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Roadside Vegetation Management Project
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Suggested Herbicide Mixtures for Roadside Vegetation Management

This publication provides examples of herbicide mixtures for different vegetation concerns along roadsides. It is intended to be illustrative, not exhaustive. We have limited the discussion to commonly used products, or products we feel could be commonly used. Listed rates represent one point in a possible range of rates. The product label is the authoritative document on the use of any herbicide. **Read it and follow all label instructions.**

Table 1. Examples of herbicides used for roadside vegetation management. They are listed by trade name, active ingredient, concentration (% for dry, lb./gal for liquids), primary application (pre-emergence or post emergence) & most common use in a roadside setting (blw-broadleaf weed control & TVC-total vegetation control).

Trade Name	Active Ingredient	Concentration	Application	Common Use
AquaNeat	glyphosate	4 lb ae/gal (5.4 lb ai/gal)	POST	nonselective
Arsenal Powerline	imazapyr	2 lb/gal	PRE, POST	TVC, brush
Assure II	quizalofop-P	0.88 lb/gal	POST	grass herbicide
Clash	dicamba	4 lb/gal	POST	blw, brush
EndRun	2,4-D MCPP dicamba	2.38 lb/gal 0.63 lb/gal 0.21 lb/gal	POST	blw
Escort XP	metsulfuron-methyl	60%	POST	blw, brush
Esplanade Sure	indaziflam rimsulfuron	24.3% 16.7%	PRE, POST	TVC
Esplanade 200SC	indaziflam	1.67 lb/gal	PRE	TVC
Freelexx	2,4-D choline	3.8 lb/gal	POST	blw, brush
Fusilade II	fluazifop-P	2 lb/gal	POST	grass herbicide
Garlon 3A	triclopyr amine	3 lb/gal	POST	blw, brush
Garlon 4 Ultra	triclopyr ester	4 lb/gal	POST	brush
Hyvar X-L	bromacil	2 lb/gal	PRE	TVC
Krenite S	fosamine	4 lb/gal	POST	brush
Method 240SL	aminocyclopyrachlor	2 lb/gal	POST	blw, brush, TVC
Milestone VM	aminopyralid	2 lb/gal	POST	blw, brush, TVC
Oust Extra	sulfometuron-methyl metsulfuron-methyl	56% 15%	PRE, POST	TVC
Oust XP	sulfometuron-methyl	75%	PRE, POST	TVC
Pathfinder II	triclopyr RTU	0.75 lb/gal	POST	brush
Piper EZ	pyroxasulfone flumioxazin	1.70 lb/gal 1.34 lb/gal	PRE, POST	TVC
Plainview SC	indaziflam aminocyclopyrachlor imazapyr	0.18 lb/gal 0.5 lb/gal 1.51 lb/gal	PRE, POST	TVC
Plateau	imazapic	2 lb/gal	PRE, POST	TVC
Platoon	2,4-D	3.8 lb/gal	POST	blw, brush
Prodiamine 65WDG	prodiamine	65%	PRE	TVC
Promenade	flumioxazin	51%	PRE, POST	TVC
Ranger Pro	glyphosate	3 lb ae/gal (4 lb ai/gal)	POST	nonselective
RoundUp Pro Concentrate	glyphosate	3.7 lb ae/gal (5 lb ai/gal)	POST	nonselective
Segment II	sethoxydim	1.5 lb/gal	POST	grass herbicide
Telar XP	chlorsulfuron	75%	POST	blw
TerraVue	aminopyralid florpyrauxifen-benzyl	71% 6%	POST	blw, brush, TVC
UpEnd Hydro Cap	pendimethalin	3.8 lb/gal	PRE	TVC
Vastlan	triclopyr choline	4 lb/gal	POST	blw, brush
Velpar DF	hexazinone	75%	POST	blw, brush

Trade names are provided for information, not as a recommendation. Many of the herbicides described in this document are available in identical formulations from multiple manufacturers. Table 1 provides a list of the herbicides mentioned in this document.

