AASHTO
AASHTO INNOVATION INITIATIVE

# AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

## Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. Sponsoring DOT (State): Washington State DOT

2. Name and Title: Raymond Willard, State Roadside Asset Manager

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## Innovation Description (10 points)

The term "innovation" may include processes, products, techniques, procedures, and practices.

3. Name of the innovation:

Roadside Landscape Asset Management System

4. Please describe the innovation.

WSDOT is utilizing and integrated set of processes and technologies to plan, execute, and track the effectiveness of roadside maintenance activities. This Roadside Landscape Asset Management System

is the result of 30 years of planning and development. The current system is embodied in a year-round process that utilizes mobile technology and mapping in combination with annual crew engagement through training and record keeping in the practice of integrated roadside vegetation management. As a basis for this data framework, WSDOT has developed a statewide mapped inventory of all planned maintenance treatments throughout the agency's 100,000 acres of roadside. Primary system components that could be replicated by other states include 1.) Area/Section Integrated Roadside Vegetation Management Plans which define maintenance actions, locations, and unit quantities for all safety related, weed control, and site restoration work, 2.) A GIS framework for developing a mapped inventory of annually planned roadside maintenance treatments and site conditions, 3.) A database framework for defining and tracking maintenance activities in terms of location/cost, and transportation objectives of system safety and preservation, environmental mitigation/protection/preservation, and visual quality/ social equity, and 4.) A measurement system to annually document the changing condition/state of repair of the roadside landscape throughout the state in response to maintenance treatments.

5. What is the existing baseline practice that the innovation intends to replace/improve?

Traditionally, roadside sustainability has been compromised due to limited maintenance funds being needed for maintenance and preservation of the built highway infrastructure. As a result, the historic approach to roadside management has been reactive and routine, and often consisting of broad uniform treatment dominated by routinely mowed grass stands. Use of this innovation will allow transportation agencies to collect data on the cost of carrying out an integrated, lifecycle approach to roadside design and management, and demonstrate the considerable cost savings to the agency and the public attainable through improved roadside management. This model also relies on roadside design and construction that provides for long term ecosystem services as well as highway safety and allows process for ongoing adaptive management/maintenance crew innovations.

6. What problems associated with the baseline practice does the innovation propose to solve?

1.) Focuses on measuring and demonstrating previously unknown environment service provisions, in addition to safety and visual quality, 2.) Creates new data analysis and planning possibilities, 3.) Generates data over time to demonstrate the overall lifecycle sustainability of the roadside, and 4.) Engages the crew as practitioners in the process, rather than just labor. Recent research has shown significant potential benefit to highway transportation sustainability and system resilience to climate change from a concerted focus on improved roadside design and management. This innovation provides a model for any agency or organization charged with the management of extensive corridor landscapes to make more informed decisions regarding design, construction, and the conduct of lifecycle-based Integrated Roadside Vegetation Management (IRVM). Through improved design and management of the roadside landscape the entire highway system can become a more beneficial and integral part of our nation's environmental and social fabric. By maintaining all roadsides in a state of good repair the entire transportation system becomes more sustainable in terms of public safety/social equity, environmental integrity, and good economics.

7. Briefly describe the history of its development.

The initial conception of this system was the result of a Programmatic Environmental Impact Study on WSDOT Roadside Vegetation Management Alternatives, completed in 1993. The preferred alternative selected in that study provided the impetus to adapt the Integrated Pest Management (IPM) process used in agriculture to the management of roadside vegetation and to develop Integrated Roadside Vegetation Management (IRVM) Plans for all roads in the state. Since 2005 the agency has maintained and annually updated area plans for all highways in the state, as part of annual crew training. In 2017 the agency implemented a new maintenance management system called HATS which utilizes a combination of mobile iPad/IOS programming technology, and ArcGIS mainframe database technology to track work and measure efficiency base on unit accomplishments. The data produced by these two systems in combination with data on system condition/maintenance performance from agency's Maintenance Accountability Process (MAP) provides the basis for budgeting, planning, tracking, monitoring, and evaluating maintenance actions in relation to the measurement of agency performance.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or weblinks here.

Attachments are inserted beginning at the end of the nomination form and include: 1.) Visualizing Roadsides as Transportation Assets Poster, 2.) example of an Area Integrated Roadside Vegetation Management Plan, 3.) HATS IRVM Features and Records List, and 4.) WSDOT's Maintenance Accountability Program (MAP) service level indicators for roadside management

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide as separate files.

## State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The AII selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

☐ Prototype is fully functional and yet to be piloted

☐ Prototype has been piloted successfully in an operational environment

☐ Technology has been deployed multiple times in an operational environment

☒ Technology is ready for full-scale implementation

The overall framework is well established; any other state would have to customize aspects of the system to fit individual organizational structure. WSDOT is still in the process of refining/finalizing all mapping and data analysis tools.

10. What additional development is necessary to enable implementation of the innovation for routine use?

WSDOT is currently working to refine the statewide GIS inventory of planned maintenance treatments and roadside landscape features, also troubleshooting the records and record keeping process. Once the inventory has been fully mapped area IRVM plans can be tied to the mapped features and assigned pending work requirements. This will allow planning and execution of calendar based, location specific treatments throughout the system.

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology?? ☐ Yes ☒ No

If so, please list organization names and contacts. Please identify the source of this information.

| Organization | Name | Phone | Email |
|---|---|---|---|
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## Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice.

12. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

This integrated set of systems in combination with each agency Labor, Equipment, Materials, and Other (LEMO) accounting systems provides the essential data to treat roadside landscape assets with the same degree of attention and diligence as is applied to other transportation system assets such as bridges and pavements. As data from these systems accumulate over time this allows for analysis of crew productivity and efficiencies and provides a basis for more informed budget planning and funding requests. This system is unique in that it has been developed entirely "in-house" with only WSDOT resources using IOS/iPad and ArcGIS technology.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

| Benefit Types | Please describe: |
|---|---|
| Organizational Efficiency | Information generated from this system can be used to demonstrate organizational efficiency and build public trust |
| Environmental Benefits | WSDOT had dramatically reduced herbicide use and mowing by using these tools and processes, this has resulted in improved pollinator and wildlife habitat as well as improve water and air quality. |
| Cost Savings | This approach has reduced WSDOT roadside maintenance costs significantly over time. Unfortunately, savings have been diverted to other highway maintenance needs rather than re-invested in restoration of neglected roadside areas. |

Provide any additional description, if necessary:

Crew engagement and training through use of these tools is an underlying benefit as well. Having a sophisticated planning and monitoring system has improve moral and comradery among the maintenance workers engages in this work.

14 How broadly might this innovation be deployed for other applications. in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

Very broadly: WSDOT is using the HATS program to track all essential highway maintenance activities and features.

## Market Readiness (20 points)

The AII selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

15. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

| Check boxes that apply | Dimensions | Please describe: |
|---|---|---|
| ☒ | Gaining executive leadership support | This effort began through executive support within WSDOT. This will not work without complete executive endorsement. |
| ☒ | Communicating benefits | The system produces the information on benefits that can be communicated to the public and the legislature. |
| ☒ | Overcoming funding constraints | The system generates data to demonstrate life-cycle based funding tradeoffs and crew efficiencies. |
| ☒ | Acquiring in-house capabilities | By engaging the crews through training, record keeping, and site monitoring/evaluation this system encourages in-house capabilities. |
| ☒ | Addressing legal issues (if applicable) (e.g., liability and intellectual property) | Records and data analysis available through the system provide more transparent operations and accounting. |
| ☒ | Resolving conflicts with existing national/state regulations and standards | This would allow all states to focus on application of “best practice” design and management template consist with the latest research and technology. |
| ☒ | Other challenges | By getting the states to work together on this would create a |

| | | |
|---|---|---|
| | | national community of practice around the subject of sustainable roadside design and management. |

16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

**Cost**: Much of the cost is embedded in the ongoing operations and development of the agency maintenance program, WSDOT Maintenance supports the systems with staff responsible for overseeing the various aspects including IRVM, HATS, MAP, and Budget. WSDOT employs two full time IT staff to handle the system programming and development of maps and records. The initial acquisition of mobile technology hardware and installing high-speed internet access to all maintenance facilities statewide cost WSDOT approximately 1.5 million dollars in 2016 and 2017. All WSDOT maintenance technicians and supervisors have iPads for mobile access to data and maps, the agency has 1,200 iPads in service and is recycling them on a four-year lifecycle.

**Level of Effort**: The most challenging aspect of deployment is engaging the statewide highway maintenance workforce in this process. The development of crew training programs for reliable record keeping and site monitoring/evaluation may take years or decades to fully deploy. Another challenging aspect is the mapping of a statewide inventory for planned roadside treatments, this depends on each agency's overall development and deployment of GIS technology.

**Time**: In order for this system to function it must engage employees at all levels within the process, and WSDOT has completely restructured and rebuilt its roadside maintenance program around these systems over the past 30 years. However, now that WSDOT's processes and systems serve a case study, other states can jump start programs if there is executive support, competent leadership within the maintenance organization, and funding for technology and training programs.

17. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

There are a few third-party consultants around the country currently working on development of similar maintenance management systems for all aspects of highway infrastructure maintenance. There is need for Information Technology programming and hardware vendors if in-house expertise is not an option. If implemented nationally this could create an opportunity for consultants to offer GIS mapping services for developing roadside maintenance treatment inventories for state DOTs.

Attachment #1 – WSDOT's Template for Roadside Design and Management

Attachment #2 – Example of one of twenty-four Area Integrated Roadside Vegetation Management Plans (10 pages beginning on the following page)

# Northwest Region, Area 4

# Integrated Roadside Vegetation Management Plan

2021

# Introduction

The Washington State Department of Transportation (WSDOT) Northwest Region, Area 4 manages approximately 235 miles of state highway corridor in south King and eastern Pierce Counties. Highways in this area carry some of the highest traffic volumes in the state. Major corridors include portions of Interstates 5 and 405. Other limited access corridors include State Routes 18, 167, 518, and a portion of 509. SR 410 east of Enumclaw is referred to as the Mather Memorial Parkway and has been designated as an All American Road. A map of the area is included as **Figure 1** on the following page.

The primary roadside vegetation management objectives are in relation to traffic safety and preservation of the highway infrastructure. Additionally, as a landowner WSDOT is required to control all listed noxious weeds that occur on the right-of-way by state law (RCW 17.10 and 15.15.010). It is important that WSDOT not only meet the legal requirements for weed control, but also consider the needs and concerns of adjacent landowners in this area.

In order to best manage roadsides with these priority objectives in mind, WSDOT practices an annually cycling process called Integrated Vegetation Management (IVM). Plans like this are maintained and updated annually for all areas of the state with an overall goal of refining the most efficient maintenance procedures, and establishing the naturally self-sustaining roadside vegetation possible. Adjustments are made year to year in each area plan based on monitoring the previous years' accomplishments and results, available budget, and prioritization of other required highway maintenance activities.

