

# **Assessment of Alternatives in Roadside Vegetation Management**

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## **Background**

WSDOT has traditionally used herbicides, along with mechanical means such as mowing, trimming, and grading to manage vegetation at the edge of highway pavement. Many citizens are concerned with herbicide use due to the possibility of impacts on human health and the environment. Historically, the majority of WSDOT's herbicide use has been focused on eliminating vegetation in a strip directly adjacent to the pavement edge. WSDOT typically maintains a 2 to 4 foot strip next to the pavement as a vegetation-free zone (referred to as Zone 1) through annual application of herbicides. This is done for a variety of reasons including, but are not limited to: pavement preservation, stormwater drainage, cost-effective maintenance, safety as related to maintenance operation and highway users, and reducing potential for roadside fire starts.

## **Problem Description**

There are alternatives to the maintenance of Zone 1 with herbicides but they have not been fully evaluated in terms of safety, cost-effectiveness, environmental impacts, and other aspects of highway design, operations and maintenance. While WSDOT personnel have begun experimenting with alternatives, have conducted some research on practices in other states and on county roads, and have developed a preliminary cost analysis of the Zone 1 and alternative approaches, a more comprehensive analysis needs to be completed that examines a wide spectrum of logically organized constraints and results to guide future WSDOT decision-making.

## **Project Objectives**

### Objective #1 – Identify decision factors

A set of factors that should be considered when determining the best practice for maintaining vegetation at the pavement edge on a given roadside will be identified. Some examples of these factors are identified in the preceding background section of this document, others may include: Roadway characteristics (i.e. traffic volume), road

shoulder (i.e. width), and roadside characteristics (i.e. configuration of ditch line and side slopes), and surrounding geography (i.e. proximity to ESA-protected stream).

Objective #2 – Identify practical alternatives for maintenance of vegetation at the pavement edge

There are a number of known alternative methods for maintenance of vegetation at the edge of highway pavement, each with a unique relationship to decision factors identified as part of Objective #1. A number of these alternative methods are currently being tried on sections of roadside in the WSDOT system; these methods along with any others found to be practical for inclusion in the study will be identified.

Objective #3 – Identify costs, benefits, and relevance of decision factors

Due to the complexity of this issue, only some of the costs and benefits relating to the various factors can be put into monetary terms. Alternative value scales (i.e. high, medium, low) will have to be used as appropriate.

Objective #4 – Develop a decision framework

A decision framework shall be developed for use by maintenance managers and design engineers to help determine the best alternative for maintaining vegetation at the pavement edge in a given location. In such a decision framework, specific roadway, shoulder, and roadside parameters would be entered. The relevance of the various decision factors identified in objective #1 to the specific highway segments would be determined. The appropriate costs/benefits of the alternatives methods identified in objective #2 would be estimated for the specific highway segments using the values identified in objective #3.

Objective #5 – Develop a field validation methodology for the decision framework

Various roadside locations will be identified at which long-term monitoring will take place in relation to the alternative methods and cost/benefit measurements generated by the decision framework. Monitoring data will help determine the actual accuracy (or lack thereof) of costs/benefits compared to the estimates projected earlier by the decision framework. Findings of the field validation can be used to make adjustments to the decision framework. Monitoring of these sites will be accomplished through a separate project using the recommended protocols from this study.

## **Benefits**

The primary benefits of this proposed research would be an improved knowledge base for decisions on maintenance of vegetation at the pavement edge, and a starting point for collection of data to fill in the knowledge base with regard to unknown or undocumented benefit/cost relationships. The knowledge base would be improved both by a study of regional conditions and by an effort to make it more explicit, with a stronger foundation in the relevant scientific literature.

## Products

1. A Decision Framework for Roadside Vegetation Management at the Pavement Edge
2. Recommendations for Ongoing Monitoring and Data Collection

## Tasks

1. Finalize scope and task breakdown: Review drafts of project proposal with WSDOT staff and project working group, including stakeholders, and revise with consideration of this input. Submit final version to WSDOT staff by Aug. 5, 2004.

*NOTE: Draft work products from the following tasks will be submitted at the scheduled time that is identified at the end of each task description.*

2. Identify decision factors (i.e., issues that influence decision-making): Review input from project working group and follow up with group members as needed to identify issues of importance to them. Review the current process of decision-making inside WSDOT to identify issues that have been important to the agency, using a roster of WSDOT staff involved in vegetation management and maintenance. Develop an initial list of decision factors. This list will include issues such as traffic volume, worker safety, roadway shoulder width, proximity to surface water bodies, stormwater drainage flow, and frequency of fire starts, among others. Schedule: 1 month after notice to proceed.
3. Define a set of management strategies for vegetation at the pavement edge (i.e., actions that can be taken to alter vegetation): Review input from project working group, gathering contact information for people who are knowledgeable about specific strategies. A comprehensive set of strategies will be produced, reflecting the actual practices of WSDOT as well as “best practices” known to members of the project working group. Examples may include mowing, chemical treatment, use of beneficial insects, and mechanical removal, among others. Schedule: 2 months after notice to proceed.
4. Literature review: Perform standard database and Internet searches with follow-up to obtain and assess relevant papers and articles according to the State of Washington’s standard for best available science. Use this review to examine the lists of decision factors and management strategies for both completeness and relevance. Schedule: 3 months after notice to proceed.
5. Interviews outside Washington State: A group of contacts who have experience managing roadsides and similar vegetation will be interviewed to learn about other vegetation management strategies that may have relevance to Western Washington. The interviews will be structured using a basic questionnaire, and

- will be conducted by phone or email. The contacts will be chosen either because they were recommended by members of the project working group, or because they were involved in recent reviews of best management practices, or because they recently participated in innovative management efforts. Schedule: 4 months after notice to proceed.
6. Refine list of decision factors: In order to establish the basis for a useful decision framework, the relative importance of each decision factor must either be identified or predicted (prediction would be used if no conclusive supporting studies are found). The list of decision factors should also be updated at this point based on what we have learned in tasks 4 and 5. Schedule: 5 months after notice to proceed.
  7. Create a decision framework based on an analysis of cost-effectiveness and cost-benefit relationships: For the set of management strategies identified in task #3, cost-related data will be identified in an effort to understand their relative cost-effectiveness. The relative benefits generated by each vegetation management strategy will also be identified, based on existing literature and interviews. Due to the complexity of this issue, only some of the costs and benefits relating to the various factors can be put into monetary terms. Alternative value scales (i.e. high, medium, low) will have to be used as appropriate. Schedule: 6 months after notice to proceed.
  8. Propose monitoring strategy: A useful decision framework must be able to adapt to new knowledge over time. This knowledge may come in the form of field observations made by WSDOT staff or via new studies done by others. A comprehensive, systematic protocol to guide field observations and record results efficiently will be developed and an associated database structure to archive and analyze these field observations will be proposed. Schedule: 7 months after notice to proceed.
  9. Field observations: The purpose of field observation in this study will be to identify if and to what extent the decision factors identified in task #2 exist, and in what settings or combinations. There may also be field conditions that affect the cost-benefit relationships associated with particular management strategies. Observations of recurring field conditions as a basis for applying the management and monitoring strategies identified in the previous tasks will be summarized. The goal is to identify a useful set of initial relationships among decision factors, management strategies and field conditions, but a comprehensive study of these relationships is beyond our current scope. Schedule: on-going through project end date, incorporated into draft and final reports.