

MassDOT



**Vegetation Management Plan
2014 – 2018**

Contents

MassDOT VEGETATION MANAGEMENT PLAN.....	1
PROPOSE AND OBJECTIVES OF VMP	1
SUMMARY REPORT 2009 – 2013.....	2
PROGRAM OVERVIEW FOR 2014-2018	3
ROADSIDE MANAGEMENT ZONES.....	3
Roadway & Guardrail Zone (ROW).....	4
Operational/Clear Zone	5
Highway Buffer Zone	7
Priority Landscapes.....	7
MassDOT Vegetation Management Practices.....	7
Mowing.....	7
Tree Removal, Trimming and Selective Clearing, Clearing and Grubbing.....	7
Brush Control.....	8
Herbicide Treatment	8
Planting.....	9
Seeding	10
Cooperation with Other Agencies	10
Implementing Integrated Vegetation Management (IVM)	10
IDENTIFICATION OF TARGET PLANTS	11
JUSTIFICATION OF USE OF HERBICIDES.....	11
IDENTIFICATION OF SENSITIVE AREAS.....	11
OPERATIONAL GUIDELINES FOR HERBICIDE APPLICATORS.....	12
REMEDIAL PLAN TO ADDRESS SPILLS AND RELATED ACCIDENTS	13
HERBICIDE ALTERNATIVES	14
ALTERNATIVE LAND USE.....	14
QUALIFICATIONS OF PERSONNEL.....	15
APPENDIX A – Sensitive Area Restriction Guide.....	16
APPENDIX B – MDAR Sensitive Materials List Summary Info.....	18

MassDOT VEGETATION MANAGEMENT PLAN

PROPOSE AND OBJECTIVES OF VMP

The purpose of this Vegetation Management Plan (VMP) is to establish MassDOT's vegetation management practices, provide guidelines for Integrated Vegetation Management, and ensure that work is in compliance with the Rights of Way Management Regulations (333 CMR 11.00) as promulgated by the Massachusetts Department of Agricultural Resources (MDAR).

The primary objective of roadside vegetation management is to provide safe use of and access to roadways, sidewalks and facilities, and to preserve the integrity of highway infrastructure. Integral to achieving this primary objective is providing stormwater control through proper management and use of plant material, maintaining slope stabilization, protecting habitat and resource area, preserving and enhancing the scenic quality of the roadside, and controlling invasive and noxious plants. Uncontrolled roadside vegetation can impede normal maintenance operations, obstruct motorists' line of vision, block safe access to roadways and sidewalks, and can cause damage to structures such as median barriers, pavements, shoulders, guard posts, drainage lines, and waterways. Uncontrolled invasive species exacerbate maintenance problems and cause degradation of right of way land and of abutting land.

MassDOT's VMP is based on the principles of Integrated Vegetation Management (IVM). The basic premise of IVM with regard to roadside vegetation management is, in short:

- to define and prioritize the needs for control
- through a combination of methods and strategies, effectively control undesirable vegetation
- where appropriate, promote desirable vegetation

The long term objective of IVM with regard to herbicide use is that through prioritization of targeted plants and locations, proper timing of applications, and use of appropriate chemicals and methods, vegetation is more effectively controlled. More effective control will result in more stable conditions, allowing for a reduction over time in the amount of herbicide necessary for management. In areas where vegetative cover is desired, vegetation management, whether mechanical, herbicidal, or through the use of planted material, should be such that, over time, it promotes a stable and sustainable roadside plant community that requires less maintenance and herbicide use, improves stormwater infiltration and control, and provides a more scenic roadside appearance. Incorporating IVM practices requires personnel familiar with vegetation and control methods.

The following VMP includes an assessment of spraying statewide, a description of vegetation management zones specific to roadways, MassDOT's vegetation management practices including potential IVM practices specific to those zones, implementation of recommended IVM practices, and information as required by 333 CMR 11.00, including identifying sensitive areas, herbicide application guidelines, and contract information for the relevant entities.

Subject to approval of this VMP by the Massachusetts Department of Agriculture (MDAR), MassDOT will prepare on an annual basis a Yearly Operational Plan (YOP) which will provide specific information about the vegetation management program to be carried out for the specified year. This YOP shall be submitted to MDAR for its review, comment and subsequent approval. Copies of the YOP, or a web site where the YOP can be viewed along with the VMP, will be submitted to the senior administrative official, Conservation Commission and Board of Health for each affected community listed in the YOP. The municipal officials and general public shall have 45 days, upon receipt, to review the YOP and submit comments to MDAR. Following the review and comment period, MDAR will provide MassDOT with formal notice of approval or denial of the YOP, or request modification as necessary.

Over the 5-year period of this VMP, MassDOT will evaluate the success of the program and, with MDAR approval, integrate appropriate new methods into the YOP.

SUMMARY REPORT 2009 – 2013

MassDOT currently consists of 6 Districts which are independently responsible for the roadside maintenance of their districts and work in consultation with the Landscape Design Section.

In 2010, MassHighway merged with the Turnpike to create MassDOT. The Turnpike previously had a yearly ROW spray program for the length of I-90 done by in-house personnel. Prior to 2009 MassHighway had not had a guardrail spray program for many years. In 2009, Districts 2 and 5 began to treat the ROW on limited routes, and District 3 began a treatment program focusing on priority locations to address invasive plants and medians. In 2012, District 1 began to treat its segment of I-90.

Through the 5 year VMP, from 2009 – 2013, the Department has been trying to establish a spray program while undergoing significant transition. In addition, the in-house licensed person retired in 2012, so currently, all spray work must now be done by contractors.

Due to the organizational and transitional changes, MassDOT currently has 3 separate VMPs: one for Districts 2-5, a second for District 6 (a new district with the merge), and a third for District 1 in order to continue to spray the Turnpike in that district. The intent for 2014-2018 is to consolidate all districts in one VMP in order to reduce the work load and to create a more consist program.

