

Assessment of Alternatives in Roadside Vegetation Management – Field Studies

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Background

The Washington State Department of Transportation (WSDOT) has traditionally used herbicides to maintain a vegetation-free condition (referred to as Zone 1) immediately adjacent to the edge of pavement on most road shoulders statewide. Following the completion of a research project on this practice, conducted by the University of Washington (UW) in 2005, WSDOT will be evaluating a series of alternative methods for managing vegetation at the edge of pavement. A comprehensive list of alternative methods was developed as a result of the initial UW research. From this list, the most promising alternatives have been selected for evaluation in the field.

Objective and Procedures

Field trials on designated roadside segments throughout Washington will be conducted and monitored for a period of three years to determine maintenance cost, and the effects on maintenance and highway operational objectives. In some cases maintenance practices and results may continue to develop over a longer period of time. Monitoring and documentation will continue as necessary in these for up to five or more years. Establishment of the test sites, and protocols for monitoring and observations will follow recommendations made in the UW report. WSDOT area maintenance personnel will work with HQ maintenance to conduct the work, evaluate the results, and produce documentation. Annual progress reports will be filed on each alternative over the three-year trial period and for additional years where necessary. A final report will be produced at the end of the study period, but it is anticipated that WSDOT policy and practice with regard to this issue will continue to evolve in subsequent years as additional data is collected and analyzed.

Alternative Methods to be Tested

Alternative methods are grouped in categories adapted from the draft decision framework in the 2005 UW report. Because of differing objectives and maintenance requirements for locations with guardrail, some alternatives are only being evaluated in locations with or without guardrail while others may be applicable in both situations. It is assumed that in most situations statewide a vegetation-free condition will continue to be maintained under guardrail installations, as initial research indicated this is the common practice throughout the country. The following list includes each alternative type to be evaluated in this project. The complete list along with detailed descriptions of evaluation sites is included as Appendix A.

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Managed Vegetation Up to the Edge of Pavement

The most common alternative to the traditional maintenance of Zone 1 with herbicides is allowing vegetation to grow up to the edge of pavement and then managing the height of this vegetation through annual mowing if necessary. This set of trials will look at various approaches to either constructing shoulders to support desirable grass stands up to the edge of pavement or transitioning unpaved shoulders from Zone 1 to desirable vegetation using maintenance practices. Except where noted, these alternatives are intended for application in areas without guardrail.

Soil Amendment – Several sites have been installed with new construction where compost or topsoil has been placed over the crushed rock and seeded with desirable grasses.

Natural Succession – In many cases maintenance has simply discontinued the maintenance of Zone 1 with herbicides in recent years, allowing existing vegetation to naturally establish up to the edge of pavement. Several evaluation sites will look at the cost and results of this alternative in varying situations. In some of these sites Zone 1 maintenance was discontinued many years ago and some historic data will be included when possible.

Managed Succession – Several sites will look at various methods to establish desirable grasses up to the edge of pavement where Zone 1 maintenance has been discontinued, using maintenance actions.

Hand Trim under Guardrail – In most cases the shoulder under guardrail will continue to be maintained vegetation-free. However, two sites will document the cost and results of allowing vegetation to establish under guardrail and managing by annual hand mowing around the hardware.

Selective Herbicide Application under Guardrail – One site will look at the cost and results of allowing grasses to grow naturally (without mowing) under guardrail, but undesirable weeds, brush and trees are controlled as needed with selective herbicides.

Low-growing Grass under Guardrail – One site will look at establishing a low-growing (12"–18") grass under guardrail in conjunction with new construction. This trial will allow the grass to grow naturally (without mowing) and undesirable vegetation will be controlled as needed.

Pavement Edge Design

Design development constraints and stormwater permit negotiations typically dictate options for pavement edge design and construction. However, some alternative designs for edge of pavement have direct effect on the need to maintain Zone 1. In each of these situations it is assumed that maintenance of Zone 1 is not necessary, but it is still important to consider impacts on highway maintenance and operational objectives.

