional term for all deciduous (broad-leaved) trees belonging to the botanical class "Angiosperm." Softwoods, also commonly referred to as evergreens and conifers, belong to the botanical class "Gymnospermae" (and are practically confined to the order "Coniferae") do not posses this regenerative trait (with one lone partial exception in the northeast – young pitch pine), and once cut below the lowest whorl of live branches will not resprout.

particularly pronounced in the juvenile or sapling stage of tree maturation resulting in the eventual production of many more stems than were originally cut. By drawing upon the food reserves in their undisturbed root systems and through a series of complex compensatory physiological plant responses, the resurgent growth from the remaining portions of the tree (stump and/or roots) is actually enhanced when a tree stem is severed. It is through the production within the plant of naturally occurring stimulatory substances together with the loss of growth inhibitors (caused by the removal of the above ground growth centers) which then exert their influence on the remaining vegetative structure to promote excessive new tree growth. These new, more numerous stems, growing much faster than when left uncut, (e.g., five to ten feet or more the first year after cutting) makes subsequent tree removal from the ROW more frequent, laborious, hazardous and costly.

The selective application of herbicides to only the tall growing target tree species can in most instances eliminate completely the resurgent tree growth problem because the herbicide when properly deposited on the target species translocates throughout the tree (including the root system) and arrests all future growth and development, i.e., killing the entire target plant not just temporarily removing the above ground portion. Selective herbicide application involves two general techniques:[4] a basal application to the lower stem of the tree and a foliar application to the leaves. Selective application of herbicides only to the targeted tall growing species allows retention of nearly all the desirable low growing vegetation on the ROW. The elimination of the tall growing trees from the ROW will also encourage the further growth and development of all the indigenous low growing woody shrubs, herbs (forbs and grasses), ferns, etc. by removing the trees that would otherwise begin to directly compete with and eventually "crowd out" the low growing species over time. With effective minimally disruptive tree removal, these lower growing desirable plant species will expand into the ROW areas formerly occupied by trees and produce a thick dense plant cover that will discourage the invasion of new tree seedlings and/or the future growth of any remaining tree seedlings. These desirable low growing plant communities act as the "biological controls" in this IPM/IVM scenario. The establishment and the preservation of these low growing plant communities on ROW serve to reduce over time the amount of work required and cost incurred by the utility to maintain the ROW each treatment cycle while coincidentally diminishing the amount of herbicide necessary for adequate coverage of the target species.

Mechanical and chemical controls are often used together with favorable synergistic results. For instance, a tree is manually cut with a chain saw and the resulting freshly severed stump is treated with a herbicide formulation to prevent resprouting. This procedure removes the immediate physical threat to the overhead electrical line as well as the future tree growth with little disruption to the surrounding desirable plant cover while requiring very limited use of herbicides in a highly efficacious spot application.

ESSENTIAL ELEMENTS OF AN IPM STRATEGY
ILLUSTRATIONS & EXAMPLES

Traditional IPM programs consist of five basic elements: (1) preventive measures, (2) biological controls, (3) monitoring, (4) assessment, and (5) control measures. These essential elements of a sound IPM/IVM program are illustrated in the following examples.

1. Preventive Measures

When the land use of a ROW is altered to preclude the establishment and growth of trees, the utility has little, if any, ROW vegetation management activities to perform. This advantageous situation occurs when a ROW fee owner or adjacent land owner productively uses the ROW in a manner compatible with the electrical facilities, and this use usurps the potential development of tall growing trees. The most common ROW multiple uses often involve various types of agricultural[5] activities, i.e., crop production, pastures for grazing livestock,

[4] Many variations of these two techniques exist.

[5] It should be noted that most agricultural pursuits require the use of significant amounts of various pesticides, e.g., insecticides, fungicides, herbicides, etc. on an annual basis. Thus, the total quantities of pesticide applications will often dramatically increase on those ROW areas converted to farmland as compared to the spot treatments of herbicides every four to seven years by the utility.

and within certain height limitations even Christmas tree plantations and some types of orchards. Those agrarian activities, as well as many other types of allowable industrial, commercial and residential multiple uses, which effectively curtail the opportunity for any tall growing vegetation to become established can thus eliminate completely the burden for any ROW vegetation management by the utility. However, any use of the ROW that allows even one tree capable of growing up into the electrical lines, e.g., hedgerows between cultivated fields, requires due diligence by the utility to prevent an electrical discharge.

2. **Biological Controls**

One of the principle goals of ROW vegetation management is to promote low growing relatively stable (long lived) plant communities, which consist of numerous species of woody shrubs, herbs (forbs and grasses), ferns, etc. on the ROW. These low growing plant communities are a very desirable ROW accessory in that they inhibit both tree establishment and their subsequent growth by directly competing with the tall growing species for the available site resources (sunlight, water, and nutrients). Thick low-growing plant communities, which hinder tree seed germination and the early development of the undesirable tree seedlings and small tree saplings, act as the biological control agents in this IPM/IVM strategy.

There may even be some indirect biochemical interactions, called allelopathy, occurring among various plants that result in a chemical competition of sorts between certain lower growing desirable ROW species and some of the tall growing tree species. Allelopathy has been defined as the influence of one plant on another via the production of natural growth inhibitors. Currently there exists only a limited understanding of this ability of plants to produce and release phytotoxic substances that can then be translocated to other plants and used to curtail certain critical physiological plant functions such as growth and reproduction. These naturally occurring "herbicides" offer yet another potential beneficial aspect of the biological controls in assisting the ROW vegetation manager to curb the spread of the undesirable tall growing trees.

In addition to their immediate benefits to the utility of reducing the undesirable tree population, these low growing plant communities offer an assemblage of plant species that provide diverse and productive habitat conditions for a wide variety of wildlife, e.g., birds and mammals. Managed ROW creates habitats that provide wildlife food and cover values that are remarkably different, and oftentimes surpassing, those of the neighboring forest. Also, this juxtaposition of two different, but complementary plant communities (one perpetually kept in a low growing condition and the other usually a forest) produces what is known as the "edge effect." This effect enhances wildlife profusion, i.e., abundance and diversity, in the boundary area transition zone (ecotone) between these two distinct habitat types. Some of the new and more numerous wildlife species attracted to these enhanced ROW created habitats provide yet another beneficial function of further reducing tree establishment and growth through their collective herbivory, e.g., browsing by deer and rabbits on young trees, girdling of tree seedlings by voles, and tree seed predation by mice.

3. **Monitoring**

As explicitly called for in an IPM program, monitoring of the pest population involves the following items:

- Regularly checking the area
- Early detection of pests
- Proper identification of pests
- Noting the effectiveness of biological controls

The ROW vegetation managers of the EEANY member systems routinely carry out all of these monitoring activities as an integral part of their electric utility ROW vegetation management programs. Monitoring procedures have been integrated into the NYS Public Service Commission approved "Long Term ROW Management Plans" developed by each member system. Monitoring activities include an evaluation of the previous treatments to determine overall program effectiveness as well as the current condition of the ROW so as to ascertain when the next treatment should occur and by what means. All of these procedures are part of a sound IPM/IVM strategy. ROW throughout New York State are regularly inspected to determine the height and density of the tall growing target tree species as well as the condition of the lower growing vegetation. Inspection results help determine, to a large extent, the timing and type of ROW vegetation treatment that the utility implements.

These field inspections also serve another important function, i.e., the fulfillment of a quality assurance/quality control (QA/QC) program. This QA/QC component of the ROW vegetation management program provides feedback as to the conduct of the field crews regarding their adherence to the work specifications as well as to determine the longer-term efficacy of the treatments. In addition to the routine utility monitoring, the Department of Public Service staff annually inspects the results of the company ROW vegetation management programs to insure compliance with all applicable regulatory mandates.

Identifying the undesirable tree species is a critical component of an IPM/IVM program. With hundreds of species present on a ROW, all vegetation treatment personnel must be sufficiently knowledgeable of plant species to enable them to readily distinguish between target trees to be treated, and all non-target desirable low-growing species to be left as undisturbed as possible. Based upon field inspections, the type of vegetation treatment will also be determined in large part by the distribution and abundance of the lower growing species. For instance, when thickets of shrubs, such as viburnums or dogwoods, are present together with only a few target tree stems, the highly selective stem specific application of herbicides would produce the most acceptable results. The extensive use of mowing for example over such a ROW segment containing only a few target species would be quite disruptive to the existing desirable low growing vegetative cover. Such an ecological disturbance would unnecessarily leave the ROW in a much more open and vulnerable condition thereby actually enhancing the ROW site conditions for the eventual re-establishment of undesirable trees as well as significantly reduce its aesthetic and wildlife values.