An assessment of the overall program since 2009 has found the following constraints:

- Difficulty spraying in a timely, and therefore effective, manner due to late advertising of spray contracts
- Not all districts have been able to complete the regulatory requirements (mapping, notifications, public hearings, field delineation) or complete them in time to spray
- Without an in-house applicator, MassDOT is completely dependent upon contractors which makes limited or spot treatment of poison ivy or other problem plants difficult
- Lack of field personnel trained and experienced in vegetation management (knowledge of vegetation, herbicides, permits, methods) makes it difficult to provide good over-sight and appropriate decision-making with regard to treatment
- Lack of knowledge regarding Integrated Vegetation Management practices for roadsides
- Lack of unified program with different VMPs, different maps and different specifications for different districts

MassDOT has made progress in the following areas since 2009:

- Established a program of treating priority locations and vegetation in District 3 as of 2009
- Addressed invasive plants through Construction and Maintenance contracts in order to improve maintenance operations, encourage native or more stable vegetation along the roadside, and reduce negative impacts to right-of-way and adjacent land
- Improved coordination with Contracts section to ensure spray contracts get advertised in time for effective spraying
- Provided some training of individuals in Maintenance as to importance of invasive control and best methods of control for specific problematic vegetation
- Continued cooperating with other agencies to treat invasive species to prevent or repair degradation of adjacent priority land and address Early Detection Rapid Response species such as Mile-a-Minute and Giant Hogweed

PROGRAM OVERVIEW FOR 2014-2018

In order to unify the spray program, provide more consistent practices, and to generally facilitate the process, the VMP for 2014-2018 VMP will include all Districts, 1-6. Maps of routes to be sprayed and corresponding Sensitive Area Restrictions are shown in the Yearly Operation Plans for each district.

Mapping

As part of an effort to facilitate permitting and review and to have consistent maps, MassDOT is shifting to GIS mapping for spray routes. Spray routes, Limited Zones and No Spray Zones will be over-laid on state GIS layers that show sensitive areas. This will provide a more comprehensive view of what roads are being treated and what areas have more resource concerns. The data can be more easily shared with Natural Heritage and Endangered Species Program (NHESP) to assist in their review of herbicide application and with other organizations to address invasive species as part of coordinated statewide efforts.

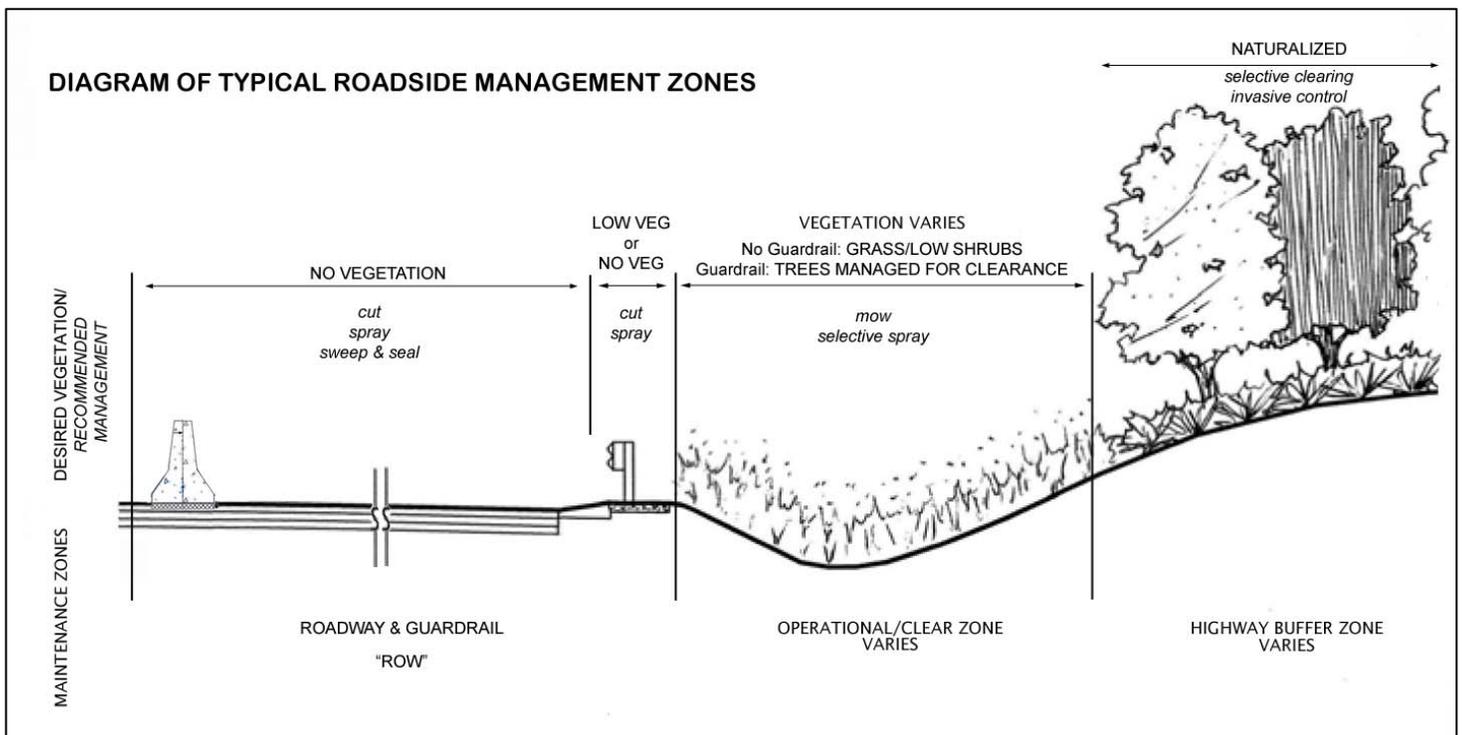
Incorporating Integrated Vegetation Management

In order to improve understanding of Integrated Vegetation Management (IVM) practices, this VMP is intended to not only outline the vegetation management plan for the next 5 years, but to provide some general guidelines on how to better achieve IVM so as to reduce the use of chemical through more effective practices that result in more stable roadside vegetation.

ROADSIDE MANAGEMENT ZONES

Vegetation management for roadsides is based on the zones of use that are typical of the roadway corridor. Understanding the vegetation management requirements and having clear objectives for these zones is essential to assessing how to balance vegetation control with IVM practices.

Roadside vegetation management covers 3 primary zones as described below. IVM strategies specific to each zone are included. Areas that require special attention regardless of zone are considered as Priority Landscapes.