Several treatments include the herbicide *glyphosate*. The *glyphosate* product 'RoundUp Pro Concentrate' mentioned within these recommendations contains 5 lb active ingredient (ai)/gal (acid equivalent 3.7 lb/gal). If you are using a *glyphosate* product 'Ranger Pro' with 4 lbs ai/gal (acid equivalent 3 lb/gal) use more product to achieve a similar acid of *glyphosate*/acre. For example, instead of 64 oz/ac of 'RoundUp Pro Concentrate', you would use 79 oz/ac of 'Ranger Pro'.

When treatments are targeting foliage, a surfactant should be included in the mixture. Consult the herbicide labels for surfactant recommendations.

Integrated Vegetation Management

Our focus here is the specifics of herbicide mixtures for a range of roadside vegetation issues. However, herbicides are just one tool available to vegetation managers. Responsible management relies on a broad-based program including establishing and preserving desirable groundcovers, judicious mowing, tree trimming and brushing. These activities are only truly effective as part of a pre-planned program.

To cover the spectrum of treatments you may use during the season in a roadside program, we have categorized the treatments as total vegetation control, selective weed and brush control, 'non-selective' weed and brush control, control of problem species and cable guiderail management.

Total Vegetation Control (TVC)

TVC applications provide bare ground under guiderails, around signposts, and along concrete barriers and traffic islands (*Figures 1 & 2*). The herbicide components of a TVC treatment usually consist of broad-spectrum residual (BSR), pre-emergence, and post emergence ingredients. BSR herbicides provide control of existing vegetation, as well as soil residual activity. BSR herbicides are potentially more prone to off-site movement and are applied at rates to provide 'just enough' activity while minimizing the application rate. Pre-emergence herbicides are generally highly insoluble and immobile in the soil, remain near the soil surface, and less likely to move off-site. These products are applied at higher label rates to prevent establishment of weeds from seed for the entire growing season. Post emergence herbicides are effective at controlling actively growing weeds that are already established. Relatively low rates of a post emergence herbicide can substitute for increasing the rates of the BSR component of the mix.

Commonly used BSR herbicides include *sulfometuron, bromacil,* and *imazapyr.*

Examples of pre-emergence herbicides include *indaziflam, pendimethalin, imazapic, flumioxazin, and prodiamine*.

Table 2. Herbicide selections to illustrate different mixes in assembling a total vegetation control treatment. Abbreviations: SOA-site of action, BSR-broad spectrum residual, PRE-pre-emergence, POST-post emergence