4. Assessment

Assessment is the process of determining the potential for pest populations (target trees) to reach an intolerable level. For ROW vegetation managers, the most opportune time to eradicate target trees is well before they reach the height of the overhead electrical lines. From an assessment perspective, an effective IPM/IVM strategy needs to: (a) prevent any interruption of electrical service and avoid risk of injury to the public, (b) treat the target species at their optimum height range as they emerge from the lower growing plant cover (at this stage they can be conveniently treated with limited amounts of herbicide so as to achieve the highest degree of control possible), (c) cause the removal of the target tree species before they become tall and dense enough to begin to crowd out and adversely alter the composition, structure and density of the desirable lower growing vegetative cover and (d) minimize any direct disruption by the treatments themselves to the existing desirable ROW plants so they continue to occupy the ROW and function as biological controls.

5. Control Measures

IPM strategy dictates that once a pest population has reached the intolerable level action should be taken. Typically, under an IPM program, chemical pesticides are used as a control measure when no other strategies will bring the pest population back under the economic threshold. In fact, the success of IPM often occurs by waiting until a pest population reaches this threshold and then often hinges on the availability of a pesticide to bring the pest population back under control quickly. For ROW vegetation management the pest population consists of only the target tree species that meet certain critical height[6] characteristics. Only those trees that have emerged from the lower growing plant "canopy" need to be selectively removed; thus many very small tree seedlings may remain untreated, submerged within the low-growing plant community on the ROW. Most of these small tree seedlings, left fully submerged within the dense low growing understory vegetation, will never fully develop into trees as they will succumb to the surrounding competitive pressures of the lower growing desirable vegetation and its associated biotic agents, e.g., animal herbivory. An additional positive attribute of this biological control feature occurs when those few remaining target trees that finally "escape" from the low growing plant communities only do so after a considerably longer time period than would normally

[6] This "critical tree height" is determined "electrically" by the distance between the tip of the tree and the overhead electric line with consideration for the voltage of the transmission facility, at any given point on the ROW. The higher the line voltage the more clearance that is necessary around the conductors which is often referred to as the wire security zone. For instance, a 765 kV line requires a greater wire security zone distance (about 10 feet more) than a 345 kV line needs. Also, as the voltage of the transmission facility increases the minimum wire distance from the ground likewise increases. The minimum conductor sag at mid-span allowed for a 765 kV line is about 50 feet from the ground whereas a 345 kV line only requires a height of around 30 feet from the ground. Finally, the location of the tree on the ROW will determine the distance to the conductors and the resulting allowable maximum tree height that can be tolerated at that particular point. Trees located near the edge of the ROW or close to tall towers can be allowed to grow taller than their compatriots located in the center portions of the ROW near conductor mid-span which is within the area of maximum line sag, i.e., where the line is closest to the ground.

happen under relatively (open) unencumbered circumstances. This helps to extend the duration between ROW vegetation treatments.

The choice of treatment technique as well as the explicit mode of application to ensure adequate control of the target tree species are also important aspects of selective ROW vegetation management that uniquely qualifies IVM as an IPM approach. As part of an IPM/IVM program, herbicides are used only to treat individual tree stems or groups of target trees, and no aerial or indiscriminate ground broadcast (blanket) applications (uniformly spraying the entire ROW) are used in New York State today. Herbicides that are used on ROW are matched to site-specific characteristics and target species, and the products are selected from dozens of commercially available materials based upon various attributes such as efficacy, toxicity, cost, etc. Furthermore, once a specific herbicide(s) is selected for application, its efficacy can be further enhanced (and its environmental impact minimized) by proper timing and selection of the most suitable method(s) of treatment (including integration with mechanical controls) together with choosing the most appropriate formulation and dosage rate.

The option of non-chemical mechanical clearing of the ROW; by hand cutting with chainsaws, mowing with large machines like a hydro-ax or even using massive earth moving equipment in a stump/soil shearing operation, is most always an available alternative. These physical methods of tree species removal are used for those ROW segments occupied by or located close to sensitive land uses or containing special resources that have been determined to be vulnerable to the application of herbicides. These designated ROW locations can be granted this extra protection through the judicious use of "no spray zones" or "set back distances" which are often referred to as "buffer zones" where herbicide use is not allowed. The determination not to use herbicides can be made by the ROW manager on a site-specific basis or through general company policy even when law, regulation, and label conditions allow such herbicide use. The discretion to employ buffer zones as well as the selection of the appropriate set back distances, must be made in a prudent manner since all the mechanical alternatives will inevitably cause an increase in the number and vigor of incompatible tree species on those portions of the ROW so treated. However, the opportunity to employ mechanical clearing of the ROW is an available option for the ROW manager on specifically chosen ROW segments with certain predetermined characteristics that warrant this treatment. Herbicide usage can be restricted in deference to specific notable ROW resources or as a consideration to particularly sensitive land use conditions while still maintaining the overall goals of a sound, long term, and effective IVM program when viewed from a system-wide perspective.

Even in certain ecologically sensitive areas, the selective use of herbicides may be apropos provided the appropriate precautions are taken. For instance, when treating vegetation in or adjacent to designated wetlands, a herbicide with the appropriate characteristics, e.g., an aquatic or wetland label could be selected. However, to assure that virtually no surface water contamination occurs (irrespective of any allowable label statements) buffer zones can be prescribed around streams, lakes, wetlands, and other sensitive water resources. Studies have shown that buffer zones of only 5 to 25 feet can effectively curtail the deposition of airborne spray particles and the movement of the herbicide by runoff into surface water resources. A dense stand of vegetation in the buffer zone will further reduce the linear distance of buffer zone necessary, as will very stem specific treatment techniques. Conversely, sparse vegetation in the buffer zone and high volume treatments will increase the distance of the buffer zone required to insure abatement of any herbicide movement. All established EEANY member system specifications for their buffer zones meet or exceed these threshold conditions.

ROW CONVERSION

One quite unique aspect of IPM, as applied to the management of ROW vegetation, is the relative long-term nature of the desired effects and the timeframe required to assess the consequences of actions taken. Although, mechanical removal of the tall growing trees will physically eliminate the immediate threat to electrical reliability and public safety, this method only serves to perpetuate the long-term tree problem and exacerbate future ROW maintenance requirements. Typically, mechanical tree removal will result in the need for more cutting as frequently as every two or at most about four years. After several mechanical treatments, i.e., over a number of ROW treatment cycles, the collection of tree stems requiring control can readily increase to over 20,000 stems per acre. Similarly, when a new ROW is cleared and all vegetation is allowed to grow back naturally, the target tree densities will likewise increase to very high levels in only a few years after the initial tree removal operations and prior to any herbicide application. In fact the term "ROW Reclamation" is customarily used to describe the extreme actions that must often occur to treat very high tree stem densities that are frequently found on a routinely mechanically treated ROW.

When herbicides are used over several treatment cycles, the period of time between treatments can usually be elongated from three or four to six or seven or even more years and concurrently the number of stems to treat each cycle becomes fewer. Herein lies the truly unique aspect of ROW vegetation management from an IPM/IVM perspective; the treatment of vegetation with herbicides must be viewed over the long term to fully grasp the significance of this system in reducing the target tree population that will also reduce the use of chemicals and concurrently increase the effectiveness of the biological controls, i.e., all the lower growing plants that volunteer to occupy the ROW. For example, when a new ROW (or an older ROW that has received only mechanical treatments) is first treated the amount of herbicide needed for proper coverage of the numerous target trees may be in the order of about two to four gallons of concentrate per acre. The following treatment, in the next cycle, may require about half that amount because the number of target species has been reduced and the lower growing desirable vegetation is beginning to exert it's influence on the ROW vegetation dynamics. Subsequent treatments will continue this downward trend in herbicide usage that produces "nearly" a tree-free ROW requiring a minimum of judiciously applied herbicide to produce the desired effect. At this stage the low growing vegetation is firmly established and offers a relatively stable condition that effectively inhibits the rapid resurgence of trees. However, in order to perpetuate this highly desirable minimum maintenance ROW condition, when new trees begin to emerge (as they most certainly will from the tree seed sources off the ROW) these target trees must still be controlled through the diligent efforts of the ROW vegetation manager to preclude their full development and ultimate dominance over their lower growing associates.

