MEMORANDUM

To: Laura Mattei, Director of Stewardship, Sudbury Valley Trustees (SVT)
From: Debra Listernick, Environmental Risk Assessor
Subject: Limited Herbicide Use for Control of Asian Bittersweet
Smith Conservation Land, Littleton, Massachusetts
Risk Assessment
Date: June 16, 2021

1.0 INTRODUCTION

The Sudbury Valley Trustees (SVT) has proposed an Integrated Vegetation Management (IVM) program for addressing the presence and potential for continued spread of the invasive plant, Asian Bittersweet, on the Smith Conservation Land in Littleton, MA. The plan was developed and revised with consultation and feedback from regulatory agencies, town officials, the public, and other land conservation groups.

The primary factors used to select the integrated eradication techniques included efficacy to permanently remove invasive plants, regulatory/permitting requirements, potential impacts on human health and the environment, and costs. The proposed plan includes several eradication techniques, including the targeted and limited use of two herbicides on a portion of the property using cut and dab and low-pressure backpack sprayers. The plan was revised to expand buffer zones around sensitive receptors (e.g., Beaver Brook and private and municipal drinking water wells), and to decrease the acreage proposed for the use of herbicides.

As stated by SVT, the high ecological value of the existing biota is and will continue to be diminished by the unchecked growth of Asian Bittersweet and other invasive plants. IVM of native and invasive plants requires a balance between the benefits of intervention and the risks that may result from intervention. SVT has selected the targeted, limited use of herbicides as the part of the practical means of control of invasive plants over a larger area, with consideration of this balance of risks. This approach is employed by other land conservation groups, government agencies, and municipalities.

The purpose of this document is to supplement the previous documents prepared by SVT and its consultants and the concerned public. This information presents additional details regarding potential risks to humans and the environment that may be associated with the site-specific targeted and limited herbicide use at the property.

This document concurs with previous conclusions from SVT that the site-specific methods and amounts (application rates) of proposed herbicide use are in accordance with or more protective than application and license requirements in the area of use with precautions for spray drift and runoff.

1. The testing and review of the herbicides by regulatory authorities, which includes additional review in Massachusetts by the Department of Agricultural Resources (MDAR), are designed to be conservative such that the maximum allowed usage of an herbicide will not pose a risk to human health and the environment. The Massachusetts Department of Public Health (MDPH) is also involved in the review process. SVT and its partners have conducted due diligence in taking a closer look at the science as well as the practices and

the results. SVT firmly believes that limited use of the herbicides will year a net benefit to the habitat and not endanger human health.

2. In invasive plant management, the amounts of herbicide that are used are well below the maximum-allowed application rates and the methods of application are focused on the target plants, further assuring that the risk posed to human health or the environment is extremely low.

3. SVT hires state-licensed applicators with experience in natural areas management and only applies herbicides approved for use in sensitive areas. Cut and dab application is the primary application method. Treatments that utilize backpack sprayers allow the operators to very specifically target only the invasive plants and avoid non-target impacts.

4. The methodology that SVT is proposing to use is a Best Management Practice (BMP) for conservation land managers. The BMP includes a combination of mechanical and herbicide treatments and is used by all of the statewide conservation organizations and agencies engaged in land management as well as many regional and local land trusts and municipalities.

5. The Massachusetts Natural Heritage & Endangered Species Program (MNHESP) has formally approved SVT's management plan for the Smith Conservation Land. MNHESP reviewed the plan because the site supports vernal pool and a rare turtle species.

6. The Littleton Water Department issued a statement that SVT's proposed approach is not a threat to the community water supply.

2.0. PROPOSED HERBICIDES USE

The herbicides identified as having good efficacy and best suited to control Asian Bittersweet at the Smith Property, while minimizing risks of unreasonable long-term adverse effects are:

- Triclopyr (trade names)
    - Garlon® 3A Triethylamine (TEA) salt
    - Garlon® 4 Butoxyethyl ester (BEE)

- Metsulfuron Methyl (trade names)
    - Escort, Escort XP(2)

Like any tool, herbicides must be used properly. Herbicide users are required to follow the pesticide label application requirements as approved by the US Environmental Protection Agency (EPA). In Massachusetts, the MDAR regulates the type of herbicides appropriate for particular uses, application methods and timing, worker safety, and environmental protections. Land conservation trust and municipal IVM plans strive to minimize the use of herbicides but recognize that the use of herbicides for specific situations is warranted.

