

MassDOT Highway Division



Vegetation Management Plan

2021 – 2025

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MassDOT HIGHWAY DIVISION VEGETATION MANAGEMENT PLAN

PURPOSE AND OBJECTIVES OF THE VMP

The purpose of this Vegetation Management Plan (VMP) is to establish Massachusetts Department of Transportation (MassDOT) Highway Division'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 areas, 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:

- 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 herbicides 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, 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 a general program overview, a description of management zones specific to roadways, MassDOT's vegetation management practices, implementation of recommended IVM practices, and information as required by 333 CMR 11.00, including identifying sensitive areas, herbicide application guidelines, and contact information for the relevant entities.

Subject to approval of this VMP by MDAR, MassDOT will prepare a Yearly Operational Plan (YOP) on an annual basis 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. A website where the YOP and the VMP can be viewed will be submitted to the senior administrative official, Conservation Commission, Board of Health, and appropriate water suppliers for each affected community listed in the YOP. 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 five-year period of this VMP, MassDOT will evaluate the success of the program and, with MDAR

approval, integrate appropriate new methods into the YOP.

PROGRAM OVERVIEW

As of 2021, MassDOT consists of six Districts which are independently responsible for the roadside maintenance of their districts and which work in consultation with the Landscape Design Section on vegetation management. Statewide, MassDOT is responsible for approximately 3,018 centerline miles of urban and rural roadways (See Appendix A, Districts & Roadways map and associated centerline miles).

Vegetation management for state roadways includes a variety of conditions: guardrails, vegetated medians, median barriers, curbs, sidewalks, maintaining clear zones, drainage channels, stormwater basins, and interchange bowls. In addition, bridges, fences, utility structures, and signs need to be kept clear of problematic vegetation.

In the past, MassDOT had three separate VMPs: one for Districts 2 & 5, a second for District 6 and a third for District 1. Although the different districts having varying priorities, MassDOT has developed a VMP that will be applicable to all Districts participating in the VMP at this time.

Maps of routes to be sprayed and corresponding sensitive area restrictions will be shown in the Yearly Operational Plans for each district.

Summary of Previous Spray Program

Through the last VMPs, from 2009 – 2016, the Department had been undergoing significant transition. In 2010, MassHighway merged with the Turnpike Authority to create MassDOT. The Turnpike previously had a yearly ROW guardrail 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, MassHighway Districts 2 and 5 began to treat guardrail on limited interstate routes and District 3 began a treatment program focusing on priority locations to address invasive plants and medians. In 2012, District 1 began treatment of a segment of I-90 in seven towns.

As of 2014, District 1, 2, 3 and 5 had limited herbicide programs for guardrail treatment, primarily along interstate routes or sections of interstate routes. In 2012, MassDOT's in-house licensed person retired, and currently, all spray work is performed by contractors.

An assessment of the overall program in the past has found the following constraints:

- Lack of field personnel trained and experienced in vegetation management (knowledge of vegetation, herbicides, permits, methods) limiting the ability to provide good over-sight and appropriate decision-making with regard to treatment and management decisions.
- Inadequate resources dedicated to mechanical methods for vegetation control limiting Department to act reactively rather than proactively.
- Lack of in-house applicators making limited or spot treatment of poison ivy or other problem plants difficult, if not impossible.
- Lack of a unified program with different VMPs, multiple YOPS, different maps, and different specifications for different districts creating inconsistencies and additional work.
- Difficulty spraying in a timely and therefore effective manner due to late advertising of vegetation management contracts.
- Different priorities for each of the Districts, all with limited funding for maintenance and resources for permitting.

Progress has made in the following areas:

- Training of individuals in Maintenance as to importance of invasive control and methods of control for specific problematic vegetation. Informing field personnel to be on the watch for invasive species, and indications of infestations etc. and developing a reporting process when encountered.
- Increased management of invasive plants through items in Maintenance and Construction contracts and by including items in Construction contracts for preventing the spread of invasive plants through construction activities.
- Continued cooperation with other agencies to treat invasive species in order to prevent spread and/or to restore adjacent priority land and to better address Early Detection Rapid Response species such as Mile-a-Minute and Giant Hogweed.
- Dedication of additional resources to mechanical methods of vegetation management to clear slopes behind guardrail and employing over the guardrail mowers to help keep slopes behind guardrail free of unwanted vegetation. As of 2020 each of the 6 MassDOT Districts have vegetation management contracts (mowing, brush and tree removal) to supplement MassDOT staff resources.
- With the approval of new FHWA tested guardrail, new guardrail specifications at MassDOT have been developed which encourages paved millings mulch in guardrail areas which will reduce exposed soil in problem guardrail areas to retard weed growth. These new guardrail standards will result in the replacement and upgrade of a great deal of guardrail providing opportunity to install pavement millings mulch.
- Evaluation of the use of under-the-guardrail mower in two Districts to reduce the need for deploying labor crews with string trimmers.
- Development of standardized tree trimming clearing and mowing contracts across the districts to more effectively use mechanical methods and improve communication and consistency among districts.
- Began shifting to GIS mapping to provide more consistent and informative maps utilizing environmental mapping layers.

