

**Item 11**

**Informal training materials for vegetation management subcontractors**



**National Grid**

National Grid Transmission USA

**Transmission IVM  
Field Manual  
2003**

## Table of Contents

- I. National Grid Division/Regional Contacts
- II. Bureau of Pesticide Locations
- III. ROW Inventory Printout
- IV. Inventory Codes
- V. Treatment Method Descriptions
- VI. Herbicide Codes

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**ROW Inventory Printout**

## RIGHT-OF-WAY INVENTORY PRINT-OUT

The inventory print-out is issued by the Division Transmission Forester to the crew for each line to be treated.

Below is an explanation of the items found on the print-out. A sample of a print-out is on the following page. The lettered statements below correspond with the letters on the sample print-out. In the remainder of the manual, Right-of-Way will be abbreviated as ROW.

### PRINT-OUT HEADING INFORMATION

The following information is printed on top of each page of the print-out.

- A - YEAR: The year the ROW is scheduled for treatment.
- B - RUN DATE: Date that the print-out was produced.
- C - FROM-TO: The station names where the main line originates and terminates. Note that the print-out may be of a tap off the main line.
- D - AREA: The Niagara Mohawk Region Number.
- E - Line #: An identification number or map number for main line.
- F - PROPERTY RECORD NUMBER: The primary identification number for the main line used to denote each ROW. A print-out for a single property record number may contain a ROW which has multiple (common) transmission lines.

### PRINT-OUT SITE INFORMATION

The following information pertains to the specific sites on the ROW being treated.

- G - SITE: A number assigned to each site on the ROW. Numbers are assigned in sequential order.
- H - DESCRIPTION: The borders of the treatment site marked by the number of the starting structure and the ending structure. If the starting structure is 20.25, then the starting point is  $\frac{1}{4}$  span from structure 20 toward 21.
- I - LAND USE: A four-digit code which describes the site characteristics.
- J - COM: A notation (No/Yes) showing that a site consists of an area that includes part of another common ROW.
- K - ACRES: The measured acreage to be treated in this site.

- L - TREAT:** The type of treatment for that site as indicated by a 2 or 3 letter code.
- M - SPECIAL NOTES:** A 35 character space where special information is communicated to the field crews regarding the site.
- N - CHEMICAL CODE:** The column where the field crew enters the chemical code for the herbicide used in that site. Two types of herbicide may be reported for each site.
- O - CHEMICAL GALS:** The column where the field crew enters the amount of whole gallons of herbicide mixture used in that site.
- P - DATE COMP:** The date is the month, day and year that the work on an individual site was completed. Use only numeric data.
- Q - TREE SPECIES UNDESIRABLE:** The tree species identified during the field inventory as being capable of creating line reliability problems. These are the target species for the designated treatment.
- R - DESIRABLE:** The tree/shrub species identified during the field inventory as being part of the low growing vegetation community. These species are expected to be preserved during treatment.
- S- SENSITIVE SITE DESIGNATION:** A (Yes/No ) at this location designates that the Forester has identified this site as being environmentally or esthetically sensitive.
- T - CONTACT LANDOWNER:** a (Yes/No ) at this location refers to whether the landowner must be contacted or not.

**NIAGARA MOHAWK  
RIGHT OF WAY - FULL INVENTORY  
FROM BRASHER STA TO BOMBAY STA C**  
(Renumbered Site Numbers)

Property Rec#: 812419 [Width] From: 010 to 070 Forester: KLK Region 1/2: 57 / D Owner: Easement Contractor: \_\_\_\_\_  
 Line #: T 015 E Volts: 34.5 Length: 20 Article 7: No Sched. Year: 03 A

Site# / Tap#	Schd Yr	Reg	From#	To#	Wid	Len	Acres	Land Use	Trt	Com	Species UNDESIRABLE	Species DESIRABLE	Chem	Gals	Date
013 G	03	57	298.00	299.00	050	0261	0.3	5001	OTH	No		APP			/ /
				H				K I L J					Sens: No	Own: No	Urgent: No
014	03	57	299.00	300.75	050	0435	0.5	6000	OF	No					/ /
													Sens: No	Own: No	Urgent: No
015	03	57	300.75	302.00	050	0435	0.5	7321	CUT	No	ELM, CED	HAW			/ /
Com: WOODED PASTURE/CUT LOGRO @ MIDSPAN M											Q	R		N T O	P
													Sens: No	Own: Yes	Urgent: No
016	03	57	302.00	306.00	050	1045	1.2	7000	OF	No					/ /
													Sens: No	Own: No	Urgent: No
017	03	57	306.00	306.00	050	0030	0.1	8223	ST	No	ASH, ELM	SMC, BUC, DOG			/ /
Com: HEDGEROW													Sens: No	Own: No	Urgent: No
018	03	57	306.00	308.00	050	0609	0.7	5230	STC	No	ASH, ELM	S			/ /
Com: TRIM&CHIP													Sens: No	Own: Yes	Urgent: No
019	03	57	308.00	309.50	050	0435	0.5	8333	ST	No	ASH, ELM	DOG, BUC, SMC			/ /
Com: SITE SKIPPED LAST TIME													Sens: No	Own: Yes	Urgent: No
020	03	57	309.50	310.00	050	0100	0.1	1213	ST	No	MAP	ALD, DOG, HAW,			/ /
Com: SMALL CREEK AREA													Sens: No	Own: No	Urgent: No
021	03	57	310.00	312.00	050	0522	0.6	8000	OTH	No					/ /
Com: RECENTLY MOWED/CUT ELM DT													Sens: No	Own: No	Urgent: No
022	03	57	312.00	312.50	050	0160	0.2	1000	OTH	No					/ /
Com: CREEK/LANDOWNER MOWED CREEK AREA											DTW:L1 DTF:100	Skid:No	Sens: No	Own: No	Urgent: No
023	ADD 03	57	312.50	313.00	050	150	0.2	1221	ST		BCH, ASH	DOG, ALD			/ /
Com: ST TALL ALDER													Sens: No	Own: No	Urgent: No
024	03	57	313.00	317.00	050	1045	1.2	8222	ST	No	PIN, ELM, BCH	GRJ, BUC, CHC, DOG			/ /
Com: LSF SM W STEMS													Sens: No	Own: Yes	Urgent: No

## USING THE PRINT-OUT IN THE FIELD:

The foreman or designee for the field crew must be able to understand the print-out and the codes used in order to accurately perform the field work. Using the sample print-out on the following page, follow along with the numbered questions.

### PRINT-OUT HEADING:

**#1. What ROW am I treating?** Check the heading for the "name of the line. The Forester is responsible for providing the correct print-out. In some limited cases the names on the print-out may not be consistent with the actual ROW name or station names. If there is any doubt, review the inventory with the Forester.

### PRINT-OUT SITE INFORMATION:

**#2. Where do I begin working?** Beginning with Site #13 determine the boundaries of the site. Looking at the "DESCRIPTION" field the print-out shows that site #13 extends from Str.# 298.00 to structure or pole #299.00 . In site #14 the example of 300.75 would mean that the site ends at three quarter span past structure #300 toward structure #301. The ROW width is listed in for every site on the inventory and relisted every time it changes. Contact the forester if there is any question about the width to be treated. Using the combination of the ROW width and the "DESCRIPTION" field the site boundaries are now established. The measured map distance between these site boundaries is the acreage listed on the print-out.

**#3. What about the Common ROW acreage?** When two or more transmission lines parallel each other on the same ROW, NMPC designates one as the MAIN LINE. The entire ROW acreage to be treated is inventoried under this MAIN LINE inventory. The MAIN LINE name and number will appear in the printout heading. The crew is responsible for the ROW treatment of any common lines or taps which enter or leave the MAIN LINE ROW unless the common ROW acreage has not been included in the inventory site acreage. Note that taps of significant length may be inventoried as a separate MAIN LINE. The COM (common) field on the printout will contain a Yes when a site includes more than the MAIN LINE ROW area.

**#4. What type of work is required in this site?** Looking at the "TREAT" field Site #15 is listed for "CUT", cut/no herbicide. There are 11 possible treatment codes for any site. Each code relates to a specific treatment or field operation. The treatments codes are:

- SF: Hydraulic Low Volume Application – Herbicide application targeted at undesirable vegetation, thoroughly wetting the leaves and branches to the point where the plant is covered. Generally requires an all-terrain vehicle mounted with a tank, pump and hoses.
- LSF: Backpack Low Volume Foliar - Herbicide application targeted at undesirable vegetation, thoroughly wetting the leaves and branches to the point where the plant is covered. This work is accomplished by using backpack sprayers with a 3 gallon tank equipped with a hand pump.

**NIAGARA MOHAWK  
RIGHT OF WAY - FULL INVENTORY  
FROM BRASHER STA TO BOMBAY STA **1**  
(Renumbered Site Numbers)**

Property Rec#: 812419 [Width] From: 010 to 070 Forester: KLK Region 1/2: 57/ Owner: Easement Contractor: \_\_\_\_\_  
 Line #: T 015 Volts: 34.5 Length: 20 Article 7: No Sched. Year: 03

Site# / Tap#	Schd Yr	Reg	From#	To#	Wid	Len	Acres	Land Use	Trt	Com	Species UNDESIRABLE	Species DESIRABLE	Chem	Gals	Date	Sens: No	Own: No	Urgent: No	
																			3
013	03	57	298.00	299.00	050	0261	0.3	5001	OTH	No		APP			/ /				
			<b>2</b>																
014	03	57	299.00	300.75	050	0435	0.5	6000	OF	No					/ /				
015	03	57	300.75	302.00	050	0435	0.5	7321	CUT	No	ELM, CED	HAW			/ /				
Com: WOODED PASTURE/CUT LOGRO @ MIDSPAN																			
016	03	57	302.00	306.00	050	1045	1.2	7000	OF	No					/ /				
017	03	57	306.00	306.00	050	0030	0.1	8223	ST	No	ASH, ELM	SMC, BUC, DOG			/ /				
Com: HEDGEROW																			
018	03	57	306.00	308.00	050	0609	0.7	5230	STC	No	ASH, ELM				/ /				
Com: TRIM&CHIP																			
019	03	57	308.00	309.50	050	0435	0.5	8333	ST	No	ASH, ELM	DOG, BUC, SMC			/ /				
Com: SITE SKIPPED LAST TIME																			
020	03	57	309.50	310.00	050	0100	0.1	1213	ST	No	MAP	ALD, DOG, HAW,			/ /				
Com: SMALL CREEK AREA																			
021	03	57	310.00	312.00	050	0522	0.6	8000	OTH	No					/ /				
Com: RECENTLY MOWED/CUT ELM DT																			
022	03	57	312.00	312.50	050	0160	0.2	1000	OTH	No					/ /				
Com: CREEK/LANDOWNER MOWED CREEK AREA																			
023	ADD 03	57	312.50	313.00	050	150	0.2	1221	ST		BCH, ASH	DOG, ALD			/ /				
Com: ST TALL ALDER																			
024	03	57	313.00	317.00	050	1045	1.2	8222	ST	No	PIN, ELM, BCH	GRJ, BUC, CHC, DOG			/ /				
Com: LSF SM W STEMS <b>5</b>																			

**BAS:** Basal Application – Herbicide application targeted at undesirable vegetation, directed at the lower portion of individual woody stems particularly the base of the stem, root collar zone, and any exposed roots. Usually applied with hand-held or backpack tank equipped with a hand pump.

**ST:** Cut and Stump Treatment – Combination of a mechanical and herbicide treatment targeted at undesirable vegetation, which requires the cutting of each individual stem and application of herbicide to the stump to control the root system. The herbicide should be directed at the outer edge or ring of the cut surface. Cutting is accomplished with a chain saw or brush saw and the herbicide is applied from a squirt bottle. Brush or slash is lopped up so that material lies flat on the ground.