Both of the herbicides proposed for use at the Site are found on the MDAR *Rights-of-Way Sensitive Area Materials List*. The herbicides found on this list have several general characteristics in common, including low toxicity to humans and other animals, short-term soil persistence, biodegradation of active ingredients, and low mobility. Herbicide treatments within a sensitive area (such as water supplies, surface waters, and inhabited areas) must be applied at the minimum labeled rate for the site, pest, and application method and must be applied selectively by low pressure using foliar techniques or basal or cut-stump applications. Buffer zones to specific sensitive areas are required by MDAR.

The SVT plan meets and exceeds the MDAR requirements for specified buffer zones to the identified sensitive areas.

Triclopyr: The general mode of action of the active ingredients in Triclopyr is as a systemic herbicide. It affects actively growing plants by mimicking a specific type of plant growth hormone, known as an auxin. Plants rapidly take in triclopyr through leaves and roots. It causes uncontrolled plant growth and plant death that stops a plant from making a protective pigment that keeps chlorophyll from breaking down in sunlight. It is also used to control aquatic weeds growing in lakes, ponds, reservoirs, and wetlands, and to control woody brush and herbaceous weeds in wetlands and on the banks and shores of aquatic sites.

As a systemic herbicide, triclopyr is absorbed through plant leaves and roots. It tends to accumulate in the growing points in a plant. The half-life (time it takes the quantity/concentration to be reduced by 50%) in plants can vary widely with the type of plant. Barley and wheat plants broke down 85% of triclopyr within 3 days of application. The half-life in grass was between 5 and 20 days. The half-life in plants ranges from 3 to 24 days.

Anti-drift adjuvants (e.g., formulated oil) are added to the mix or solution in foliage and pre-emergent applications to help reduce the potential exposure to non-target organisms, reduce the break-up of sprays into fine droplets and increase selectivity and herbicide deposition onto target plants. Therefore, drift from spray application is further reduced.

In the recent USEPA Triclopyr Interim Registration Review Decision, Case Number 2710, December 2020, Section III C, Benefits Assessment (EPA, 2020), the report states "In non-croplands, triclopyr is recommended for the control of broadleaf weeds, vines, brush, and trees using foliar treatment, basal bark, cut surface, and cut stump applications. Selective control is more important in non-cropland use sites such as fencerows and rights-of-way as opposed to industrial sites which are often left bare ground. These areas can contain both desirable and non-desirable plants which makes the use of a selective herbicide like triclopyr important. Other selective herbicides used in non-cropland settings include picloram and dicamba. Other herbicides used for basal bark applications in these areas include 2,4-D; however, triclopyr has really become the primary herbicide for this application method since it is a more selective chemical that prevents damage to nearby desirable tree species. For additional information on the benefits of triclopyr, see the document *Usage, Benefits and Alternatives for Triclopyr*."

Metsulfuron Methyl: This herbicide is a residual sulfonylurea (organic structure SO_2NH_2) compound that is used as a selective pre- and post-emergence herbicide for broadleaf weeds and some annual grasses. It was initially registered in 1986 for use on wheat and barley and non-cropland sites, such as Rights of Way. It is a systemic compound with foliar and soil activity, and it works rapidly after it is taken up by the plant. Its mode of action is by inhibiting cell division in the shoots and roots of the plant, and it is biologically active at low use rates. Leaves of susceptible plants appear chlorotic from 1 to 3 weeks after application and the growing point subsequently dies.

3.0 POTENTIAL RISKS ASSOCIATED WITH HERBICIDE USE

A clear understanding of the risk of using a particular herbicide requires information on the delivered concentrations and knowledge of the toxicity of the herbicide, as well as the likelihood of exposure. Toxicity is a measure of how harmful any chemical compound is. It can be measured in many different ways and evaluated for many different biological systems. However, even the most toxic chemical cannot have any effects on an organism without an exposure. Because wildland weed management with herbicides necessarily introduces chemicals into the environment, the challenge is to estimate the amount of exposure (the dose) for different types of wildlife, as well as non-target plants. The presence of an herbicide in the environment may not be a concern if the exposure for non-target organisms is sufficiently low that it is unlikely to have a negative impact.

Risk = Concentration x Exposure x Toxicity

3.1 Concentration

The level of exposure will largely be dependent on application rates and fate/transport mechanisms that may dilute, attenuate, and degrade initial concentrations. The herbicide active ingredient is often formulated by the manufacturer with additional, non-herbicidal ingredients to improve its effectiveness. For example, a surfactant or penetrant may be added to help the herbicide cover and penetrate a leaf’s waxy outside layer as a first step to absorption and translocation. Such adjuvants may also be added to the spray tank by the applicator. Once applied, the concentration of the active ingredient of the herbicide will change depending on the form, chemical and physical properties of herbicides, and uptake and transformation factors (fate & transport) in the substrate media (e.g., plants, soil, water). The level of residues in the environment will further degrade over time dependent on a myriad of factors (e.g., plant and soil type).