Mix #	Products	Product/ac	Comments
1	Method 240SL Esplanade 200SC Arsenal Powerline RoundUp Pro Conc.	12 fl oz 5 fl oz 8 fl oz 64 fl oz	A standard PennDOT roadside bare ground mix. Excellent pre-emergence and post emergence activity. If emerged vegetation is not present, the glyphosate treatment is not needed for any treatment listed. The rate for 'Method 240SL' can range from 12-16 oz/ac and 'Esplanade 200SC' can range from 5-6 oz/ac. We have observed similar control with the lower rate of each product compared to the higher rates.
2	TerraVue Esplanade 200SC Arsenal Powerline Fusilade II	5 oz 5 fl oz 8 fl oz 24 fl oz	This mix provides an alternative SOA for rotating out of *glyphosate* (SOA 9). This mix would provide POST control of most annual blw and grass weeds. However, the switch of 'TerraVue' for 'Method 240SL' doesn't rotate SOA since both are SOA 4.
3	TerraVue Prodiamine 65WDG Oust Extra RoundUp Pro Conc.	5 oz 32 oz 4 oz 64 fl oz	The *prodiamine* (SOA 3) in 'Prodiamine 65WDG' replaces *indaziflam* (SOA 29) in 'Esplanade 200SC' as the pre-emergence component. Can be used as a pre-emergence rotation option for Mix 1 or 2. The *sulfometuron* in 'Oust Extra' has the same SOA as the *imazapyr* in 'Arsenal Powerline'.
4	UpEnd Hydro Cap Hyvar X-L RoundUp Pro Conc.	128 oz 128 oz 64 fl oz	The *pendimethalin* (SOA 3) in 'UpEnd Hydro Cap' provides a pre-emergence roation and the *bromacil* (SOA 5) in 'Hyvar X-L' provides a BSR rotation for mix 1 & 2.
5	Esplanade 200SC Oust Extra RoundUp Pro Conc.	5 fl oz 4 oz 64 fl oz	This mix does not contain 'Method 240SL' or 'TerraVue' which provides a rotation out of SOA 4 herbicides and should be consider using along secondary roads. The *metsulfuorn* in Oust Extra is SOA 2. 'Oust Extra' increases foliar avtivity, particularly against woody species that maybe present such as vines.
6	Plainview SC	48 fl oz	Plainview SC' doesn't contain *glyphosate* in the premix. Use with caution due to the amount of *imazapyr*.
	Esplanade 200SC Piper EZ Promenade UpEnd Hydro Cap Prodiamine 65WDG Plateau	5 fl oz 20 fl oz 12 oz 128 fl oz 32 oz 12 fl oz	This lists PRE herbicides that would be added to a BSR. 'Esplanade 200SC' is widely used because it is effective. 'Piper EZ' and 'Promenade' provides improved control of resistant kochia. 'UpEnd Hydro Cap' and 'Prodiamine 65WDG' is very effective against annual grasses. 'Plateau' is effective against grasses but weak on legumes.

The most commonly used post emergence herbicide is *glyphosate* (see Table 1 for trade names for herbicide active ingredients).

Examples of herbicide mixtures for TVC applications are listed in Table 2. These mixtures are intended to provide bare ground for the entire growing season. These treatments have a high material cost per acre, but typically manpower and equipment are the most expensive elements of this application. Doing it twice with a cheaper mix costs more than doing it once with the right mix.

An increasingly important issue with TVC treatments is *herbicide resistance*. Many weeds are genetically variable, and some of the genetic strains (biotypes) within a species are less susceptible to certain herbicides. If this herbicide is applied repeatedly, the susceptible biotypes are eliminated, and resistant biotypes become dominant. When this occurs, the treatment is no longer effective. This has occurred throughout Pennsylvania in the past with kochia (*Kochia scoparia*). It is important to rotate herbicide mixtures every season or two and change the *site-of-action*s within the mixture to reduce the onset of herbicide resistance. The herbicides 'Oust XP', 'Arsenal Powerline', and 'Plateau' have the same site-of-action. Substituting among these materials is not a viable rotation.

Figure 1. Most total vegetation control applications to roadsides are fixed-pattern, truck-based treatments to guiderails, concrete barriers, and shoulders. Signposts and traffic islands are treated with a handgun application.

TVC treatments are applied early-season to prevent the establishment of vegetation. However, applying later within this window provides two advantages - your treatment needs to provide residual activity for a shorter time, and the post emergence activity of your treatment increases as the leaf area of the target vegetation increases.

Additional sites that require total vegetation control are concrete traffic islands, jersey barriers, curbs, and stockpile areas (Table 3). Unique sites such as concrete traffic islands, jersey barriers and curbs require herbicides that are labeled for road surface, crack and crevice, and/or spot treatment applications. As always read and follow all label directions prior to applications. Thorough label reviews are necessary to find the appropriate language for these specialized applications to concrete traffic islands, jersey barriers and curbs. For instance, 'RoundUp Pro Concentrate' label states, it may be used along roadsides to control weeds. 'Esplanade 200SC' label states it may be applied to hardscapes as a spot treatment. A mix to consider is *glyphosate* (3.7 lbs ae/gal) at 64 oz/ac + 'Esplanade 200SC' at 5 oz/ac. Alternative pre-emergence products to consider in place of 'Esplanade 200SC' includes 'Esplanade Sure', 'Promenade', 'Piper EZ' or 'Up-End Hydro Cap'.