**STW:** Cut and Stump Treatment/Wind-row – Same as above except the brush or slash cut must be wind-rowed, moved to the edge of the ROW and then lopped up so as to lie flat.

**STC:** Cut and Stump Treatment/Chip – Same as ST but the brush or slash must be chipped.

**CUT:** Cut/No Herbicide – Mechanical treatment of the undesirable vegetation, which requires the cutting of each individual stem without the application of herbicide.

**CTW:** Cut, Wind-row/No Herbicide – Mechanical treatment of undesirable vegetation which requires the cutting of individual stems without the application of herbicide and the piling of slash at the edge of the ROW where it is lopped up so as to lie flat.

**TRM:** Trim – Mechanical treatment of undesirable vegetation which requires the trimming or topping of individual trees. TRIM trees are those which originate or are rooted within the actual ROW, not trees leaning into the ROW. Trees originating or rooted outside the ROW which require trimming are inventoried separately as DANGER TREES. The slash is to be lopped up so as to lie flat unless wind-row or chipping is listed in the SPECIAL NOTES field.

**MOW:** Mowing – Mechanical treatment used to clear the ROW or a particular area of the ROW such as an access road for example. No herbicide treatment is required when MOW is listed alone, however a follow-up herbicide treatment may be called for in the SPECIAL NOTES for the site.

**OF:** Open Field – A no-work treatment used for crop field and pastures which do not contain undesirable vegetation.

**OTH:** Other – A no-work treatment used for sites other than open-field which do not contain undesirable vegetation.

**NOTE:** All treatment changes should be approved by the Forester or his designee before the field change is made.

**#5. What types of information are in the SPECIAL NOTES?**

The SPECIAL NOTES contain a variety of information. Most important to the field crew is the work notes. Regardless of the treatment type, the SPECIAL NOTES may contain specific work tasks which the crew is responsible for doing.

FOR EXAMPLE:

**CUT PINE** – The crew must cut the pine in this site. This note would probably refer to a SF or LSF treatment site which contains some pine.

**ST TALL STEMS** – The crew is responsible for cutting the taller stems on this site. This note would refer to a SF or LSF treatment site where NMPC wants the tall stems cut and stumps treated before the stem foliar treatment.

**LSF SMSTEMS** - This note would generally be seen for an ST site. This means that the crew can use the LSF technique to treat the small stems (<4') on the site rather than cut and stump treat every undesirable stem.

**TRIM MAPLE** – The crew is responsible for trimming a maple tree on a site of a different treatment type such as ST. This most commonly occurs near residential areas or road crossings where some minor trimming may be required on one tree.

**CHIP SLASH** – The crew is responsible for chipping the slash on this site. This note would be used on a TRM (Trim) site.

**CUT LOGRO@MIDSPAN**- This note instructs the crew to CUT, LSF, SF or ST. The low growing vegetation at the mid span where there is a minimum of conductor to ground clearance. In this case, all woody-stemmed vegetation located in the conductor zone (conductors plus 10' either side) over 5 feet tall must be treated.

The SPECIAL NOTES may also contain road names, waterway names and station names used to help identify locations along the ROW. NMPC separates the information in the notes using the "/" character.

For example: 100'ROW/HOMER STA (LS2) OLD

What is the crew responsible for besides the treatment types and special notes?

The crew has two additional field work responsibilities for each site on the print-out. Both pertain to all sites except sites with treatments types of OF or OTH. The additional responsibilities are as follows:

- A) The crew must maintain or create a patrol path or access roadway of 20' wide, clear of vegetation, within the ROW.

- 10'
- B) The crew is responsible for clearing a 29' area around the outside of each tower, structure, or pole. That includes the area directly under or inside the tower legs. The crew has the option of foliar spraying the structures as long as the site is not environmentally or esthetically sensitive. The area around guy anchors must be cleared for a 5' radius around the anchor.
- C) The crew is to cut and stump treat every vine on any structure, guy or stub pole. The vines are to be cut twice. Once at ground level ( and stump treated) and once at 4.5' from the ground. The vines do not have to be pulled off the structure or guy.

Besides work site responsibilities the crew or foreman is also responsible for:

- D) Completing the chemical and date fields on the printout. (covered in the next section of this manual)
- E) Keeping the Forester or designee informed as to the location the crew on the ROW.
- F) Advising the Forester or designee of any problems encountered during the job including such things as:
1. Accidental brushing or hitting the conductor while removing or trimming a tree.
  2. Herbicide/Chemical Spills
  3. Landowner complaints or concerns
  4. Injury to persons on the ROW
  5. Structure or conductor damage on the ROW
  6. Unusual or unlawful use of the ROW

## **COMPLETING THE PRINT-OUT**

The foreman or designee for the field crew must provide specific information on the print-out. Information is required for all sites on a ROW print-out regardless of where work is performed. Refer to the sample print-out on the following page for the remainder of this explanation.

**PRINT-OUT HEADING:** Enter your company name on the first page.

**WORK SITES:** A work site is any site where cutting trimming, or herbicide application is performed regardless of the treatment type. After completing the work required on the site the following information must be entered on the print-out:

#1 - The date complete in the DATE COMP field.

#2 - The type of herbicide used, blank if none. Two types of herbicide may be reported for each site – one above the other. For example, a ST site where the access road is sprayed. For chemical codes see appendix C.

#3 - The gallons of herbicide used, blank if none. The gallons of mix are reported in whole gallons. If less than ½ gallon is used enter a 0, greater than ½ gallon enter a 1 for one gallon. If you use the same type of chemical on several sites then enter the whole gallon (1) only on the actual sites where the gallon is finally used up. On the other sites where the chemical is used enter 0 gallons.

**Treatment Changes:** If a site requires a different treatment technique than identified in the original inventory, then the crew must cross out the old treatment type and write in the actual treatment used next to it. This may include such examples as a site inventoried for Foliar Spray (SF) which the crew changes to Cut and Stump Treat (ST) for environmental reasons or a site inventoried for No Work, Other (OTH) and the crew changes it to Cut and Stump Treat (ST) because there are stems to be treated in the ROW. The Treatment Type Codes are listed in Appendix B.

**NOTE:** All treatment changes should be approved by the Forester or his designee before the field change is made.

**NON-WORK SITES:** A non-work site is any site where no work is required for the corresponding treatment type and no work is listed in the "SPECIAL NOTES" Field.

After passing a site where no work was performed only the following item must be entered on the print-out:

#1 - The date passed in the DATE COMP field.

**NIAGARA MOHAWK  
RIGHT OF WAY - FULL INVENTORY  
FROM HIGH FALLS TO UNION FALLS  
(Renumbered Site Numbers)**

Property Rec#: 812327  
Line #: T122

[Width] From: 025 to 120  
Volts: 46

Forester: KLK  
Length: 9

Region 1/2: 57 /  
Article 7: No

Owner: Easement  
Sched. Year: 03

Contractor: \_\_\_\_\_

Site#/Tap#	Schd Yr	Reg	From#	To#	Wid	Len	Acres	Land Use	Trt	Com	Species UNDESIRABLE
025	03	57	101.75	115.75	090	4500	9.3	9232	SF	No	POP, BIR, MAP
026	03	57	115.75	116.25	075	0161	0.3	3313	ST	No	BIR, POP
Com: CASS ROAD											
027	03	57	116.25	118.50	060	0697	1	8111	LSF	No	BCH
Com: ABANDON PASTURE											
028	03	57	118.50	121.00	060	1655	2.3	2212	CUT	No	MAP
Com: TOO SOFT TO CROSS											
029	03	57	121.00	126.00	075	1425	2.5	9222	LSF	No	BIR, POP
030	03	57	126.00	129.50	075	1200	2.1	2211	CUT	No	BIR, POP, MAP
031	03	57	129.50	130.00	075	0261	0.4	9223	LSF	No	BIR, BAF
032	03	57	130.00	131.00	025	0200	0.1	8331	ST	No	BCH, BIR
Com: 1/2 ROW IN OF											
033	ADD 03	57	131.00	133.50	050	0650	0.7	8000	OTH		ST
Com: MOWED FIELD											
034	ADD 03	57	131.00	133.5	050	200	0.2	8110	LSF		BCH
Com: TWO STRS IN FIELD											
035	03	57	133.5	134.75	050	0300	0.3	8223	LSF	No	POP, BIR
Com: SPRAY LOGRO @ MIDSPAN											
036	03	57	134.75	STA	050	0354	0.4	3220	STC	No	BCH
Com: RIVERVIEW STATION/SOUICY RD STC STATION											

Species DESIRABLE	Chem	Gals	Date
WIL, DOG, SPI, ALD	2		1/4
Sens: No	Own: No		Urgent: No
ALD, DOG, WIL, SPI	A	0	5/11/03
Sens: No	Own: No		Urgent: No
SPI	3		
Sens: No	Own: No		Urgent: No
ALD, WIL, SPI			/ /
Sens: No	Own: No		Urgent: No
SPI, DOG, ALD, WIL			/ /
Sens: No	Own: No		Urgent: No
ALD, WIL, SPI, WIN			/ /
Sens: No	Own: No		Urgent: No
WIL, SPI, DOG			/ /
Sens: No	Own: No		Urgent: No
SPI, WIL	A	1	5/11/03
Sens: No	Own: No		Urgent: No
	A	0	5/11/03
Sens: No	Own: No		Urgent: No
			/ /
Sens: No	Own: No		Urgent: No
SPI, DOG, HAW, ALD			/ /
Sens: No	Own: No		Urgent: No
APP			/ /
Sens: No	Own: No		Urgent: No

## Inventory Codes

### Treatment Codes

<u>Type</u>	<u>Code</u>
Open Field/no work	OF
Mowing	MOW
Hydraulic Low Volume	SF
Backpack Low Volume	LSF
Basal	BAS
Cut and Stump Treat	ST
Cut and Stump treat/Windrow	STW
Cut and Stump treat/Chip	STC
Cut/No Herbicide	CUT
Trim	TRM
Other/no work	OTH

The land use categories are:

Land use (in the thousands position)

- 1000 – Streams
- 2000 – Wetlands
- 3000 – Road Crossings
- 4000 – Commercial/Industrial
- 5000 – Residential
- 6000 – Active Cropland
- 7000 – Active Pasture
- 8000 – Brush Lands
- 9000 – Woodlands

Height - Undesirable, taller growing species (in the hundreds position)

- 000 – no height
- 100 – small (less than 6 ft.)
- 200 – medium (6 to 12 ft.)
- 300 – tall (over 12 ft.)

Density - Undesirables (in the tens position)

- 00 – no density
- 10 – very light (generally less than 100 stems/acre)
- 20 – light (up to 30% canopy cover, and 100 to 1,500 stems/acre)
- 30 – medium (30 – 65% cover, and 1,500 to 5,000 stems/acre)
- 40 – heavy (greater than 65% cover, and over 5,000 stems/acre)

Density - Compatible shrubs (in the ones position)

- 0 – none
- 1 – light (less than 30% woody shrub canopy)
- 2 – medium (30 – 65% canopy cover)
- 3 – heavy (greater than 65% canopy closure)

- c) Plant community: The inventory shall include identifying and reporting the height and density of up to four predominate undesirable taller growing species, together with the density of the predominate desirable woody shrub species. The following species lists shall be used as a guide to identify woody tree and shrub species and their compatibility within each site. Within the limits of any easement, property owner concerns, or environmental constraints, the long-term objective should remain the eventual removal of any species capable of invading the wire security zone, while retaining and fostering smaller compatible species already present within the site.