This process of "conversion" from a ROW that is literally filled with trees to one that is dominated by lower growing vegetation with only a few remaining tree stems capable of growing into the overhead electric lines is not a simple one step process, but requires an extended program commitment and adherence to a long range vegetation management plan. Each phase in the ROW conversion process can be quite complex depending in large part upon the target species mix coupled with tree height and density together with the abundance and distribution of the low growing vegetation as well as other site specific characteristics. As the stem density of the target species is reduced with each passing treatment cycle, the type of treatment chosen can then become more selective. Finally, after several treatment cycles when the ROW is occupied by a low density of target trees and the conversion process virtually completed some continuing herbicide use will still be required, but the focus at this stage shifts to selecting techniques which offer the minimum amount of disturbance to the desirable lower growing vegetation, i.e., the biological controls.

GENERAL CONSIDERATIONS

The use of herbicides by the EEANY member systems is subject to regulation under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) administered by the U.S. Environmental Protection Agency (EPA) and Article 33 of the New York Environmental Conservation Law (ECL) administered by the Department of Environmental Conservation (DEC). Pursuant to FIFRA regulations, no herbicide may be marketed, distributed, sold or advertised until the EPA registers it. After many years of product development, advanced toxicology studies and field testing, the pesticide manufacturers submit to EPA thousands of pages of research data that are compiled into a registration application. From this voluminous registration package, the manufacturer develops a proposed product label that identifies the pest or pests that the product will be effective in controlling and provides complete instructions for correct use, handling, and disposal of the product as well as other information required by FIFRA. In New York State, the DEC has the responsibility for establishing regulations and standards for the registration of pesticides, the certification of pesticides applicators, and all other matters pertaining to pesticide use as well as the responsibility for enforcement of all it's regulations and standards.

Other Federal, State and even local laws and their resulting regulations may impinge on the manner in which ROW vegetation management activities will occur. As mentioned previously, wetland protection requirements can have a pronounced effect on the types of vegetation management techniques chosen. Considerations for the protection of endangered or threatened species and their habitats can similarly become a dominant concern on some ROW. For instance, the nurturing of the endangered Karner blue butterfly and its requisite host plant, the blue lupine, has resulted in considerable evaluation of selected ROW herbicide use in the preservation and enhancement of the habitat conditions necessary for the survival of this endangered species of

butterfly. Even the State requirements for management of river corridors under the Wild and Scenic Rivers Act provide definitions and requirements for IPM. Local ordinances, zoning mandates, as well as property owner concerns may sometimes play a critical role in the selection of ROW vegetation management techniques, e.g., the control of poisonous plants, invasive weeds, and allergy producing pollinators. In some instances voluntary compliance with provisions of the Federal Noxious Weed Act may require action on the part of utility ROW vegetation managers to prevent the spread of listed deleterious weeds and other alien invasive species. For example, the control of infestations of the introduced weed, purple loosestrife, which threatens the biological integrity of North American wetland ecosystems by displacing native vegetation is a goal shared by the electric utility industry with both state and federal environmental agencies.

Prevention of Non-point Sources of Pollution & Storm Water Discharge Requirements

Another important regulatory program that can directly affect the choice of ROW vegetation management practices available under IPM/IVM is found within the authority of the Clean Water Act as amended by the Water Quality Act of 1987 and involves the control of non-point sources of water pollution along with some aspects of the permit requirements for stormwater discharges for point sources resulting from construction activities. These regulatory programs focus on water quality issues, i.e., the prevention and control of water pollution. In both programs, as they apply to the ROW maintenance situation, the focus is on using management practices to prevent, reduce, minimize or otherwise control the availability, release, or transport of substances that adversely affect surface and ground waters. They both act generally to diminish the generation of potential water pollution emanating from sources on the ROW.

The control of non-point sources of pollution is accomplished through the identification of "best management practices" (BMP's) and their implementation on a site-specific basis using best professional judgment and experience. The control of stormwater discharges which can be considered as point sources due to their collection of runoff into a single outlet, e.g., a culvert or ditch, are similarly treated by the requirement to prepare a "Stormwater Pollution Plan" under the auspices of a SPDES (State Pollutant Discharge Elimination System) General Permit. This plan essentially enumerates the BMP's that will be used to prevent and/or control polluted runoff from occurring. Neither of these programs imposes effluent limits for specific substances, rather they provide for an effective means of reducing or preventing the impact of pollution generated from land management activities. In addition to the ROW managers primary concern of minimizing pesticide related impacts within the context of an IPM strategy, these two somewhat interrelated regulatory programs broaden the environmental concerns arising from IVM to encompass other pollution control objectives. Thus, both of these clean water related programs could directly influence the decision-making process of the ROW vegetation manager and in some cases virtually dictate the menu of treatment choices available.

The most common potential source of pollution arising from a ROW is erosion and the resulting generation of sediment causing siltation in streams and other waterbodies. Sedimentation from all sources is a major water quality degradation issue in New York State. Also, the loss of soil nutrients and their entryway into surface watercourses or groundwater by excessive leaching or as attached to sediment particles is likewise an important water quality concern. Both of these major sources of water pollution can be generated from ROW if bare soils are present or insufficient plant cover occurs. Therefore, in choosing ROW vegetation management techniques, particularly on steep slopes or other areas of high erosive potential, e.g., riparian zones, the ROW vegetation manager must be concerned with their effects on the local hydrology. Vegetative disturbances resulting in bare surfaces or exposed soils and the degree to which vehicular traffic movement occurs causing rutting can become limiting factors in the selection of target tree control methods. For instance, mowing with a hydro-ax on a steep slope or along a streambank could cause erosion by vehicular rutting as well as through denuding the site by excessive removal of vegetation.

The imposition of these regulatory programs to prevent and/or control sources of potential degradation of water resources arising from ROW vegetation management activities results in the following two general precepts: (1) maintain as complete a vegetative cover as possible at all times, and (2) keep exposed soil and any soil disturbance/compaction operations to a minimum especially in critical areas. By keeping these two relatively simple fundamental principles a host of positive attributes can be ascribed to the ROW vegetation management program including: (1) dense low growing vegetation on the ROW will act as filter strips for the surrounding area thereby decreasing overland flow, increasing soil water percolation and removing pollutants, (2) complete vegetative cover on the ROW will stabilize soils and prevent erosion and sediment transfer, (3) minimizing soil compaction by restricting heavy vehicular traffic on the ROW decreases the amount of surface

water generated on a given area and thus reduces the volume of stormwater runoff, and (4) avoidance of any soil disturbance on the ROW will reduce or eliminate the need for amelioration activities that would otherwise be required under these clean water programs to restore the disturbed area to its original slope, soil compaction, ground cover, and hydrologic condition.

ROW Management Research

IPM is never a finished or static process. As fresh data become accessible and new knowledge is obtained about the pests in question and the various control treatments available, the specifics and details of the currently acceptable IPM strategies will naturally be altered and thus subject to constant modification. IPM practitioners can aid and abet this dynamic adaptation and improvement process through conducting basic ecological research on the pests in question as well as applied research in new and promising control strategies. Also needed is the constant reappraisal of existing techniques in order to modify them to produce even more efficacious results. The member systems of the EEANY have individually conducted research into IPM related ROW management matters but even more so collectively, through the auspices of the former Empire State Electric Energy Research Corporation (ESEERCO)[7], have collaborated on numerous research projects over a 25 year span of time involving many diverse aspects of ROW vegetation management. These studies were conducted on a wide range of subjects and a host of issues important to utility ROW managers in their execution of ecologically sound and cost effective IPM/IVM programs.