Table 3. Example of herbicide combinations for concrete traffic islands, jersey barriers, curbs, and stockpiles.

Mix	Products	Product/ac	Comments
1	Esplanade 200SC + RoundUp Pro Concentrate	5 oz 64 fl oz	An herbicide combination with appropriate label directions, can be applied to concrete traffic islands, barriers and curbs. This mix may be used along edges of stockpiles where a limited residual application is needed while preserving adjacent desirable vegetation.
	Replacing 'Esplanade 200SC' in the above mix with either 'Up-End Hydro Cap' (128 fl oz/ac) or 'Promenade' (12 oz/ac) or 'Piper EZ' (12-20 oz) or 'Esplanade Sure' (3-5 oz/ac) is an alternative mix for concrete traffic islands, jersey barriers and curbs.		
2	Esplanade 200SC + Arsenal + Escort XP + RoundUp Pro Concentrate	5 oz 8 fl oz 0.5 oz 64 fl oz	This mix may be applied to stockpiles where site conditions allow for the use of "soil residual" materials applied outside the root zone of desirable species and to areas where runoff is not a concern. Addition of 'Milestone VM' or 'Method 240SL' may be appropriate when outside the root zones of desirable trees and shrubs

Applications to stockpiles need to consider the site. Adjacent vegetation and landscape plants that border stockpiles must be evaluated prior to applications. Stockpiles may have two different application zones- edge and interior. The edge zone may require mixes that don't contain products with soil activity that may be absorbed by desirable vegetation, trees, and shrubs. Selection of appropriate (i.e. not causing offsite damage) products are acceptable to apply to the edges of stockpiles. A mix to consider for edge zones is *glyphosate* (3.7 lbs ae/gal) at 64 oz/ac + 'Up-End Hydro Cap' at 128 oz/ac or 'Prodiamine 65 WDG' at 32 oz/ac. Interior zones may be situated where mixes containing soil active herbicides such as 'Oust XP' or 'Arsenal' may be used safely without risk of offsite damage. Some stockpiles may be able to be sprayed with mixes containing soil active herbicides. These stockpiles as well as interior zones may consider mix 2 in Table 3. Each stockpile should be evaluated prior to application to determine the proper mix.

Figure 2. A traffic island that will be spot sprayed with a handgun application to provide total vegetation control. Herbicides used for these applications shall provide label directions allowing for spot treatment, crack and crevice, or "hardscape" applications.

Figure 3. Selective weed and brush control along roadsides targeting encroaching shrubs and broadleaf weeds.

Selective Weed and Brush Control

Many herbicide combinations for weed and brush control are intended to selectively control herbaceous broadleaf weeds, as well as encroaching brush without injuring roadside turf (Figure 3). In general, controlling woody plants requires a more potent treatment than controlling herbaceous weeds. If you are targeting only broadleaf weeds in mowed, roadside turf, a common 'three-way' turf weed control product such as 'EndRun' (*2,4-D, MCPP, dicamba*) will be effective and economical. When targets include brush or herbaceous species that are not subject to mowing, you need to use more potent herbicides.

Table 4 provides examples of herbicide mixtures that will control broadleaf weeds and brush while limiting injury to grasses. Mixes that include 'Escort XP' will cause discoloration and temporary growth inhibition of many grasses. Where this is unacceptable, use the mixes that do not include 'Escort XP' or reduce the rate to 0.33 oz/ac.

Table 4. Example of herbicide combinations for selective broadleaf weed and brush applications.