Mapping

As part of an effort to facilitate permitting and review and to have consistent vegetation management maps, MassDOT will over time shift to GIS mapping. Spray routes, no-spray areas and limited-spray areas will be overlaid 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, as well as with municipalities and other organizations to address invasive species as part of coordinated statewide efforts.

MassDOT Vegetation Management Program Strategies

MassDOT has spent the past two years evaluating a program that can incorporate herbicide in a more directed and responsive manner resulting in a diminished use of herbicide over time.

Key Elements

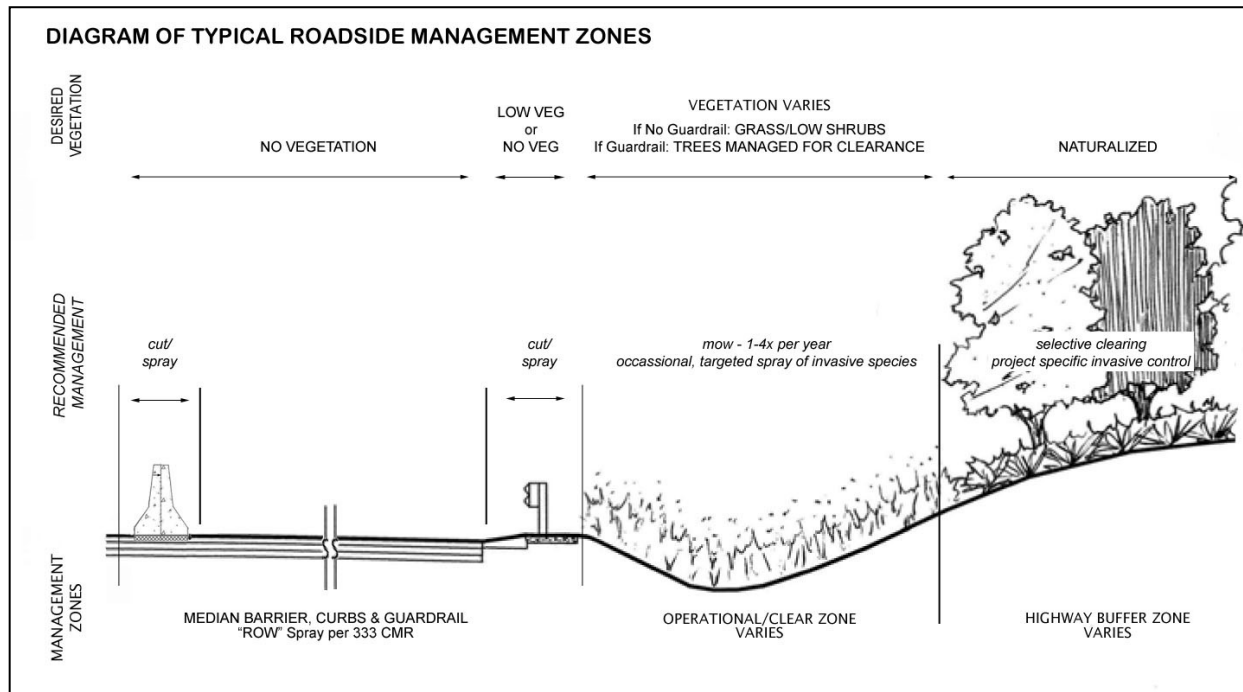
1. Over the life of this VMP MassDOT will transition from traditional annual or two-year herbicide spray contracts to multi-year contracting more consistent with the duration of the VMP. MassDOT is investigating moving from a contract based on low bid which tends to promote spraying to a “best value” method of procurement based upon qualifications, performance, meeting program goals as well as the delivery of services. This should encourage better consistency and familiarity with the targeted problem areas and more consistent reporting.
2. To conduct periodic literature checks for alternatives to herbicide and methods of reducing the use of herbicide.