Roadway & Guardrail Zone (ROW)

This zone consists of guardrail, curb, sidewalk, barriers, and medians. For the purposes of permitting per 333 CMR 11.00 Rights of Way Management, this zone will be referred to as the **ROW Zone** as work is specific to the needs of maintaining the roadway and roadway infrastructure. This area is the primary zone targeted for routine herbicide applications as guardrail and signage make control by mowing difficult and heavy traffic creates difficult and hazardous conditions under which to work. Herbicide application in this zone for the purpose of routine maintenance of the roadway and associated structures is subject to 333 CMR 11.00 regulations.



Photo 1 – Rapid re-growth of Tree of Heaven in median guardrail creates visibility and structural problems.

ROW Management Goals

The management goal for hard surfaces (i.e., curb, sidewalk, median barriers) in the ROW is as a vegetation free zone to meet the requirements of sight distance, visibility of guardrails and signs, to allow safe vehicle and pedestrian access, allow for proper stormwater drainage, and to preserve infrastructure.

The management goal for vegetation under and behind the guardrail is to maintain visibility of the guardrail and signage and to preserve the integrity of the structure. Maintaining a neat appearance is also important. To achieve these goals, guardrail vegetation is typically cut low or sprayed to 3 feet back from the curb. For double-faced guardrail in the median, spraying is typically a 4 foot swath, 2 feet on each side. Vegetation that is low-growing or contained such that it does not interfere with visibility or structural integrity and is not unsightly is acceptable.



Photo 2 – Mugwort and ragweed block visibility, cause structural degradation and are unsightly.

Problematic plant material in the ROW zone consists primarily of annual and perennial weeds growing in pavement cracks, along curbs, and in median barriers, and a variety of plants behind the guardrail. Mugwort and ragweed are non-invasive species that are highly problematic along the guardrail in terms of difficulty of control, blocking visibility and unsightliness. Invasive species that re-sprout or spread following cutting such as bittersweet, knotweed, black locust, and Tree of Heaven are highly problematic behind the guardrail. Bittersweet is particularly problematic on fences and utility poles and along structures where access for cutting is difficult.

Methods of Management

The primary method of vegetation control in the ROW is by mowing and line trimming and herbicide application along selected routes as shown in the YOP. Milling mulch is used in construction of new guardrail or in replacing old guardrail to suppress the growth of vegetation.

IVM Strategies for the ROW

Assess and prioritize existing vegetation along the guardrail so as to determine whether vegetation is problematic or not prior to cutting or spraying. For locations where vegetation is not problematic (Photo 3), effort should be made to eliminate mowing or spraying until problematic vegetation moves in (Photo 4). Method of control should be based on characteristics of that vegetation.

Selective treatment of targeted invasive plants will allow for more effective treatment by killing the root zones of the plant and may eliminate need for mowing (Photo 5). While this may be a short term increase in herbicide, the elimination or significant reduction of mowing is a greater environmental, aesthetic and cost benefit.

Targeted spraying using a handgun or backpack sprayer where problematic vegetation is sporadic results in less herbicide applied. This method was used for the median of I-290 in Worcester as a means of maintaining effective control with reduced amount of chemical. While recommended for treatment in sensitive areas and select locations, as it is more time consuming, it is not economical for long stretches of roadway.

General guidelines for herbicide use are listed under Implementing Integrated Vegetation Management Practices.

Operational/Clear Zone

The Operation or Clear Zone extends from the end of the ROW Zone to a 20-30 foot setback as required for errant vehicle recovery, sight distance at intersections, visibility of signage, and other operational or safety functions. The width of the Clear Zone varies depending on the roadway, the roadway setting (rural or urban), whether there is guardrail or not, and varies with the posted speed.

Management Goals

The primary management goals are to control vegetation that can grow to have a stem diameter greater than 4 inches in caliper, maintain visibility of signage, and allow for stormwater drainage and infiltration. The Clear Zone is typically mowed 2-4 times per year. Desirable vegetation within the Clear Zone is a stable plant community that resists invasion by trees and invasive weeds. Grass, herbaceous species and low shrub groundcover, or a mix of these plant types, is acceptable. A groundcover of



Photo 3 & 4 - Switchgrass, a native clump grass, behind guardrail does not require mowing as it does not block visibility or damage structure. To avoid mowing, selective herbicide treatment is recommended for control of sporadic re-sprouting plants such as black locust, as shown in Photo 4.



Photo 5- Selective treatment of new population of Japanese knotweed is recommended to prevent spread on and off-site.

shrubs is more resistant to invasion by trees than grassland, and where appropriate, can be encouraged. As recovery zone, low mowed grass is not required; it is done primarily to meet an aesthetic expectation.

Invasive perennials (i.e., knotweed, spotted knapweed, phragmites) and invasive woody plants (i.e., black locust, autumn olive, buckthorn, bittersweet) are frequently problematic in this zone. While all trees are considered undesirable in this zone, trees that re-sprout, including native species, are particularly problematic with regard to long term control. As in the ROW Zone, fencing creates conditions where vines, in particular bittersweet, are difficult to reach and control by cutting. This is often unsightly and promotes the spread of bittersweet into adjacent areas.

Methods of Management

Methods of vegetation control in the Clear Zone are routine mowing, tree and brush removal, tree trimming and selective removal, and in certain situations, herbicide application as part of selective treatment or invasive control.

IVM Strategies for Clear Zone

The desired vegetation in the Clear Zone is a stable plant community of grasses, perennials and shrubs that requires little maintenance and has a plant density that resists invasion by trees and invasive species. The following strategies incorporate IVM in the Clear Zone:

Reduced mowing will result in cost savings, less pollution, increase in habitat, and increased stormwater control and infiltration. Reforestation of bowls or median areas through reduced mowing will also help reduce snow drift onto the roadway.

Reduced mowing strategies can include the following:

- Where appropriate, eliminate mowing in open areas beyond the clear zone in order to allow area to return to forest (Photo 6);
- Reduce frequency of mowing in interior area while continuing to mow along the road edge on a routine basis in order to maintain a cared-for appearance and allow visibility of signs (Photo 7).