This plan serves as the guidance document for vegetation maintenance in Northwest Region Area 4 for the 2021 growing season. It identifies priority locations and prescribes treatments for accomplishing safety and weed control objectives through a combination of integrated, seasonally timed control measures. Each year's actions are designed as part of a coordinated multi-year strategy to minimize roadside maintenance requirements wherever possible. This plan also accounts for specific locations where maintenance tactics are adjusted due to environmental issues, neighboring properties, local partnerships, or restoration work done through WSDOT design and construction.

The information contained in this plan document can be geographically referenced by crews in the field using iPads and the agency's Highway Activity Tracking System (HATS). Accomplishments and results are also tracked geographically through this system, providing site specific reference of historic actions and results. This development in WSDOT maintenance management will greatly improve the agency's success in properly executing planned actions, monitoring and documenting results of treatments, and in measuring cost and results over time.

WSDOT welcomes input from local public and private entities on its weed control and other vegetation management activities. Wherever appropriate the agency is looking for opportunities to plan and cooperate with others in managing the roadside. Please direct any questions, comments or suggestions to the Northwest Region Area 4 Superintendent Mike Golden, Assistant Superintendent Gary Durst, or the State's roadside asset manager Ray Willard:

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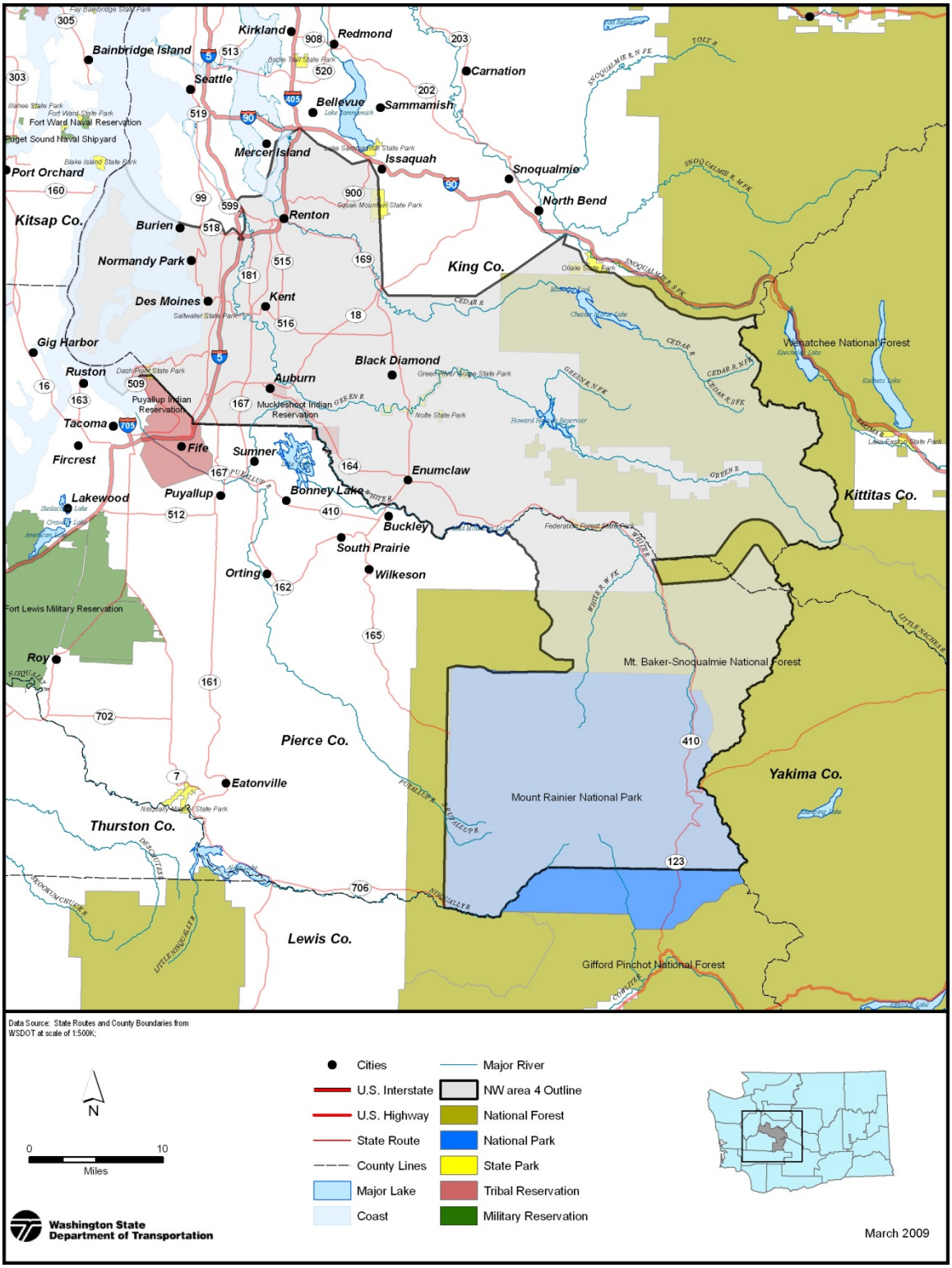
Kirkland
Redmond
Bainbridge Island
Seattle
Carnation
Bellevue
Sammamish
Fort Ward Naval Reservation
Puget Sound Naval Shipyard
Mercer Island
Issaquah
Snoqualmie
Port Orchard
North Bend
Kitsap Co.
Burien
Renton
King Co.
Normandy Park
Des Moines
Kent
Gig Harbor
Black Diamond
Ruston
Auburn
Puyallup Indian Reservation
Muckleshoot Indian Reservation
Tacoma
Fife
Sumner
Fircrest
Enumclaw
Lakewood
Puyallup
Bonney Lake
Buckley
South Prairie
Orting
Wilkeson
Fort Lewis Military Reservation
Roy
Mt. Baker-Snoqualmie National Forest
Pierce Co.
Eatonville
Yakima Co.
Mount Rainier National Park
Thurston Co.
Lewis Co.
Gifford Pinchot National Forest
Wenatchee National Forest
Kittitas Co.
Data Source: State Routes and County Boundaries from WSDOT at scale of 1:500K;
N
0
10
Miles
Cities
U.S. Interstate
U.S. Highway
State Route
County Lines
Major Lake
Coast
Major River
NW area 4 Outline
National Forest
National Park
State Park
Tribal Reservation
Military Reservation
Washington State Department of Transportation
March 2009