Products	Product/ac	Comments
Garlon 3A + Freelexx + Escort XP	64 fl oz 96 fl oz 0.5 oz	A commonly used combination that has minimal soil activity. Controls a wide spectrum of herbaceous and woody species. 'Escort XP' can injure cool season grasses. 'Garlon 3A' rates will range from 32 to 64 oz/ac, and 'Escort XP' rates are typically 0.5 to 1.0 oz/ac.
Replacing 'Garlon 3A' in the above mix with either 'Method 240SL' (8-10 fl oz/ac) or 'Milestone VM' (6 fl oz/ac) or 'TerraVue' (2.85 oz/ac) is an alternative mix for wide ROW's. **Use with caution** due to soil activity especially along smaller ROW's & secondary roads.		
Garlon 3A + Clash	64 fl oz 32 fl oz	Removing 'Escort XP' from the mixture improves safety to grasses, but the rates of 'Garlon 3A' and 'Clash' should maintain the same activity against woody species.
EndRun	64 fl oz	Targets BLW in mowed roadside turf areas

'Non-selective' Weed and Brush Control

Herbicide mixtures that include *glyphosate* or 'Krenite S' are commonly used to target brush, but these mixtures will injure all vegetation that is contacted. These mixtures are useful against dense stands of brush and weeds where there is no desirable groundcover present (Figure 4), or for targeting encroaching branches (side trimming) on narrow rights-of-way. When targets are scattered, apply these treatments selectively to preserve desirable vegetation.

An advantage of a *glyphosate*-based mixture is that any undesirable species can be targeted during the application, whether grass, broadleaf, or woody.

Table 5 lists treatments that include *glyphosate* or 'Krenite S'.

'Problem Species' Mixtures

Herbicide programs for roadside vegetation management are intended to address a broad range of species. However, some species 'escape' the normal program and become very problematic. Often, these species require specific applications, and multiple applications within a growing season.

Table 6 illustrates suggested herbicide mixes and sequences for tree-of-heaven, or ailanthus (*Ailanthus altissima*), Japanese knotweed (*Fallopia japonica*), Canada thistle (*Cirsium arvense*), and poison hemlock (*Conium maculatum*) and other biennial weeds growing in crownvetch areas.

Our Japanese knotweed recommendations include a treatment early in the season to 'burn down' or defoliate roadside knotweed. This is not the best time to treat knotweed, but it is often necessary to prevent the knotweed from reducing sight distance and encroaching into the roadway. The early-season application on roadsides serves as a 'chemical mowing' prior to a late-season *glyphosate* application.

Figure 4. A non-selective mixture of the herbicides glyphosate plus imazapyr is applied to a dense stand of tree-of-heaven (Ailanthus altissima) using a handgun.

Ailanthus is another species that should be treated twice in the same growing season, particularly tall, dense colonies. We recommend a foliar treatment in July using *glyphosate* mixed with 'Arsenal' or 'Escort XP' (Figure 4). After the effects of this treatment are clear, we make a follow-up application using a basal bark treatment, targeting the missed stems. The initial foliar treatment greatly reduces the stem number, and the follow-up treatment very selectively eliminates the remaining targets.

The recommendations for Canada thistle address turf or crownvetch areas. In turf areas, or areas you are converting to turf, a late season application of 'Milestone VM' maximizes injury to thistle. In crownvetch, an early

Table 5. Herbicide combinations for broad spectrum brush and weed control. These mixtures must be applied selectively to prevent injury to non-target vegetation.

Products	Product/ac	Comments
AquaNeat	128 fl oz	Broad spectrum, inexpensive, with no residual activity. *Glyphosate* alone will miss some species, such as autumn olive (*Elaeagnus umbellata*) and red maple (*Acer rubrum*). Tank mixing with other herbicides is recommended.
AquaNeat + Arsenal + Escort XP	96 fl oz 8 fl oz 1 oz	This three-way mix is non-selective and has significant soil residual activity. We have used 'Arsenal' or 'Escort XP' in two-way combinations with *glyphosate* with good success on mixed brush species.
Krenite S + Arsenal	192 fl oz 3 fl oz	'Krenite S' is the standard treatment to side trim brush. *Fosamine* is a bud-inhibitor and mostly stays in the part of the plant where it was applied. 'Arsenal' increases the species spectrum, but also increases the translocation beyond the contacted branches.