3. Establish training of field and office personnel engaged in the program to ensure a more consistent and effective use of the various methods of vegetation control/management available. Remote meeting tools learned in 2020 should improve communication between office and field staff and permit more effective and regular meeting statewide.
4. Coordinating the activities of Construction, Maintenance and Landscape Divisions to effectively identify strategies to deal with specific problem locations

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 three primary zones, the Roadway and Guardrail Zone, the Operational/Clear Zone, and the Highway Buffer Zone, and Special Maintenance Areas. The diagram below illustrates the three zones which are typically found along the roadway corridor. Special Maintenance Areas are locations that require or have specific management concerns such as highly visible areas or stormwater treatment areas.



Roadway & Guardrail Zone (ROW)

This zone consists of guardrail, curb, sidewalk, barriers, and medians. For the purpose 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 and all requirements listed in this VMP and in the YOPs.



ROW Zone 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, to 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 three feet back from the curb. For double-faced guardrail in the median, spraying is typically a four foot swath, two 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.

Problematic plant material in the ROW Zone along high speed roadways 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 (Photo 1). Invasive species that re-sprout or spread following cutting such as bittersweet, knotweed, black locust, and tree of heaven are highly problematic along or behind the guardrail (Photo 2). Bittersweet is particularly problematic on fences and utility poles and along structures where access for cutting is difficult.



Photo 1 – Mugwort and ragweed block visibility, cause structural degradation and are unsightly.

Problematic plant material in the ROW Zone along urban roadways is typically poison ivy or knotweed that blocks accessibility of sidewalks and potentially forces pedestrians into the roadway (Photo 3).





Photo 3 – Poison ivy, Japanese knotweed and other weeds block accessibility and visibility along the sidewalk.

Methods of Management

The primary method of vegetation management in the ROW Zone is by mowing and line or string trimming. Herbicide application is used along interstates and select routes where traffic and access create dangerous conditions for workers to perform routine control or where vegetation is particularly problematic.

MassDOT promotes use of paving millings mulch at selected guardrail locations to suppress the growth of vegetation along guardrails at these locations. In addition, MassDOT is investigating the effectiveness of using asphaltic or rubberized joint sealers to seal pavement cracks along concrete median barrier to prevent or retard weed growth.



Photo 4 Paving Millings mulch under guardrail

Operational/Clear Zone

The Operational/Clear Zone, referred to hereafter as the 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.



Operational/Clear Zone Management Goals

The primary management goals are to prevent the growth of trees, maintain visibility of signage, and allow for stormwater drainage and infiltration. Desirable vegetation within the Clear Zone is a stable plant community that resists invasion by trees and invasive weeds. Grasses and non-invasive herbaceous species and low shrub groundcover are acceptable. A groundcover of shrubs is more resistant to invasion by trees than grassland, and where appropriate, can be encouraged.

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 the Clear 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, can damage fencing, and allows bittersweet to spread 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 targeted treatment for invasive control.



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 Highway Buffer Zone is typically a variety of plant types (trees, shrubs, groundcover) and varies through-out 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 of the Highway Buffer Zone is important to prevent the spread of invasive species into the Clear Zone and ROW Zone and to prevent spread onto abutting properties. Particular attention should be paid to areas that are adjacent to resource areas and priority habitats.

Special Maintenance Areas

Special Maintenance Areas include those roadside locations that have special considerations, unique requirements or are managed in cooperation with external agencies or organizations. Special Maintenance Areas include more formally designed landscapes that signify the entrance to a town or region, enhancement areas, areas with altered mowing schedules to protect rare species, and stormwater basins. These areas may require extra attention for aesthetic or environmental purposes, monitoring for undesirable species, or to ensure stormwater treatment functions.

MassDOT VEGETATION MANAGEMENT PRACTICES

The following practices are used for vegetation management in the zones described above.

Mowing

Mowing and line trimming are the principal vegetation control methods used by MassDOT as part of routine practice for maintaining vegetation in the ROW and Clear Zones. Work has been typically done by in-house personnel with an expanding use of contractors. Mowing of the Clear Zone takes place one to three times per year, depending on location and district scheduling.

The purpose of mowing is to control vegetation to maintain sight distances, prevent the growth of trees in the ROW and Clear Zones, and to control vegetation around guardrails, sign posts and other structures. The goals of mowing operations should be clearly identified and communicated to the operators.

Methods

Timing of mowing, to the extent possible, should be with regard to controlling seed production of invasive or other undesirable species and controlling cool season weeds or grasses to encourage establishment of warm season grasses if appropriate.