Application Rates -

Triclopyr: The initial determinant of concentration is the herbicide’s concentration in the application formula and application rate. **The maximum EPA label application rate for triclopyr generally ranges from 6 lbs/Acre to 9 lbs/Acre.** The accompanying EPA label has stringent requirements for conditions of application (e.g., rain and wind) and spray drift management (EPA, 2020, Appendices B and C).

MDAR application rates requirements for triclopyr in proximity to sensitive receptors buffer zones are further restrictive:

> Garlon 4 (62719-40) - Between 10 feet and 50 feet of the resource: Lowest labeled rate OR **0.5 pints per acre**.
>
> Garlon 4 Ultra (62719-527) - Between 50 feet and the boundary of the limited spray zone: Lowest labeled rate OR **3 pints per acre**. Includes standing and flowing waters.

Metsulfuron Methyl: Lowest labelled rate for all products.

The SVT plan specifies buffer zones around sensitive receptors ranging from 50 to 200 feet, with the buffer zones for residential water wells and vernal pools greater than required by MDAR. Specifically,

SVT will maintain the following mechanical-only (no chemical) control areas:

- 125-foot buffers around residential water wells. SVT increase this buffer by 25 ft. in response to a request from the neighbors.
- 100-foot buffers from wetland boundaries.
- 200-foot buffers from vernal pool margins (100 ft. more than conservation commission jurisdiction).
- 50-foot buffers from residential activity areas for those neighbors who wish to have this additional setback.

All resources identified at the Smith property are greater than 50 feet from the application site. Therefore, an application rate of 3 pints per acre or less of Triclopyr would be protective of identified sensitive receptors following these MDAR requirements.

SVT provided the following information to the Town of Littleton Conservation Commission with information about the amounts of herbicides that were used to treat bittersweet at a site with some similar characteristics and that was treated by the same contractor who will be doing the work at this Site. A higher concentration (25%) is used for cut-stem work than for backpack spraying (only 4%). At that site, the forested area contained significantly less bittersweet than what we have at Smith. In the forested area, they used the following amount in the <u>cut-stump application</u>:

Chemical mix per acre - 24 ounces
The chemical (Garlon 4 Ultra) is mixed at 25% concentration, in a basal oil solution.
So that equates to 6 ounces of Garlon 4 Ultra per acre used.
Garlon 4 Ultra contains 60.45% active ingredient triclopyr;

Therefore, the amount of actual triclopyr used was 3.63 ounces per acre.

At that same site, the contractor conducted a <u>spray application</u> to bittersweet in an <u>open field</u> area. In the field area, they applied 13.75 gallons per acre of a tank mix (which is mostly water). They used the following mix:

Garlon 4 Ultra 4%
Escort XP 4 ounces per 100 gallons

That equates to:
0.55 gallons of Garlon 4 Ultra concentrate per acre
And 0.55 ounces of Escort XP (weight ounces) per acre

To further break it down, Garlon 4 Ultra concentrate has 60.45% active ingredient triclopyr.
Escort XP has 60% active ingredient metsulfuron methyl

Therefore, in the final breakdown, 0.33 gallons of triclopyr per acre (42 ounces per acre) and 0.33 ounces of Escort per acre.

**The amounts will vary widely depending on the density and the size of the stems cut and treated. Larger vines, of course take up more chemical, but where there are smaller vines, there are often more of them per acre.

These estimated application rates for triclopyr are significantly less than the maximum label application rates from 6 lbs/Acre to 9 lbs/Acre, and less than application rate for sensitive resources of 3 pints (48 ounces)/acre with buffer zones greater than 50 feet to sensitive receptors. Site-specific water resources are located 100 to 200 feet from the application area.

Fate and Transport -

Triclopyr: Once triclopyr is applied, ester and salt forms of triclopyr rapidly turn into the triclopyr acid form in the environment. Most triclopyr is soluble in water, meaning it dissolves easily. However, the ester form is less soluble. Triclopyr has a low vapor pressure, meaning it is not likely to release fumes into the environment. Triclopyr in water breaks down faster with light. The half-life of triclopyr in water with light is around 1 day. Without light, it is stable in water with a half-life of 142 days (Strid et al., NPIC, 2018).

Triclopyr breaks down relatively quickly in soils. It is mainly broken down by microbes. The soil half-life ranges from 8 to 46 days. In deeper soils with less oxygen, the half-life is longer. Triclopyr is mobile in soils. However, movement studies show that triclopyr was not measured in soils deeper than 15 to 90 centimeters (about 6 to 35 inches). Its movement in soil is affected by the amount of compost and rain, among other factors (Strid et al., NPIC, 2018).