Table 6. Herbicide mixtures and sequences for Japanese knotweed (*Fallopia japonica*), ailanthus (*Ailanthus altissima*), Canada thistle (*Cirsium arvense*), and poison hemlock (*Conium maculatum*).

Timing	Products	Product/ac	Species and comments
spring *followed by* late summer	Garlon 3A + Escort XP + *followed by* AquaNeat	64 fl oz + 1 oz + *followed by* 96 fl oz	**Japanese knotweed** - a late-season (September) application of *glyphosate* has proven to be economical and effective. However, knotweed grows early in the season and needs to be treated in the spring to maintain sight distance and reduce encroachment. 'Vanquish' can be substituted for 'Garlon 3A'. The *glyphosate* treatment is applied late in the summer to knotweed regrowth.
July *followed by* Aug/Sep	AquaNeat + Arsenal Garlon 4 basal oil	96 fl oz 4 fl oz 25 % v/v 75 % v/v	**Ailanthus** - well established (tall) stands should be treated twice during the same growing season, between July 1 and fall color. A high-volume application of *glyphosate* and *imazapyr* provides effective control and minimal residual activity, allowing quicker revegetation. 'Arsenal' can be replaced by 0.5 oz/ac of 'Escort XP', which is very active against ailanthus but has more soil residual activity. The 'Garlon 4' or 'Pathfinder II' basal bark application (at least 30 days later) addresses the larger stems not adequately treated by the foliar treatment as well as misses.
in turf Sep/Oct *in crownvetch* June	 Milestone VM Velpar DF	 7 fl oz 20 oz	**Canada thistle** - In turf, or areas you are converting to turf, fall applications of 'Milestone VM' have provided excellent reduction, and will also eliminate crownvetch. If mustard species are present, tank-mix with an herbicide such as 'Garlon 3A', 'Clash', or 'EndRun'. In crownvetch, a Velpar DF treatment will burn down thistle and most other weeds.
in crownvetch April or June	 AquaNeat Velpar DF Velpar DF	 12 fl oz 20 oz 20 oz	**Poison hemlock and other biennials in crownvetch-** these species typically infest crownvetch areas where regular mowing or weed control is not practiced. Treating poison hemlock in early April allows you to complete this program prior to starting the bareground program. 'Velpar DF' is safe to crownvetch, and the low rate of *glyphosate* applied early in the season causes minimal injury. If Canada thistle is also a target, delay the application to early June and don't add *glyphosate*. Poison hemlock in turf areas is readily controlled with the treatments listed in Table 7.

June application of 'Velpar DF' will selectively burn down the thistle and prevent seed set.

Poison hemlock and other biennial weeds may occur in crownvetch areas. An early April application of 'Velpar DF' plus *glyphosate* allows you to target the weeds while they are still small and take advantage of a window prior to the start of the TVC program. Waiting until June with 'Velpar DF'-only (no *glyphosate*) provides better control of Canada thistle, but the 'skeletons' of biennials like poison hemlock, will be 5 to 8 ft tall.

A key to managing any problem species is vigilant follow-up and a dedicated maintenance program after you have achieved initial control.

Roadside turf areas infested with wild parsnip or poison hemlock are best managed with herbicide applications targeting the plant prior to flowering. Some herbicides and combinations are recommended in Table 7.

In Pennsylvania, wild parsnip flowers from June to late July while poison hemlock flowers from late May-August. Proper herbicide timing will eliminate seed set and addition to the seed bank. Common weed and brush mixes are effective on rosettes of wild parsnip or poison hemlock if patches are present during these operations. Otherwise, targeted herbicide applications can be applied in the spring before flowering of either species. With most sites one treatment will not eliminate wild parsnip or poison hemlock, repeat applications are necessary to exhaust the seed bank.

A proactive cultural practice to consider is the establishment of low growing grasses such as fine fescues to fill in bare spots with the goal of outcompeting not only wild parsnip or poison hemlock but other undesirable weeds.

Table 7. Herbicides or herbicide combinations for wild parsnip and poison hemlock management in roadside turf.