Reducing mowing of the Clear Zone and prioritizing control of weeds such as mugwort and ragweed along the guardrail (ROW Zone) is an example of more effective management.

Timing and frequency of mowing can be adjusted to control infestations of certain invasive species such as spotted knapweed. Mowing prior to seeding prevents spread of seeds and frequent mowing of certain species weakens plants over time, allowing desirable vegetation to take over.



Photo 6 – Mowing stopped in interior of interchange to reduce snow drift and allow natural restoration over time.



Photo 7- Once a year cut with routine edge cut. Dense stand of Little Bluestem provides stable and attractive groundcover.

Proper mowing practices should be followed. Poor mowing practices can have detrimental effects on the landscape. Mowing can spread invasive species by transporting seeds and root fragments, and scalping of groundcover can result in erosion and infestation of invasive species which are quick to move into and germinate in disturbed soils. Recommended practices for mowing include cutting high to reduce weeds, avoiding scalping and rutting of soil, and avoiding mowing invasive plants that spread from mowing activities.

Integrate mowing with selective herbicide application to control invasive species for better long term management for both maintenance and ecological purposes. Selective herbicide application when combined with reducing mowing, can allow for re-vegetation of areas with grasses, ferns, forbs and low shrubs. A low shrub environment is a more stable plant community than grasses as dense cover by shrubs is less susceptible to invasive by trees than grassland. Shrub species such as low-bush blueberry, sweet fern and juniper are low-growing shrubs that should be encouraged in the Clear Zone as part of creating a more stable roadside plant community.

General guidelines for herbicide use are listed under Implementing Integrated Vegetation Management Practices.

Highway Buffer Zone

The Highway Buffer Zone extends from the edge of the Clear Zone to the right-of-way limit or fence line. These areas are typically not managed except for tree cutting and for control of invasive plants species. The management objective in this zone is to maintain and preserve a self-sustaining plant community that provides: screening of the roadway for abutters; a continuous green corridor for roadway users; a protective buffer for rivers, wetlands and water bodies; and stormwater and habitat benefits.

Vegetation in the Buffer Zone is typically a variety of plant types (trees, shrubs, groundcover) and varies throughout the state from consisting of primarily native plants to being highly infested with invasive plants such as bittersweet, knotweed, autumn olive, multiflora rose, buckthorn and Tree of Heaven. Management in the Buffer Zone is important to prevent the spread of invasive species into the Clear Zone and ROW and to prevent spread onto adjacent lands. Particular attention should be paid to areas that are adjacent to resource areas and priority habitats.

Priority Landscapes

More formally designed or designated landscapes that signify the entrance to a town or region (referred to as “Gateway Plantings”) may require more maintenance for proper upkeep, such as more frequent mowing, hand weeding, or monitoring for invasive plants.

MassDOT Vegetation Management Practices

The following control methods are used by MassDOT for vegetation management in the Management Zones described above.

Mowing

Mowing and line trimming along guardrails, fences and at the base of utility poles and other structures are the principal vegetation control methods used by MassDOT as part of routine practice for maintaining vegetation in the ROW and Clear Zones. Work is typically done by in-house personnel along with contracts. Mowing of the clear zone takes place 2-4 times per year, depending on location and district scheduling.

Tree Removal, Trimming and Selective Clearing, Clearing and Grubbing

Hazardous trees, trees obstructing sight distance or trees in the Clear Zone that will grow over 4 inches are removed by contractors and in-house personnel.

MassDOT receives many requests for tree removals. Prioritization for removal is for those trees that present the most immediate hazard. Such hazards include trees that are dead, diseased or otherwise damaged and pose an imminent threat of falling on the roadway, pedestrians, or homes or property. Following that, tree removal and trimming is done in instances where trees may be damaging infrastructure such as sidewalks and where foliage obscures sightlines to traffic, pedestrian movement or signs and signals. Large scale tree removal is done to prevent shadowing of the roadway which causes delays in snow and ice melting resulting in potentially hazardous situations or to remove trees that may cause damage to roadway infrastructure within the relatively immediate future.

Brush Control

Brush cutting is in the Clear Zone and involves cutting the upper part of the plant and allowing roots to remain. Allowing roots to remain, as opposed to grubbing which removes the root systems, prevents soil disturbance, however, certain species will re-sprout or send up new shoots.

Herbicide Treatment

Types of Treatment

- ROW spraying - this includes guardrail, curbs and medians and other locations within the ROW as defined under Management Zones. Spraying is done along selected routes as shown in the Yearly Operation Plan and consists primarily of Interstates and Primary Roads (limited access routes). ROW spraying must follow the 333 CMR 11.00 regulatory restrictions and all requirements listed in this VMP and in the YOPs. Herbicide used shall be from the MDAR Rights of Way Sensitive Materials List and shall be lowest label rates (see additional summary information in Appendix B).
- Invasive Plant Control – Invasive control is done selectively in pre-determined locations for both protection of the environment and to prevent spreading and re-sprouting from mowing practices. Protection of environment may include NHESP priority locations, protection of wetlands or water ways, protection of landscape plantings, and to prevent spread of invasive plants along the roadway corridor and onto abutting properties.

Treatment is based on prioritization of plant or location, feasibility of control, and long term means of treating and monitoring plants or locations. Invasive control is done through both Maintenance and Construction contracts. Contractors are required to submit qualifications and treatment plan for approval by MassDOT qualified personnel.

Management of invasive species that spread by rhizome or root fragments is considered necessary in order to prevent potential spread along the roadway corridor or to new locations through routine maintenance operations such as mowing. Herbicides kill the root zone with less work and more immediately than mechanical methods and therefore are considered more cost effective. Species such as Japanese knotweed grow rapidly, resulting in frequent complaint calls and necessitating frequent cutting to keep growth in check. Cutting of certain species, such as Tree of Heaven, black locust and knotweed encourages them to re-sprout or send out new shoots, thereby exacerbating the problem.

MassDOT ascribes to the definition of invasive plant species as described by Massachusetts Invasive Plant Advisory Group (MIPAG): “non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.” The plants targeted for invasive plant control are those on the MIPAG list available at: <http://www.massnrc.org/mipag/>.