Vegetation targeted for control should be identified and mowing operations should take measures to protect desirable and ornamental plants and to avoid spreading invasive species by transporting seeds and root fragments to new sites. Plants to be targeted and plants to be avoided should be clearly communicated to the equipment operators. Equipment should be cleaned as necessary to avoid spreading weed seeds or root fragments into clean areas.

Poor mowing practices can cause soil compaction and erosion, leading to degradation of the larger landscape. Recommended practices for mowing include cutting high to reduce weeds, avoid mowing when the soil is wet to prevent compaction and rutting, and avoid scalping the soil when blades are set too low or when mowing slopes. The mower deck should be maintained at 4-6 inches from the ground to reduce scalping of soil.

Note: recognizing the value of grass and meadow areas for pollinator habitat, MassDOT has started identifying locations where mowing schedule can be altered to allow the establishment and flowering of native grasses and forbs.

Tree and Brush Control

Trees and brush are controlled for safety purposes which include establishing roadside clear zones, maintaining adequate sight distances at curves and intersections, insuring advanced visibility of signs, and removing trees that pose an immediate hazard. Work is typically done by in-house personnel along with contractors.

Prioritization for tree removal is for those that present the most immediate risk. Trees considered to be risk trees include those that are dead, diseased, leaning, structurally damaged or unsound, and that pose an imminent threat of falling on the roadway, pedestrians, or homes or property. Following that, 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. In some cases, trees cause shading and create excessive frost problems on the roadway. In order to allow for solar warming and reduce risk of localized ice formation, the tree canopy may be thinned or trees may be removed.

Methods

Removal of undesirable trees and brush is accomplished by cutting, trimming, and mowing.

In select instances, use of herbicide for cut-stump treatment may be included to control invasive trees that re-sprout following cutting, such as autumn olive and black locust, or native species that re-sprout and are problematic. Herbicide application shall be by licensed applicators only and must meet all regulatory requirements.

Desirable shrubs should be left along the edge of the Highway Buffer Zone or naturalized areas to protect the forest edge from invasion by undesirable or invasive species and to provide habitat.

Where possible, trees should be chipped and left on site to improve soils through the addition of organic matter and to protect soils from erosion.

Visual impact must be considered as well as the effectiveness of the operation. Tree trimming and removal should not result in the loss of vegetative screening for abutters and the site should have a neat appearance upon completion of work. Wood chips should be used on site to protect bare soils. Where bare soil cannot be prevented, the site should be immediately seeded (See examples in Photos 4 & 5).

Use of a rotary drum/disc or other equipment that “shreds” vegetation, leaves bare soils, or has unacceptable visual impact should be avoided or used only in select instances where access is difficult, such as in over-the-guardrail situations, and where visual impact and public perception will not be a concern.

Contractors and in-house personnel are expected to follow proper pruning practices. As with all vegetation management, plant knowledge and identification is important in order to make sound decisions, reduce damage, minimize visual impact, and be cost effective.

Herbicide Control

Herbicide control includes routine treatment of general vegetation in the ROW Zone and treatment of invasive plants and poison ivy.

General vegetation along guardrail, curbs, median barriers and structures is treated along selected routes as shown in the Yearly Operation Plan and consists primarily of selected Interstates and Primary Roads (limited access routes).



Photo 4 & 5 – Photo 4 (top) shows clearing and grubbing resulting in bare soil, unsightly conditions, and remnants of bittersweet (the most problematic plant) left on site. Photo 5 shows mowing where desirable vegetation (native shrubs) was left on site and soil is covered and stabilized by cut material. Mowed site will receive targeted application of herbicide to control invasive species and allow for restoration of native species.

Invasive control is done selectively in pre-determined locations as part of ROW Maintenance, for protection of the environment, to prevent spreading and re-sprouting from mowing operations, and to protect infrastructure. 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.

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 or through construction work. 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.

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. Invasive plant control is coordinated through MassDOT Landscape Section for statewide consistency and as a centralized reporting area for identification of invasives.

Poison ivy is frequently treated to keep walkways clear for pedestrians, to maintain safe access to structures and facilities, and to protect the safety of workers. Efforts are being made to better address poison ivy where it can be eradicated prior to becoming a problem for MassDOT personnel and the public.

Methods

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.

Any herbicide used for ROW application shall be restricted to those on the MDAR Sensitive Area Materials List. Currently found at <https://www.mass.gov/service-details/rights-of-way-sensitive-area-materials-list> and shall be applied at lowest label rate.