In a laboratory study using sandy loam soil with a low organic matter content (0.62%), 75-80% of the applied Triclopyr leached through a 12 inch soil column between days 11 and 15. Water was applied at the rate of 0.5 inches/day for 45 days. The major degradation product, tricloropyridinol required 13 inches of applied water to elute, nearly twice as much (15 days x 0.5 inches/day = 7.5 inches) as Triclopyr (MDAR, 2011a). This means that trichloropyridinol is two times less mobile in soil than Triclopyr.

In a field study, Garlon 3A was applied at the rate of 3 gallons/acre (9 lbs/acre) to six soils ranging from clays to loamy sands in six states. Rainfall was reported to be normal, but not given. Small amounts of Triclopyr and its metabolites were found in the 6-12 inch and 12-18 inch layers of soil 28 to 56 days after application. Although an application rate of 9 lbs per acre is rather high, the presence of Triclopyr at those depths should be noted especially since there is a correlation with the previous laboratory studies (MDAR, 2011a). This means that this field study is generally consistent with lab studies, where significant mobility through soil was not indicated.

In other studies, Triclopyr exhibited significantly lower mobility than had been previously reported. In a field study conducted in Massachusetts, Triclopyr was applied to sandy loam soil at a rate of 0.6 lb/acre. Rainfall was reported as normal, but not given. Triclopyr was never detected below the top ten inch layer of soil at any time during the three month study. As part of the same study, Triclopyr was applied to soil columns containing the same soil as in the field study at the rate of

0.6 and 6.0 lbs/acre. Simulated rainfall was applied to the soil columns at a rate of 1 inch per week for a total of 5 inches. Triclopyr was not detected below the top 4 inch layer of soil. These results indicate lower mobility than previously reported, but they may reflect the short persistence of Triclopyr in soil rather than its mobility through the soil profile (MDAR, 2011a). This means that Triclopyr does not remain in soil long enough to migrate significantly down through soil.

Metsulfuron methyl: According to MDAR (2011b), Metsulfuron methyl has a moderate to high mobility in the soil profile and is relatively persistent in the environment, especially when applied in the fall. It will be retained longer in soils with higher percentages of organic matter. These factors would be of concern under most circumstances. However, metsulfuron methyl is applied at very low rates (3-4 ozs./A) and therefore the amounts which reach the soil are quite low. Consequently, Metsulfuron methyl should not impact groundwater as a result of leaching or migrate from the target area.

Potential for Migration to Public and Private Drinking Water Wells -

The depth to groundwater at the Site was cited as 6.5 feet below ground surface. In a letter from the Littleton Water Department to the Board of Selectman dated December 1, 2020 "The Water Department has received many calls and emails regarding the proposed application of a Triclopyr-based herbicide to control Asian Bittersweet, an invasive species, at the Smith property off Whitcomb Ave near the Littleton town line. The potential for Triclopyr to leach into groundwater depends primarily on the percent organic matter in the soil where it is applied[1]. The United States Department of Agriculture's Soil Survey Data for the Smith Property identify these soils as containing 95% organic matter and having a very low pesticide leaching potential[2]. In addition, soil movement studies for Triclopyr have shown that Triclopyr does not penetrate the soil any deeper than 36 inches; well above the groundwater table in this area[3]. Based on these facts, the Water Department does not expect the proposed application of Triclopyr at the Smith Property to have any effect on drinking water quality."

According to Corey Godfrey, Water and Sewer Superintendent for the Town of Littleton, the Site is within the Zone II of the Whitcomb Ave Public Water Supply wells, located approximately 1.5 miles downstream. These overburden wells are 20-35 feet deep. Overburden means the unconsolidated sediments (sand and gravel, in this case sitting atop the bedrock). These wells are not drilled into bedrock, but were driven through the overburden material until bedrock was reached, at which point the wells terminated.

Well completion reports were obtained from MassDEP for three residential drinking water wells installed in 1987 on Whitcomb Avenue. The well logs indicated that the static level of water ranged from 6 to 12 feet below ground surface (bgs) with the depth of bedrock indicated at 8 to 20 feet bgs. Wells were completed at water-bearing zones at depths of 245 to 405 feet bgs with flow rates ranging from 15 to 40 gallons per minute (gpm).

Information on a fourth Whitcomb Avenue well was obtained from the Massachusetts Department of Environmental Management/Division of Water Resources. In this well's installation, bedrock was encountered at 24 feet bgs, the water-bearing zone identified at 250 to 300 feet bgs, and total depth of the well at 300 feet bgs.