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Angled Pavement Edge – If the outside 18” or so of shoulder pavement is angled down-slope, stormwater can drain freely from the road surface without the chance of sheet flow being restricted at the edge from a build up of soil and vegetation, the need to maintain Zone 1 for surface drainage is eliminated.

Curb and Contained Drainage – If the highway is constructed with a contained subsurface drainage system consisting of curb, catch basins and pipes, the need to maintain Zone 1 for surface drainage is eliminated.

Compacted Aggregate – One site will be monitored to evaluate the used highly compacted asphalt pavement grindings placed in a 2 ft. wide strip along the edge of pavement at a down-slope angle. This creates a solid surface that is resistant to the establishment of vegetation, in effect creating a paved Zone 1.

Zone 1 Maintenance with Cultivation

This practice uses annual disturbance and re-compaction of soil/crushed rock at the pavement edge to prevent the permanent establishment of vegetation at the pavement edge to maintain a vegetation-free condition. Preliminary tests of this technique have shown promising results. With this alternative method, naturally occurring vegetation is allowed to seasonally establish in Zone 1 during the fall and winter months, providing erosion control and stormwater filtration when it is needed, but annual cultivation and re-compaction prevents buildup of sediment and vegetation along the edge. Several variations of cultivation technique will be studied.

Glyphosate Treatment Followed by Cultivation – In areas cultivated in the spring or early summer, some vegetation typically begins to emerge in the fall. This light vegetative cover is actually advantageous over the winter months for controlling erosion and filtering stormwater. However, if the vegetative roots become too well established this organic matter can interfere with cultivation/re-compaction. Pre-treatment of cultivated areas with a non-selective, post-emergent herbicide such as glyphosate will be evaluated for the effect of stopping vegetative growth and root development in the spring prior to cultivation in early summer.

Cultivation Once per Year – For comparison with the alternative described above, cost and results will be evaluated for the practice of cultivation and re-compaction only, with cultivation/re-compaction being done annually in early summer.

Cultivation Twice per Year – As another way to limit the development of vegetative roots in the spring, cost and results will be evaluated for the practice of cultivation and re-compaction twice per year, once in the spring and once in early summer.

Weed Barriers

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Several products are commercially available for installation under guardrail to prevent the establishment of vegetation. In addition, there are some locations where the shoulder has been designed and constructed with pavement under the guardrail. These methods require a significant up front investment for construction/installation, but may result in reduced maintenance requirements over time. All available products will be evaluated base on installation costs and maintenance costs and results over time.

WeedEnder – This is a permeable woven fiber mat that is pinned down and sealed at the joints. This product has the advantage of not creating additional impervious highway surface, which may impact stormwater permitting and mitigation requirements. This product will be evaluated at several sites.

Turboscape – This is also a permeable surface treatment. It consists of a weed prevention fabric place under a 2 to 3 in. layer of rubber mulch, sealed and bonded over the top with a spray-on polyurethane coating.

Traffix Weed Mat – Interlocking rubber tiles, sized to fit typical guardrail post spacing, made from recycled materials.

Universal Weed Cover – Interlocking molded plastic tiles, sized to fit typical guardrail post spacing.

Pavement Under Guardrail – Two locations will be evaluated for this construction technique, one is a recent installation and one has been in place for a number of years.

Maintenance of Zone 1 with Non-Conventional Herbicides

Traditional maintenance of Zone 1 with herbicides involves the mixture of both post-emergent and pre-emergent, non-selective herbicides to control any existing growth and prevent seed germination through the growing season. One alternative/non-traditional herbicide method will be evaluated as part of this study.

Glyphosate Only Under Guardrail – Due to effects on hardware visibility, ease of maintenance, and limiting moisture around wood structures, it is assumed that Zone 1 will continue to be maintained with traditional herbicide application around guardrail in most locations. This alternative will evaluate the cost and results of using only a non-selective, post-emergent herbicide (glyphosate) to eliminate emerging vegetation under the guardrail.