Foliar Application

Routine guardrail treatment is typically a foliar application done with a truck-mounted spray boom, hose and handgun equipped with a low-pressure nozzle with pressure not to exceed 60 psi. For median barriers, hard to reach areas, around sign post, and in sensitive locations, treatment would be with a back pack sprayer.

For targeting specific plants or treating localized populations, foliar application with hose or back-pack spraying is the most commonly used method as it is the most economical. Large infestations of knotweed adjacent to the roadway would be treated with a hose and handgun off the truck. To facilitate application and improve effectiveness of treatment, targeted vegetation, such as knotweed, may be cut earlier in the season and the re- growth sprayed in August-September.

Application requirements for foliar treatment are as described below under Operational Guidelines for Herbicide Application. Specific practices should be periodically checked to ensure conformance with current best practices

Cut Stump Application

Cut stump treatment may be used to prevent sprouting or re-growth of woody species. It is most commonly used for invasive species such as Norway maple, black locust, tree of heaven, autumn olive, and for bittersweet that is

climbing desirable vegetation. Application of herbicide is applied to the stump immediately following cutting.

Time of application is late spring through winter. Treatment in the spring during period of heavy upward sap flows should be avoided. Treatment may not be effective on certain species once trees are over two to four inches in caliper.

Frilling or Basal Bark Application

Cuts are made around the entire circumference of the lower 12 to 18 inches of the tree trunk with an axe or hatchet and herbicide is immediately applied into the cuts. Herbicide may be mixed with oil and applied until the bark is saturated. Treatment is from early spring to mid-fall. Some species may be treated during winter. Application during heavy upward sap flow in the spring should be avoided. This method is effective on trees of all sizes.

Pre-emergent

Pre-emergent herbicide, which may be applied using either granular or liquid application, prevents seeds from germinating. It may be used alone or in combination with other herbicides and is frequently included in ROW treatments. Pre-emergent herbicide is also used to control annuals as they spread by seed rather than vegetatively.

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 6— 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 6). 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 most cost-effective method of restoring vegetative cover. Quality seed, proper timing, proper soil preparation, and the appropriate species are essential to establishing quality vegetation.

All areas disturbed should be immediately seeded to prevent erosion and prevent invasion of weed seeds. A good roadside seed mix will include annual seed to provide quick establishment and perennial cool-season and warm-season species. Cool season species grow during the spring and fall and warm-season species grow during the hot months when cool season species are dormant. Warm-season species, such as Little Bluestem and Switchgrass, have deep root systems, providing better long-term soil stabilization.

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, U.S. Fish and Wildlife Service at Parker River National Wildlife Refuge, MDAR, and other agencies and organizations to assist in:

- Treating invasive species in locations considered of high priority-
- Targeting Early Detection Rapid Response 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 by reducing frequency of mowing or by incorporating mowing to maintain grassland habitat.
- Participating in training with MDAR and others to expand staff training and involvement and in roadside vegetation management. With a goal of involving more field staff in identification and early detection.
- Conduct training of personnel with MDAR to assist in the early detection and reporting and invasive plant and insect infestations.

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.

General Guidelines

- Prevent the spread of invasive plants to reduce problems and need for herbicide: avoid transporting of invasive plants (seed or root fragments) along road corridor through mowing, excavating and moving soils, or stockpiling activities.
- Define management objectives, whether mechanical or herbicidal and achieve treatment achieves the objectives.
- Evaluate site and/or vegetation to determine effectiveness of treatment and change treatment as necessary.
- Prioritize locations for herbicide treatment with regard to accessibility and safety concerns. For instance, interstate and principal arterial roads with high speed and high volume traffic are a priority. Median barriers adjacent to high speed lanes are a safety concern, requiring lane closures and exposure to field personnel and are therefore a priority.
- Target undesirable plants: where one species such as Japanese knotweed or poison ivy is the primary cause of concern, herbicide selection and methods should be targeted to those plants only.
- Treat targeted species at the appropriate time and with the appropriate herbicides.
- Incorporate use of targeted herbicide application to retain adjacent desirable vegetation (Photos 7 & 8) or to selectively treat trees in order to reduce mowing.



Photo 7 & 8 - 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 8.

IVM Strategies for Maintaining the ROW Zone

Assess and prioritize existing vegetation along the guardrail so as to determine whether vegetation is problematic or not prior to cutting or treating rather than following a routine schedule. For locations where vegetation is not problematic (Photo 7), effort should be made to eliminate mowing or spraying until problematic vegetation moves in (Photo 8). Method of control should be based on characteristics of that vegetation.