SVT has concluded that the 125-ft residential well buffers and the 100-foot wetland buffers provide the additional precautionary protection to prevent groundwater or water supply contamination.

Two studies completed in Massachusetts further indicate that this approach is sound. In SVT's previous letter to the Select Board, SVT referenced the simulation study conducted for Eastham, MA that concluded, *"At the rate and with the method of application, the herbicides used in the rights-of-way area in Eastham will not result in herbicide concentrations in ground and surface water that would cause harm to humans and aquatic wildlife."* In a second study, MDAR has been monitoring five public water supply wells on Cape Cod that are located in potential influence areas of Rights-Of-Way vegetation management with herbicides, including triclopyr, that has been in practice for many years. The monitoring has occurred monthly for the past two years and NO traces of any of the six herbicides – including triclopyr – have been detected in the wells. The monitoring did detect trace amounts of pesticides commonly used in lawn care (below levels of concern). Finally, in addition to triclopyr being on the list of herbicides permitted in sensitive areas, it is NOT on the list of chemicals of concern for groundwater contamination in Massachusetts. (Groundwater Protection List | Mass.gov)

Particularly relevant to the proposed management at Smith is the 2010 study done by MDAR chemist Hotze Wijnja for Barnstable County for herbicides including triclopyr and metsulfuron methyl.

The study came to the following conclusions:

- Right-of-way (ROW) herbicides are applied at relatively low rates
- Simulated concentrations in ground- and surface water are well below health-based and ecological standards
- These low exposure levels indicate minimal risk to human health and non-target organisms

Further Reduction of Exposure

- Simulations represent worst-case scenario or high-end of exposure potential
- Exposure is reduced by limited-spray zones and no-spray zones
- No-spray zones include: – 50 ft from private well – 10 ft from surface water or wetland

***Conclusion* "At the rate and with the method of application, the herbicides used in the rights-of-way area in Eastham will not result in herbicide concentrations in ground and surface water that would cause harm to humans and aquatic wildlife."**

Based on the findings of this study and Site-specific information on application rates, details of locations and depth of public and private drinking water supply wells, and no spray zones, impacts to drinking water are highly unlikely.

3.2 Potential Exposure

Human - The maximum potential for direct contact and inhalation exposure from herbicide application is to the applicators themselves. Licensing and application requirements specify risk mitigation measures to protect both the applicator (e.g., person protective equipment [PPE]) and non-target people and environmental receptors, including spray drift reduction measures (see Triclopyr EPA, 2020, Appendices B and C). In addition, applicators could secure the area of application until the herbicides are dried.

Subsequent to application of these herbicides to surface waters, potential exposure pathways to herbicides diluted in surface water may be direct contact and incidental ingestion during swimming; ingestion of drinking water from private wells, if surface water is drawn into these wells; and ingestion of fish caught in the surface water.

The National Pesticide Information Center (NPIC) recommends that if you are in an area during or shortly after application, you could contact it, breathe it in, or get it in your eyes.

Triclopyr: Most triclopyr incidents that were reported to the EPA from 2000 to 2014 involved homeowners who were mixing or applying products. While accidents can happen, following label instructions and taking steps to minimize exposure can help reduce risks. If any exposures occur, be sure to follow the First Aid instructions on the product label carefully. For additional treatment advice, contact the Poison Control Center at 800-222-1222. If you wish to discuss a pesticide problem, please call 800-858-7378.

The USDA Forest Service, which uses triclopyr for forest vegetation management programs, characterizes two types of potential exposure: general and accidental/incidental. The term “general” exposure assessment is used to designate those exposures that involved estimates of absorbed doses based on the handling of a specified amount a chemical during specific applications (e.g., a license applicator). The accidental/incidental exposure scenarios involve specific types of events that could occur during any type of application (e.g., the general public). An accidental exposure that results in acute exposure to an individual of the general public is not likely to occur with the controlled use of herbicides by licensed applicators. However, incidental exposures could occur from indirect exposure to spray drift or dermal contact with herbicide residues on plants, soil, or water.

Ecological - As summarized by the USDA Forest Service, terrestrial animals might be exposed to applied herbicides from direct contact spray, the ingestion of contaminated media (vegetation, prey species, or water), grooming activities, or indirect contact with contaminated vegetation. The highest exposure of terrestrial vertebrates will occur after the consumption of contaminated vegetation or contaminated insects.

The primary hazards to non-target terrestrial plants are associated with unintended direct deposition or spray drift. Unintended spray drift will result in an exposure level equivalent to the application rate. At least some plants that are sprayed directly with triclopyr at or near the recommended range will be damaged. The potential for effects on aquatic species is based on estimated concentrations that may reach a water body from the application site.