Beginning with a literature review in 1973, this extended ESEERCO ROW management research program has included projects on ROW treatment cost comparisons, long term effectiveness, ROW treatment cycles, herbicide fate and mobility, allelopathy, ROW multiple uses, buffer zones, soil compaction and mitigation, repeated mechanical cutting effects on vegetation and costs and the effects of ROW treatments on wildlife. Two of the more recent multi-year studies have recently been published in the mid 1990's; ROW Vegetation Dynamics conducted by the Institute of Ecosystem Studies and ROW Stability by the State University of New York College of Environmental Science and Forestry. The final ROW research product to come out of ESEERCO program in 2000 involves a risk assessment and environmental evaluation of the use of tree growth regulators. These numerous and diverse research projects have greatly assisted the New York State electric utility industry to focus their ROW Vegetation Management Programs on the most cost effective and least disruptive techniques while also allowing them to tailor the research results to their own individual company circumstances. The latest ROW research efforts currently being undertaken by the electric utility industry are now found within the bailiwick of the Electric Power Research Institute (EPRI). EPRI has picked up where ESEERCO left off and has created a new research target, "ROW Environmental Management & Development" which is currently being subscribed to by 44 electric utilities across the nation.

Summary

The overall goal of a utility ROW vegetation management program is to provide for the safe and reliable transmission of electric power in an economic and environmentally compatible manner. This lofty goal translates "on the ground" into the vegetative conversion of a strip of land, i.e., the ROW, often initially found filled with tree saplings to a ROW corridor that harbors mainly a profusion of lower growing species. This goal is currently being achieved in New York State by the implementation of sound IPM/IVM programs at each of the electric transmission and distribution systems of the EEANY members. To paraphrase applicable IPM terminology; ROW vegetation managers use multiple tactics to prevent pest (tree) buildups that could endanger electric system reliability and public safety by: monitoring pest (tree) populations, assessing the potential for damage (system reliability, public safety, preservation of the biological controls), and making professional management and control decisions, considering that all pesticides (herbicides) should be used judiciously. ROW management decisions depend in large part upon the mix of target species, the height and density of the dominate individual stems, and the abundance and distribution of the low growing desirable species. As the number of different target species is reduced and their stem density decreases with each passing treatment cycle, the type of vegetation treatment performed can become more selective with the attendant benefit of reducing the amount of herbicide needed to maintain the ROW. Thus, after several treatment cycles, when the ROW is occupied by a

[7] ESEERCO ceased to exist in 1999 due to the increased economic pressures of a deregulated competitive electric market.

greatly reduced number of target trees, some minimum herbicide use will still be required but the focus now shifts to selecting techniques with the least amount of disturbance to the lower growing vegetation.

It should be stressed in closing that these ideal ROW conditions of a "minimum maintenance" ROW (composed almost entirely of low growing plants) to be achieved through the attentive implementation of an IPM/IVM program, is simply just that, minimum not zero maintenance. Although the low growing plants will help immensely in precluding the growth of trees, due to the pressures of natural plant community succession that ultimately will occur, (the close proximity to an abundant tree seed sources in the surrounding forest) these voluntary biological controls can never be expected to fully exclude trees alone over long periods of time from invading the ROW and exploiting their well defined ecological niches. Even after many treatment cycles using herbicides, when the ideal ROW condition is seemingly achieved, if the ROW is left untreated or if mechanical methods are resorted to, the ROW will revert rather quickly to a tree dominated landscape and all the attendant benefits of a stable low growing mosaic of desirable ROW vegetation will be lost. These attendant benefits include species diversity in an aesthetically pleasing setting with increased wildlife abundance while protecting soil and water quality values. Thus IVM is truly an ecologically based approach to pest management.

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APPENDIX C

ORANGE & ROCKLAND UTILITIES
500 ROUTE 208
NEW YORK, NY 10950

SPECIFICATION VM-01-09, Revision 2

PROJECT SPECIFICATION
TRANSMISSION VEGETATION MANAGEMENT – 2010-2012

Mark S Bamish — October 2009

Manager, Vegetation Management — Date

1.0 Purpose

The purpose of this project is to perform mechanical and herbicide treatment of vegetation on the right-of-way (ROW) of Orange and Rockland's overhead electric transmission system during the contract period of February 1, 2010, through January 31, 2012.

Work will be performed Orange, Rockland, and Sullivan counties in New York, as well as Bergen and Passaic counties in New Jersey.

2.0 Scope Of Work

2.1 Vegetation Management Cycle Work – Unit Price per ROW Mile

The contractor shall selectively remove, treat with herbicides, and prune trees and brush on the ROW or overhanging the ROW in order to remove all incompatible vegetation on the ROW and/or obtain "At Time of Vegetation Management" clearances between conductors and vegetation in areas where the ORU Modified Plan will be implemented. This work shall be performed on a unit price per mile of ROW basis.

2.2 Work Not Covered Under Unit Prices for Cycle Work

The contractor shall submit a unit price for tree removals and toppings, stump removals, and for other work type units. The contractor shall also submit T&E rates that may be used to perform unplanned hot-spotting work or other work that is not covered under the unit prices for cycle work

3.0 General

3.1 The contractor shall furnish all labor, supervision, transportation, tools, material (including herbicides and adjuvants), and equipment required to perform the work in accordance with this specification.

3.2 All maintenance of tools, equipment, and vehicles shall be included in the unit prices and T&E rates. All tools required to perform all work covered under this contract shall be provided by the contractor. Each crew shall carry as a minimum the following tools: climbing belts, safety harness and lanyards, ropes, hanger poles, axe, ladder, rake, broom, shovel, traffic control signs, sledge hammers, pruning saws, herbicide application bottles, 20" chain saws, 30" chain saws, brush saws, tape measure, and other tools/equipment as necessary.

3.3 O&R reserves the right to perform work with its forces or permit others to prune, remove, apply herbicides or otherwise treat vegetation, and to determine the locations at which work shall be performed and the sequence in which it shall be performed.

3.4 Unit quantities for cycle work and other work type units provided herein are not a guarantee of work that will be performed under this contract. They are estimated quantities and are provided for bid evaluation purposes only.

3.5 The contractor shall be aware of and comply with all federal, state, and local regulations governing the environment and worker health and safety. The contractor shall confirm pesticide notification requirements with the company. Before starting work, the contractor shall prepare an Environmental, Health and Safety Plan (EHASP) and submit it to the company representative for review. The EHASP shall include processes for anticipating, identifying, assessing and controlling any potential effects to the environment and potential hazards to workers, Orange and Rockland employees, and the public. Orange and Rockland personnel will review the EHASP against the project work scope, specifications and EH&S considerations and notify the contractor if the plan is acceptable or requires additions or modifications. The contractor shall begin work only after the company has accepted the final EHASP and issued a Notice to Proceed to the Contractor.

4.0 Detailed Description Of Work

4.1 Vegetation Management Cycle Work

The following work shall be included in the unit price per ROW mile.

4.1.1 Mechanical and herbicide stump treatment of all incompatible vegetation[1] removed on the ROW and/or pruning of branches of remaining vegetation to the "At Time of Vegetation Management" clearances in area of the ORU Modified Plan, in accordance with the requirements of this specification on the rights-of-way listed and described in Attachment A.

4.1.2 Removal of all incompatible vegetation in the wire zone[2], and both border zones[3], regardless of size, shall be included in the unit price for cycle work in the areas of full ROW VM work. This may include situational compatible species or situational compatible species that are inferring with visual inspections of the conductor.

In areas where the ORU Modified Plan will be implemented at the direction of the ORU representative, wire zone incompatible vegetation will be removed regardless of size, and border zone vegetation will be pruned to the "At Time of Vegetation Management" clearances, unless the vegetation has entered the priority zone, a condition which requires the vegetation to be removed to ground.

4.1.3 All incompatible vegetation on the right-of-way shall be removed by mechanical means, unless otherwise noted in Attachment A or by the company representative. Mechanical means in this case refers to removal of

[1] Incompatible vegetation is vegetation that has the potential to grow to a point where it can jeopardize line reliability due to falling or growing into the line or encroaching into a vegetation clearance zone. See Attachments B and C.
[2] For the purpose of this specification the wire zone is defined as the area of right-of-way between the vertical projection of the outboard conductors of a transmission line plus 10 feet in each outboard direction.
[3] The border zone is defined as the area of right-of-way between the wire zone and the right-of-way boundary. On rights-of-way with multiple transmission lines no border zone exists between the transmission lines. The wire zone is continuous between the outboard conductors of all lines on the right-of-way.

the tree by cutting it at the base with a chain saw. All work that involves the removal of noncompatible vegetation shall include stump treatment with herbicides in accordance with section 7 of this specification. Stump treatment shall not be applied in areas designated for "no herbicide treatment" in Attachment A or designated as such by the company representative during the course of the work.