Targeted treatment focusing on problematic vegetation such as individual trees (Photo 8), isolated stands of knotweed (Photo 9) or where general vegetation along guardrail or medians is sporadic results in less herbicide applied. While recommended for treatment in sensitive areas, to target specific plants, and for select locations, as it is more time consuming, it is not economical for long stretches of roadway.

IVM Strategies for Maintaining the 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. Allowing areas beyond the required Clear Zone (such as the interior of interchange bowls or of wide medians) to naturalize through reduced mowing will not only reduce the area requiring mowing but may also help reduce snow drift onto the roadway.

Mowing strategies can include the following:

- Eliminate mowing, where appropriate, in open areas beyond the clear zone in order to allow areas to naturalize (Photo 10).
- 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 11).
- Prioritize control of problem vegetation that looks unsightly and causes structural damage, such as mugwort and ragweed along the guardrail (ROW Zone), rather than mowing open areas where “meadow” grass is not problematic and adds visual interest.
- Adjust timing and frequency of mowing to control infestations of 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.

Integrate mowing with targeted herbicide application to control invasive species for better long-term management for both maintenance and ecological purposes. Targeted herbicide application when combined with reduced



Photo 9- Targeted treatment of new population of Japanese knotweed is recommended to prevent spread



Photo 10 – Mowing stopped in interior of extensive, open interchange to allow area to naturalize in order to reduce snow drift.



Photo 11- Once a year cut with routine edge cut. Dense stand of Little Bluestem provides stable and attractive groundcover.

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 invasion 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.

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.

When targeting invasive plants, 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 is frequently targeted to address complaint calls and to protect personnel from toxicity of plant.



Nuisance vegetation such as poison ivy creates a public safety hazard to workers and motorists. The traveling public cannot step behind guardrail, where it is safest, in the event of an emergency.

Invasive Vegetation

Some areas of MassDOT Turnpike ROW have become heavily infested with invasive plant species. In some instances, invasive species on the ROW may encroach on adjacent significant habitats. Specific target invasive plants include but are not limited to tree of heaven (*Ailanthus altissima*), Japanese knotweed (*Polygonum cuspidatum*), multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculatus*), and autumn olive (*Elaeagnus umbellata*). A comprehensive list of designated invasive plants in Massachusetts is available at the following website: <http://www.massnrc.org/mipag/>



Example of invasive vegetation such as Japanese knotweed, which can, in addition to degrading natural habitat, compromise highway structures and impair visibility.

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. Weed whacking/string trimming median barriers and guardrail adjacent to high volume and high-speed traffic and cutting poison ivy puts workers at risk, whereas herbicide application from a truck reduces worker exposure to hazardous conditions.

Proper herbicide treatment also 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 needed for the same locations, saving time

and money, reducing personnel time in hazardous conditions, 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.

Timely and targeted use of herbicide can be an effective tool to target prevailing plant species at the ideal time, prior to plants going to seed whereupon it becomes impossible to control by mechanical means.

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 B** of this VMP.

Herbicide used shall be restricted to those on the MDAR Sensitive Area Materials List. Currently found at <https://www.mass.gov/service-details/rights-of-way-sensitive-area-materials-list>

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 B, 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 Massachusetts Department of Environmental Protection (DEP) Watershed Maps (delineates the perimeter of public watersheds and the locations of public wells) and Massachusetts DEP Wetland Conservancy Maps.

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 no-spray and limited-spray areas along those routes will be shown overlaid on MassGIS layers. No-spray and limited-spray areas are based on layers created by MassGIS, DEP, NHESP, and other state agencies. No-spray and limited-spray areas for wetlands and rivers will be field verified.

All delineated wetlands will be officially confirmed by town Conservation Commissions during the YOP permitting process.

Field Confirmation for Application Operations

Prior to commencement of herbicide application operation, the treatment crew will be provided with the YOP maps with which to confirm the boundaries of no-spray or limited-spray areas. The treatment crew will visually survey the area to be treated for any additional sensitive areas.

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 per label instructions and recommendations. MassDOT may suspend applicator's operations if conditions or circumstances warrant. Considerations include but are not limited to the following:

- Herbicide applications will not occur during periods of rainfall that may cause herbicide to wash off the leaves.
- Herbicide applications will not occur if air movement or breeze may cause drift. If the applicator can see the herbicide moving off target, the application will immediately stop and shall not resume 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. More low-drift may be added, at discretion of applicator to control increased drift.
- Cut surface treatments, frill/girdling, basal treatment, and stem injection will cease during measurable precipitation and will not resume until precipitation has ceased.