**Northwest Region, Area 4 Map**

Figure 1

*NW Region, Area 4 IVM Work Plan – 2021*

The section outlines the overall approach and geographic distribution of roadside vegetation management requirements throughout the maintenance area in 2021. Information is organized in relation to four groups of activities defined in the WSDOT Maintenance Accountability Program (MAP) for the performance of roadside vegetation maintenance activities: **Control of Vegetative Obstructions**, **Noxious Weed Control**, and **Nuisance Weed Control**. Specific locations as noted in this work plan are also mapped in the Highway Activity Tracking System (HATS) for reference by maintenance in the field.

## Safety First

Safety of our employees, the traveling public, and the environment are WSDOT's highest priorities and key to our success. Pre-Activity Safety Plans (PSAP) are developed for all activities and crews review, discuss and sign these plans at tailgate meetings, prior to each day's work. When applying herbicides, our licensed pesticide applicators read the entire label before using products and use the products strictly in accordance with label precautionary statements and directions. WSDOT has implemented additional agency specific environmental restrictions on some products, to minimize any risk to aquatic or terrestrial ecosystems. Applicators wear protective equipment applicable to the products being used and discuss any potential environmental and/or human health risks as part of the daily PASP meeting. Technicians inspect their calibrated equipment daily to ensure it is in proper working order. Herbicides are stored in locked facilities and kept in an organized condition.

## Control of Vegetative Obstructions – 3A4

The work of this group of maintenance activities relates to the safety and operational requirements of the highway. These items are considered first priority in terms of the overall roadside maintenance needs. Vegetation management objectives and work activities in this category fall into four groups – **Pavement Edge Maintenance/Zone 1**, **One Pass Mowing/Zone 2**, **Tree and Brush Control/Zone 2 and 3**, and **Hazard Tree Removal/Zone 3**.

**Pavement Edge Maintenance/Zone 1**

**Work Operation: 1615**

**HATS Form: Spray Zone 1**

**HATS Map Layer: Reference lines – Roadside Features/Spray Zone 1 Reference**

This work includes the application of herbicides to road shoulders where necessary throughout the area. The objective of these applications in designated locations is preserving of a band of gravel shoulder adjacent to the pavement that is free of vegetation. This treatment is necessary in the mapped locations described below to provide visibility and maintainability of roadside hardware and guideposts, allow room for vehicles to safely pull off on shoulders, facilitate stormwater drainage, and/or provide added visibility of wildlife approaching the highway.

Total Units of Planned Treatment

- Approximately **250 acres** of bare ground road shoulders are maintained throughout the area.

Locations of Planned Treatments

- Planned treatment sites are mapped in HATS layer – **Zone 1 Treatments**.
- All road shoulders in the area receive annual bare ground treatments in the fall, with the following exceptions:
  - SR 410 MP 47.6 to 69.2 (within National Forest and Park)
  - SR 123 MP 7.6 to 16.3 (with National Park)

Treatment Methods

- Herbicides are applied using a truck mounted power spray system calibrated to deliver a 4-foot band of spray mixture adjacent to the paved shoulder. The resulting width of treated shoulder may be wider than 4 feet in areas with steeper shoulder slope.
- Some noxious weed species emerging on the edge will be treated selectively in spring and summer as needed in combination with other targeted weed control activities.
- In locations with cable rail – If the rail is less than 8 ft. from the edge of pavement, the bare ground treatment will extend from the pavement edge to the back side of the cable rail. In locations where the rail is greater than 8 ft. from the edge of pavement, treatment will be applied in 4 ft. band directly under the rail.
- All locations will be treated in the September – October timeframe with Blend R4 plus a drift control agent:
  - Lockdown SC @ 8 oz/acre
  - Esplanade @ 5 oz/acre
  - Roundup Pro Concentrate @ 32 oz/acre
  - Escort XP @ 1.5 oz/acre
  - Crosshair @ 4 oz/acre

**Safety Mowing/Zone 2**

**Work Operation: 1625**

**HATS Form: Mowing Zone 2**

**HATS Map Layer: Reference lines – Roadside Features/Mowing Zone 2 Reference**

This work includes routine mechanical cutting of all vegetation on the road shoulder in a band width immediately adjacent to pavement. Mowing is necessary in areas where taller growing grasses or other vegetation are present and must be annually or semi-annually cut back for visibility and maintenance of roadside hardware and delineators, to maintenance traffic sight distance at curves and intersections, and for improved visibility of wildlife approaching the highway. Mowing height for these operations is typically 6 to 8 inches above the ground.

