

1006990026
February 11, 2025

Town of Ashfield Selectboard
Steven Gougeon, Chair
Todd Olanyk
Tom Carter, Vice Chair
Paul McLatchy III, Town Administrator
C/O Ron Coler, Dam Keeper
Via email: roncoler@gmail.com

Re: **Ashfield Lake Dam Vegetation Management Study**

Members of the Selectboard:

As requested, Tighe & Bond has developed a study program to allow the Town to compare vegetation management techniques at Ashfield Lake Dam. The recommendations and additional background information are contained within the attached memorandum. As you are aware, the Town is having difficulty controlling vegetation, primarily Asiatic bittersweet, on the riprap slopes of the dam using manual control techniques, including hand pulling and flame weeding. We appreciate the Town's dedication to maintaining the dam while using environmentally friendly methods, and we acknowledge that it can be a challenge. The study program, were it to be implemented, would allow the Town to compare the manual techniques to two other approaches in terms of the associated efficacy, effort, and cost.

We have reviewed vegetation management options typically used for the control of invasive bittersweet, and the two additional approaches we recommend for the program are smothering and the use of triclopyr salt, a commonly-used herbicide that is allowed for use near water.

Tighe & Bond appreciates the opportunity to continue working with the Town on these important topics. Should you have any questions regarding our memorandum, please contact Dan Buttrick at 413-237-7489 or drbuttrick@tighebond.com. Otherwise, we look forward to our meeting on this topic on February 13, weather permitting.

Very truly yours,

TIGHE & BOND. INC.



Daniel R. Buttrick, PE
Senior Project Manager

Enclosure: Vegetation Control Advice memorandum

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Ashfield Lake Dam Vegetation Control Advice

To: Town of Ashfield Select Board (Steven Gougeon, Chair; Tom Carter, Vice Chair; Todd Olanyk)
Paul McLatchy III, Town Administrator, Town of Ashfield

FROM: Daniel Buttrick, PE, Tighe & Bond
Lucas Acaba, Tighe & Bond

COPY: Ron Coler, Dam Keeper, Town of Ashfield
Tom Poissant, Superintendent, Town of Ashfield Highway Department

DATE: February 11, 2025

1 Background

The Town of Ashfield (Town) is having difficulty controlling vegetation, specifically Asiatic bittersweet (*Celastrus orbiculatus*), on the riprap slopes of Ashfield Lake Dam using manual pulling and flame weeding. The dam embankments need to be kept reasonably clear of vegetation to maintain integrity of the dam and visibility for site inspections. The photograph below shows the typical conditions of the dam embankment prior to the dam repairs that were constructed in 2022. During the repairs, the contractor removed the vegetation mechanically as requested and left these areas free of visible weeds, but the weeds have regrown since extirpation was not possible. Additional photographs of the dam embankment after the dam repair construction are provided in Attachment 2.



PHOTO 1-1

Typical conditions of the dam embankment prior to repair construction (October 7, 2016).

Tighe & Bond has prepared this memorandum to provide recommendations for testing several vegetation control options to demonstrate their relative effectiveness to residents. In general, the management of invasive plants is difficult, complete eradication is often unattainable, and successful management requires consistent treatment over several growing seasons. The goal of this study is to attempt the use of several management methods on individual test plots and provide a preliminary evaluation of both their success in controlling Asiatic bittersweet (*C. orbiculatus*) as well as their practicality for long-term implementation at this site to demonstrate to residents as to whether non-herbicide control methods could be as effective as herbicide controls. This information will then be used to develop a long-term management plan for the site.

Although Tighe & Bond is not a vegetation management specialty firm, we are involved in many projects involving vegetation management on an annual basis from a planning and permitting perspective. Of our team on this project, Lucas Acaba has experience in invasive plant management utilizing a wide range of approaches such as manual removal, smothering, and various herbicide application methods. Dan Buttrick, as a dam engineer who has significant ecological restoration experience, has planned and permitted projects that have addressed vegetation management through a variety of techniques, including hand pulling, excavation, and the use of herbicide. Other Tighe & Bond experience is provided in Attachment 4.