Up to four desirable and undesirable species may be reported for each site.

## Undesirable Tall Growing Species

The following is a list of tall growing tree species that are considered undesirable in most right-of-way situations and should be removed from the right-of-way floor wherever practicable, to the extent permitted by landowner constraints and easement conditions. The primary objective of the Transmission Right-of-Way Management Program is to effectively remove and control the regrowth and reinvasion of these species.

Species	Code	Species	Code
Ash	ASH	Cucumber Tree	CUC
Balsam Fir	BAF	Elm	ELM
Basswood	BAS	Hemlock	HEM
Beech	BEE	Hickory	HIC
Birch	BIR	Maple	MAP
Cherry		Oak	OAK
Black	BCH	Pine	PIN
Domestic	DCH	Poplar/Aspen	POP
Black Gum/Tupelo	BGU	Sassfras	SAS
Black Locust	BLO	Spruce	SPR
Black Walnut	BWA	Tamarack/Larch	TAM
Butternut	BUT	Tree-of-heaven	THE
Catalpa	CAT	Tulip/Yellow Poplar	TUL
Cedar	CED	Willow	WIL
Chestnut	CHE	Other	OTH

### Small to Medium Trees

The following is a list of small to medium trees that may be compatible along the edges of the right-of-way, except on narrower sub-transmission rights-of-ways. They should be removed from under wire areas except where the mature height would not invade the wire security zone. They may also be removed from the border zone once they invade the wire security zone. These smaller tree species may be preferred for retention in buffer areas and other sensitive sites rather than taller growing tree species.

Species	Mature Height	Code
Apple	20 - 30	APP
Buckthorn		BUC
Common Buckthorn	16 - 26	.
European Buckthorn	20	.
Dogwood		
Alternate Leaf	25	ADG
Flowering	10 - 40	FDG
Cedars	40 - 50	CED
American Hornbeam		
"Ironwood"	20 - 40	HOR
Hawthorne	25 - 40	HAW
Hophornbeam	20 - 40	HOP
Mountain Ash	40	MAS
Mountain Maple	20	MOM
Pear	20 - 35	PER
Red Mulberry	30 - 60	MUL
Choke Cherry	6 - 20	CCH
Pin (Fire) Cherry	10 - 30	PCH
Shadbush/Serviceberry	15 - 40	SHD
Striped Maple	15	SMA

### Woody Shrubs

The following is a list of shrub species commonly found on rights-of-way across the service territory. While they are nearly always compatible in the border zone, along the edge of the right-of-way, several may grow tall enough to invade the wire security zone and will need to be removed from the wire zone.

The conductor to ground clearances, the wire security zone requirements, and the mature height for each species will be key factors in determining which shrubs may be retained in the wire zone at each mid-span. For example, a bulk transmission line, with mid-span conductor-to-ground clearances of 38 feet and a wire security zone of 25 feet can have shrubs with a mature height of up to 13 feet in that site. Shrubs that have invaded

the wire security zone will targeted for removal. As shrub densities in the wire zone begin to exceed 70%, taller growing shrubs will also be targeted for removal in an effort to maintain the values and benefits of the herbaceous component.

Species	Mature Height	Code
Speckled Alder	6 - 12	ALD
(note: mature heights of up to 25 ft reported)		
American Barberry	5	BAR
Chokeberry		
Black Chokeberry	10	BCB
Red Chokeberry	20	RCB
Blueberry		
Low	2 - 3	BLU
Highbush	12	HBL
Button Bush	3 - 8	BTN
(note: mature heights of up to 18 ft reported)		
Dewberry	12	DEW
Dogwood		DOG
Red Osier	10	.
Stiff (similar to Red Osier)	15	.
Grey	10	.
Silky	10	.
Roundleaf	10	.
Elderberry	3 - 13	ELD
Hazelnut		HAZ
American Hazelnut	10	.
Beaked Hazelnut	10	.
Honeysuckle	4 - 10	HON
Huckleberry	6	
Juniper		GRJ
Dwarf	1 - 4	.
Ground/Trailing	1	.
Mountain Holly	6	MOH
Mountain Laurel	10	MOL
New Jersey Tea	4	NJT
Norther Prickly Ash	4 - 10	NPA
Shrub Oak (Bear Oak)	6 - 18	SOK
Privet	15	PRI
Gooseberry	3 - 5	RIB
Rose		
Domestic	4 - 6	DOR
Multiflora	15	MUR
Rubus		RUB
Blackberry	10	.
Raspberry	6	.

Woody Shrubs (continued)

Species	Mature Height	Code
Silverberry		
American	12	SIL
Autumn Olive	12	AUT
Sumac	15	SUM
Common Spicebush	12	SPB
Spirea		SPI
Sweetfern	5 - 6	.
Steeple Bush	5 - 6	.
Sweetfern	5	SWF
Viburnum		VIB
Arrowwood	15	ARR
Highbush Cranberry	3 - 10	HCR
Mapleleaf	7	MVB
Nannyberry	9 - 18	NAN
(note: mature heights of up to 30 ft. reported)		
Northern Wild Raisin	12	RAI
Hobblebush	10	HOB
Witch Hazel	10 - 25	WIH
Shrub Willow	10 - 20	WIL
Winterberry Holly	15	WIN
American Yew	3 - 6	AMY

Climbing Vines

Bitterwseet	tangled or climbing vine	CLB
Grape	climbing vine	GRA

Note that some of these species can be classified as either exotic or invasive. In some situations management objectives within and adjacent to the right-of-way may warrant the removal or reduction of these species. Future discussions with State and Federal agencies to address invasive and exotic species on a landscape scale may require modifications of the current treatment course of action for some species.

- d) Other site conditions: The inventory shall also note areas of significant erosion and locations where failure or deterioration of stream crossing devices may have occurred; also dumping, trespass, or other incompatible uses should be noted. The Forester shall note locations where corrective action is required.

Additional landowner contact or notification requirements together with special terms or considerations shall also be noted in the inventory. A separate herbicide notification registry has been developed to identify adjacent landowners that have requested notification before herbicides are applied.

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**Treatment Method Descriptions**

## **G. Definitions and Selection Criteria of Vegetation Management Techniques**

National Grid currently recognizes eight vegetation management techniques, with variations thereof to prescribe maintenance based on specific site conditions. A descriptive analysis of each vegetation management technique follows, including a list of site parameters associated with the selection criteria for each method. These guidelines are factored into the right-of-way management inventory and treatment prescription process by the Division Forester.

The Company recognizes that site conditions vary widely and a multitude of desirable and undesirable species conditions may occur within any given mile of line. The following guidelines have been instituted to meet this maintenance requirement in a manner that cost effectively controls undesirable species and retains desirable species whenever practicable, and minimizes adverse environmental impacts. The basis of the company's Integrated Vegetation Management (IVM) program is recognition that each technique is suited to certain site conditions and that, given the wide variation in field conditions, no one tool is suitable to all sites.

### **1. Buffer Zones**

Inherent in the National Grid's procedures for selection of treatment methods is consideration of buffer zones, which are designated to minimize the potential for off-target damage. When it becomes necessary to treat in proximity to aquatic resources such as streams, lakes, rivers, ponds, or non-jurisdictional wetlands with standing water, minimum buffer zones for use of non-aquatic herbicides shall be:

- 5 feet for cut/stump treatment
- 15 feet for low-volume backpack foliar
- 25 feet for low-volume hydraulic foliar
- 50 feet for high-volume hydraulic stem foliar

Herbicides shall not be used within 100 feet of a potable water supply or DEC regulated wetland, unless otherwise allowed by permit, rule, or regulation. The Company is developing an Arcview GIS layer within its transmission mapping system that will help identify public water supplies located near our facilities.

Herbicide application within DEC regulated wetlands or the adjacent 100-foot buffer area is done in concert with the Company's statewide freshwaters wetland permit. This allows the Company to use the low-volume hydraulic foliar, low-volume backpack foliar, or the cut-stump treatment methods within regulated wetlands and adjacent buffer zones to control target vegetation. Herbicides with aquatic labeling are approved for use with these three methods.

Buffer zones or no treat zones are also incorporated for sensitive land uses such as active residential, active croplands and orchards, organic farms, active public parks, schools, and public recreational areas including golf courses and athletic fields.

- For all foliar techniques a buffer zone of reasonable size, generally 25-100 feet is maintained around active residential areas depending on site specifics. When herbicide treatment is required within these buffer zones for active residences, cut and stump treatment methods are used.
- For active croplands including active orchards, low-volume hydraulic foliar techniques use buffer zones ranging from 0-50 feet. For high-volume hydraulic foliar applications, the buffer zone range is generally increased to 25-100 feet depending on site specifics. The range depends on the density of brush to be maintained and the potential for the applicator to position the vehicle in such a way to allow application to be directed away from the crop.

Low-volume backpack foliar and cut and stump treatment methods may be used right up to the edge of active cropland and orchards where appropriate. With the backpack method the applicator can stand and direct the application away from the crop or orchard area.

- For active parks, schools, and athletic fields, the buffers zones for foliar applications range from 10-25 feet for low-volume backpack operations to 10-50 feet for low-volume hydraulic, and 25-100 feet for high-volume hydraulic foliar applications. Note that no work may be completed on the property of public or private schools, or registered day care facilities without advance pre-notification under the NYS DEC pesticide notification regulations.

All of the specific buffer zone applications are included in the individual application method descriptions later in this section. In all cases, National Grid may utilize greater distances when the Forester conducting the field inventory finds aesthetic, public, or environmental reasons to increase the size of a buffer zone. This procedure allows the Forester to consider site specifics like slope, rock outcrops, soil conditions, densities of vegetative ground cover, proximity to water, height and density of undesirables, wire security zone, type and location of crops, natural buffers, and any off right-of-way sensitive areas.

## **2. Environmental Impacts**

Environmental impacts common to all vegetation management techniques are discussed below. The environmental impacts associated with a particular maintenance technique are discussed in the appropriate section.

The procedures outlined in this Transmission Right-of-way Management Program are primarily directed towards minimizing and avoiding any potentially adverse environmental impacts associated with herbicide applications. It has been proven that those adverse impacts to adjacent land, water resources, and off right-of-way vegetation can be minimized or completely avoided using prescription programming, proper buffer zones, appropriate supervision, and responsible, careful herbicide applications.

### 3. Off-Site Herbicide Movement

A study completed by the engineering firm of Calocerinos and Spina, "Herbicide Mobility Study," analyzed herbicide persistence in soil and movement from overland flow, soil leaching, and drift. The persistence of three herbicides (triclopyr, picloram, and 2, 4-D) used on rights-of-way in upstate New York was found to be no longer than 10 weeks. Since these herbicides biodegrade rapidly, the risk of off-site movement approaches zero, especially when proper buffer zones are established.

According to the "Herbicide Mobility Study" off-site movement of herbicides by overland flow into nearby streams, lakes, ponds, etc. was found to be highly unlikely. Overland flow of herbicides can occur when herbicide applications are immediately followed by rainfall. However, the linear extent of herbicide movement is minimal, as the herbicide degrades rapidly. Vegetation buffer zones are the key to preventing herbicide movement into environmentally sensitive areas.

Herbicide movement into groundwater via leaching is also highly unlikely. The "Herbicide Mobility Study" found that herbicide leaching to a depth of only 10-15 inches is rare. Downward leaching of herbicides is generally caused by rainfall immediately after application, heavy rainfall within a day after application, or through an application method that deposits large quantities of herbicide directly on the soil, such as conventional basal. For this reason, the company seldom uses basal application. The low-volume backpack foliar method has effectively replaced most basal applications today. The potential for herbicide leaching can be better minimized through the use of foliar techniques, since the majority of the herbicide product is targeted and intercepted by the foliage of the plant and does not reach the soil level.