- Poison Ivy Control—Management of poison ivy is necessary to keep walkways clear for pedestrians and maintenance structures and facilities accessible to personnel. Management is frequently in response to requests from the Towns. Poison ivy is typically cut, however, to protect the safety of personnel and to achieve long term control by killing the root system, herbicide application is preferred in locations where repeated control may be required or to protect the safety of workers.

Common Control Methods for Types of Treatment

- ROW herbicide application for guardrail, curb and median is typically done with a truck-mounted spray boom, hose and handgun equipped with a low pressure nozzle, or for median barriers, hard to reach areas, around sign post, and in sensitive locations, with back pack sprayer.
- Invasive control is typically done by foliar application with hose or back-pack sprayer or cut-stem treatment and is targeted at specific invasive or noxious plants. Control of annual invasive plants, such as Mile-a-Minute, is typically hand-pulling and use of a pre-emergent. Large infestations of knotweed adjacent to the roadway may be treated with a hose and handgun off the truck. Specific methods for each location and species targeted are as proposed by the Contractor responsible for control and eradication and as approved by qualified MassDOT personnel.
- Integrated selective treatment targets invasives or other undesirable vegetation. For instance, invasive plants or plants that re-sprout may be treated to reduce or eliminate mowing in order to establish meadows or native low growing shrubs – both of which have stormwater, habitat and scenic benefit over mowed turf. Selective treatment is also used to target invasive species in the Buffer Zone so as to allow restoration over time by naturally occurring native plants.

For all herbicide applications, MassDOT and the applicators must follow applicable regulatory requirements with MDAR, the Town Conservation Commission, DEP, and NHESP.

The ultimate goal or end result of herbicide treatment is to eliminate unwanted vegetation and, where appropriate, replace it with appropriate naturally occurring native vegetation or appropriately planted/seeded vegetation. All herbicide work outside of paved areas should be done with this goal in mind.

Planting

Planting at MassDOT is typically done through Construction Contracts. Roadside planting should be done with the goals of the Vegetation Management Plan and feasibility of maintenance, where applicable, in mind.

In general, roadside plantings should be naturalistic plantings that imitate the patterns of naturally occurring plant communities for that location. Plantings should be in groupings that include a diversity of species and reflect the vegetative layers one would find in nature: perennials, shrubs, understory species, and trees as appropriate to the needs and location. Planting within a defined Clear Zone should be grasses, perennials or low shrubs. Close spacing of shrubs is recommended to create a dense groundcover so as to discourage invasion by weeds and invasive species.



Photo 8— Cultivars of native species selected for compact growth and ornamental characteristics.

Use of native plants is recommended to provide habitat for native wildlife species and to reflect the natural characteristics of a region. Cultivars may be used to achieve more ornamental characteristics traditionally

expected or to meet low growing requirements (Photo 8). Suckering species are recommended to achieve dense groundcover to prevent invasion by invasive species and to reduce the need for control using herbicides.

Despite being designed for low/no maintenance, due to the prevalence of invasive plants along the roadside, all planted areas require monitoring for invasive plants. The importance is greatest during initial establishment and in locations that are adjacent to infested areas. Planting adjacent to infested areas without regular monitoring and maintenance is not recommended.

Seeding

Bare soil is highly problematic with regard to invasive plants and erosion. Bare soils along the roadway result from construction or maintenance work, clearing and grubbing of vegetation, and from improper mowing practices that result in scalping or rutting. Seeding is the simplest and cheapest method of restoring vegetative cover. Quality seed, proper timing, proper soil preparation, and the appropriate species are essential to establishing quality vegetation.

Cooperation with Other Agencies

As part of a larger and more comprehensive vegetation management program, MassDOT will continue working with Fish and Wildlife, Natural Heritage and Endangered Species, Mass Audubon, Parker River Refuge, MDAR, and other agencies and organizations to assist in:

- Treating invasive species in locations considered of high priority, such as Kamposoa Bog
- Targeting EDRR species such as perennial Pepperweed, Mile-a-Minute and giant hogweed in state layout when possible
- Altering vegetation management practices to protect endangered species such as changing mowing practices and increasing mowing (tree removal) to encourage endangered species

Implementing Integrated Vegetation Management (IVM)

IVM is typically defined as the practice of controlling vegetation and, where appropriate, promoting desirable, stable plant communities through a combination of methods that take into consideration the need for control, cost-effectiveness, environmental protection, and regulatory compliance. For roadside purposes, a stable plant community would be defined as one that requires little maintenance and resists invasion by trees and invasive plants. IVM involves preventative maintenance (pro-active) as opposed to reactive and requires an ongoing process of implementation and evaluation. Implementing IVM strategies requires determining the management needs, implementing recommended practices to achieve that need, and evaluating work so as to assess whether methods used are achieving the goals.

Recommended guidelines for implementing IVM include the following:

- Prioritize spray locations with regard to accessibility and safety concerns: Interstate and Principal Arterial roads (limited access) are the most difficult to maintain and therefore rate as higher priority; medians adjacent to high speed lanes are a safety concern and require lane closures and therefore rate as priority.
- Increase prioritization with regard to problematic plants: Where one or two species such as Japanese knotweed or poison ivy is the plant causing concern, herbicide selection and methods should be targeted to those plants only.
- Improve program to treat targeted species at the appropriate time and with the appropriate chemicals.
- Incorporate use of selective herbicides with mowing to retain desirable vegetation
- Ensure treatment achieves clearly defined management objectives
- Regular assessment of sites by knowledgeable personnel as to whether treatment is effective and/or whether herbicide use can be reduced.

- Reduce need for herbicide use by preventing the spread of invasive plants: avoid transporting of invasive plants (seed or root fragments) along road corridor through mowing, excavating and moving soils, or stockpiling activities

IDENTIFICATION OF TARGET PLANTS

Plants targeted in the ROW Zone are as mentioned above under Roadside Management Zones.

The desired goal in the ROW is no vegetation in the paved areas, such as along jersey barriers in the medians and in the cracks along curbs, and control of vegetation that can block signs and required sight distances. The desired goal for the guardrail is no vegetation that blocks visibility of the guardrail or of signs and no vegetation that can potentially cause structural damage.