2 Existing Conditions

2.1 Project Site

The Project Site is located at the southern end of Ashfield Lake on the Ashfield Lake Dam embankment on both the east and west sides of the dam's spillway. Ashfield Lake is open to the public for swimming, boating, and fishing. Ashfield Lake is impounded by Ashfield Lake Dam and flows through the spillway to the South River. The surrounding area consists of forested land, agricultural fields, and low-density residences.

2.2 Test Plots

Four test plots have been identified for testing different vegetation control options on the Ashfield Lake Dam embankment. A figure showing the locations of the test plots is provided in Attachment 1. The test plot locations were selected based on having similar conditions and density of Asiatic bittersweet (*C. orbiculatus*) as well as being priority areas for vegetation control. Figure 2-1 below provides a summary of the test plot locations.



FIGURE 2-1 - Proposed test plot locations at Ashfield Lake Dam

2.2.1 Test Plot 1

Test Plot 1 is located on the southern, downstream slope of the embankment at the westernmost extent of the installed riprap. Test Plot 1 does not border Ashfield Lake. A vegetated wetland is present at the toe of the embankment slope south of the Test Plot. An approximately 35 foot by 25 foot area of the embankment was selected for this study. Asiatic bittersweet (*C. orbiculatus*) is present at approximately 90% cover in this area.

2.2.2 Test Plot 2

Test Plot 2 is located on the southern, downstream slope of the embankment on the east side of the primary spillway. Test Plot 2 does not border Ashfield Lake. The entirety of the riprap embankment in this area was selected for this study and is approximately 45 feet by 30 feet. Asiatic bittersweet (*C. orbiculatus*) is present at approximately 80% cover in this area.

2.2.3 Test Plot 3

Test Plot 3 is located on the northern, upstream slope of the embankment on the east side of the primary spillway. Test Plot 3 is adjacent to Ashfield Lake and the public beach. The entirety of the riprap embankment in this area was selected for this study and is approximately 40 feet by 30 feet. Asiatic bittersweet (*C. orbiculatus*) is present at approximately 80% cover in this area.

2.2.4 Test Plot 4

Test Plot 4 is located on the southern, downstream slope of the embankment on the west side of the primary spillway. Test Plot 4 does not border Ashfield Lake. An approximately 40 foot by 30 foot area of the embankment was selected for this study. Asiatic bittersweet (*C. orbiculatus*) is present at approximately 90% cover in this area.

3 Recommended Management Methods

Given the Town's interest in comparing management methods, Tighe & Bond recommends the following approaches be used in the test plots. Each management method is recommended to be implemented at the respective test plot starting in Spring 2025 and will be evaluated at the end of the 2025 growing season. Methods were selected based on experience in Asiatic bittersweet (*C. orbiculatus*) management, literature review, and suitability at the location of each Test Plot.

3.1 Test Plot 1 – Herbicide Treatment

Test plot 1 is recommended for herbicide treatment as it is the furthest from the public beach area, is on the slope of the dam draining away from Ashfield Lake, and least likely to cause disruption. Chemical herbicides are an effective means to control various invasive plants, including Asiatic bittersweet (*C. orbiculatus*), because of their ability to be absorbed into the root system of the plant causing die-off and discouraging regrowth. Other methods (such as mowing, smothering, and flame weeding) rely on preventing the plant from producing energy through photosynthesis resulting in starvation. These methods require frequent suppression of the plant to be effective and can quickly result in reestablishment if the plant is left unsuppressed.

Herbicides with the active ingredient triclopyr have been found to be effective at controlling Asiatic bittersweet (*C. orbiculatus*) when used as a foliar spray, as compared to herbicides with the active ingredient glyphosate (such as Roundup®)¹. Both triclopyr and glyphosate based herbicides are effective when applied directly to freshly cut stumps of Asiatic bittersweet (*C. orbiculatus*). However, this method is best used for larger, mature vines and is impractical for the treatment of dense populations of immature plants. For this reason, foliar treatment with a triclopyr based herbicide is the recommended management method at this site. A typical foliar treatment schedule would include cutting the vegetation low at the beginning of the growing season, followed by an initial herbicide treatment in early summer (July), and a follow up treatment in early fall (September). Depending on the level of control achieved, subsequent treatments would include one or two foliar treatments per growing season for several years. The quantity of herbicide required to achieve adequate control would decrease each year until the treatment consists entirely of spot foliar application to emergent plants as needed.