Wild Parsnip		
Products	Product/ac	Comments
Method 240SL + Freelexx + Escort XP	10 fl oz 96 fl oz 0.5 oz	This three-way mix is a commonly used in selective weed and brush program and is effective on wild parsnip. 'Method 240SL' can be replaced with 'TerraVue' at 2.85 oz
Vastlan + Freelexx	48 fl oz 96 fl oz	A combination commonly used in the selective weed and brush program
Escort XP	0.5 oz	These herbicides can be applied singularly with similar control as combinations.
Telar XP	1 oz	
Method 240SL	10 fl oz	
Freelexx	96 fl oz	
Poison Hemlock		
Products	Product/ac	Comments
Method 240SL + Freelexx + Escort XP	10 fl oz 96 fl oz 0.5 oz	This three-way mix is a commonly used in selective weed and brush program and is effective on wild parsnip. 'Method 240SL' can be replaced with 'TerraVue' at 2.85 oz
Vastlan + Freelexx	48 fl oz 96 fl oz	A combination commonly used in the selective weed and brush program
Escort XP	0.5 oz	These herbicides can be applied singularly with similar control as combinations.
Telar XP	1 oz	
Method 240SL	10 fl oz	
Freelexx	96 fl oz	
Vastlan	48 fl oz	
TerraVue	2.85 oz	
Plateau	12 fl oz	

Cable Guiderail Vegetation Management

Cable guiderails located along roadsides provide a unique set of management challenges. Some are situated in grass medians while others are placed near stone or paved shoulders. If cable guiderails are placed in stone shoulders where erosion is not a concern, typical total vegetation control applications are suitable (Table 2). Cable guiderails in paved shoulders that require vegetation management should follow spot treatment or hardscape recommendations for concrete islands or barriers (Table 3). Some cable guiderails in turf medians are mowed with specialized equipment to maintain vegetation which may be an expensive option.

Roadside turf areas especially where tall fescue exists around cable guiderails may be managed with plant growth regulators to suppress seedhead formation (Figure 5). This application requires precise timing. For the treatment to be effective, applications are made in the spring *prior* to seedhead expansion, known as the boot stage. The boot stage is when the seedhead has developed and becomes swollen near the bottom of the tall fescue stem. At this point, PGR's need to be in place to be effective. A common product is 'Plateau' at 2 oz/ac. The addition of 'Milestone VM' or 'Method 240SL' provides broadleaf weed control (Table 8).

Figure 5. Applications to cable guiderails require precise timing to achieve the goal of the treatment. Plant growth regulators to suppress seedheads is an example of an herbicide application requiring precise timing. Additional applications include selective reduction of tall fescue under cable guiderails. (Photo Credit: Ray Boronyak)

Sites where tall fescue and fine fescue coexist, a management option is to selectively remove tall fescue leaving the fine fescue near the cable guiderail. This technique can be accomplished only if there is enough fine fescue present to fill the voids after removing tall fescue. 'Assure II' or 'Segment II' may be used to selectively remove tall fescue while not damaging fine fescue. Experience has demonstrated that applications over multiple years is necessary to successfully remove existing tall fescue from the stand.

Broadleaf weed control around cable guiderails will be necessary to maintain a neat appearance. These applications will need to be made separate from either 'Assure II' or 'Segment II' applications. The best time to treat broadleaf weeds is late summer. Please be sure to follow all label instructions regarding timing and application of 'Assure II' and 'Segment II' in conjunction with broadleaf weed herbicides.

Seeding low growing fine fescues near cable guiderails will aid in establishing and maintaining a sustainable low growing groundcover. Once fine fescues are established the roadside manager may only need to treat such areas for broadleaf weed control every few years eliminating the PGR application and selective removal of tall fescue application (Figure 6).

For More Information

Don't make a treatment if you are unsure of it.

Always consult the product labels for application and safety information. The manufacturer's representative and your herbicide distributor are good sources of information.