Additionally, a 1994 University of Massachusetts study entitled, "Study of Environmental Fates of Herbicides in Wetlands on Electric Utility Rights-of-way in Massachusetts over the Short Term," investigated the fate of two herbicides, triclopyr and glyphosate when applied in wetlands. That study identified low-volume foliar applications with glyphosate as the method of choice for controlling targeted trees. It also found there was no lateral or vertical movement of glyphosate in the soil, nor was there any accumulation of the herbicide.

Other herbicides used at National Grid, but not included in these studies are fosamine and imazapyr. However, the "Herbicide Handbook, Weed Science Society of America, Seventh Edition-1994" tells us that these products have little to no mobility in soil following application.

Off-site herbicide movement through drift can be avoided through proper application techniques. In fact, herbicides were not found at any off-site locations in this study.

#### 4. Soils

Impacts to soils from vegetation maintenance techniques arise from compaction and rutting caused by maintenance equipment traffic along the right-of-way. An ESEERCO Report 80-5 entitled "Cost Comparison of Right-of-way Treatment Methods," found that soil compaction from wheeled maintenance equipment does occur; however, the amount of compaction is minor. A limited amount of erosion in the wheel tracks occur after treatment then diminishes during the following growing season. Due to the "once through" nature of maintenance equipment, compaction and erosion impacts from vegetation management activities are considered inconsequential.

#### 5. Wildlife

An ecologically-centered approach to right-of-way management, employing IVM methods, promotes the selective retention of compatible vegetation and seldom results in long-term adverse effects on wildlife. Instead, selective maintenance techniques generally increase the abundance and diversity of plant species within the right-of-way that are preferred by wildlife for food or cover. In contrast, non-selective treatment methods such as mowing will cause an immediate temporary reduction in cover and reduce or eliminate many food sources for smaller mammals and birds.

The research of Drs. Bramble and Byrnes on Gameland's 33 in Central Pennsylvania was one of the first studies to identify the benefits to wildlife from herbicide use on rights-of-way. In fact, many wildlife species are known to utilize rights-of-way to meet their habitat requirements for nesting, foraging, bedding, and cover.

The 1982 ESEERCO Report EP 82-13, "The Effects of Right-of-way Vegetation Management on Wildlife Habitat," identified that while high-volume broadcast methods had the most immediate effect on reducing food and cover available to wildlife, selective methods helped to minimize these impacts. In addition, a successfully managed ROW develops relatively stable shrub/herb/grass communities that benefit a wide variety of species. Furthermore, while the ROW cannot meet the habitat needs of all species, vegetation management on ROWs encourages a broad spectrum of species.

More recent research conducted by the State University of New York at the College of Environmental Science and Forestry in 2000 and 2001, "Effects on Vegetation Management on the Avian Community of a Power Line Right-of-way," investigated the site specific effects of vegetation management on songbird communities. This study found that shrub-nesting songbirds respond directly to shrub habitat on ROWs. Songbird nesting increased as shrub density increased. Field observations by researchers suggested there might be an upper limit to this increased nesting as shrub density increases beyond 70%. The study found that once established, the permanence of the plant community that is produced through selective herbicide

application may be better for relatively short-lived bird species than the regular destruction of those communities through normal mechanical maintenance methods such as mowing.



Cedar Waxwing sitting on her nest on National Grid's Volney-Marcy ROW.

#### 6. Density Definitions:

The brush density definitions used by National Grid to identify the density of either desirable or undesirable woody plant species are:

- Very Light (undesirable only, generally less than 100 stems/acre)
- Light up to 30% canopy cover
- Medium 30 to 65% canopy cover
- Heavy greater than 65% canopy cover

Another guideline for assessing undesirable densities translates these percents of cover into approximate stem densities as follows:

- Very Light 100 stems/acre or less
- Light 100 to 1,500 stems/acre
- Medium 1,500 to 5,000 stems/acre
- Dense greater than 5,000 stems/acre

## **7. Height Definitions:**

The height definitions used by National Grid to identify the height of vegetation to be treated are as follows:

- Small            less than 6 feet
- Medium         6-12 feet
- Tall             over 12 feet

The average heights of vegetation to be treated are captured in the site inventory data. Within a site there may be a wide range of vegetation heights. Generally, for sites where the average vegetation height is over 15-16 feet, a foliar herbicide treatment is not appropriate. On these sites an initial cut and stump treatment, possibly followed by a low-volume backpack operation, may produce more effective control while minimizing the risk of off-target treatment and the total amount of herbicide per acre necessary to achieve total control. While there are situations where the average height of target vegetation on a foliar site may be only 8-10 feet, there may be scattered stems on the same site that are as tall as 18-20 feet. It is allowable and appropriate for the crew to foliar treat these taller stems as long as they are away from sensitive environmental resources and areas of high visual sensitivity, and the crew is able to get into close proximity of the target to prevent off right-of-way drift. In these situations the applicator should be riding on the rig 4-6 feet off the ground, and extending their arms and spray guns to effectively reduce the application distance from 20-feet back down to 10-12 feet. This will increase the accuracy and efficiency of the herbicide application onto the target foliage and minimize the potential for off-target damage.

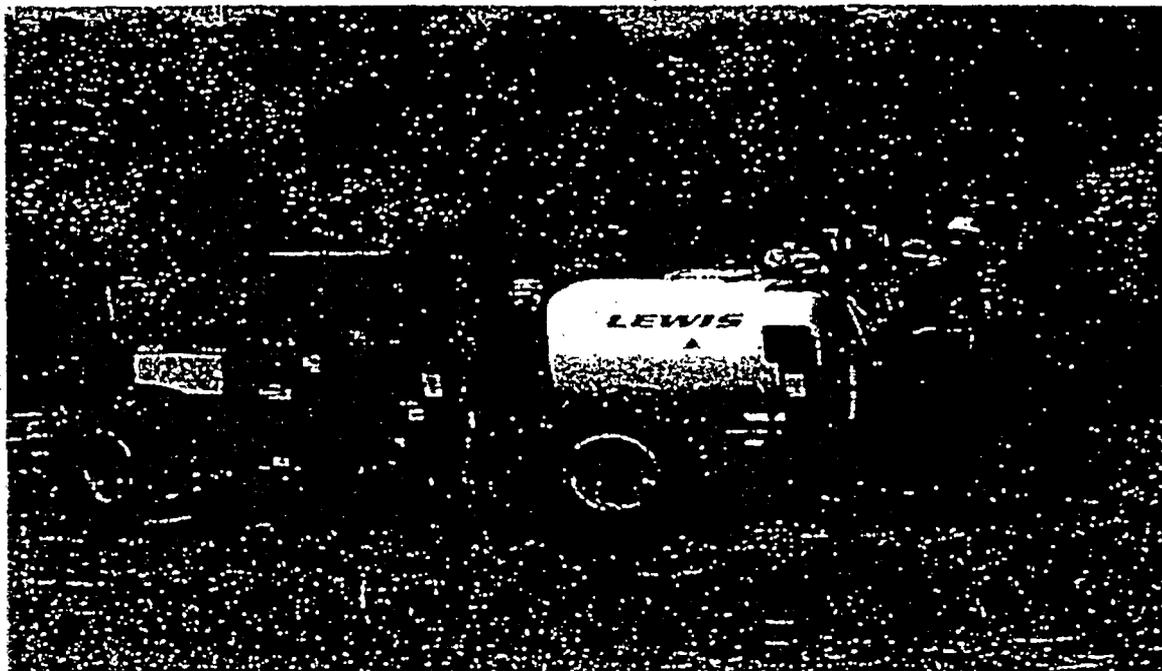
## **8. Vegetation Management Techniques**

The approved vegetation management applications include:

- a. High-Volume Hydraulic Stem-foliar
- b. Low-Volume Hydraulic Foliar
- c. Low-Volume Backpack Foliar
- d. Cut and Stump Treatment
- e. Basal Application
- f. Cutting and Trimming, No Herbicide Treatment
- g. Mowing
- h. Mowing and Cut Stubble Herbicide Treatment
- i. Helicopter

Each method will be discussed in detail in the following pages of this section.

a. High-Volume - Hydraulic Stem-Foliar Application



**Application:** Target-Selective stem foliar requires full coverage of the target plant's leaves, branches, and stem to the point of runoff. This method is especially effective for controlling medium- to high-density undesirable vegetation, while minimizing herbicide use requirements as much as possible.

**Equipment:** All-terrain type vehicle, hydraulic tank, pump, hoses and spray guns.

**Herbicide:** Selective or non-selective products available, approximately 60-120 mixture gallons/acre depending on target species density.

**Limitations:** In dense brush conditions, walking or hose dragging becomes onerous; therefore, applications from the spray unit are the most efficient and effective method for treating dense or tall stands of undesirable species. Selectivity increases as density decreases and spacing between target and non-target vegetation increases. It is most effective on sites where the average heights are less than 15-16 feet.

**Drift:** *Operating pressure below 150 psi at the nozzle and operator is less than 25 feet from the target plant.* Mix additives such as surfactants and drift control agents are utilized.

**Buffer zones:** The use of high-volume hydraulic foliar shall be avoided within:

- 50 feet of streams, ponds, unregulated wetlands, or lakes with standing water and/or running water

- 100 feet of a regulated wetland, unless otherwise allowed by permit  
(Note that this technique may only be used inside this buffer when treating undesirable stems in seasonally dry wetlands or adjacent area using products approved for aquatic applications in accordance with approved wetland permits. Low-volume hydraulic methods shall be preferred to high-volume methods where every possible.)
- 25-100 feet of an active residence or ornamental plantings
- 25-100 feet of active croplands, orchards, etc.
- 25-100 feet of active parks, schools, athletic fields, golf courses, etc.

Visual Effects: Some brownout may be caused by dead or dying foliage, which may be mitigated by high selectivity. The remaining green, compatible vegetation also reduces this effect.

#### **Full discussion of Technique:**

The high-volume stem foliar technique is especially effective for sites with high undesirable densities. The higher spray pressures help ensure adequate plant coverage on these sites, while the reduced herbicide concentration in the mixture helps minimize the amount of active ingredient applied per acre. As undesirable densities rarely reach these conditions today, this application method is not required as often as it was in earlier cycles.

Application: A herbicide mix is directed at the target vegetation so as to wet all leaves, branches, and stems to the point of runoff. The applicator should be within 25 feet of the target plant in order to maximize application efficiency and effectiveness and minimize off target damage. To further minimize drift, the operating pressure of the unit should not exceed 150 psi at the nozzle, and the nozzle opening shall be regulated so as to produce a coarse spray of large droplets.

Equipment: The application equipment generally includes an all-terrain type vehicle, either tracked or rubber tired, and mounted with a hydraulically operated pump, a 100-1000 gallon mix tank, two hoses at least 100 feet long, and two spray guns with suitable nozzles. Ground support equipment includes a 500-1000 gallon water resupply truck. Manpower normally consists of 3-4 persons.

Herbicide: The herbicide mix contains *generally less than 1% active ingredient and is applied at an average of 60-120 mixture gallons per acre*, depending upon undesirable species density. Application rates may run as high as 300-400 gallons per acre on high-density sites. While selective herbicide mixtures are preferred for high-volume applications, because they tend to preserve more grass and fern species in the site. Non-selective mixtures may be used when the herbicides provide environmental advantages such as aquatic labeling, reduced soil residual, or less active ingredient per acre.