4.1.4 Clearance pruning shall be performed to ROW edge, except in areas where the Modified Plan will be implemented to the "At Time of Vegetation Management" clearances listed in section 6 of this specification. In cases where the clearance can not be achieved due to right-of-way width limitations side pruning shall be performed along the right-of-way edges, from ground to sky to ensure that branches attached to trees that are rooted off the right-of-way are cut back to the edge of the right-of-way.

4.1.5 All trees, branches, and vegetation that are removed by mechanical means shall be chipped and spread on the right-of-way or removed to an offsite location provided by the contractor at the contractor's expense. In some isolated instances in wooded areas cutting, stacking, and wind rowing will be allowed, but only with permission of the company representative. Most areas will require chipping or removal from the right-of-way.

4.1.6 Herbicide treatment of all incompatible vegetation will be included in the ROW price per miles under the following guidelines: Between January 1 and May 31 of the year, all noncompatible vegetation will be cut to ground and stump treated regardless of size. Between June 1 and September 15, the contractor will have the option to continue to cut all noncompatible vegetation to ground and stump treat, or complete a LVF application to noncompatible vegetation under 6 feet in height (over six feet is to be cut and stump treated). From September 16 to December 31, all noncompatible vegetation will be cut to the ground and stump treated regardless of size. The LVF applications shall be performed in accordance with section 7 of this specification. Herbicide treatment shall not be applied in areas designated for "no herbicide treatment" in Attachment A or designated as such by the company representative during the course of the work. Follow up LVF herbicide treatment will be required during to following foliar application season of all noncompatible woody vegetation to ensure that treatment effectiveness meets the requirements of section 7 of this specification. 20% will be withheld from the final payment until the LVF follow up treatment is completed.

4.1.7 Removal of vegetation from all access roads and tower locations, including removal of vines on towers, poles, and guy wires. All access roads shall be mowed or cleared for a width of ten feet for their entire length. The area around all tower and pole bases shall be cleared of vegetation for 15 feet around the structure's perimeter (rectangular or square pattern around lattice towers and radially around poles). The area around all guy wires shall be cleared of vegetation for 10' in all directions (10' radially).

4.1.8 Notification of property owners as further described in the special conditions.

4.1.9 New Jersey Transmission VM work – Work on transmission ROW's located in New Jersey will follow rules established under N.J.A.C 14:5.9 (rules will be finalized in the fourth quarter 2009), and may include removal of all vegetation exceeding three (3) feet in height in the wire zone, and fifteen (15) feet in the border zone.

4.2 Work Not Covered Under Unit Price for Cycle Work

The following work is not included in the unit price for cycle work.

4.2.1 Off-ROW tree removal and topping, and any other work not covered under the unit prices will be paid using the unit or T&E rates established in the contract. This work shall only be performed when ordered by the company representative.

4.2.2 Stump grinding will be paid using the unit prices for this work established in the contract. Stump grinding shall only be performed when ordered by the company representative.

5.0 Pricing

5.1 Unit Price Per ROW Mile

This work shall be performed on a unit price per linear ROW mile basis for each corridor segment identified in Attachment A. The price per mile shall include all mechanical and herbicide work described in sections 2.1 and 4.1 of this specification. The corridor segment includes all transmission lines on a particular ROW as defined in Attachment A. For example, corridor segment W10 consists of the Line 24, 25 and 27 ROW between the Middletown Tap and the Chester Substation. It features one double circuit transmission line and one single circuit transmission line for a length of approximately 8.5 miles along a ROW which is 180 feet wide. Corridor segment W17 consists of the Line 122 ROW between Silver Lake Substation and Washington Heights Substation. It features one single circuit transmission line for a length of approximately 1.4 miles along a ROW which is 100 feet wide. This illustrates that pricing shall include treatment of all vegetation on a particular corridor segment regardless of how many circuits or lines exist on that corridor segment.

ROW widths are shown in Attachment A, on a span by span basis. In some case the ROW width within a span varies. These variations occur infrequently and no adjustment to payments will be made for these variations. Treatment shall be performed on the full ROW width, unless otherwise specified.

Payment for the unit price per ROW mile shall be applied as follows. Estimated mileage is shown in Attachment A.

- The company will make regular inspections to follow the progress of the work and to determine that the work is performed in accordance with the specifications before payments are approved. A reverse billing protocol will be followed, whereby the contractor will inform the company representative of the work that is completed each week and the company representative will verify the work and then advise the contractor of the billing quantities that will be accepted

5.2 Other Work Units

Other work unit pricing are requested to be submitted including pricing for tree removals, tree topping, stump grinding, pre-emergent applications, vine cutting and treating, gas ROW maintenance, foliar spot treatments, and per day units for 3 and 4 person work crews with vehicles. A detailed price sheet and unit description will be attached in the ORU transmission bid package.

5.3 Time and Equipment Rates

The Contractor shall furnish the following T&E rates. This is primarily a unit price contract. Unit prices include all labor, supervision, tools and equipment to perform the work. T&E rates will apply to work that is specifically approved by the company representative and not covered under the unit prices. In addition the T&E rate for Notification Person will be applied to establish a credit or extra as described in the specific conditions section of this specification.

Hourly straight time and over time rates shall be provided for labor. Labor overtime rates shall include a meal component (any overtime meals shall be the responsibility of the contractor). Hourly and weekly rates shall be provided for equipment. Overtime rates will not be applied to equipment. In addition to the T&E rates requested herein, the contractor may submit additional rates that he feels would be applicable to this work. A Labor and Equipment rate sheet will be attached in the ORU transmission bid package.

Labor Titles

General Foreman
"A" Foreman
"B" Foreman
Journeyman Treeman
Tree Equipment Operator
Treeman Trainee, 3rd Year
Treeman Trainee, 2nd Year
Treeman Trainee, 1st Year
Inexperienced Ground Man
Notification Person (with vehicle)
Flag Person

Equipment

4WD Bucket Truck
4WD Spray Truck (500 Gallon)

55' Bucket Truck
65'-70' Bucket Truck
55'-60' Skidder Bucket Truck
4WD Truck (Split Dump)
4WD ¾ Ton Pick Up Truck
4WD ROW Truck with Chassis Mounted Chipper
Disc Chipper
Power Saw
Brush Saw
4WD Gator/ATV
Skytrim/Jarraff
Bobcat Type Mower with Trailer
Hydro Ax Type Mower
Log Truck
Grapple/Track Chipper
DR Type Brush Mower
125' Aerial Crane

6.0 Transmission Line Vegetation Clearance Tables

6.1 As stated earlier in this specification, work will generally consist of removal of incompatible species from the right-of-way by mechanical means or by herbicide application. In areas where trees will be pruned the "At Time of Management" clearances listed in Table 1 shall be achieved. (This section will now only be for the Modified Plan area…all other will be full ROW width maintenance)

Table 1 – Clearance Between Trees and Conductors

Voltage (KV)	Lateral (Cs) (Feet)	Vertical (As) (Feet)	Clearance Classification
500	51 30 15	31 25 15	At Time Of Vegetation Management Action Threshold Minimum Clearance
345	44 20 10	26 20 10	At Time Of Vegetation Management Action Threshold Minimum Clearance
138	41 14 5	23 14 5	At Time Of Vegetation Management Action Threshold Minimum Clearance
69	35 10 4	16 10 4	At Time Of Vegetation Management Action Threshold Minimum Clearance
34.5	15 8 4	15 8 4	At Time Of Vegetation Management Action Threshold Minimum Clearance

Notes for Table 1:

1. At Time of Vegetation Management Clearance – Clearance to be achieved at time of vegetation management. Equivalent to NERC FAC-003-1 Clearance 1.
2. Action Threshold Clearance – Clearance greater than Minimum Clearance, but less than the Clearance at Time of vegetation Management. If found during growing season monitor every seven days until cleared, otherwise clear prior to next growing season.
3. Minimum clearance – Minimum radial clearance around conductor under all operating conditions. Equivalent to NERC FAC-003-1 Clearance 2.
4. In cases where "At Time of Vegetation Management" or "Action Threshold" clearance cannot be attained because of ROW width limitation, trees shall be pruned to the right-of-way edge.
5. For vee string construction reduce "Action Threshold" lateral clearance by 4' for 345 kV and 2' for 138 kV.