Species targeted in the ROW include annuals, perennials, shrubs, and trees. Mugwort and ragweed are particularly problematic herbaceous weeds along the guardrail as they grow tall and fall into the roadway. Black locust, bittersweet, tree of heaven, Japanese knotweed, and phragmites are highly problematic invasive species found growing in and behind the guardrail and along fences. These plants block visibility of sight distances and signs and may cause structural damage. Many re-sprout when cut, becoming even more problematic.

Poison ivy is frequently targeted to address complaint calls and to protect personnel from toxicity of plant.

JUSTIFICATION OF USE OF HERBICIDES

Justification for the use of the herbicides is as described above. MassDOT manages many miles of roadside with limited personnel. Vegetation in the medians, curbs, guardrails, sidewalks must be controlled for safe operation of roadways and protection of infrastructure. Proper herbicide treatment allows for longer term control in areas that are difficult to access and where vegetation is difficult to control. This reduces the frequency of control for the same locations, saving time and money and resulting in less traffic interruption. For species that re-sprout or are encouraged to spread by cutting, such as knotweed or Tree of Heaven, herbicide application is a more cost effective control as it kills the root system of the plant, thereby achieving long term control.

IDENTIFICATION OF SENSITIVE AREAS

Per the regulations for all Right-of-Way herbicide use, herbicides shall be subject to the restrictions and setbacks from natural resources and water supplies as described in 333 CMR 11.00 and listed on **Appendix A** of this VMP.

Sensitive Areas defined in 333 CMR 11.04 include public groundwater supplies, public surface water supplies, private drinking water supplies, surface waters, wetlands, vernal pools, inhabited areas and agricultural areas. For the purpose of identification, sensitive areas can be separated into two categories: areas not readily identifiable in the field and areas that are readily identifiable in the field. (See Appendix A, Sensitive Area Restriction Guide).

Sensitive Areas not readily identifiable in the field include public groundwater supplies, private water supplies, public surface water supplies, and some wetlands.

Sensitive Areas readily identifiable in the field include surface waters, residential areas, agricultural areas, and certain wetlands not identified on source materials (e.g. bordering vegetated wetlands).

All Sensitive Areas that can be mapped using reference sources shall be mapped to show locations. Maps and field delineations shall be confirmed by the Conservation Commissions.

Sources. Map sources for identifying sensitive areas not readily identifiable in the field include USGS maps, municipal maps and records, boards of health, conservation commissions, and MassGIS data layers, which include the following:

- Massachusetts Department of Environmental Protection (DEP) Watershed Maps (1:25,000: delineates the perimeter of public watersheds and the locations of public wells.
- Massachusetts DEP Wetland Conservancy Maps (scale usually 1:1,000).

In addition, for endangered species and habitat protection, MassDOT funds a position at the Executive Office of Energy and Environmental Affairs (EOEEA) Natural Heritage and Endangered Species Program (NHESP) specifically for the review of MassDOT projects, including its Vegetation Management Program.

Mapping Procedures.

MassDOT will be transitioning to GIS mapping for the YOP maps. Spray routes and restricted zones along those routes will be shown overlaid on MassGIS layers. Highlighted restricted zones are based on calculated buffers based on the MassGIS layers. These layers were created by MassGIS, DEP, NHESP and other state agencies.

Restricted zones shown on the map, based on sensitive areas such as wetlands and rivers, will be field checked with actual physical conditions and exceptions or differences noted and accounted for on the maps.

Limits of restricted areas will be field marked as required and per the YOP. All delineated wetlands will be officially confirmed by town Conservation Commissions during the YOP permitting process.

As GIS data layers, the spray routes and restricted zones layers will be available to other agencies to coordinate efforts noted under IVM.

Field Confirmation for Application Operations

- Prior to commencement of herbicide application operation, the treatment crew will be provided the marked-up topographical map with which to confirm boundaries or the boundaries of the appropriate buffer zone.
- The treatment crew will visually survey the area to be treated for any additional sensitive areas.

Setbacks and restrictions for Sensitive Areas

Setbacks and periodic restrictions for sensitive areas include both no-spray areas where herbicide use is prohibited and limited-spray areas where herbicide use is allowed under certain conditions. These setbacks and restricts, per 333 CMR 11.04, are shown in Appendix A of this VMP. Herbicide used shall be restricted to those on the MDAR Sensitive Areas Materials List.

OPERATIONAL GUIDELINES FOR HERBICIDE APPLICATORS

Weather conditions and drift controls. Herbicide application will be restricted during certain adverse weather conditions, such as rain, wind or deep snow.

- Herbicide applications will not occur during periods of moderate or heavy rainfall.
- Foliar applications may be allowed in light mist situations. However, any measurable rainfall that creates leaf runoff will require application to stop until the rain ends and active leaf runoff has ceased.
- Cut surface treatments, frill/girdling, basal treatment, and stem injection will cease during measurable precipitation and will not resume until precipitation has ceased.

- For foliar applications, when wind speeds are sufficient to bend the tops of the main stems of roadside trees, the applicator will monitor foliar application to insure that there is no drift of the herbicide off target. If the applicator can see the herbicide moving off target, the application will immediately stop until the wind has subsided enough to permit further application.
- All herbicide solutions to be used for a foliar application will contain low drift agents. Low-drift agents will be added to the foliar herbicide solution as per the low-drift agent label. In moderate wind conditions, as per label recommendations, more low-drift may be added, at discretion of applicator to control increased drift.
- Cut surface treatments, frill/girdling, and stem injection treatments may occur in wind conditions as they are much less affected by wind because they are not applied by spray, and often are close to the ground.

Equipment - Foliar Application

- Foliar application equipment will be calibrated at the beginning, and during the season as well as prior to touch-up application treatment, and in accordance with manufacturer's recommendations. Foliar application equipment will be calibrated to maintain pressure specified below.
- The foliar treatment used shall be low pressure, below 60 psi at the nozzle, with a normal working pressure of 40 psi for application at volumes of less than 50 gallons/acre.
- Low pressure nozzles will be used to produce the largest possible droplet size and a drift control agent shall be added at the rate recommended on the label to keep spray drift to an absolute minimum. Previous studies and experience indicate minimal drift occurs when using low-pressure applications and adjuvants.
- Mechanical throttles will be kept to the minimum setting required to transport the herbicide solution to the tops of each target and penetrate the foliage to the main stem of each target.
- For vegetation beneath and immediately adjacent to roadway, a low-pressure foliar treatment typically shall be applied using a truck-mounted spray boom, attached to either side of the front of the unit. In addition, a separate handgun equipped with a low pressure nozzle and adequate length of hose will be used for low-pressure spot treatments of target vegetation growing in pavement, median and traffic island cracks, around bridge structures, drainage structures, sign posts and other structures and appurtenances. For targeted vegetation not accessible by boom or hose, a backpack sprayer shall be used for foliar application.