Exposure Mitigation Measures - As mentioned previously, application at the Site will be far less than maximum label application rates. Herbicides use by licensed applicators in accordance with EPA label requirements, including those for application weather conditions, use of PPE, spray drift management and no spray zones, and targeted applications will minimize potential general and incidental exposures to humans and the environment.

3.3 Potential Toxicity and Risks

Human -

Trichlopyr: EPA (2020) used the most current science policies and risk assessment methodologies to prepare a risk assessment in support of the registration review of triclopyr. (For additional details on the human health assessment for triclopyr, see the Triclopyr, Triclopyr Butoxyethyl Ester, and Triclopyr Salts. Human Health Draft Risk Assessment to Support Registration Review, which is available in the public docket). The EPA risk assessment quantified levels of exposure and risks to the general public through dietary sources (food + drinking water), and for residential appliers (inhalation), post-application exposures (soil and water), and non-occupational spray drift. The report concluded that "Aggregate risks reflect combined dietary (food and drinking water) and residential exposures. All aggregate risk estimates for triclopyr are not of concern."

USDA Forest Service report presented that "Potential risks associated with terrestrial applications are greatest for workers, as well as women consuming vegetation contaminated with triclopyr." Consumption of vegetation at the Smith site is not a potential exposure pathway.

Metsulfuron methyl: According to MDAR, the herbicide has low toxicity (EPA Toxicity Category III) for acute dermal exposure and primary eye irritation and is Category IV for all other acute exposures. (Note: Category IV is least toxic and Category III is next to least toxic). The chronic studies indicate no oncogenicity (i.e., ability to produce tumors) response and no evidence of teratological (fetal) effects in animal studies at the highest doses tested, while there was evidence of maternal toxicity at higher doses.

Ecological -

Triclopyr: EPA (2020) also reported on the completed ecological risk assessment for triclopyr (EPA, 2019). The following forms of triclopyr were assessed: triclopyr acid, triclopyr butoxyethyl ester (BEE), triclopyr choline (COLN), and triclopyr triethylamine salt (TEA). The application parameters assessed were maximum single application rates (e.g., 6 lb ae/A for tree stump treatment and 9 lb ae/A for non-crop rights of ways). Risk estimates, expressed as risk quotients (RQs) were derived for mammals, birds, reptiles, and terrestrial-phase amphibians, terrestrial invertebrates (honey bees), terrestrial plants, fist, aquatic invertebrates, and aquatic plants.

The EPA 2020 report summarized from EPA 2019, Table 1-1 summarized "Many of the high risk quotients (RQs) from triclopyr use are associated with the high maximum application rates ranging from 6 to 9 lb ae/A for uses in forestry, non-cropland areas, tree cut stump treatment, and rights of ways. Applications at these high rates are generally rare and when used, applications are highly localized and are done as brush treatment, basal bark treatment, stump treatment, hack and squirt treatment, frill or girdle treatment, and as spot treatment for targeted management of undesirable trees, shrubs, or other vegetation. Triclopyr can be applied via aerial applications in forestry settings but aerial applications are geographically limited and typically applied at a lower rate than the 6 lb ae/A rate assessed in risk assessment.[9] Information gathered by USDA's Office of Pest Management Policy from the US Forest Service suggest that application of triclopyr in public forests occur at applications between 1-2 lb ai/A. Private foresters reported primarily using rates between 1-2.5 lb ai/A. An application rate of 1-2 lb ai/A is more common when applying triclopyr as a broadcast foliar treatment, aerial or ground, for the control of undesirable vegetation across forestry, non-cropland areas, and rights of ways use sites.[10] The Agency concludes that risk to non-target organisms from use on forests, non-crop areas, and rights of ways is likely lower than estimated and is likely to be geographically limited. A summary of maximum RQs for triclopyr across use sites is detailed in Appendix A."

The California Invasive Plant Council & Pesticide Research Institute (CAL-IPC) estimated risk for various wildlife receptors using half of the maximum application rates for triclopyr and other herbicides. **These rates used for triclopyr were 4 quarts/acre for Triclopyr BEE as Garlon 4® and 1.5 gallons/acre for Triclopyr TEA as Garlon 3®.** Based on the application rates, a hazard quotient (HQ) was derived for different wildlife receptors. The HQ is a measure of risk and is defined as the ratio of the predicted exposure to a Toxicity Reference Value (TRV) using a no adverse effect level or concentration as the toxicity endpoint. If the HQ value is less than 1, exposure does not exceed the "No Effect Level".