6.2 Tree pruning and removal shall be performed in accordance with ANSI Z 133.1 and ANSI A-300 standards. Pruning shall be performed so as to provide maximum clearance from conductors and other facilities without injury to the tree and preserving as nearly as possible the tree's natural growth pattern. All work shall be performed to the satisfaction of the company and authorities having jurisdiction over pruning and removal of trees on public property and owners on private properties.

Prior to pruning trees which are rooted off-ROW the contractor shall inform the property owner of required clearances and approximate number of limbs which are to be removed and whether or not the contractor wishes to enter the private property to perform the work. The owner's permission to enter private property to prune trees shall be obtained by the contractor prior to performing any work.

In cases where limbs of off-ROW trees extend over the ROW and require pruning to the ROW edge, and permission to enter the property to prune the branches is denied by the property owner it may not be possible to adhere to the above referenced standards. In these cases the limbs shall be pruned to the right-of-way edge if the right-of-way is not wide enough to obtain the specified clearances. In such cases the contractor shall trim the overhanging branches along the vertical projection of the right-of-way edge for the full height of the tree(s). This work shall be performed from the right-of-way property using suitable equipment, such as a skidder bucket or telescoping tree trimmer and appropriate work methods.

7.0 Herbicides

7.1 The following Herbicides approved for use within the company's rights- of-way are:

7.1.1 PATHFINDER II, EPA REG. NO. 62719-176 as manufactured by Dow Agro Sciences LLC, Indianapolis, Indiana 46268.

7.1.2 ACCORD CONCENTRATE, EPA REG. NO. 62719-324; ACCORD SP EPA REG. 524-517, as manufactured by Dow Agro Sciences LLC, Indianapolis, Indiana 46268

7.1.3 ARSENAL, EPA REG. NO. 241-346, as manufactured by BASF Corporation, Research Triangle Park, NC 27709.

7.1.4 ESCORT, EPA REG. NO. 352-439, as manufactured by E.I. DuPont DeNemours and Company, Agricultural Products, Willmington, Delaware 19898.

7.1.5 Krenite S, EPA, REG.NO. 352-395, as manufactured by E.I. DuPont DeNemours and Company, Agricultural Products, Willmington, Delaware 19898.

7.1.6 Garlon 4, EPA REG. NO. 62719-40 as manufactured by Dow Agro Sciences LLC., Indianapolis, Indiana 46268.

7.2 The following Spray adjuvants approved for use within the company's rights-of-way are:

7.2.1 AQUFACT as manufactured by Aqumix, Inc. 218 Simmons Drive, Cloverdale, Virginia 24077.

7.2.2 CLEAN CUT as manufactured by Arborchem Products Co, Mechanicsburg, Pennsylvania 17055.

7.2.3 BULLSEYE SPI Colorant as manufactured by Milliken Chemicals, Inman, SC 29349.

7.2.4 38F Drift Retardant as manufactured by SANAG Products, Inc., 359 Goodwin Ave., Los Angeles, CA. 90039-1187.

7.2.5. SHARPSHOOTER, Sticker and Drift Control Agent, as manufactured by CWC Enterprises Inc., 214 Simmons Drive, Cloverdale, Virginia 24077.

7.3 Approved mixes are as follows. The contractor shall indicate which foliar (A or B) and which stump treatment (A or B) will be used when he submits his bid.

TREATMENT	CHEMICAL	MIXTURE
Low Volume Foliar – A	Accord Concentrate EPA REG No. 62719-324 Escort EPA REG No. 352-439 – Arsenal EPA REG No. 241-346	4 Gal Accord Concentrate 2 Oz Escort 2 Qt. Arsenal 1 Gal Aqufact Drift Control Adjuvant[4] Water to make 100 Gal
Low Volume Foliar – B	Krenite S EPA REG No. 352-395 Escort EPA REG No. 352-439 Arsenal EPA REG No. 241-346	4 Gal Krentie S 4 Oz Escort 2 Qt. Arsenal 1 Gal Aqufact Drift Control Adjuvant Water to make 100 Gal
Stump Treatment	Pathfinder II EPA REG No. 62719-176	Ready to Use

7.4 The contractor shall be responsible for the purchase, storage and application of all herbicides used for foliar and stump treatments, as well as for removal and disposal of all unusable herbicides and empty herbicide containers in accordance with applicable USEPA, NYSDEC, and NJDEP regulations. Containers shall not be disposed of or left on company property or ROW. The contractor shall not clean equipment on company property or right-of-way except for minor cleaning, e.g. spray nozzles. Herbicides shall not be stored on company property or ROW.

7.5 The contractor shall ensure that all herbicides are delivered in pre mixed containers whenever possible and shall use a closed mixing/agitating system.

7.6 The contractor shall ensure that all personnel involved in the handling, use, and application of herbicides in New York State are trained and/or certified in

[4] Add to mix in accordance with instructions on label for foliar treatments A and B.

accordance with New York State Department of Environmental Conservation (NYSDEC) requirements. The contractor shall designate a certified pesticide applicator, category 6A, to supervise all pesticide activities associated with this project in New York. Each foliar treatment crew leader (Foreman) shall be a category 6A certified applicator or technician.

7.7 Personnel that perform the above-mentioned herbicide related activities in New Jersey shall be trained and/or certified in accordance with the New Jersey Department of Environmental Protection (NJDEP) requirements. The contractor shall designate a certified pesticide applicator, category 6, to supervise all pesticide activities associated with this project in New Jersey.

7.8 Personnel that perform the above-mentioned herbicide related activities in Pennsylvania shall be trained and/or certified in accordance with the Pennsylvania Department of Agriculture requirements. The contractor shall designate a certified pesticide applicator, category 10, to supervise all pesticide activities associated with this project in Pennsylvania.

7.9 Herbicides shall be applied selectively only to incompatible plants. Applications shall be carefully made to minimize potential damage to compatible plants. Each herbicide crew member shall be able to identify compatible and incompatible vegetation on the right–of-way.

7.10 The company reserves the right to remove samples of the herbicide solution from the contractor's application equipment for the purpose of analysis to determine the nature and concentration of the mixture.

7.11 Application of herbicide for low volume foliar treatments shall be done in windless conditions to reduce chances of injury to nearby compatible vegetation. Herbicide mixture shall be applied to completely cover the leaves and stems of target vegetation. Backpack spray equipment which exhibits good control of spray on concentrated areas of vegetation shall be used to apply the herbicide mixture.

7.12 Applicators shall exercise extreme care during application to avoid contact of herbicide mixture with compatible vegetation, ornamental vegetation, farm crops, animals, swamps, brooks, rivers, ponds, lakes, or any other non-target subject. Low volume foliar applications shall not be made during inclement weather when precipitation or fog may dilute the herbicide mixture. All applications done within two hours of a rain fall shall be reapplied after vegetation has dried.

7.13 All herbicide applications shall be made in accordance with the applicable rules and regulations established by the NYSDEC, NJDEP, and the PA Department of Agriculture. The contractor shall be responsible for complying with NYSDEC, NJDEP, and the PA Department of Agriculture notification requirements regarding herbicide applications. This includes, but is not limited to, public notices, sign posting, individual customer contact, and/or other required environmental agency regulations.

7.14 Herbicides shall not be applied in nurseries, orchards, crop lands, pasture lands, or areas identified on plan and profile drawings or in Attachment A as "no herbicide

treatment" areas. They shall not be applied within 100' of drinking wells or designated wetland buffers.

7.15 All incompatible tree species between one and one-half feet and ten feet in height shall be foliar treated with herbicide. Trees taller than ten feet shall be cut and stump treated with herbicide.

7.16 Treatment Effectiveness – The contractor shall be responsible for a complete top and root kill including stump sprouts and root suckering, for a minimum of ninety (90%) percent of incompatible vegetation (1½ feet or higher) on each treated corridor, by the August 1 the year following initial treatment. The contractor shall perform follow-up treatment as necessary to achieve 90% minimum kill. All incompatible plants which were missed or show incomplete kill shall be retreated at this time.