REMEDIAL PLAN TO ADDRESS SPILLS AND RELATED ACCIDENTS

All mixing and loading of herbicides will be conducted at a MassDOT District facility. Mixing only the amount of herbicides necessary to carry out the vegetation control, based on the monitoring results, will ensure that there will be no waste and minimize potential problems. The vehicle carrying out the spray operation will be equipped with a bag of absorbent, activated charcoal leak-proof containers, a broom and a shovel in case of minor spills. A clipboard log of the herbicides on the vehicle will be kept on the vehicle. Herbicide labels, YOP, and fact sheets will be carried on site by the applicator.

Spill Response

As soon as any spill is observed, immediate action will be taken to contain the spill and protect the spill area. The source of the spill must be identified and secured. Spill containment will be accomplished by covering the spill with absorptive clay or other absorptive material or, for large spills, building clay or soil dikes to impede spill progress. Protection of the spill area will be accomplished by placing barriers, flagging or crewmembers at strategic locations. If a fire is involved, care will be taken to avoid breathing fumes from any burning chemicals.

In the event of a spill information on safety precautions and clean up procedure may be gathered from the following sources:

- Herbicide label

- Herbicide MSDS sheet
- Herbicide Manufacturers
 - Dow (517) 636-4400
 - Dupont (800) 441-3637
 - Monsanto (314) 694-4000
 - BASF (800) 832-4357
 - NuFarm USA (630) 455-2000
- Massachusetts DAR - Pesticide Bureau (617) 626-1700
- Massachusetts DEP Emergency Response Section (888) 304-1133
- ChemTrec (800) 424-9300
- Massachusetts Poison Control Center (800) 682-9211
- Massachusetts Department of Public Health
 - Bureau of Environmental Health
 - Environmental Toxicology Program (617) 624-5757
- MassDOT
 - Boston Headquarters (857) 368-9180

Minor spills will be remedied by soaking up the spill with absorptive clay or other adsorptive material and placing it in leak proof containers for proper disposal. Dry herbicides, such as granular, will be swept up or shoveled up directly in leak proof containers for proper disposal. All contaminated soil will be placed in leak proof containers, removed from the site and disposed of properly. Activated charcoal will be incorporated into the soil at the spill location at a rate of seven pounds per thousand square feet to inactive herbicide residue. Any minor spill will be reported to the Pesticide Bureau.

Major spills will be handled in a similar manner as minor spills, except in cases where the spill cannot be contained and/or removed by the crew. In this case the DEP Incident Report Unit and MDAR must be contacted.

All spills that exceed regulatory thresholds of material shall be reported to MassDEP Emergency Response Section.

HERBICIDE ALTERNATIVES

Mass DOT has made a concerted effort to identify effective alternatives to conventional herbicides. With funding from the Federal Highway Administration, the agency oversaw an intensive three-year field and greenhouse study of alternative herbicide materials and control methods, conducted by the University of Massachusetts Plant and Soil Sciences Department. The published report of this study is available by contacting George Batchelor, Supervisor of Landscape Design at MassDOT Highway Division (george.batchelor@state.ma.us).

While MassDOT remains committed to finding effective alternatives, to date no effective alternative to conventional herbicides has been developed or proven to provide superior control in right of way applications. However, MassDOT will continue to research methods and technologies for minimizing herbicide use and will consider seeking approval from MDAR to incorporate any effective new technologies or practices into our right of way program and YOP during the course of this Vegetation Management Plan.

ALTERNATIVE LAND USE

MassDOT does not have an alternative land use program.

QUALIFICATIONS OF PERSONNEL

The individual submitting this plan is George Batchelor, Supervisor of Landscape Design at MassDOT Highway Division. In his capacity as Statewide Program coordinator for the former Massachusetts Highway Department's Vegetation Management Program, Mr. Batchelor has been responsible for contract and plan design, implementation, interagency issues, and correspondence associated with the State's Vegetation Management program. Mr. Batchelor is a landscape architect whose 19-year career with MassDOT has been dedicated to the enhancement and care of the roadside environment. Mr. Batchelor has been supervisor of the MassDOT Landscape Design Section for 15 years.

As required by 333 CMR 11.00, all applicators on roadside rights of way must hold a valid MDAR pesticide applicators license and all work shall be directly supervised, as required by regulations, by an individual with Right-of-Way Certification. In addition to the applicable rules and regulations, applicators will adhere to the following operations guidelines.

APPENDIX A – Sensitive Area Restriction Guide**Sensitive Area Restriction Guide (333 CMR 11.04)**

Sensitive Area	No Spray Area	Limited Spray Area	Where Identified
Wetlands and Water Over Wetlands	Within 10 feet	10 – 100 feet; 12 months must elapse between applications; Selective low pressure, using foliar techniques or basal or cut-stump applications	YOP Maps and identify on site
Certified Vernal Pool	Within 10 feet	10 feet to the outer boundary of any Certified Vernal Pool Habitat; 12 months must elapse between applications; Selective low pressure, using foliar techniques or basal or cut-stump applications	YOP Maps and identify on site
Public Ground Water Supply	Within 400 feet (Zone I)	Zone II or IWPA (Primary Recharge Area); 24 months must elapse between applications; Selective low pressure, using foliar techniques or basal or cut-stump applications	YOP Maps
Public Surface Water Supply	Within 100 feet of any Class A public surface water source	100 feet to the outer boundary of the Zone A; 24 months must elapse between applications; Selective low pressure, using foliar techniques or basal or cut-stump applications	YOP Maps
	Within 10 feet of any tributary or associated surface water body located outside of the Zone A	10 feet to the outer boundary of the Zone A; 24 months must elapse between applications; Selective low pressure, using foliar techniques or basal or cut-stump applications	
	Within 100 feet of any tributary or associated surface water body located within the Zone A of a Class A public surface water source		
	Within a lateral distance of 100 feet for 400 feet upstream of any Class B Drinking Water Intake	Within a lateral distance of between 100 - 200 feet for 400 feet upstream of intake; 24 months must elapse between applications; Selective low pressure, using foliar techniques or basal or cut-stump applications	
Private Water Supply	Within 50 feet	50 – 100 feet; 24 months must elapse between applications; Selective low pressure, using foliar	In YOP well list and identify on site