Total Units of Planned Treatment

- Approximately **250 acres**

Locations of Planned Treatments

- One 6-8 ft. pass on all roads where guardrail is not present.
- Area will be reevaluating mowing needs based on application of a 4 ft. Zone 1

Treatment Methods

- Mowing width is typically dictated by the shoulder configuration and varies between 5 and 25 feet as specified on the HATS maps.
- Mowing will be done with multiple types of tractor mounted mowers including a 3-deck, 25 ft. total width mower, side arm mounted flail and rotary mowers, and orchard mowers.
- Mowing widths may be wider if necessary, for traffic visibility at intersections and curves.

**Tree and Brush Control/Zone 2 and 3**

**Work Operations: 1622, 1625, 1626**

**HATS Forms: Tree/Brush Control – Spray, Trimming Mechanical, Trimming Manual, and Mowing**

**HATS Map Layer: None**

This includes safety and traffic operations related work in Zone 2, such as periodic side-trimming or removal of brush and trees or tree branches encroaching on or overhanging traffic operations and impacting sign visibility. Also included is work in Zone 2 and 3 when selectively controlling emergent early succession tree species – to prevent them from growing into mature hazard trees within striking distance of the road.

Total Units of Planned Treatment

- Approximately **30 acres** will be mechanically trimmed throughout the area.
- Approximately **10 acres** will be trimmed with hand tools throughout the area.
- Approximately **6 acres** will be treated with herbicides throughout the area.

Locations of Planned Treatments

- SR 516
- SR 509 Limited Access
- SR 900 MP 14-17
- SR 164 MP 4-14

Treatment Methods

- Mowing and side trimming with tractor mounted side arm flail mower
- Some control of seedling trees and encroaching brush in Zone 2 will be treated with herbicides incidental to noxious weed control operations.
- Target seedlings and encroaching brush in the fall with Vastlan 96 oz/acre plus Milestone @ 10 oz/acre
- Cut stump treatment with Garlon 4 whenever possible when cutting unwanted trees.

**Hazard Tree Removal/Zone 3**

**Work Operation: 1628**

**HATS Forms: Hazard Tree Removal – Individual Tree Removal, Stand Removal, and Cleanup Fallen Trees**

**HATS Map Layer: None**

Trees within and adjacent to the right of way are routinely monitored by maintenance staff for potential risk to the highway and/or neighboring structures. Individual and stands of mature trees identified as a potential imminent threat will be further evaluated and removed as soon as possible where needed.

Total Units of Planned Treatment

- Approximately **200 trees** in prioritized areas.

Locations of Prioritized Areas

- I-5 SB MP 154/Klickitat Dr. hillside
- I-5 SB by the weigh station stand of dead trees
- SB 167 MP 18, 21-25
- SB 405 MP 2 along the ramp
- SR 410 MP 22-57 (ESA restrictions are followed for timing)

Treatment Methods

- Crews are continuously looking for trees that exhibit structural defects and could strike the road or neighboring property if they come down. Any hazard trees identified at any time are removed as soon as possible.
- If trees growing outside WSDOT right of way are hazards, crews work with the neighboring property owner to negotiate removal.
- For trees in areas with Endangered Species concerns, the Regional Maintenance Environmental Coordinator will be consulted prior to action
- Cut and drop in place wherever possible
- Stump treat with herbicides to prevent re-growth

## Noxious Weed Control – 3A2

This group of activities includes control of non-native invasive weed species as defined by state law and individual county designation. This group of activities is second priority vegetation management work after safety related objectives have been addressed. While all Class A, B, and C noxious weed species as listed in RCW 17.10 are considered potential targets for WSDOT noxious weed control, the agency is currently not funded to achieve 100% control of all noxious weeds. Therefore, the top priorities for weed control are focused on locations and species that are more limited in distribution on the right of way – where there is a chance of successful eradication. To prioritize control of species that are already widespread in the area, WSDOT works with the local county noxious weed boards and coordinators, to annually review and determine which species and locations will be specifically targeted.

To prioritize, plan, and track noxious weed control, WSDOT maps and monitors weed infestations in three categories: **Priority**, **Planned Treatment**, and **General Reference**. **Priority** locations are where Class A noxious weed species exist on the right of way, and complete eradication is required by state law. **Planned Treatment** sites are locations where there are new, and/or limited distribution infestations of Class B and C noxious weed exist, and eradication is possible. **General Reference** sites are recorded for reference only to document the presence of noxious weed species which are more commonly occurring in the local area.

**Noxious Weed Control**

**Work Operations: 1616, 1618, 1641, 1699**

**HATS Forms: Pesticide Application (for spray applications,) and three sub-forms under Noxious Weed Control General– Manual/Mechanical, Seed/Fertilize/Mulch, and Biological**

**HATS Map Layer: Reference Points – Roadside Features/Noxious Weed Control Priority (red dots), Noxious Weed Control Planned Treatment (orange dots), and Noxious Weed Control General Reference (pink dots)**

Operations are prescribed throughout the season to prevent the spread of any legally designated noxious weed species, and to reduce or eliminate populations wherever possible. Integrated treatment plans combine field monitoring and an integral mixture of seasonally timed control methods with proven effectiveness on designated species. Successful plans are consistently implemented over a series of years and annually adjusted as necessary based on field observations. Care must be taken in all cases to avoid damage to surrounding desirable/native vegetation.