Limitations: When dense brush conditions make walking or hose dragging onerous, or the scattered spacing of desirable or undesirable stems would improve crew efficiency, the crew is authorized to make the treatment while riding on the back of the spray unit. Application from the elevated platform also helps improve selectivity by keeping the applicator closer to the

canopy of the undesirable vegetation, often enabling them to treat down onto the target stems. This treatment should not be used on sites where average brush heights exceed 15-16 feet. Individual trees or small clones of taller vegetation up to about 20 feet may be treated when the applicator can get in close proximity to the target with the vehicle and spray from the elevated deck to reduce the potential for over spray and off-target damage.

#### **Environmental Considerations:**

**Drift:** High-volume hydraulic applications have the greatest risk of drift due to the high operating pressures and increased application rates. Mix additives, including surfactants and drift control agents, are required to eliminate small droplets and prevent drift. In addition, limits on the height of target vegetation, treatment distance, and the size of the nozzle opening helps minimize the potential for off-target damage.

This method has the greatest "zone of effect" on adjacent understory vegetation of all the approved foliar methods, due to the higher pressures and application rates. However, this increased pressure is necessary to achieve effective control in medium to dense stands and has been one of the foremost reasons for the past success of the program. The broader zone of effect is also helpful for economically converting tall or dense woody stands to the more compatible herbaceous stands in the wire zone, while using less herbicide than either low-volume foliar or cut and stump treatment in these higher densities.

**Buffer zones:** Where site conditions warrant larger buffers, the Forester shall so designate as part of the site-by-site assessment and/or ground follow up.

**Visual Effects:** The short-term visual effect from the selective stem-foliar technique is the variable brownout condition caused by dead or dying foliage. The green, non-target, and compatible vegetation remaining on the treatment site mitigate the overall brownout effect. A long-term visual impact associated with this technique may be the sight of dead stems following the treatment.

#### **Site Conditions Favorable for this Technique:**

Selective high-volume stem-foliar application may be specified when the treated portion of the right-of-way:

1. has dense undesirable species (65-100%); or
2. has moderate (30-65%) to dense (65-100%) undesirable species, with light to medium desirable species (1-65%); or
3. is within the mid-span, wire zone site that contains tall or dense shrubs. High-volume treatment with more diluted mixtures would provide proper coverage and reduce herbicide use, while converting the site to a stable mix of grass and herbaceous species; and
4. site proposed for treatment is accessible to ground equipment; and the site is sufficiently removed from environmentally sensitive sites so as to minimize potential impacts unless otherwise allowed by permit.

b. Low-Volume Hydraulic Foliar Application



**Application:** Target-Selective Foliar requires coverage to lightly wet the leaves, all growing tip areas, and the entire terminal leader area of the target plant.

**Equipment:** All-terrain type vehicle, hydraulic tank, pump, hoses, and spray guns.

**Herbicide:** Selective or non-selective products available at rates of approximately 15-30 mixture gallons/acre depending on target species density.

**Limitations:** In dense brush conditions, undesirable densities may be too high to insure adequate coverage, and walking or hose dragging may become onerous. Selectivity is dependent on density and spacing of target/non-target vegetation. Use on lower density sites with average heights of less than 15-16 feet.

**Drift:** *Operating pressure below 50-pounds/square inch (psi) at the nozzle with the operator within 15 feet of the target plant.* Mix additives such as surfactants and drift control agents are necessary.

**Buffer zones:** The use of low-volume hydraulic foliar shall be avoided within:

- 25 feet of streams, ponds, unregulated wetlands, or lakes with standing and/or flowing water
- 100 feet of a regulated wetland, unless otherwise allowed by special wetlands permit (Note that this technique may only be used inside this buffer when treating undesirable stems in seasonally dry wetlands or adjacent area using products approved for aquatic applications in accordance with approved wetland permits.)
- 25-100 feet of an active residence or ornamental plantings

- 0-50 feet of active croplands, orchards, etc.
- 10-50 feet of active parks, schools, athletic fields, golf courses, etc.

**Visual Effects:** Some brownout may be caused by dead or dying foliage, however, it may be mitigated by increased selectivity. The remaining green, compatible vegetation on the treatment site will also mitigate this effect.

**Full discussion of technique:**

Low-volume hydraulic foliar is the predominate treatment prescribed by the Company for all non-sensitive, upland sites. This method was used to treat 100% of the brush acres receiving hydraulic foliar application in 2001, which completely replaced the high-volume technique. This conversion to highly selective, low-volume methods across nearly all of the ROW system was possible due to the effectiveness of past methods and reductions in undesirable densities over the past two decades.

**Application:** A herbicide mix is directed at the target vegetation so as to lightly wet the leaves in all growing tip areas and across the entire terminal leader area of the target plant. The applicator should be within 15 feet of the target plant in order to maximize the accuracy of the application and minimize off-target damage. To further minimize drift, the operating pressure of the unit should not exceed 50 psi at the nozzle, and the nozzle opening shall be regulated so as to produce a coarse spray of large droplets.

**Equipment:** The application equipment generally includes an all-terrain type vehicle, either tracked or rubber tired that is mounted with a hydraulically operated pump, a 100-1000 gallon mix tank, two hoses at least 100-feet long, and two spray guns with suitable nozzles. Ground support equipment includes a 500-1000 gallon water resupply truck. Manpower normally consists of 3-4 persons.

One highly specialized variation of this method includes low-volume foliar applied through a Radiarc nozzle mounted on four-wheel ATVs for access roads, designated wire zone areas, and narrow ROWs, such as gas rights-of-way. This method limits the application width to approximately 20 feet. The method uses a small pump and 15-30 gallon tank.

**Herbicide:** The herbicide mix contains *generally 1-2% active ingredient* and is *applied at an average of 15-30 mixture gallons* per acre depending upon undesirable species density. Either a selective or non-selective herbicide can be used. A selective herbicide will tend to preserve more ground cover vegetation such as grasses, herbs, and ferns on the right-of-way floor, which may be preferential. However, some non-selective herbicide products may have a lower environmental risk or may require less active ingredient per acre.

**Limitations:** Since much of the Company's rights-of-way now contain medium to dense populations of compatible vegetation, walking or hose dragging has become difficult. For that reason, crews generally make this foliar application from the deck of the vehicle. By working from this elevated position, targeting the undesirable stems is improved by enabling the applicator to work from above the target. The lower pressures require the applicator be within

approximately 15 feet of the target stem. However, the crew must not increase nozzle pressures to extend their reach or herbicide use will increase. This technique should not be used to control high-density sites, because the lower pressures and lighter wetting will result in poor coverage of dense vegetation. Increasing the pressure will rapidly increase the gallons/acre requirements.

Low-volume hydraulic foliar should not be used on sites where average undesirable brush heights are above 15-16 feet. Individual trees or small clones of taller vegetation up to about 20 feet may be treated when the applicator can get in close proximity to the target with the vehicle and spray from the deck to reduce the potential for over spray and off-target damage.

#### **Environmental Considerations:**

**Drift:** Effectively controlled and prevented with low-volume hydraulic applications through reduced pressures and control of nozzle openings to create large, coarse droplets. Mix additives such as surfactants are required to improve surface wetting and adherence of the herbicide on the leaf together with thickening or drift control agents that help to eliminate the formation of small droplets or "fines" and prevent drift. Drift and off-target damage can be minimized by limiting the applicator's distance from the target stem by reducing the height of the target vegetation and by decreasing spray pressures.

The phrase "zone of effect" has been coined to describe the "shadow effect" of the spray pattern on adjacent understory vegetation. Whenever herbicides are foliar applied to wet the leaf surface of the target plant, some mixture falls on adjacent understory vegetation within the right-of-way. As long as the spray pattern is contained within the right-of-way, this zone of effect of the spray pattern is *not* considered a drift problem.

Different application methods will have different "zones of effect." The size or extent of the impact on adjacent understory vegetation increases as operating pressures, treatment rates, and the distance increases from the nozzle to the target vegetation. The Program has always weighed and balanced the loss of compatible vegetation against the requirements for effective control and long-term reliability. As treatments have become more selective over the years, the "zone of effect" has become much smaller. When compared to past helicopter or high-volume foliar applications for dense brush, today's low-volume foliar methods have a vastly reduced "zone of effect" within the total right-of-way.

Recent studies on the Volney-Marcy ROW have begun to investigate this effect for a variety of treatments. Preliminary results indicate that most of the spray pattern that falls on adjacent, understory vegetation is intercepted by the foliage of those plants with very little herbicide actually reaching the soil. In addition, the effect on the herbaceous communities varies with different herbicide mixtures. Most sites experience a temporary setback but begin to recover within the same growing season and are fully revegetated by the next growing season.

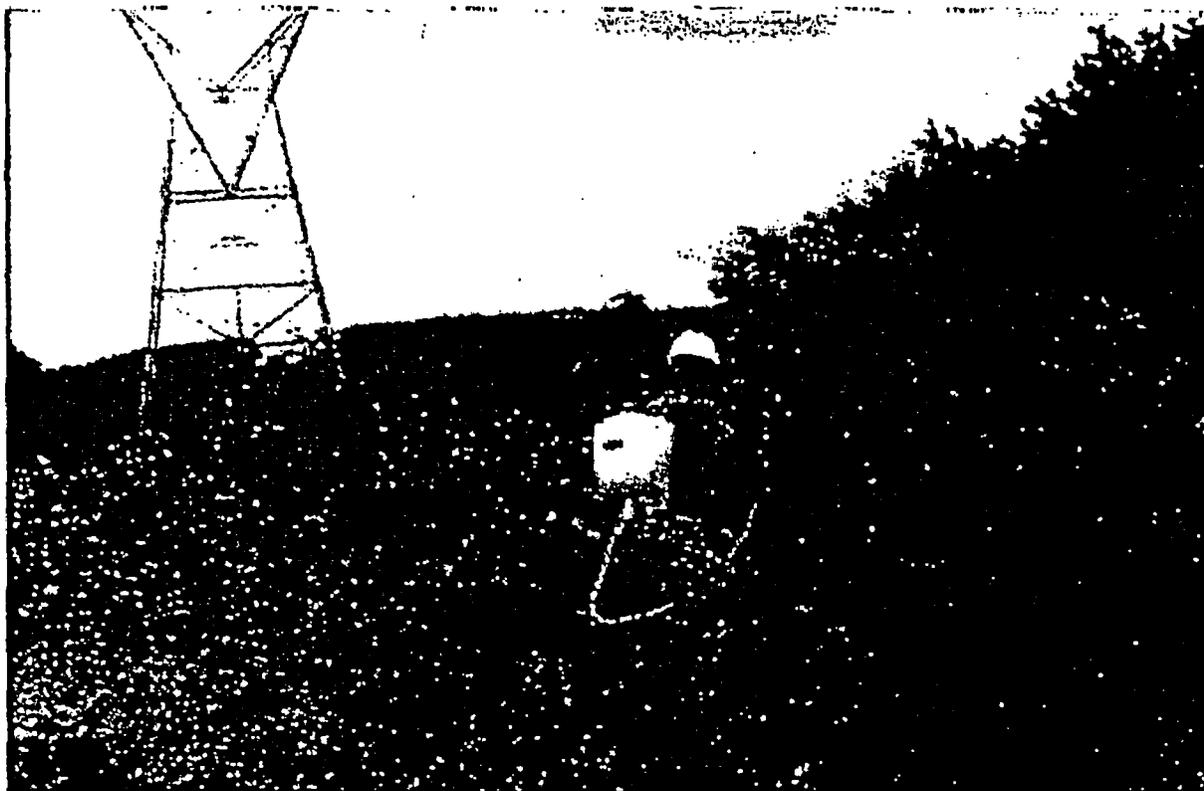
**Buffer zones:** Where site conditions warrant larger buffers, the Forester shall so designate as part of the site-by-site assessment and/or ground follow up.