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 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 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.

Equipment - Other

- Cut surface treatment squirt bottle applicators will be adjusted to deliver the herbicide solution in a thin stream to the target zone.
- Injection treatment may be used selectively to apply herbicide into stems of plants such as Japanese Knotweed.

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 SDS sheet
- Herbicide Manufacturers
 - Dow (517) 636-4400
 - DuPont (800) 441-3637
 - Bayer (800)334-7577
 - BASF (800) 832-4357
 - NuFarm USA (630) 455-2000
- Massachusetts DAR - Pesticide Bureau (617) 626-1776
- Massachusetts DEP Emergency Response Section (888) 304-1133
- CHEMTREC (800) 424-9300
- Mass Poison Control Center (Hot Line) (800) 222-1222
- Massachusetts Poison Control Program (800) 994-9846
- Massachusetts Department of Public Health
 - Bureau of Environmental Health
 - Environmental Toxicology Program (617) 624-5757
- MassDOT
 - Boston Headquarters (857) 368-4636

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 Emergency Response Section 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 is amenable to exploring alternative land uses or management agreements that would minimize the need for herbicides. As part of this, MassDOT may allow private abutters to maintain roadside vegetation. However, any alternative use or management program must be consistent with federal guidance, as well as MassDOT policies and operational needs. Any options must control the undesirable vegetation in a manner that is environmentally sound and consistent with the requirements of this VMP.

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 twenty seven- 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 seventeen 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 Rights-of-Way Certification (Category 40).

DISTRICT CONTACTS

DISTRICT 1

Highway District 1 Office
270 Main Street, Lenox, MA 02140
(413) 637-5700

CONTACTS

David Sherman -District Maintenance Engineer
Amer Raza -District Environmental Engineer
Steven Webster – Field Engineer Supervisor
Stephen Kotski- Program Coordinator

DISTRICT 2

Highway District 2 Office
811 North King Street, Northampton, MA 01060
(413) 582-0599

CONTACTS

Timothy Meyer- Assistant District Maintenance Engineer
Kenneth Crochiere District Maintenance Engineer
Rob Natario District Environmental Engineer

District 5

Highway District 5 Office, Mary-Joe Perry, District Highway Director
1000 County Street, Taunton, MA 02780
Tel. (508) 824-6633

CONTACTS

Terrence Roche- Assistant District Maintenance Engineer
Andrea Coates – District Environmental Engineer
Joseph Auger- District Roadsides and Snow and Ice Engineer.
Cassandra Asvestas – Assistant District Roadsides Engineer.

MassDOT Headquarters

10 Park Plaza – Boston MA 02116
Mark Carmichael – Statewide Maintenance Engineer
Tel. 857-368-9683

APPENDIX A
PROPOSED SPRAY LOCATIONS

District 1

BERKSHIRE, HAMPDEN, HAMPSHIRE, FRANKLIN COUNTIES

7 Communities/1 Route

<u>Route</u>	<u>Municipalities</u>
I-90	West Stockbridge, Stockbridge, Lee, Beckett, Otis, Blandford and Russell