**Class A noxious weed species known to exist in Northwest Region Area 4:**

| Common Name/Botanical Name | Treatment Notes |
|---|---|
| Milk thistle/*Silybum marianum* | Monitor for periodic emergence SR169 MP 9.89 EB shoulder. Plants have been dug and removed on two previous occasions. |

**Noxious Weed Targets on WSDOT Right of Way in Northwest Region Area 4:**

| Common Name/Botanical Name | Treatment Notes |
|---|---|
| Butterfly bush/Budlia davidii | Target EDRR infestations mapped and treated spring and fall, all other plants controlled incidental to seasonal weed patrols |
| Common teasel/*Dipsacus fullonum* | Target EDRR infestations mapped and treated spring |
| Common reed/*Phragmites australius* | EDRR for all mapped sites |
| Dalmatian toadflax/*Linaria dalmatica* | Target sites mapped and treated in the spring and fall |
| Hawkweed sp./*Hieracium sp.* | Control where visible in conjunction with seasonal patrols |
| Knapweed sp./*Centauri sp.* | Control where visible in conjunction with seasonal patrols |
| Knotweed sp./*Polygonum sp.* | Target sites mapped and treated after flower stage in late summer |

| Common Name/Botanical Name | Treatment Notes |
|---|---|
| Pampas grass/*Cortaderia selloana* | Target EDRR infestations mapped and treated spring and fall, all other plants controlled incidental to seasonal weed patrols |
| Poison hemlock/*Conium maculatum* | Control where visible in conjunction with seasonal patrols, priority target sites are mapped and treated in the spring |
| Policeman's helmet/*Impatiens glandulifera* | All known infestations have been controlled. Target sites have mapped and annually monitored for reoccurring plants. |
| Purple loosestrife/*Lythrum salicaria* | Target sites mapped and treated at early flower stage in summer |
| Common St. Johnswort/*Hypericum peroratum* | Control where visible in conjunction with seasonal patrols |
| Tansy ragwort/*Senecio jacobaea* | Occurs sporadically throughout the area. All visible plants are sprayed in the spring prior to bud/seed set, any remaining plants visible in flower are hand pulled with seed heads removed, bagged, and disposed of |
| Rush skeletonweed/*Chondrilla juncea* | Target EDRR infestations mapped and treated spring |
| Shiny geranium/*Geranium lucidum* | Target EDRR mapped infestations and treat in early spring, monitor for re-emergence throughout the season. |
| Scotch broom/*Cytisus scoparius* | Controlled in conjunction with seasonal weed patrols when present in small isolated patches, control of all emerging plants is a priority along SR410 east of Enumclaw |
| Sulfur cinquefoil/*Potentilla recta* | Target EDRR infestations mapped and treated spring |
| Wild chervil/*Anthriscus sylvestris* | Target sites mapped and treated in the spring |

Total Units of Planned Treatment

- Approximately **110 acres** will be treated with herbicides.
- Up to **10 acres** may be pulled by hand if needed.

Locations of Planned Treatments

- Treatment locations are described in the table above

Treatment Methods and Timing

- Treatments are carried out as described in the table above
- Herbicide mixtures used include:

**Early Season Targets**

- Capstone @ 128 ozl/acre
- MSO @ 16 ozl/acre

**Mid-Season Targets**

- Capstone @ 128 ozl/acre
- MSO @ 16 ozl/acre

**Late Season Targets**

- Opensite @ 3 ozd/acre
- MSO @ 16 ozl/acre

## Nuisance Vegetation Control – 3A3

Nuisance vegetation control takes place only in a select set of carefully prioritized locations along the wider areas of right of way throughout the state. These locations are delineated on maps in HATS as polygon outlines where right of way is wide enough for Zone 3 to exist. Locations are prioritized to receive treatments where there is heightened local interest in a more controlled visual appearance and highly maintained condition. Typical locations include: wider areas along limited access freeways in urban and suburban areas, freeway interchanges for local urban centers, environmentally sensitive areas, and areas where neighbors are willing to partner with WSDOT on management efforts. Because nuisance weed control activities are not related to safety or legal requirements, and are primarily undertaken to improve the visual appearance of the roadside, they are considered the lowest priority vegetation management needs.

For all areas designated to receive Nuisance Vegetation Control, multi-year treatment plans have been developed. The actions contained in these plans will be executed and tracked in relation to specific Zone 3 polygons for **Nuisance Vegetation Control Zone 3,** referenced on HATS maps and described below.

**<u>Nuisance Vegetation Control Zone 3</u>**

**Work Operations: 1611, 1612, 1641, 1699**

**HATS Forms: Pesticide Application (for all spray applications), and 3 sub-forms under Nuisance Veg. Control General – Manual/Mechanical, Biological, and Seed/Fertilize/Mulch**

**HATS Map Layer: Reference polygons – Zone 3 Nuisance Reference**

Maintenance activities in each identified location are planned and tracked as multi-year treatment strategies utilizing monitoring and the most effective combination of control methods – with a goal of establishing desirable vegetation that requires only minimal maintenance. Undesirable species are identified and specifically targeted while care is be

taken to avoid damage to surrounding desirable/native vegetation. In some cases, soil enhancements may be used as well as seeding or planting of beneficial competition species. Successful plans are consistently implemented over a series of years and annually adjusted as necessary based on field observations.

Total Units of Planned Treatment

- Approximately **10 acres** will be treated with herbicides for nuisance weed control.
- Approximately **20 acres** will be mowed for nuisance weed control.