**Visual Effects:** The short-term visual effect from the highly selective low-volume foliar technique is the variable brownout condition caused by dead or dying foliage. High selectivity and the green, non-target compatible vegetation remaining on the treatment site mitigate the overall brownout effect. A long-term visual impact associated with this technique can be the sight of dead stems that remain in the treatment site for a few years following treatment.

**Site Conditions Favorable for this Technique:** Selective low-volume hydraulic foliar applications may be specified when the right-of-way is:

1. a wide right-of-way (150+ feet) where backpack foliar operations become inefficient; or
2. a right-of-way with medium to dense desirables that are too tall for back pack operations, and very light to light tall growing stems where riding the unit would place the applicator on an elevated platform above the desirable shrub layer, improving treatment effectiveness, or
3. a right-of-way with medium to heavy undesirable species densities and average heights of 15-16 feet or less, where the high-volume stem foliar treatment is neither appropriate, practical, or necessary; and
4. the site proposed for treatment is accessible to ground equipment; and
5. the site is sufficiently removed from environmentally sensitive sites so as to minimize potential impacts unless otherwise allowed by permit.

c. **Low-Volume Backpack Foliar Application**



**Application:** Target-Selective Foliar requires very light wetting of the leaves, especially in the growing tip and terminal leader areas of the target plant.

**Equipment:** Hand powered or motorized backpack tank and spray gun with a two-way nozzle to apply either a cone or stream pattern.

**Herbicide:** Selective or non-selective products available in a variety of different tank mixes and modes of action. Mix generally at 4-6% active ingredient, apply at approximately 3-6 gals per acre.

**Limitations:** Selectivity is dependent on density and spacing of target and non-target vegetation. Use on sites with average heights of less than 10-12 feet and very light to light brush densities. Dense desirable brush makes this treatment impractical.

**Drift:** Relatively low pressure application at close target distances. Surfactants are required and drift control agents may be utilized.

**Buffer Zones:** The use of low-volume backpack methods shall be avoided within:

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

- 100 feet of a regulated wetland, unless otherwise allowed by permit  
(Note that this technique may be used as a preferred treatment method within wetland buffers when treating undesirable stems with approved aquatic products in seasonally dry wetlands or adjacent areas, in accordance with approved wetland permits.)
- 25-100 feet of an active residence or ornamental plantings
- 10-25 feet of active parks, schools, athletic fields, golf courses, etc.
- No buffer is required for this technique next to crop fields or orchards when the treatment can be directed away from the crop area.

Visual Effects: Some scattered, variable brownout caused by dead or dying foliage may be mitigated by high selectivity and the effect of the green, non-target, compatible vegetation remaining on the treatment site.

#### **Full discussion of Technique:**

The low-volume backpack method is especially effective on narrower ROWs in very light to light density sites where desirable densities are low enough to allow the applicator to traverse the site by foot. This treatment is also preferred for the treatment of sensitive buffer areas as research has shown that less herbicide is deposited on the soil surface as compared to cut and stump treatment.

Application: The herbicide mix is directed at the target vegetation so as to very lightly wet the leaves in the growing tip and terminal leader areas of the target plant using a very low pressure application method. The applicator should be within a few feet of the target plant, but not more than 10 feet, in order to maximize application and minimize off-target damage. To further minimize drift, the operating pressure of the backpack unit should be maintained around 25-30 psi and should never exceed 50 psi at the nozzle. The nozzle opening should be regulated so as to produce a coarse spray of large droplets. The spray gun may be equipped with a two-way nozzle to provide a "cone" pattern for the treatment of smaller vegetation as well as a "stream" pattern for the treatment of taller target plants.

Equipment: Manpower normally consists of two or more persons. The most common backpack system consists of a hand operated simple diaphragm or piston-pump backpack equipped with a spray wand and one nozzle (either a flat fan or adjustable cone). As an added feature many applicators utilize a dual nozzle spray gun that allows the operator to switch between a narrow-angle "stream" nozzle for longer distances or a wide-angle "cone" tip for shorter distances and wider coverage.

Herbicide: The herbicide mix contains generally 4-6% active ingredient and is applied at an average of 3-6 mixture gallons per acre depending upon undesirable species density. Either a selective or non-selective herbicide can be used. A selective herbicide will tend to preserve more groundcover vegetation such as grasses, herbs, and ferns on the right-of-way floor, which may be preferential. However, some non-selective herbicide products may have a lower environmental risk or may require less active ingredient per acre.

Limitations: This treatment should not be used on sites where average heights exceed 10-12

feet. Occasionally, individual stems or clones of stems upwards of 15 feet can be treated using the "stream" pattern nozzle as long as the applicator can get into a good position for treatment and minimize off-target damage. This treatment is not efficient for wide rights-of-way over 150 feet or on rights-of-way with medium to dense desirable brush where walking is difficult. The low-volume hydraulic foliar method should be the treatment of choice for those conditions. Additionally, low-volume backpack should not be used to treat continuous areas of moderate to dense undesirables since the application rates as measured by active ingredient may be too high for the higher density sites. The low-volume or high-volume hydraulic methods would reduce the application rates for those situations.

#### **Environmental Considerations:**

Drift: The close proximity of the applicator to the target, along with the low pressure of the backpack equipment makes the risk of drift virtually non-existent. Mix additives such as surfactants are required for uniform spreading of the herbicide mix over the leaf surface, and drift control agents may be necessary when using motorized backpacks.

The reduced pressures and close proximity of the application make the "zone of effect" for this treatment smaller than what is experienced with the hydraulic foliar methods.

Buffer zones: Where site conditions warrant larger buffers, the Forester shall so designate as part of the site-by-site assessment and/or ground follow up.

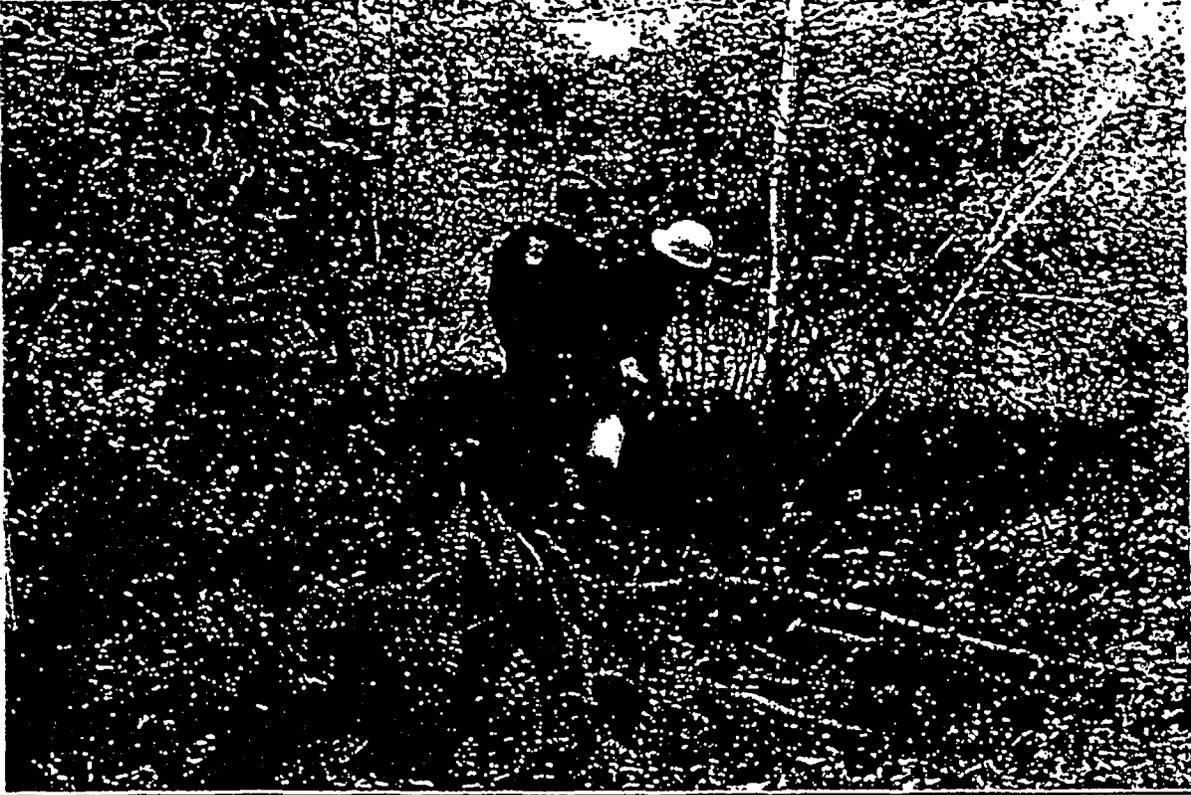
Visual Effects: The short-term visual effect from the low-volume backpack foliar technique is the variable brownout condition caused by dead or dying foliage. High selectivity and the green, non-target, compatible vegetation remaining on the treatment site mitigate the overall brownout effect. A long-term visual impact associated with this technique may be the presence of dead stems that remain in the treatment site for a few years following treatment.

#### **Site Conditions Favorable for this Technique:**

The selective low-volume backpack foliar application may be specified when the treated portion of the right-of-way:

- a. consists of very light to light undesirable species (0-30%) with average heights below 10-12 feet and light to medium desirable densities that can be traversed by foot; or
- b. consists of any density of undesirable species where the only access to the site is by foot;  
and
- c. is sufficiently removed from environmentally sensitive sites so as to minimize potential impacts unless otherwise allowed by permit.

d. Cut and Stump Treatment



Application: Target-Selective Cutting is when the stem is cut and the stump is treated with herbicide to prevent resprouting.

Equipment: Chainsaw and small squirt bottle or backpack tank.

Herbicide: Water-base or oil-base products.

Limitations: Most effective when applied immediately after cutting and during the active growing season.

Drift: Drift is not a significant problem due to low pressures and low-volume applications.

Buffer Zones: The use of non-aquatic products shall be avoided within:

- 5 feet of a stream, pond, regulated wetland, or lake with standing and/or flowing water.
- 100 feet of a regulated wetland unless otherwise allowed by permit.  
(Note that herbicides that have been registered for use in aquatic settings may be used in wetlands and adjacent areas, by permit, with no direct spray into standing water.)

Visual Effects: The cut slash is the primary visual effect. Various slash disposal methods may be prescribed by the Forester to minimize the impacts on adjoining land uses.

## Full discussion of Technique:

Cut and stump treatment is the preferred method to control undesirable stems within the buffer zones for foliar applications next to residential, active cropland, orchards, public parks, schools, athletic fields, golf courses, etc. It also is the most common method used to control tall growing vegetation near standing water, when using approved aquatic herbicides. It may also be used to clear taller vegetation that has become too tall for the foliar techniques. Finally, this method may be prescribed by the forester for sites that have high visual sensitivity.

**Application/Equipment:** Cut and stump treatments are designed to remove individual stems and chemically control the root system. The technique is most widely employed inside buffer zones for foliar treatment, for cutting of vegetation that is over the foliar height restrictions, or in visually sensitive areas. The cutting is primarily accomplished using either a chainsaw or brush saw. Variations in the manner of slash disposal recognized by National Grid include:

- Cut and stump treatment is where the slash remains lopped where it falls.
- Cut and stump treatment and windrow is when the slash is disposed of by hand piling or windrowing.
- Cut and stump treatment and chip are where the slash is disposed of by chipping. The chips may be disposed of on site or hauled away.

Note that in all cases, slash may not be left in an identifiable watercourse.