7.17 Treated plants shall be left standing and allowed to fall naturally.

7.18 It is the company's practice to permit foliar applications to standing plants only during the foliage season of June through October. Stump treatments may be made during any season but not in the spring when excessive sap bleeding may hinder herbicide effectiveness, or when snow and ice is two or more inches in depth around the stumps to be treated. Stumps shall be treated immediately after cutting before the surface suberizes, to assure herbicide penetration into the vascular tissue.

7.19 The contractor shall be responsible for any damage resulting from the chemical application. The company shall consider unskilled or careless application by nozzle operators as just cause for stopping work and failure by contractor to replace same with skilled and careful operators as just cause for cancellation of Contract.

7.20 The contractor shall keep daily records of chemical applications and furnish the company's representative each week with the Spray Records. Prior to final payment, the company will require receipt of complete spray records for the entire project.

8.0 ORU Special Conditions

8.1 The contractor shall ensure that all supervisory and notification personnel assigned to this project receive Orange & Rockland Utilities (ORU) contractor identification cards. Contractor personnel will be required to have photographs taken at O&R's Spring Valley Operations Center and provide information required to have identification cards made. The cost of this effort shall be included in the contractor's unit prices.

8.2 The contractor shall conduct an 8-hour training course prior to the foliar application season for all personnel assigned to the project. This training course shall be approved by the NYSDEC for recertification credits for Pesticide Applicator or Technician licenses. In addition to pesticide training the curriculum for this course shall include identification of incompatible and compatible species and a review of O&R's transmission clearance specifications.

In addition, the contractor shall make provisions for five O&R employees or consultants to attend this training course. The cost of this effort shall be included in the contractor's unit prices, with the exception of the salaries of the O&R attendees. O&R will provide a conference room for the training on a mutually agreed upon date if requested to do so by the contractor.

8.3 The contractor shall ensure that clearance pruning is performed to the ROW edge. In some cases this will result in pruning of trees rooted off the ROW whose branches overhang the ROW. In many of these cases it will be necessary to prune the branches along the vertical projection of the property line for the full height of the trees. The contractor shall ensure that he has the correct equipment and personnel with the appropriate skills to perform this work safely and in accordance with this specification (i.e. an all wheel drive mechanical sky trimmer, skidder bucket, and/or personnel that can climb the trees to perform the work). The company does not require that the referenced equipment be used on this project. It is mentioned here to illustrate nature of the work that is required under the unit prices in this contract. In some cases the contractor may elect to enter private property for the purpose of climbing the tree in order to prune it. In these cases, the contractor shall obtain permission from the landowner.

8.4 Vegetation management cycle work shall be performed on the entire transmission ROW identified in Attachment A between the outboard face of the first transmission structure inside one substation and the outboard face of the first transmission structure inside the next substation. In other words this work shall be performed along the entire transmission ROW to the first structure inside each substation. The contractor shall notify the company representative prior to entering substations, so that the company representative can make appropriate arrangements with Substation Operations.

Vegetation management cycle work shall include complete removal of incompatible buffer vegetation at all road crossings. Compatible buffer vegetation shall be protected by the contractor during the conduct of the work. In some cases the company only has pruning rights at road crossings. In these cases no removals shall be performed. The company representative will make the contractor aware of these locations.

8.5 The locations of all reporting areas shall be the contractor's responsibility. The contractor shall locate reporting areas as close to the job site as practical. All reporting locations and moves from one reporting location to another shall be the responsibility of the contractor and shall be included in the unit prices. Parking of vehicles and equipment will be permitted on O&R property in some cases. These areas shall be approved by the company representative. Fueling, vehicle repairs, and other support and/or logistical activities shall be included in the unit pricing. Whenever T&E rates are applied under this contract, fueling, vehicle repair, etc. shall be done during non-working hours at no additional cost to the company.

8.6 The contractor shall provide two full time notification persons (40 hours per week) that will work in conjunction with company or company-consultant notification personnel. They shall deliver door hangar notifications, review the scope of work

with each land owner or resident along the ROW, document the communications on a company-provided form, and follow up with work crews to ensure that work is performed as planned. The cost of the notification persons shall be included in the unit price per ROW mile. If notification personnel are removed from the project by the contractor or the company or if additional notification personnel are deployed the contract T&E rates shall be used to establish the associated credit or extra. Notification personnel shall be capable of interacting with landowners and customers in a professional manner. The contractor shall provide written and verbal notification of vegetation management work to all surrounding properties between one and two weeks prior to the start of work. O&R will provide notification door hangers to the contractor.

8.7 At most locations, the company possesses only easement rights for the transmission lines, with the land being owned by others. At certain locations, the company owns the right-of-way. The contractor shall not plan work or discuss work with landowners without the ROW easement documents and the Plan and Profile drawings. These documents are available in the Blooming Grove Operations Center or from the company representative.

8.8 The contractor shall confine his activities to the ROW shown on the drawings and shall conduct the work in accordance with the limits established by the right-of-way grants or easements. The contractor shall strictly adhere to all restrictions in the right-of-way grants.

8.9 The contractor shall provide one full time general foreman (40 hours per week) to the project as part of the unit price per ROW mile. The general foreman shall only be responsible for the transmission work covered under this specification, and shall not have responsibility for distribution work covered under this contract or any other work. T&E rates for the general foreman shall not be applied unless the general foreman is specifically directed to work overtime by the company. The general foreman or designee shall be available for contact around the clock (24 hours) for the duration of the contract.

8.10 The general foreman, crew leaders (foremen), and notification personnel shall be equipped with a cell phone and a laser range finder that is accurate to ± 1 yard over a 600 yard distance. The general foreman and notification personnel shall also possess an active e mail address that can be used to communicate with the company representative.

8.11 If stump grinding is required the unit price for stump grinding will be applied. The company will endeavor to develop a backlog of approximately 6 or more stumps prior to requesting stump grinding in order to allow the contractor to work efficiently. Stump grinding with a lower backlog will only be performed where safety conditions need to be addressed or in very sensitive areas.

8.12 The listings of compatible and incompatible species in Attachments B and C are provided as a general guideline. Incompatible species are species which have the potential to grow tall enough to jeopardize the integrity of a transmission line by falling or growing into the line or encroaching into a minimum clearance zone.

Other species which are not listed as incompatible in Attachment C or which are listed as compatible in Attachment B may be identified as incompatible in the field by the contractor or company representative because of their growth potential and location relative to the conductor, and shall be removed as part of the unit price.

8.13 The contractor shall ensure that a minimum of one three person crew is assigned to this project at all times during the contract period.

8.14 Contract labor and equipment costs during rain delays shall be considered part of the unit price. T&E for rain delays will not be paid by the company under any circumstances.

8.15 The contractor shall keep the company representative informed on a daily basis of the location (s) where each crew will be working, the crew leader's name and the number of personnel in each crew. This notification shall be made via e mail at the start of the workday.

8.16 The contractor shall attempt to resolve any public complaints regarding work under this contract. Any unresolved questions or complaints shall be brought to the company representative's attention.

8.17 All work areas shall be kept in such a manner so as to minimize inconvenience to the general public and adjacent property owners. The contractor shall take all necessary precautions for the protection of workers and the safety of the public, and shall comply with the regulations of all authorities having jurisdiction. Company approval shall not relieve the contractor of such compliance.

8.18 All wood and brush shall be chipped or disposed of within four (4) weeks after felling. In Sensitive Areas all wood and brush shall either be chipped or removed from the area by the end of each work day. No on-site burning of materials resulting from cutting and pruning operations will be permitted.

8.19 Cherry Leaves – Wilted cherry leaves produce prussic acid which is poisonous to livestock. Therefore, in areas frequented by livestock, all wilted cherry foliage shall be immediately removed from the site and disposed of in a manner that will assure animal safety.

8.20 It shall be understood by the contractor that all work near existing transmission and distribution lines shall be undertaken while the lines are presumed to be energized and operating at voltages up to and including 500kV.