Documentation and Monitoring of Field Trials

A database is being created to store information, photographs, and observations of each field trial. Baseline information for each site will include:

- Alternative type
- Location type (guardrail, no guardrail, or either)
- Alternative description
- Comments on the alternative practice or specific site variables

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- Maintenance objectives for the alternative (eliminate vegetation, manage vegetation types, or manage vegetation height)
- Limits of the alternative application site by route and mile post
- Designated contact person for the local maintenance area
- Designated locations for taking chronological photos
- Directional location of the site in relation to the highway shoulder (N/S/E/W)
- Number of traffic lanes
- Paved shoulder width
- Direction (up or down) and angle of shoulder adjacent to pavement
- Number of lanes draining to shoulder
- Total width of pavement draining to shoulder
- Average daily traffic count

Observations and tracking of maintenance activities will be conducted for each site for a period of three years. Data collected on actions and results for each site will include:

- Chronological photos taken from a designated point or points within each site on or near the first of each month throughout the year
- Historic data on maintenance practices if applicable and available
- Recording of any and all maintenance actions taken to manage vegetation or surface drainage in relation to the edge of pavement (labor, equipment and material costs)
- Ratings and comments recorded annually on each site in relation to achieving maintenance objectives in managing vegetation at the edge of pavement. Maintenance objectives include:
 - Drainage related
 - Visibility for traffic safety
 - Safe vehicle recovery
 - Maintenance worker safety
 - Fire starts
 - Noxious weed control
 - Nuisance weed control
 - Road kill accidents
 - Structural deterioration of guardrail
 - Structural deterioration of utility boxes
 - Structural deterioration of guide posts

Comparison of Alternatives to Traditional Maintenance of Zone 1 with Herbicides

As part of the overall roadside vegetation management planning process and ongoing development of the area Integrated Roadside Vegetation Management Plans, each maintenance area will meet annually to discuss, evaluate and document the success of roadside management practices in the area. Part of these annual discussions will focus on each area's overall practice in managing

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vegetation at the edge of pavement. As a result of these discussions and observations made over the course of each year, a report on each area's overall program for managing vegetation at the edge of pavement will be produced annually following the elements described above for data collected on actions and results for each of the field trial sites. The content of these annual area reports will be analyzed and discussed in relation to findings from the field trials as part of the final report.

Production of Final Report

After data has been collected for calendar years 2007, 2008, and 2009, findings will be analyzed and summarized in a final report with conclusions drawn and recommendations for future maintenance policy and practice in managing vegetation at the edge of pavement. In some cases data and findings will continue to be drawn and analyzed succeeding calendar years to further refine conclusions and recommendations.

Appendix A - Documented Field Study Locations

Alternative Type	Location Type	Description	Comments	Application Limits	Maint. Contact	Photo Location(s)	
A. Managed Vegetation Up to the Edge of Pavement							
1	Soil Ammendment	No guardrail	2" compost layer over crushed rock, seeded with native grasses	New construction installed Fall 2004	SR-525 Whidbey, MP 26.45 to 27.4	John Tellesbo MP 27	
2	Soil Ammendment	No guardrail	Type B top soil added over CSBC @ 2-4" with 2" compost added and incorporated over the type B topsoil	New construction installed Fall 2005	US-12, Snake River Bridge to Casey Pond	Scott Smith/Steve Underwood	MP 295.3
							MP 295.3
							MP 297
							MP 297
							MP 299
3	Soil Ammendment	No guardrail	2" later of 40% compost mixed w/ 60% crushed rock, placed over rock base, seeded in three sections w/ low-grow grass	New construction installed Fall 2005. Three separate grass seed mixes tested	SR 507 Roy, MP 36.63 to 37	John Davis MP36.9 (speed limit sign)	
4	Natural Succession	No guardrail	Discontinue maintenance of Zone 1 w/ herbicides (1997)	Only maintenance has been annual mowing and occasional grading to remove build up	US-2 Gold Bar to Region Boundary, MP 28.75 to 56.75	Cecil Rench	MP 49 (looking west)
							MP 32
5	Natural Succession	No guardrail	Discontinue maintenance of Zone 1 w/ herbicides (2004)	Only maintenance so far has been mowing	SR -525 Whidbey, MP 8.5 to 30.52	John Tellesbo	MP 10
							MP 28
6	Natural Succession	With and without guardrail	Discontinue maintenance of Zone 1 w/ herbicides (1997)	Only maintenance has been annual mowing and occasional grading to remove build up	US-101 Hoquiam Watershed, MP 94.4 to 98.24	Randy Moody	MP 96
							MP 97
7	Natural Succession	No guardrail	Discontinue maintenance of Zone 1 w/ herbicides (2005)	Only maintenance so far has been mowing	Chehalis Maintenance Area	Larry Stritmatter	I 5 MP 65
							SR 12 MP 76
							SR 508 MP4
							SR 6 MP 32
8	Managed Succession	No guardrail	Discontinue maintenance of Zone 1 w/ herbicides and establish grass in former Zone 1	Control all vegetation in Zone 1 throughout the summer, hydro-seed w/ low-grow grass in Fall 2006	I-5 Bellingham to Ferndale NB, MP 257.82 to MP 262.57	Rick Willand MP 257	
9	Managed Succession	No guardrail	Discontinue maintenance of Zone 1 w/ herbicides and allow existing grasses to establish in former Zone 1	Control all broadleaf vegetation in former Zone 1 w/ the use of selective herbicides as necessary	I-5 Bellingham to Ferndale SB, MP 262.57 to MP 257.82	Rick Willand MP 262	