District 2

HAMPDEN, HAMPSHIRE, FRANKLIN COUNTIES

19 Communities/ 5 Routes

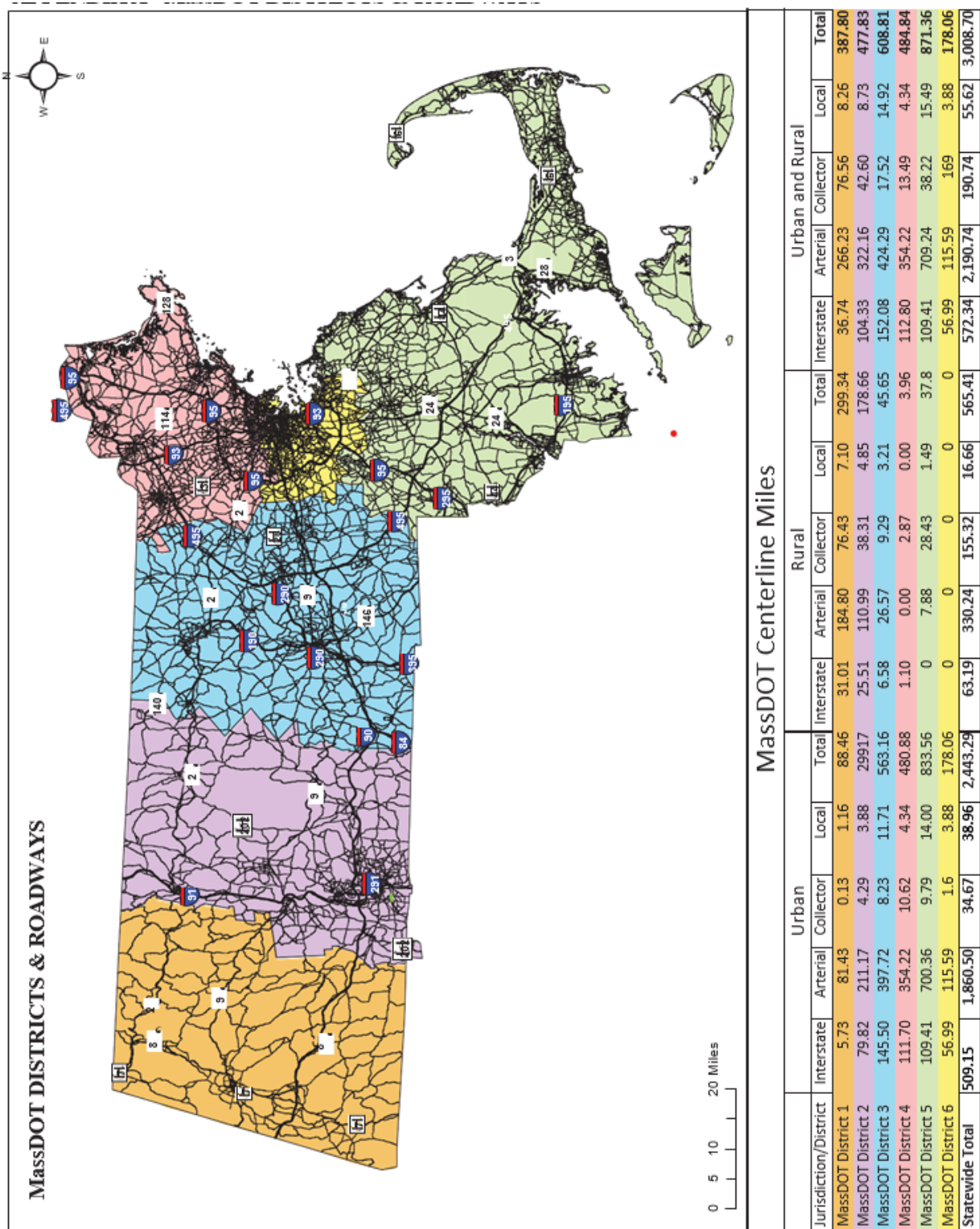
<u>Route</u>	<u>Municipalities</u>
I-90	Brimfield, Chicopee, Ludlow, Palmer, Warren, West Springfield, Westfield & Wilbraham
I-91	Bernardston, Chicopee, Deerfield, Easthampton, Greenfield, Hatfield, Holyoke, Longmeadow, Northampton, Springfield, West Springfield, Whately
I-291	Springfield, Chicopee
I-391	Chicopee
Route 57	Agawam (Ramps to Routes 75 & 159)
Route 33	Chicopee

District 5

BRISTOL, NORFOLK, PLYMOUTH COUNTIES Excluding BARNSTABLE, DUKES AND NANTUCKET CO.

22 Municipalities / 5 Routes

<u>Route</u>	<u>Municipalities</u>
1	Foxborough, Norwood, Sharon, Walpole
3	Duxbury, Hanover, Hingham, Kingston, Marshfield, Norwell, Pembroke, Plymouth, Rockland
24	Avon, Berkley, Bridgewater, Brockton, Freetown, Raynham, Stoughton, Taunton, West Bridgewater
I-95	Attleboro, Foxborough, Mansfield, North Attleboro, Norwood, Sharon, Walpole
295	Attleboro, North Attleboro

APPENDIX A (CONTINUED) - MassDOT DISTRICTS AND ROADWAYS**MassDOT Districts and Roadways**

APPENDIX B – 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	In YOP well list and

2014-2018 VEGETATION MANAGEMENT PLAN

Sensitive Area	No-spray Area	Limited-Spray Area	Where Identified
		applications; Selective low pressure, using foliar techniques or basal or cut-stump applications	identify on site
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