Locations of Planned Treatments

- Areas prioritized for nuisance weed management in Zone 3 will be mapped in the 2021 plan for this area in reference HATS layer – **Nuisance Vegetation Management**. The following areas will receive annual mowing for vegetation management. Mowing will be conducted in late spring/early summer once seasonal growth has stopped. Locations include:
  - SeaTac main entrance SR509
  - 509 at 160 and 518
  - 516 and 167 in Kent
- There are a series of wetland mitigation sites within the area that have satisfied their permit requirements and are now considered part of the overall Zone 3 inventory in the area. Sites are mapped in HATS and require annual monitoring to document state of repair and plan for any required repairs.

Treatment Methods and Timing

- Rotational Zone 3 mowing where possible on a 3-5 year schedule
- Spot and broadcast treatment as necessary as a follow up to mowing operations depending on regrowth of undesirable plants.

## Safety Rest Area Site Maintenance – 7B1

Landscape maintenance work at safety rest areas throughout the state includes all vegetation management activities that take place in relation to the design and layout of individual rest areas. For these highly developed landscape assets, the goal is to maintain healthy, attractive plantings throughout the site as well as along the rest area frontage along the highway. Planted vegetation is intended to be preserved and enhanced over time, through pruning, hedging, trimming, with irrigation and periodic fertilization used where necessary.

**Safety Rest Area Site Maintenance**

**Work Operations:**

**HATS Forms:**

**HATS Map Layer: Reference polygons – SRA Landscape Reference**

Rest area landscape maintenance operations are carried out by the Rest Area Attendants in many cases, with the local area maintenance crews or regional specialty crews helping out when needed for irrigation and specialized weed control operations.

Locations of Planned Treatments

- Rest area facilities maintained by NW Region Area 4 include:
  - SeaTac SRA NB I-5 @ MP 140.7

Total Units of Planned Treatment

  - High maintenance landscape – **1 acre**
  - Low maintenance landscape – **2 acres**

Treatment Methods and Timing

- Routine pickup of vegetative debris as needed
- Annual start up and winterization of irrigation system
- Routine lawn mowing throughout the growing season
- Weed control operations

## Stormwater Facilities Maintenance – 2A4

Stormwater facilities maintenance operations that include vegetation management considerations are discussed in this section of the plan. This work is regulated by the agreement WSDOT has established under the statewide National Pollution Discharge Elimination System (NPDES) permit granted to the agency by the USEPA.

**NPDES Maintenance**

**Work Operations: 1368, 1399**

**HATS Forms: Pesticide Application (for all spray applications)**

**HATS Map Layer: All biofiltration feature types listed under Stormwater Features Layer**

There are several vegetation management activities necessary to maintain function and operation of certain constructed stormwater management facilities such as vegetated filter strips and swales along the edge of pavement and throughout the roadside, and stormwater retention/detention ponds in the more urbanized areas. Each of these features includes a manual which details the requirements in relation to control of vegetation and sediment buildup over time. Any vegetation control work required within designed treatment features is charged to the stormwater program.

Locations of Planned Treatments

- All stormwater management facilities with biofiltration components are mapped within the Stormwater Features Layer in HATS.
- Vegetation management activities in stormwater management features are specified in the Owner's Manual for each constructed feature.
- Required work in stormwater features within the area for 2021 include:
    - None required

Treatment Methods and Timing

- Weed control within stormwater management features is carried out in concert with other weed control activities throughout the area.

Attachment #3 – WSDOT IRVM Record Keeping Forms and Maps:

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**HATS Forms for Recording IVM Actions:**

1. **Pesticide Application** (Zone 1, Noxious Weed Control, Tree/Brush Control, Nuisance Veg. Control Zone 3, Landscape)
2. **Mowing Zone 2**
3. **Tree/Brush Control** (Manual, Mechanical)
4. **Hazard Tree Removal** (Individual, Stand, Clean up Fallen Trees)
5. **Noxious Weed Control** (Manual/Mechanical, Seed/Fertilize/Mulch, Biological)
6. **Nuisance Veg. Control Zone 3** (Manual/Mechanical, Seed/Fertilize/Mulch, Biological)
7. **Landscape Maintenance** (All 1500 series work operation codes)

---

**IVM Reference Layers:**

**Zone 1**

- Light blue lines drawn along all road edges where treatments are planned
- Attribute data for each line includes:
  - Seasonal timing,
  - Herbicide mix/rates
  - Width of application

**Mowing Zone 2**

- Green lines drawn along all road edges where treatments are planned
- Attribute data for each line includes:
  - Width of mowing pass

**Tree/Brush Control**

- No reference lines at this time
- IVM Plans will identify general locations of highest priority and explain planned treatments
- As actions for tree and brush control are recorded on HATS forms through the course of the year, reference lines will be created to show when, what, and where actions were taken

**Noxious Weed Control**

- Three sets of point data will be created for each area:
  - Red - Priority Noxious Weed (Class A infestations only)
  - Orange - Early Detection Rapid Response (EDRR) or Planned Treatment points
  - Pink - General Reference points
- Only species listed in the IRVM Plan and locations mapped are controlled as noxious weeds. Other weed species/locations controlled will be either as obstructions if creating safety hazard in Zone 1/2, or as part of planned Nuisance Veg. Control Zone 3
- Weed species included as attribute reference for all points
- Attribute references for EDRR points:
  - Seasonal timing of planned treatment
  - Herbicide mix/rates
  - Photo?