You can reach us through the contact information at the bottom of this page. Our website (https://plantscience.psu.edu/research/projects/vegetation-management) features several publications addressing vegetation management in non-crop areas.

Figure 6. Cable guiderail with low growing fine fescue groundcover maintained with regular mowing up to cable guiderail plus broadleaf weed control applications.

Table 8. Cable guiderail applications. Herbicides combinations for plant growth regulation (PGR's) and seedhead suppression. Other treatments around cable guiderails include selectively removing tall fescue while maintaining low growing fine fescues.

PGR's/ Seedhead Suppression			
Products	Product/ac	Comments	Timing
Plateau Milestone VM	2 fl oz 6 fl oz	This mix is commonly used to minimize tall fescue seedheads. 'Method 240SL' at 10 fl oz can be used in place of 'Milestone VM'. The addition of 'Milestone VM' or 'Method 240SL' adds broadleaf weed control to the mix.	boot stage spring
Selective tall fescue removal where fine fescue remains			
Assure II Segment II	8 fl oz 24 fl oz	Apply 'Assure II' or 'Segment II' to actively growing tall fescue in late summer or very early fall. Spring applications are suitable too.	spring or late summer
Broadleaf Weed Treatments			
Method 240SL	10 fl oz	BLW herbicides can be applied to supplement any of the above applications. Follow label directions when applications are made in conjunction with grass herbicides 'Assure II' or 'Segment II'.	late summer - early fall
Milestone VM	6 fl oz		
Freelexx	96 fl oz		
EndRun	64 fl oz		

Table 9. Site of action (SOA) of commonly used herbicides in roadside vegetation management. Based on Weed Science Society of America categorization. (**Herbicide Handbook**, Weed Science Society of America, Tenth Edition, 2014)

Total Vegetation Control			
Trade Name	**Active Ingredient**	**USE**	**WSSA SOA**
Esplanade 200SC	indaziflam	PRE	29
Esplanade Sure	indaziflam rimsulfuron	PRE POST	29 2
Prodiamine 65WDG	prodiamine	PRE	3
Promenade	flumioxazin	PRE, POST	14
Piper EZ	pyroxasulfone flumioxazin	POST PRE, POST	15 14
UpEnd Hydro Cap	pendimethalin	PRE	3
Oust XP	sulfometuron-methyl	BSR	2
Arsenal Powerline	imazapyr	BSR	2
Hyvar X-L	bromacil	BSR	5
AquaNeat	glyphosate	POST	9
RoundUp Pro Concentrate	glyphosate	POST	9
Method 240SL	aminocyclopyrachlor	POST+Residual	4
Milestone VM	aminopyralid	POST+Residual	4
TerraVue	aminopyralid florpyrauxifen-benzyl	POST+Residual POST	4 4
Plainview SC	indaziflam aminocyclopyrachlor imazapyr	PRE POST+Residual BSR	29 4 2
Oust Extra	sulfometuron-methyl metsulfuron-methyl	BSR POST	2 2
Broadleaf Weed and Brush			
Arsenal Powerline	imazapyr	brush	2
Clash	dicamba	blw, brush	4
Escort XP	metsulfuron-methyl	blw, brush	2
Freelexx	2,4-D choline	blw, brush	4
Platoon	2,4-D	blw, brush	4
Garlon 3A	triclopyr amine	brush	4
Garlon 4 Ultra	triclopyr ester	brush	4
Pathfinder II	triclopyr RTU	brush	4
Vastlan	triclopyr choline	brush	4
Krenite S	fosamine	brush	27
Method 240SL	aminocyclopyrachlor	blw, brush	4
Milestone VM	aminopyralid	blw, brush	4
Velpar DF	hexazinone	blw, brush	5
Telar XP	chlorsulfuron	blw	2
EndRun	2,4-D MCPP dicamba	blw	4 4 4
Grass Herbicide			
Plateau	imazapic	PGR	2
Assure II	quizalofop-P	grass	1
Fusilade II	fluazifop-P	grass	1
Segment II	sethoxydim	grass	1

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