The evaluation calculated the following HQs for half of the maximum application rates.

Herbicide	Application Rate	Wildlife Receptor	Mode of Exposure	HQ[1]
Triclopyr BEE Garlon® 4	4 quarts/ acre	Honey Bee	Direct Spray of Drift	0.13
		Aquatic Invertebrates	Acute from First-Flush Runoff	0.036
		Fish	Acute from First-Flush Runoff	0.018
		Small Mammals	Acute Consuming Contaminated Fruit	0.0032
		Small Mammals	Acute Consuming Contaminated Insects	0.047
		Large Mammals	Chronic Consuming Contaminated Vegetation	**3.7**
		Large Birds	Chronic Consuming Contaminated Vegetation	0.38
		Small Birds	Acute Consuming Contaminated Insects	0.36
Triclopyr TEA Garlon® 3	1.5 gallons/ acre	Honey Bee	Direct Spray of Drift	0.15
		Aquatic Invertebrates	Acute from First-Flush Runoff	0.00054
		Fish	Acute from First-Flush Runoff	0.00068
		Small Mammals	Acute Consuming Contaminated Fruit	0.0036
		Small Mammals	Acute Consuming Contaminated Insects	0.053
		Large Mammals	Chronic Consuming Contaminated Vegetation	**6.3**
		Large Birds	Chronic Consuming Contaminated Vegetation	0.64
		Small Birds	Acute Consuming Contaminated Insects	0.40

[1] Most Probable Risk Estimate.
Bolded values of HQ>1; indicating wildlife may be at risk of adverse effects.

USDA Forest Service summarized that the risk characterization for ecological effects is parallel in many respects to the risk characterization for human health effects. At an application rate of 1 lb a.e./acre, HQs exceed the level of concern for exposures involving the consumption of contaminated vegetation by mammals and birds. HQs are greatest for large mammals. As with the human health risk assessment, the high HQs suggest the potential for adverse effects, but not overt toxic effects, in large mammals. Based on a very cursory probabilistic assessment, exposures of mammalian wildlife that would be associated with upper bound HQs are probably rare occurrences. This means that toxic effects to mammals are generally low, with the exception of large mammals where high application rates are employed.

With the exception of aquatic plants, substantial risks to nontarget species (including humans) associated with the contamination of surface water are low, relative to risks associated with contaminated vegetation. Applications of triclopyr BEE in excess of about 1.5 to 3 lbs a.e./acre could be associated with acute effects in sensitive species of fish or invertebrates, in cases of substantial drift or off-site transport of "triclopyr via runoff." Given the proposed application rates and distance to surface water, acute effects are not likely.

<u>Metsulfuron methyl</u>: The USDA Forest Service summarizes that "Metsulfuron methyl is an effective and potent herbicide. Adverse effects on some nontarget terrestrial plant species and, to a lesser degree, some aquatic plant species are plausible unless measures are taken to limit exposure. For terrestrial plants, the dominant factor in the risk characterization is the potency of metsulfuron methyl relative to the application rate. The typical application rate considered in this risk assessment, 0.03 lb/acre, is over 800 times higher than the no-observed-effect concentration no-observed-effect-concentration (NOEC) in the vegetative vigor (direct spray) assay of the most sensitive nontarget species – i.e, 0.000037 lb/acre – and approximately 8 times higher than the NOEC for the most tolerant species in the same assay – i.e., 0.0039 lb/acre. The highest application rate that may be considered in Forest Service programs – i.e., 0.15 lb/acre – is over 4000 times the NOEC in sensitive species and a factor of about 40 above the NOEC in tolerant species. Given these relationships, damage to sensitive nontarget species could be expected in ground broadcast applications at distances of about 500 feet from the application site in areas in which off-site drift is not reduced by foliar interception. This risk characterization applies only to ground broadcast applications. When used in directed foliar applications (i.e., backpack), offsite drift could be reduced substantially but the extent of this reduction cannot be quantified.

Damage to aquatic plants, particularly macrophytes, appears substantially less than for terrestrial plants. Except for the hazard quotient of 2 associated with acute exposures based on the peak concentrations of metsulfuron methyl, all hazard quotients are below the level of concern, with a range of 0.002 to 2 for acute exposures and 0.02 to 0.08 for chronic exposures. Thus, if metsulfuron methyl is applied in areas where transport to water containing aquatic macrophytes is likely, it would be plausible that detectable damage could be observed.

Aquatic algae do not appear to be as sensitive to metsulfuron methyl. The highest hazard quotient observed for acute exposure is 0.03 associated with the upper range for the most sensitive species. For chronic exposures, the highest hazard quotient is 0.001 associated with the upper range for the most sensitive species. Therefore, it is not anticipated that adverse effect in aquatic algae would result from exposure to metsulfuron methyl at application rates used by the Forest Service.