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Alternative Type	Location Type	Description	Comments	Application Limits	Maint. Contact	Photo Location(s)	
10	Managed Succession	No guardrail	Apply compost tea to naturally occurring vegetation in former Zone 1	Compare side by side w/ soil and plant vigor in untreated conditions. Tea applied to NB shoulder, but not SB.	SR-525 Whidbey, MP 25.65 to 26.45	John Tellesbo	MP 26
							MP 26 (directly across from MP marker)
11	Managed Succession	No guardrail	I-90 MP. 113, 7 consecutive 1/10 mile sections. Multiple revegetation methods will be tested on this site	Residual chemicals applied at 4' band through 2005 season	I-90 MP. 117 to MP 117.70	Galen Rogers	MP 113
12	Managed Succession	No guardrail	Establish Kochia Pestrada as a zone 1 treatment for fire control		I-82, I-182, SR-240 Define location 5/11	Scott Smith	MP 20.48 at SR 225 intersection
							MP 21
13	Managed Succession	No guardrail	Reveg during 2002 construction project	Existing grass stand will be evaluated	US-97 Blewett Pass, from Liberty Rd. to Blewett Shed	Rick Wood	MP 153
							MP 153
							MP 168
14	Managed Succession	No guardrail	Zone 1 Reveg using several methods located on US-2 MP. 200	Site consists of 3 1/10 mile sections	US-2 MP 200	Tom Hennigh	MP 196
							MP 196
							MP 200
							MP 200
15	Hand Trim	Under guardrail	Use weed eater to cut vegetation growing under and around guardrail		US-101 Lake Crescent, all guardrail runs within the Nat. Park	Tim Roening	MP 229.66 (looking east, back of speed limit sign)
16	Hand Trim	Under guardrail	Use weed eater to cut vegetation growing under and around guardrail		SR-20 North Cascades, all guardrail runs within the Nat. Recreation Area	John Tellesbo	MP 114
17	Selective Herbicides	Under guardrail	Allow grass to grow under guardrail w/out mowing, control brush and broadleaf weeds with selective herbicides		SR-20 Whidbey Island, Penn Cove	John Tellesbo	MP 26
18	Selective Herbicides	Under guardrail	Allow grass to grow under guardrail w/out mowing, control brush and broadleaf weeds with selective herbicides		SR-20 Okanogan Nat. Forest	Don Becker	MP 168
19	Low-growing Grass	Under guardrail	Establish low-growing grass under guardrail	New construction 2006, encroaching brush controlled with mowing as necessary	SR-305 Bainbridge	Frank Allen	Later this summer following construction
20	Soil Ammendment	No guardrail	2" topsoil layer over crushed rock, seeded with native grasses	New construction installed 2006	SR-20 Whidbey, we will get the monitoring point established this summer, later in the construction process	John Tellesbo	Later this summer following construction
B. Pavement Edge Design							
1	Angled pavement edge	No guardrail	Shoulder pavement angles down at outside edge creating a paved Zone 1	Difficult to construct, most locations where this exists have 18 to 24" thick asphalt	I-5 Lacey	John Davis	MP 112
							MP 111