**Herbicides:** There are two approaches to herbicide materials and applications. One method uses water-borne products that are applied directly to the cut surface immediately following cutting, while the other uses oil-based products that may be applied to the entire stump surface any time following clearing, including days or weeks later.

- 1). Water-based herbicide application is accomplished through use of hand-held squirt bottles or small capacity hand or backpack pressure sprayers. The material is either pre-mixed from the manufacturer or field mixed by diluting the concentrate by 50% with water, and applying it to the outer circumference of the cut surface with emphasis on the cambium layer. The application must be made *immediately* after cutting. The mode of entry is through direct uptake into the water-based system of the tree and transported by the phloem tissues down into the roots. Delaying treatment after cutting may allow formation of air bubbles or drying at the cut surface, blocking the trees transport system and preventing effective translocation of the herbicide into the roots.
- 2). Oil-based herbicide application uses a backpack hand sprayer to deliver the oil-based herbicide mixture onto the bark surface of the stump and all exposed roots. The mixture is applied to the point of run down and puddling at the root collar. Following application, the herbicide penetrates the bark to disrupt the cambium and prevent emergence of dormant buds within the exposed bark and root collar zone. Translocation of oil-based mixtures into the root system is poorer than other methods, because these oil-based products will not dissolve as easily and enter the water-based transport systems of the tree.

**Limitations:** Experience has shown that stump treatment methods often produce unreliable results when used on stumps of root suckering species. Seasonal differences in the plant physiology and herbicide transport mechanisms, as well as human error, also cause variations in results of this technique. Special slash disposal methods like windrowing or chipping escalate per acre maintenance costs beyond the basic cut and stump treatment method where the slash remains lopped where it falls.

**Environmental Considerations:**

**Drift:** The high selectivity of this technique causes little or no damage to non-target shrub species. Drift is non-existent due to the low-pressure, close-hand application equipment. Non-target herbaceous vegetation within 6 inches-2 feet from the treated stump may be damaged by herbicide that splashes from the stump during application and from the over spray of the spray pattern falling on adjacent grasses, herbaceous material, and shrub stems. Off-target herbicide movement via root uptake can also occur when using water-based treatments on some species during cut and stump treatment applications. Herbicide applied to the cut stumps can be transported through interconnected root systems and damage or kill trees beyond the edge of the right-of-way. Root suckering tree species that grow in clones are especially susceptible to damage from root uptake.

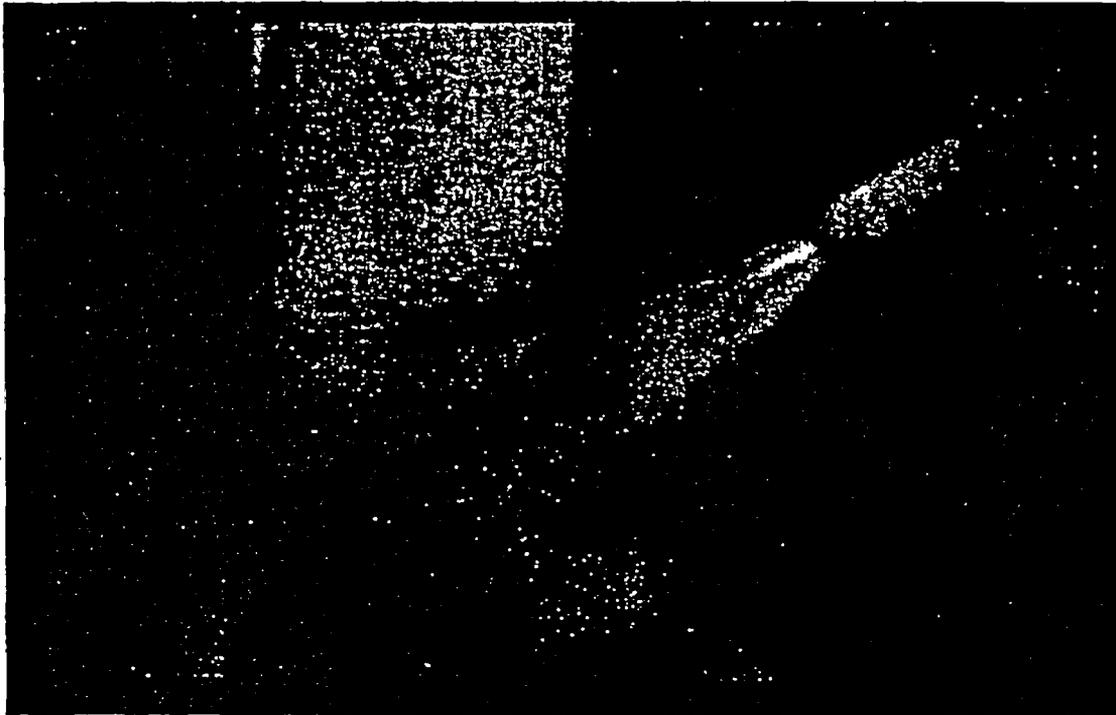
**Buffer Zones:** Where site conditions are so sensitive that cut and stump treatment cannot be completed, the Forester may elect to only cut or trim and not use herbicides.

**Visual Effects:** The short-term visual impacts associated with this technique may be the sharply defined cut edge of the right-of-way, or the sight of drop and lopped or piled brush. The remaining non-target vegetation within the treatment site often mitigates these visual effects.

**Site Conditions Favorable for this Technique:** Cut and stump treatment should be specified when the proposed site for treatment is:

1. inside the buffer zone area for any of the foliar techniques; or
2. an area of high visual sensitivity, such as heavily-used highways or public park areas, where the undesirable growth requires removal; or
3. an area immediately adjacent to residential areas where, due to intense land use practices, stem removal is warranted over appropriate foliar applications; or
4. an area within the limits of a public water supply or immediately adjacent to a domestic water supply, where an aquatic herbicide can be approved and prescribed for that use; or
5. within the buffer zone and adjacent area of a regulated wetland and aquatic herbicides are approved for use on the permit; or
6. where individual target plant heights exceed acceptable limits for foliar applications and must be removed.

e. Basal Applications



**Application:** Target-Specific Basal is a spray application applied to the lower portion of individual standing woody stems. The application requires a thorough wetting of the lower 12-15 inches of the stem down to ground line including the root collar zone.

**Equipment:** Most commonly applied with a 1-5 gallon, hand-held or backpack unit equipped with a hand pump and spray wand. Various mixtures may also be applied with small, hand-held squirt bottles or even larger hydraulic units, dragging hoses, and using low pressures. Manpower normally consists of a 2-3 person ground crew.

**Herbicide:** Today, mainly ready-to-use products that contain specially developed penetrants are used, rather than the old, conventional fuel-oil basal mixtures. Various herbicides are diluted in these penetrants at rates of 10-50%.

**Limitations:** Most effective when used in very small areas during active growing season. Increased skips and misses as site density and size increase, and when snow covers the base of the stem. Oil-based products have reduced translocation, with poorer control of root suckering species.

**Drift:** Drift is not a factor because of the relatively low pressure application and close target distances.

**Buffer Zones:** The use of basal applications shall be avoided within:

- 15 feet of a stream, pond, regulated wetland, or lake with standing or flowing water

- 100 feet of a regulated wetland, unless otherwise allowed by permit

Note: Use of basal applications is allowed up to the edge of residential areas, active croplands, orchards, public parks, schools, athletic fields, golf courses, etc.

Visual Effects: Brownout will occur when basal applications are made in either the active growing season or the dormant season. The brownout associated with dormant season treatments actually occurs the following summer. The visual impact is softened by the high selectivity of this treatment that retains a high percentage of the compatible shrub species on the site.

#### Full discussion of Technique:

The basal method has evolved over the past two decades, specifically in regards to the herbicide products used for this treatment. The old, conventional basal method employed a herbicide diluted in a fuel oil carrier, generally at a rate of 1-4 gallons of herbicide per 100 gallons of mixture (a 1-4% solution). The application was targeted at the lower 12-18 inches of the stem, saturating the basal area to the point of rundown and puddling at the root collar zone. There were several disadvantages to the conventional basal application method including:

- The method utilized large quantities of fuel oil, requiring as much as 150 gallons per acre or more, adding greatly to the cost, difficulty of handling, and environmental concerns with the application.
- Higher herbicide concentrations were generally required to achieve even minimal effectiveness.
- Poor agitation and mixing frequency also lead to spotty results.
- The low solubility of the oil-borne solution within the plant's water system reduced translocation and led to poor root control of root sprouting species.
- Additionally, this limited mobility required more exact application to insure complete coverage and rundown. If the back or side of the stem was missed and not completely encircled, "green streaking" occurred whereby food and nutrients were still able to continue through the thin untreated strip keeping the stem alive. If the stem was circled, but not puddled at the root collar, dormant buds below the treated area would sprout to maintain life within the plant system.
- Application when the bark is wet may result in herbicide/oil mixture run-off of the plant, and ultimately poor or no control.

More common and appropriate today is the use of the concentrate basal application method involving the use of specially developed penetrants to replace the fuel oil of conventional basal mixtures. These penetrants are designed to more effectively penetrate the waxy suberin of the bark, carrying the herbicide into the cambium area. These product advancements have helped minimize the effects of many of the issues stated above. The basal method still requires some of the highest rates per acre of herbicide concentrate to achieve effective control. As a result, basal is used only sparingly in the program.

Application: Basal-bark treatments can be effectively used to control brush and trees up to six inches in diameter. Application is made as a fine mist that is used *to lightly wet the bark, rather*

*than wetting to the point of rundown.* The method is useful for selectively removing very light to light density undesirable vegetation where the applicator can traverse the site by foot, and where the right-of-way is not over-grown with shrub species. The number of skips or misses related to this operation increases as shrub density increases due to the difficulty in locating the target stems within a moderate to dense shrub understory. Conventional basal treatments primarily control woody brush by chemically girdling the stem. Treatments can be made any time of the year including the dormant season as long as snow depths do not prevent access to the lower portion of the stem. However, best results occur during growing season treatments between April and October. With some herbicide products, trees treated in the dormant season may leaf out in the spring since the buds are set, and then wilt and die once stored food reserves are burned up. This brownout can be a problem in visually sensitive areas.

**Equipment:** Equipment used for this application can vary from small, hand-held squirt bottles to 1-5 gallon, hand-held or backpack units equipped with a hand pump and spray wand. Although uncommon today, it can also be applied using the hydraulic type spray unit normally associated with ground foliar treatments. The treatment is directed at the lower 12-15 inch portion of the stem and is made with very low pressures using a solid cone or flat fan nozzle. Manpower normally consists of a 2-3 person ground crew.

**Herbicide:** Various herbicide ingredients can be formulated by combining them with basal bark penetrants at rates of 10-50% to create a concentrated basal ready-to-use formulation. As this is a low-volume approach, one gallon of concentrate basal solution replaces the equivalent of 10-12 gallons of the old conventional basal mixture. The newer concentrate basal products also provide a systemic mode of action that significantly improves effectiveness by controlling the plant's root system. The combination of the penetrants with a higher herbicide concentration result in more rapid and consistent basal treatments. The higher herbicide concentrations may also tend to avoid the problems of mixing oil-borne and water-borne solutions.

**Limitations:** The treatment is recommended for stems under six inches in diameter, on sites with low densities of undesirable brush. The exact, tedious coverage requirements of this application often result in complete misses or only partial control of the target stems. Once within the plants, the degree of mobility and translocation is limited by the poor mixing of oil-based products with the water transport system of the tree. Time of year, tree species, herbicide, carrier, mixture rate, solubility, and other factors all effect control and performance. Basal applications cannot be made when snow prevents the spraying of the stem down to the ground line.