Just as there is little reason to doubt that adverse effects on some plant species are plausible, there is no clear basis for suggesting that effects on terrestrial or aquatic animals are likely or would be substantial.”

4.0 REFERENCES

General

Sudbury Valley Trustees (SVT). 2020. Smith Land Management - Habitat Restoration and Invasive Plant Control. https://www.svtweb.org/smith-habitat-management Updated 12/11/2020.

Invasive Species Management

Massachusetts Department of Agricultural Resources (MDAR). Rights of Way Sensitive Area Materials List.
https://www.mass.gov/service-details/rights-of-way-sensitive-area-materials-list
https://www.mass.gov/rights-of-way-vegetation-management
https://www.mass.gov/service-details/rights-of-way-vegetation-management-vmps-yops-and-notices

Massachusetts Audubon Society (MAS). Invasive Species Management Strategy.
https://www.massaudubon.org/our-conservation-work/ecological-management/habitat-management/invasive-species/management

MAS. Policy on the Use of Pesticides.
https://www.massaudubon.org/content/download/7237/131992/file/MAS-Pesticide-Policy-2011-Update.pdf

Town of Acton, Massachusetts. Five Year Vegetation Management Plan 2021-2025. Prepared by: Davey Resource Group, Inc. December 16, 2020.
https://www.mass.gov/doc/town-of-acton-vmp-2021-2025/download

Town of Natick, Massachusetts. 2020-2024 SIDEWALK AND ROADWAY VEGETATION MANAGEMENT PLAN. https://www.mass.gov/doc/natick-vmp-2020-2024/download

Town of Southborough, Massachusetts. FIVE YEAR VEGETATION MANAGEMENT PLAN 2018-2022.
https://www.mass.gov/files/documents/2018/03/22/Southborough-VMP-2018-2022_0.pdf

Town of Wilmington, Massachusetts. DEPARTMENT OF PUBLIC WORKS VEGETATION MANAGEMENT PLAN January, 2020 - December, 2024
https://www.mass.gov/doc/wilmington-vmp-2020-2024/download?_ga=2.105014595.1589525499.1554116560-1247820788.1434388100

Triclopyr

California Invasive Plant Council & Pesticide Research Institute (Cal-IPC). 2015.

Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management. Cal-IPC Publication 2015-1. California Invasive Plant Council, Berkeley, CA.
https://www.cal-ipc.org/docs/bmps/dd9jwo1ml8vttq9527zjhek99qr/BMPHerbicide.pdf

United States Environmental Protection Agency (EPA), 2019. Triclopyr (Acid, Choline salt, TEA salt, BEE); Draft Ecological Risk Assessment for Registration Review. September 30, 2019.

EPA, 2020. Triclopyr Interim Registration Review Decision Case Number 2710 December 2020. Docket Number EPA-HQ-OPP-2014-0576 www.regulations.gov

MDAR. 2011a. Rights of Way Sensitive Area Materials List, List of Sensitive Materials, Active Ingredient Factsheets: Triclopyr. https://www.mass.gov/doc/triclopyr-2011pdf/download

MDAR. 2010. Fate of Herbicides in Carver Soil Evaluation for Utility Rights-of-Way Herbicide Applications on Cape Cod Massachusetts Hotze Wijnja, Ph.D. Division of Crop & Pest Services http://www.barnstablecounty.org/wp-content/uploads/2010/09/Fate-of-Herbicides-in-Carver-Soil1.pdf

Strid, A.; Hanson, W.; Cross, A.; Jenkins, J. 2018. *Triclopyr General Fact Sheet*; National Pesticide Information Center, Oregon State University Extension Services. npic.orst.edu/factsheets/triclopyrgen.html

USDA Forest Service, 2011. Triclopyr – Revised Human Health and Ecological Risk Assessments **Final Report**. Submitted by Syracuse Environmental Research Associates, Inc. https://www.fs.usda.gov/nfs/11558/www/nepa/113067_FSPLT3_5242278.pdf

Metsulfuron Methyl

MDAR. 2011b. Rights of Way Sensitive Area Materials List, List of Sensitive Materials, Active Ingredient Factsheets: Metsulfuron Methyl
https://www.mass.gov/doc/metsulfuron-methyl-2011pdf/download

USDA Forest Service, 2004. Metsulfuron Methyl - Human Health and Ecological Risk Assessments **Final Report**. Submitted by Syracuse Environmental Research Associates, Inc. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_041636.pdf