Sensitive Area	No Spray Area	Limited Spray Area	Where Identified
		techniques or basal or cut-stump applications	
Surface Waters	Within 10 feet from mean annual high-water line	10 feet from the mean annual high water line and the outer boundary of the Riverfront Area; 12 months must elapse between applications; Selective low pressure, using foliar techniques or basal or cut-stump applications	YOP Maps and identify on site
Agricultural and Inhabited Areas	N/A	0 – 100 feet 12 months must elapse between application; Selective low pressure, using foliar techniques or basal or cut-stump applications.	Identify on site
State-listed Species Habitat	No application within habitat area except in accordance with a Yearly Operational Plan approved in writing by the Division of Fisheries and Wildlife		YOP Maps

MDAR Rights of Way Sensitive Materials List - General Information Summary

Active Ingredient	Product Name (EPA #)	Mode of Action	Target Vegetation	Treatment/Use	Notes	Restrictions	Cautions/Mobility
Glyphosate	Round Up Pro, Razor, Razor-Pro, Riverdale AquaNeat Aquatic Herbicide, Glypro-Plus, Accord Concentrate, Rodeo	Amino acid synthesis inhibitor reducing protein synthesis and inhibiting growth. Uptake through foliage, some root uptake may occur.	Systemic, broad spectrum herbicide for treatment of weeds and grasses (i.e., guardrail). Works well for black locust stump treatment and on knotweed.	Nonselective control. No residual control of plants not present at time of application.	Rodeo, Aquamaster and AquaNeat are approved for use in or over water.	Accord Concentrate, Rodeo, Glyphosate VMF and AquaNeat are approved for sensitive materials, but does NOT mean they can be used for aquatic weed control or directly applied to water.	Short residual time of 7 days. Relatively immobile in most soils due to strong adsorption to soil particles. Unlikely to enter water through run-off or leaching.
Metsulfuron Methyl	Escort XP, Patriot Selective Herbicide	Amino acid synthesis inhibitor. Inhibits cell division. Effects evident 4-6 weeks after application. Ultimate effect on perennials & woody plants occurs in growing season following application.	Broadleaf weeds and some annual grasses, tree and brush control	Selective broadleaf and conifer treatment	Warm, moist soil promotes activity; cold, dry soil reduces or delays activity. Recommend not use in cold weather.		Moderate to high mobility in soil and relatively persistent in the environment. Moderate eye irritant. Low toxicity in mammals, birds, and aquatic organisms.
Sulfometuron Methyl	Oust XP	Amino acid synthesis inhibitor. Blocks cell division in actively growing parts of plant stems and roots.	Broad-leaf weeds and grasses.	Nonselective pre/post emergent grass and weed control. Use in combination with glyphosate for residual control.	Discontinue use if spraying after July 31 as may be ineffective late in season.		Moderately mobile and moderately persistent. Half life of 1-2 months depending on soil, temperature, water and oxygen. Non-toxic to birds, slightly toxic to freshwater fish.
Mesulfuron Methyl & Sulfometuron Methyl	Oust Extra						
Ammonium Salt of Fosamine	Krenite S	Growth regulator - inhibits bud and leaf formation. Usually applied late summer & early fall.	Tree and brush control	Selective broadleaf treatment			Low mobility in soil and not persistent. Low potential to leach. Low aquatic and invertebrate acute toxicity.
Imazapyr	Arsenal, Habitat	Amino acid synthesis inhibitor. Absorbed by foliage and from soil by root systems.	Non-selective. Annual and perennial weeds, deciduous trees, vines and brambles. Ester - higher vapor pressure.	Pre and post-emergent non-selective control of all vegetation			Relatively immobile herbicide. Persistent in soils. High water solubility. High surface runoff potential. Build-up potential in soil - interval is required to allow for degradation of soil residues before repeat application.
Triclopyr Ester	Garlon 4, Garlon 4 Ultra	Growth regulator, synthetic auxin. Absorbed by leaves and roots, translocated throughout plant. Disrupts glucose production causing plant to die from lack of nutrients. Maximal response when made soon after full leaf development & when sufficient soil moisture for plant growth.	Effective against a variety of woody plants as foliar spray, basal spray and when applied to cut surfaces. Noxious and nuisance weed control, tree and brush control. Works well on poison ivy, bittersweet and autumn olive.	Selective broadleaf treatment. More effective on hardwood than softwood.	Works well for cut-stump or basal treatment. Fall application for broadleaf weed control. Ester - higher vapor pressure and more effective during colder spring months because penetrate leaf cuticle more readily (Purdue U). Warmer temps switch to amine.	MDAR: Lowest of following rates: 1) Between 10 and 50 feet of the resource: lowest label or 0.5 pints per acre; 2) Between 50 feet and the boundary of the limited spray zone. Lowest labeled rate or 3 pints per acre	Moderate mobility in most soil. Moderate persistence in warm weather, longer in cold. Highly toxic to fish
Triclopyr Amine	Garlon 3/Garlon 3A	Growth regulator , synthetic auxin			Amine less volatile than ester, safer near sensitive plants	NOT APPROVED ON MDAR SENSITIVE MATERIALS LIST	Can cause irreversible eye damage
Paclobutrazol	Cambistat	Plant growth regulator	Soil injected	Used to limit the size and growth of trees and shrubs in power line and utility row corridors.			Non-target plants potentially at risk.

References: MDAR Fact Sheets (<http://www.mass.gov/eea/agencies/agr/pesticides/rights-of-way-vegetation-management.html>), Extoxnet (<http://extoxnet.orst.edu/>), Maine Department of Transportation Roadside Vegetation Mangement Policy