**Nuisance Veg. Control Zone 3**

- No nuisance weed control other than in Zone 3 areas identified in the Area IVM Plans
- All areas where nuisance vegetation control is prioritized will be identified in the Area IVM Plans, outlines for areas of planned treatments (green shaded polygons) will be available for reference on HATS maps

- Attribute data attached to the polygons:
  - Multi-year treatment plan for the area
  - 2018 planned treatments and season timing
  - Herbicide mix/rates (if applicable)
  - Notes

**Landscape Maintenance**

- No detailed planning or tracking of landscape maintenance actions at this time
- All areas designated as Landscape Maintenance are recorded for reference on HATS maps (tan shaded polygons)
- Actions recorded by location and work op code only, no unit data for landscape recorded at this time (except for pesticide apps)

Attachment #4 - WSDOT's Maintenance Accountability Program (MAP) Performance Measures for Roadside Management

Maintenance Accountability Process

**Perfomance Measures**

## Group -

| | | | |
|---|---|---|---|
| **Activity Number:** | 3A1 | **Priority Rank** | 31 |
| **Activity Name:** | Litter Pickup | | |
| **Survey Period:** | Summer | **Detail Level:** | Statewide |
| **Indicator:** | Presence of litter on the roadside. | | |
| **Outcome Measure:** | Number of fist sized or larger objects present per centerline mile. | | |
| **Outcome Unit:** | EA/CLM | | |

**Outcome Thresholds**

| Service Level | | | | |
|---|---|---|---|---|
| **A** | **B** | **C** | **D** | **F** |
| 0 - 125 | 126 - 250 | 251 - 500 | 501 - 1000 | >1000 |

**Comments:**

**Data Source** Field Surveys

| | | | |
|---|---|---|---|
| **Activity Number:** | 3A2 | **Priority Rank** | 27 |
| **Activity Name:** | Noxious Weed Control | | |
| **Survey Period:** | Summer | **Detail Level:** | Statewide |
| **Indicator:** | Presence of noxious weeds on the roadside. | | |
| **Outcome Measure:** | Percent of roadside area with legally designated noxious weeds present. | | |
| **Outcome Unit:** | % Roadside | | |

**Outcome Thresholds**

| Service Level | | | | |
|---|---|---|---|---|
| **A** | **B** | **C** | **D** | **F** |
| 0 - 1% | 1.1% - 2.5% | 2.6% - 5% | 5.1% - 15% | >15% |

**Comments:** This data is to be collected by persons qualified to identify noxious weeds. Current IVM weed lists can be found online.

**Data Source** Field Surveys

| | | | |
|---|---|---|---|
| **Activity Number:** | 3A3 | **Priority Rank** | 29 |
| **Activity Name:** | Nuisance Vegetation Control | | |
| **Survey Period:** | Summer | **Detail Level:** | Statewide |
| **Indicator:** | Presence of nuisance vegetation on the roadside. | | |
| **Outcome Measure:** | Percent of roadside area with nuisance vegetation present. | | |
| **Outcome Unit:** | % Roadside | | |

**Outcome Thresholds**

| Service Level | | | | |
|---|---|---|---|---|
| **A** | **B** | **C** | **D** | **F** |
| 0 - 2.5% | 2.6% - 5% | 5.1% - 10% | 10.1% - 20% | >20% |

**Comments:** This data is to be collected by persons qualified to identify noxious weeds. Current IVM weed lists can be found online.

**Data Source** Field Surveys

Maintenance Accountability Process

**Perfomance Measures**

## Group -

| | | | | | |
|---|---|---|---|---|---|
| **Activity Number:** | **3A4** | | **Priority Rank** | | **16** |
| **Activity Name:** | **Vegetation Obstruction Control** | | | | |
| **Survey Period:** | **Summer** | | **Detail Level:** | | **Statewide** |
| **Indicator:** | **Presence of vegetation blocking site lines to intersections or signs.** | | | | |
| **Outcome Measure:** | **Percent of centerline miles with instances of vegetation obstructions.** | | | | |
| **Outcome Unit:** | **% CLM** | | | | |
| **Outcome Thresholds** | **Service Level** | | | | |
| | **A** | **B** | **C** | **D** | **F** |
| | **0 - 0.5%** | **0.6% - 1.5%** | **1.6% - 3.5%** | **3.6% - 6%** | **>6%** |
| **Comments:** | **Presence of one or more vegetation obstructions reported as a yes or no.** | | | | |
| **Data Source** | **Field Surveys** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Activity Number:** | **3A5** | | **Priority Rank** | | **30** |
| **Activity Name:** | **Landscape Maintenance** | | | | |
| **Survey Period:** | **Summer** | | **Detail Level:** | | **Statewide** |
| **Indicator:** | **Appearance and health of landscaped roadside areas.** | | | | |
| **Outcome Measure:** | **Condition score. Sum of Weed Control, Plant Health, and Trimming/Pruning/Planting condition ratings. See MAP Landscape Survey Matrix.** | | | | |
| **Outcome Unit:** | **Score** | | | | |
| **Outcome Thresholds** | **Service Level** | | | | |
| | **A** | **B** | **C** | **D** | **F** |
| | **3** | **4** | **5 - 6** | **7 - 8** | **9** |
| **Comments:** | **Regions will update landscape locations as needed, each year.** | | | | |
| **Data Source** | **Landscape Field surveys completed by HQ., unless designated to be completed by Regions<br>See Chapter 4-Appendix for further description for Landscape Surveys** | | | | |