8.21 In order to ensure the safety of his employees, the general public and the continuity of service of the transmission lines, the contractor shall exercise extraordinary precautions in removing trees and tree limbs that are in close proximity to or within fall over distance of the conductors. Such trees shall be topped before being removed, removed with the aid of ropes, and/or taken down one section at a time. The intent of this project is to perform the work with the circuits energized, however, if the contractor encounters a situation where de-energizing the lines is required to ensure safety, he shall immediately make this request to the company representative.

8.22 With the exception of access road clearing, no trimming, spraying or tree removals shall be undertaken in ravines or other low areas along the right-of-way where conductor clearances are well in excess of the "At Time of Vegetation Management" clearances established in this specification, assuming all trees reach maturity. These locations shall be determined solely by the company representative.

8.23 The contractor shall provide protection which will prevent damage to property such as shrubs, lawns, compatible vegetation, roads, fences, buildings, ditches, water bars, berms, drains, bridges, pipelines, and any other property by the passage of his equipment. The contractor shall assume sole responsibility for any damage that occurs due to his work. The contractor shall notify the company representative immediately if and when damage occurs. Damage to property shall be repaired by the contractor at his expense, to a condition that is as good as or better than the original condition.

All compatible plants which will not affect line reliability shall be preserved. The contractor shall take reasonable precautions not to remove, spray or damage existing low-growing vegetation, either natural or planted, which are to be preserved on the right-of-way. Where road screen compatible vegetation, either natural or planted, has been damaged beyond reasonable repair because of the contractor's negligence, this vegetation will be replaced by the company at the contractor's expense.

8.24 The contractor shall conduct his work activities so as to safeguard and avoid alterations to stream and wetland habitats. The Conductor shall generally keep equipment and materials out of the wetland buffer areas, streams and other bodies of water. If it is necessary to cross a stream, the contractor shall restrict vehicles to access points approved by the company representative. The contractor shall otherwise avoid activities that produce siltation of the waterway or bank erosion that could cause future siltation.

The contractor shall take precautions to protect watercourses and wetlands from pollution and shall avoid disturbing stream beds and banks and the low-growing vegetation protecting them. Vegetation which is cut shall not be felled into or across streams and ponds. Brush chipping shall be performed in such a manner that the chipped material shall not enter any watercourse, wetland, or wetland buffer area, nor accumulate in excess of four inches in depth at any location.

8.25 The contractor shall comply with all Federal, State, County, and Municipal laws, ordinances, rules, and regulations and with the requirements of all permits obtained by the company.

8.26 The contractor will be required to obtain permits when work is to be performed on properties administered by the New York State Thruway Authority and the New York City Board of Water Supply. The contractor may also be required to obtain a special permit when work is called for along State Highways.

8.27 Where the company's right-of-way parallels or crosses railroad property and the contractor elects to gain access to the right-of-way from the railroad property, he

shall be responsible for all applicable permits, rules, regulations, and fees pertaining thereto.

8.28 The contractor shall conform to all company safety rules which will be provided to the successful bidder.

9.0 Personnel

9.1 The contractor's personnel shall be trained and competent in identifying specific compatible and incompatible vegetation, pesticide storage, application procedures, techniques, handling methods, and standards pruning practices. They shall be qualified by the contractor for work near or adjacent to electric lines.

9.2 Crews

9.2.1 A crew leader shall be assigned to cover each crew.

9.2.2 Minimum crew size shall be two persons, including the crew leader.

9.2.3 The contractor shall furnish a list showing each employee's number and title (classification). The contractor shall advise the company of any and all changes in his roster of employees assigned to company work.

10.0 Vehicles and Equipment

10.1 All contractor vehicles used on the rights-of-way shall be four-wheel drive (4WD). Private vehicles shall not be permitted on the right-of-way or the access roads unless approved in advance by the company representative.

10.2 Condition

- All vehicles and equipment shall be in satisfactory condition. The contractor shall remove and replace any vehicles deemed by the company to be in unsatisfactory repair, or condition or otherwise unsuitable. Any vehicle leaking fluid shall be removed from the right-of-way. The contractor shall immediately report all leaks to the company representative, cleanup and properly dispose of all material.

- No payments will be made for equipment that is inoperative during activities where T&E has been agreed upon. The contractor shall have immediately available replacement equipment to ensure continuity of work.

- All equipment and work must comply with local noise standards.

- The general foreman and notification personnel shall be equipped with a suitable 4WD vehicle that is licensed to travel on parkways in New York State.

- No separate payment or surcharge for fuel or for time required for refueling and maintenance will be made.

10.3 Identification – All vehicles shall prominently display the contractor's name, address and telephone number. Pesticide labeling on vehicles and equipment shall be in accordance with applicable NYSDEC regulations.

10.4 Vehicle rates, when required, shall include all necessary equipment for tree pruning and tree removal, including but not limited to the following minimum tools: climbing belts, safety harness and lanyards, ropes, hanger poles, axe, ladder, rake, broom, shovel, traffic control signs, sledge hammers, pruning saws, herbicide application bottles, 20" chain saws, 30" chain saws, brush saws, tape measure, and other tools/equipment as necessary.

10.5 All vehicles shall be provided with emergency spill kits similar to Arborchem Attack Pac and Arborchem Spill Guard containing materials capable of absorbing oil, water, fuel and chemical spills on land.

11.0 Site Restoration

11.1 The contractor shall clean up all slash and rubbish resulting from his work as work progresses and leave the site in a condition satisfactory to the company representative.

11.2 The contractor shall be responsible for all damage to the access road system as a result of his equipment, material or personnel use. Restoration of the access road system by grading, filling, seeding or any other means necessary shall be at the contractor's own expense, and to the satisfaction of the company representative.

11.3 All soil exposed by the contractor's operations shall be scarified and seeded and mulched within eight (8) days after initial disruption.

ATTACHMENT A

Transmission Corridor Segments & Descriptions

(VM-01-09 Attachment A)

REDACTED

REDACTED

REDACTED

ATTACHMENT B

SITUATIONALLY COMPATIBLE NATIVE VARIETIES

SMALL TREES

Ironwood
Juniper
Mountain Maple
Redbud
Shadebush
Striped Maple
White Flowering Dogwood
Viburnum
Witch Hazel

SMALL SHRUBS

American Yew
Blackberry
Blueberries
Bush Honeysuckle
Checkerberry
Chokeberry
Greenbrier
Ground Hemlock
Meadow Sweet
Mountain Laurel
Patridgeberry
Pinxterbloom-Azalea
Raspberry
Red & Yellow Osier
Sweet Fern
Trailing Arbutus
Viburnums
Wintergreen

LARGE SHRUBS

Alder
Choke Berry
Deciduous Holly
Dogwood
Dwarf Willow
Elderberry
Hazelnut
Rhododendron
Scrub Oak
Spicebush
Viburnum
Witch Hazel

SITUATIONALLY COMPATIBLE ORNAMENTALS

Alpine Currant
Arborvitae
Beauty Bush
Cedar
Chinese Redbud
Cotoneaster
Myrtle
Deutzia
Dogwoods
Euonymus
Flowering Cherry
Flowering Crab
Flowering Peach
Flowering Plum
Flowering Quince
Forsythia
Golden Chain
Hawthorn
Honeysuckle
Hydrangea
Junipers
Lilacs
Magnolia
Mockorange
Red Leaf Japanese Maple
Rose Acacia
Rose of Sharon
Russian Olive
Silk Tree
Smoke Tree
Tamarix
Viburnums
White Fringe
Winged Burning Bush
Wisteria Tree
Yew

ATTACHMENT C

NON-COMPATIBLE TREES

Ailanthus	Hickory
Ash	Maples
Basswood	Oaks
Beech	Pines
Birch	Poplars
Black Cherry	Sassafras
Black Locust	Spruces
Catalpa	Sumac
Elm	Sycamore
Gum	Tulip
Hackberry	Weeping Willow
Hemlock	Balsam Fir
Choke Cherry	Black Walnut
Butternut	Cedar
Mulberry	Striped Maple
Hop Horn Beam	Mountain Ash

ATTACHMENT D

ELECTRIC SUBSTATION, GAS REGULATOR, ORU FACILITIES, AND GAS GATE LOCATIONS AND APPROXIMATE ACERAGES

REDACTED

REDACTED

REDACTED

REDACTED

ATTACHMENT E
GAS TRANSMISSION AND DISTRIBUTION LINES AND APPROXIMATE LENGTHS

REDACTED

REDACTED