Appendix A - Documented Field Study Locations

Alternative Type	Location Type	Description	Comments	Application Limits	Maint. Contact	Photo Location(s)	
2	Curb/contained drainage	No guardrail	No Zone 1 behind curb	Use of this design alternative is dependent on negotiations with local jurisdiction for stormwater permits	Find a location somewhere around Olympia	John Davis	Need to find location
3	Compacted aggregate	No guardrail	Pavement grinding material placed along the edge of pavement and compacted to create Zone 1	May require occasional herbicide treatments if vegetation emerges	SR-516 Kent	Paul Krueger	MP 4 (photos looking both directions)

C. Zone 1 Maintenance with Cultivation

1	Glyphosate/Cultivation	No guardrail	Treat w/ glyphosate in April prior to cultivation in June		Everett Maintenance Area, all limited access highways	Rich Lawson	I 5, MP 202
							I 5, MP 197
							SR 2, MP 4 (mile marker is across from site)
2	Cultivation once/year	No guardrail	Cultivate annually in Aug/Sept, selective treatment with glyphosate if/where heavy vegetation develops		I-5 Tacoma	John Davis	John Davis will advise
3	Cultivation twice/year	No guardrail	Cultivate twice/year in April/May and June/July		SR 28 Trinidad Vic (2007)	Terry VanHoven	SR 28

D. Weed Barriers

1	Weedender	Under guardrail	Woven fiber permeable mat	Installed 2003	SR-525 Whidbey	John Tellesbo	MP 9.75
2	Weedender	Under guardrail	Woven fiber permeable mat	Installed 2004	SR-112 Jim Creek, both sides of road	Tim Roening	MP 32
3	Weedender	Under guardrail	Woven fiber permeable mat	Installed 2005	SR-20 North Cascades	John Tellesbo	MP 112.13 (curves ahead warning sign)
4	Weedender	Under guardrail	Woven fiber permeable mat	Installed 2005	SR 2	Rick Wood	MP 90.72
5	Turboscape	Under guardrail	Ground up tire mulch, placed over weed fabric, sealed with polyurethane coating	Installed 2004	I-5 Woodland	Mike Gartman	MP 20.07 (even with northmost point on guardrail)
6	Traffix Weedmat	Under guardrail	Interlocking rubber tiles made of recycled materials	Installed 2006	SCR A-2	Scott Clark	Scott to Advise
7	Traffix Weedmat	Under guardrail	Interlocking rubber tiles made of recycled materials	Installed 2006	SR-20 North Cascades	John Tellesbo	MP 115.1 (need to establish with pavement mark and delineator on post)
8	Univ. Weed Cover	Under guardrail	Interlocking molded plastic tiles	Installed 2006	SCR A-2	Scott Clark	Scott to Advise
9	Univ. Weed Cover	Under guardrail	Interlocking molded plastic tiles	Installed 2006	SR-20 North Cascades	John Tellesbo	MP 115
10	Pavement	Under guardrail		Installed 2003?	SR-105 Grays Harbor	Randy Moody	MP 43.52, Not at mile marker, use delineator at end of run
11	Pavement	Under guardrail		Installed 199?	I-90 Issaquah	John Stetcher	MP 16.76 (delineator on guardrail post)

E. Zone 1 Maintenance with Non-Conventional Herbicides

1	Glyphosate only	Under guardrail	Maintain Zone 1 through the summer months with non-selective post emergent herbicides as necessary		SR-525 Whidbey, all guardrail runs except in designated sensitive areas.	John Tellesbo	MP 15
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