#### **Environmental Considerations:**

**Drift:** The high selectivity of this technique causes little or no damage to non-target vegetation. The basal technique utilizes low pressures, because the mixture must be delivered within approximately two feet of the stem. As a result, drift is not a factor.

The "zone of effect" for this application is greater than the zone associated with cut and stump treatment, due to the heavier application rates, fine spray pattern, and the high concentration of the material. Since this application is directed at the base of the target stem and uses the highest

application rates of all methods, it places the greatest amount of herbicide at the ground level. This may result in a high level of herbicide actually reaching the soil and may increase the depth of herbicide leaching. Low-volume backpack foliar methods have generally replaced basal methods in the field, because they require greatly reduced application rates and most of the over spray or shadow of the spray pattern is intercepted by the foliage of the herbaceous understory and never reaches the ground.

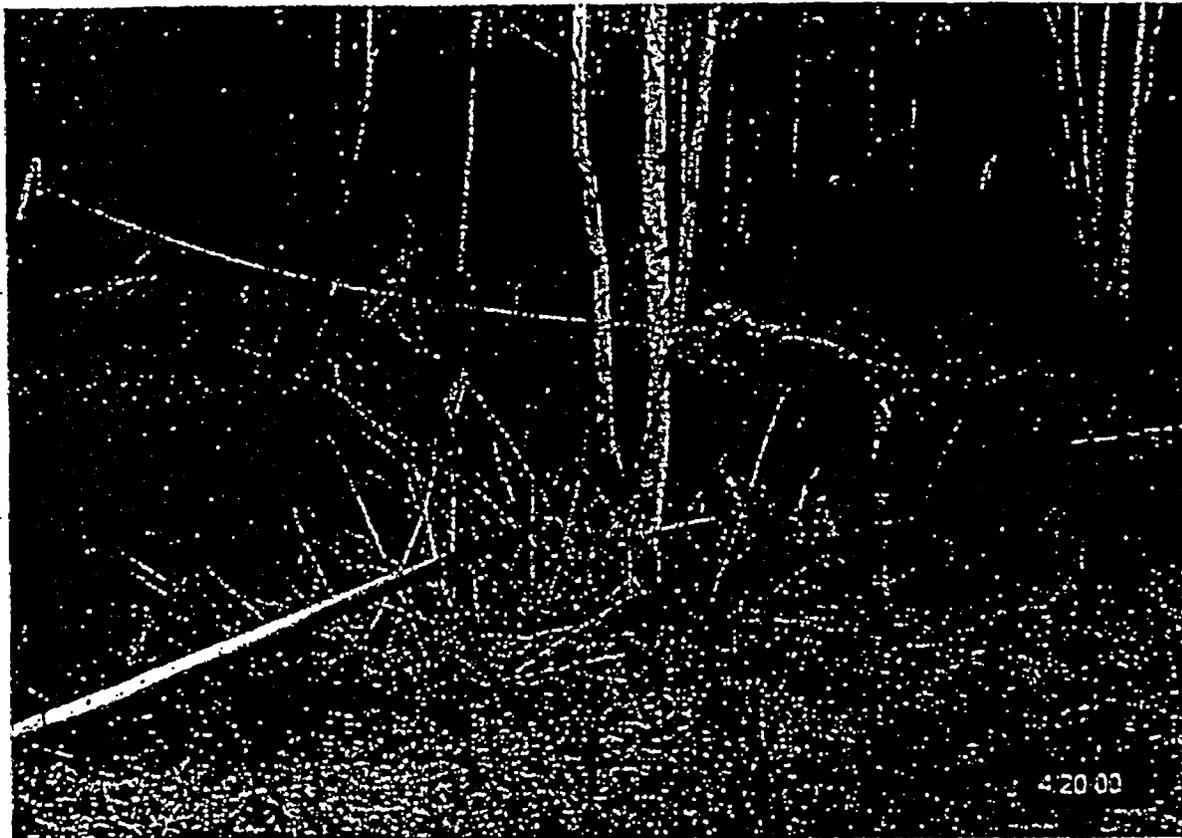
**Buffer Zones:** Where site conditions warrant larger buffer zones, the Forester shall so designate them as part of the site-by-site assessment and/or ground follow up.

**Visual Effects:** The short-term visual effect from the basal technique is brownout caused by dead or dying foliage. The overall brownout effect is somewhat mitigated by the high selectivity and retaining compatible shrub and herbaceous vegetation within the site. A longer-term visual effect may be the standing dead stems.

**Site Conditions Favorable for this Technique:** Selective basal applications should be specified when the site proposed for treatment is:

1. A relatively small area, such as a hedgerow, road crossing, or similar buffer zone, where undesirable densities are very light to light and desirable densities are low, and the crew can easily move through the understory to identify and treat the tall growing stems.

f. **Cutting and Trimming, No Herbicide Treatment**



**Application:** Target-Selective Cutting cuts vegetation as close to the ground as possible and no herbicides are applied.

**Equipment:** Chainsaw

**Limitations:** No control of root system. Most northeastern hardwoods will resprout following hand cutting, some prolifically.

**Buffer Zones:** None

**Visual Effects:** The cut slash is the primary visual effect. Various slash disposal methods may be prescribed by the Forester to reduce visual impacts depending on adjoining land uses and sensitivities.

**Full Discussion of Technique:**

**Application/Equipment:** Cutting without herbicide treatment is primarily used to clear undesirable species in areas of high sensitivity such as lawns, parks, and other buffer zones

where only cutting or pruning is allowed due to deep public concern about herbicides, or easement or regulatory restrictions apply. In the absence of sufficient desirable vegetation, some tall growing species can be temporarily retained and pruned if necessary. The decision to trim, rather than cut, undesirable vegetation within a visual buffer zone should be made after considering the following criteria:

- conductor clearance at the site
- density and height of desirable vegetation
- how visually sensitive and at what angle will the right-of-way be viewed (residence, park, road, river, etc.)
- the relative number of individuals who may be exposed to view the site and the duration of their exposure
- the probable activity of individuals at the time of view exposure

Once adequate cover of desirable species is established on the site, the trimmed vegetation may be systematically removed. In some instances the cost to trim or recut a site may become fairly high. In those cases, the Forester will evaluate the costs of removing undesirable trees and replanting with desirable species.

Hand cutting is primarily accomplished using either a chainsaw or brush saw. Variations in the method of slash disposal recognized by National Grid include:

- Cut only is when the slash remains lopped where it falls.
- Cut and windrow is where the slash is disposed of by piling or windrowing.
- Cut and chip is where the slash is disposed of by chipping. The chips may be disposed of on site or hauled away.

Note that in all cases, slash may not be left in an identifiable watercourse.

**Limitations:** Hand cutting is very labor intensive. When combined with the fact that tall-growing, undesirable species may be retained or rapidly regrow, hand cutting results in high per acre costs and shortened maintenance cycles. The lack of herbicide stump treatments to control sprouting (while warranted under certain site conditions) greatly reduces the long-range effectiveness of this technique.

#### **Environmental Impacts:**

**Buffer Zones:** The high selectivity of this technique causes little to no damage to non-target shrub species. However, the heavy resurgence of stump and root sprouts may cause the loss of compatible shrub and herbaceous cover over time, as undesirable stems increase in density and eventually suppress more desirable species.

**Visual Effects:** The impacts associated with this technique are the clearly defined cut edge of the right-of-way and the accumulation of drop and lopped or piled brush. These visual effects may be mitigated on some sites by the retention of desirable vegetation where it exists in the right-of-way.

Site Conditions Favorable for this Technique: Cutting without herbicides and/or trimming may be proposed when the site is:

1. a lawn, park, or other highly sensitive area; or
2. a no-herbicide zone to protect sensitive resources such as streams, ponds, lakes, or wetlands; or
3. a no-herbicide buffer zone adjacent to registered organic farm fields.

## New York - HERBICIDE CODES FOR BRUSH CONTROL - YEAR 2003

Code	Trade Name	EPA #	Percent Active	Mixture	Treatment
A#	Pathway	62719-31	5.4% Picloram 20.9% 2,4-D	Premixed, Ready-to-use	Stump
B	Accord C or Glypho/Arsenal	524-343/62719-324/241-346	53.8% Glypho.	40% Accord C / 3% Arsenal / 57% Water	Stump
C	Accord C. or Glypho	524-343/62719-324	53.8% Glypho.	40% Accord C / 60% Water	Stump
D	Pathfinder II	62719-176	13.6% Triclopyr	Premixed, Ready-to-use	Basal
E#	Garlon 4/Stalker	62719-40 241-398	61.6% Triclopyr 27.6% Imazapyr	20% / 1% in Hi-Grade Oil	Basal
F#	Tordon 101/Garlon 4 Hydraulic High Volume	62719-5 62179-40	10.2% Picloram 39.6% 2,4-D 61.6% Triclopyr	2 qts / 1.5 qts. in 100 gals. Water (0.5% Tordon 101 / 0.375% Garlon4)	Selective Foliar (SF)
G#	Tordon 101/Garlon 4 Hydraulic Low Volume	62719-5 62719-40	10.2% Picloram 39.6% 2,4-D 61.6% Triclopyr	2 qts / 3 qts. in 100 gals. Water (0.5% Tordon 101 / 0.75% Garlon 4)	Selective Foliar (SF)
N	Accord C or Glypho/Arsenal Hydraulic Low Volume	524-343/62719-324 241-346	53.8% Glypho. 28.7% Imazapyr	4.5 qts / 1 pt. in 100 gals Water (1.125% AccordC / 0.125% Arsenal)	Selective Foliar (SF)
P	Krenite/Arsenal/Escort Hydraulic Low Volume	352-395 241-346 352-439	41.5% Fosamine 28.7% Imazapyr 60.0% Metsulfuron	2 gals / 1 qts. / 2 oz. in 100 gals. Water (2% Krenite / 0.25% Arsenal / Escort)	Selective Foliar (SF)
T	Accord C* /Escort Hydraulic Low Volume	524-343/62719-324 241-346	53.8% Glypho. 60.0% Metsulfuron	4.5 qts / 2 oz. in 100 gals. Water (1.125% Accord C / Escort)	Selective Foliar (SF)
L#	Accord C or Glypho/Arsenal Backpack Low Volume	524-343/62719-324 241-346	53.8% Glypho. 28.7% Imazapyr	3.75 gals / 1 pt in 100 gals Water (3.75% AccordC / 0.125% Arsenal)	Selective Foliar (LSF)
R	Krenite/Arsenal Backpack Low Volume	352-395 241-346	41.5% Fosamine 28.7% Imazapyr	5 gals / 1 qts. in 100 gals. Water (5% Krenite / 0.25% Arsenal)	Selective Foliar (LSF)
W	Krenite/Arsenal/Escort Backpack Low Volume	352-395 241-346 352-439	41.5% Fosamine 28.7% Imazapyr 60.0% Metsulfuron	5 gals / 1 qt / 4 oz. in 100 gals. Water (5% Krenite / 0.25% Arsenal/Escort)	Selective Foliar (LSF)
X	Accord or Glypho/Escort Backpack Low Volume	524-343/62719-324 352-439	53.8% Glypho. 60.0% Metsulfuron	3.75 gals / 2 oz. in 100 gals. Water 3.75% Accord C / Escort)	Selective Foliar (LSF)
Z	Test Plots				

**NOTES:** \* Either Glypho or Accord Concentrate may be used in these mixes.  
# Primary herbicide mix.

**2003 Soil Sterilant**

8 lbs. Krovar / 3 ozs. Oust per 100 gals Water per acre  
3 pts. Arsenal / 4 ozs. Oust per 100 gals. Water per acre  
5 lbs. Predict / 3 ozs. Oust per 100 gals. Water per acre #