Several different formulations and herbicide products are available that use triclopyr as the active ingredient. Due to the proximity of Test Plot 1 to the vegetated wetland to the south and Ashfield Lake to the north, an herbicide product that is approved for use in and near aquatic areas would be required. Based on an Environmental Protection Act (EPA) assessment, triclopyr ester formulations have been found to be moderately to highly toxic to freshwater fish and aquatic invertebrates, while the triclopyr salt formulations have been found to be practically non-toxic to freshwater fish and aquatic invertebrates². With the exception of eye irritation, acute toxicity of triclopyr is characterized as slightly toxic to practically non-toxic to humans². Triclopyr degrades into the metabolite TCP and the EPA found "...even using

¹ Todd L. Mervosh and David Gumbart "Cutting and Herbicide Treatments for Control of Oriental Bittersweet, Pale Swallow-Wort and Morrow's Honeysuckle," *Natural Areas Journal* 35(2), 256-265, (1 April 2015). <https://doi.org/10.3375/043.035.0206>

² Reregistration Eligibility Decision: Triclopyr; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 1998. <https://archive.epa.gov/pesticides/reregistration/web/pdf/2710red.pdf>

exaggerated exposure assumptions, neither the acute nor the chronic aggregate dietary risk from the metabolite TCP is of concern for the general population or any sub group.”² However, TCP has been found to be relatively mobile and persistent and should be considered when applying in areas with permeable soils and shallow water tables which could result in groundwater contamination². A typical triclopyr salt based product approved for use in these areas would be Vastlan®. The product label for Vastlan®, which includes details on approved uses and methods, is provided in Attachment 3. Following proper procedures and permitting, this product can be used in wetlands and to control aquatic plants. As described on the product label, if Vastlan® was applied for the control of aquatic plants, there are no use restrictions of water in the treatment area including swimming and fishing³. Tighe & Bond does not endorse a specific product, but Vastlan® represents an example of a product that would be appropriate for this application. Herbicide applications must be conducted by licensed applicators and the use of specific products is subject to contractor means and methods, to the extent of restrictions put forth by the Town.

Approximate Cost: \$3,000 for two treatments in 2025 (early summer and early fall)

3.2 Test Plot 2 – Smothering

Test plot 2 is recommended to be managed through smothering as it located on the downstream side of the dam embankment and is less likely to be effected by high winds from Ashfield Lake. This involves the use of impermeable material to cover the area and suppress the growth of Asiatic bittersweet (*C. orbiculatus*). With consistent maintenance over a period of several growing seasons, this method can be effective at preventing the plants from producing energy through photosynthesis and results in carbohydrate starvation. The smothering material can then be removed with minimal plant regrowth.

Smothering material consisting of plastic sheeting as thin as 4 millimeters is generally considered to be adequate at suppressing plant growth. However, the dam embankment consists of riprap that is likely to tear holes in thinner plastic which would allow Asiatic bittersweet (*C. orbiculatus*) to grow through the material. The Town has also expressed interest in reusing the material at other locations. Therefore, a thicker material such as 20 to 45 millimeter rubber pond liner is recommended. Test Plot 2 is a 45 foot by 30 foot area and the smothering material would need to extend several feet beyond the extent of the Asiatic bittersweet (*C. orbiculatus*) patch to prevent plants from growing past the edge of the material. The plants need to be cut as low as possible early in the growing season and the smothering material applied immediately afterwards.

Difficulties associated with smothering include the initial cost of material, labor required for installation, and long-term maintenance. The smothering material will need to be adequately anchored in place to maintain coverage over several growing seasons. The material will also need to be monitored for any holes and replaced, repaired, or augmented as needed to maintain coverage. In addition, there may be undesirable aesthetic impacts associated with the installation of pond liner material on the dam embankment.

Approximate Cost: \$1,000 - \$2,500. Does not include installation.

³ At an application rate of 1.75 quarts per acre (higher end of recommended application rates for control of Asiatic bittersweet (*C. orbiculatus*) and similar plants), 0.035 quarts of Vastlan® would be mixed with water for treatment of test plot 1. If this entire solution were to spill into Ashfield Lake, it would result in a concentration of approximately 0.052 parts per billion.

3.3 Test Plot 3 – Hand Pulling or Flame Weeding

Test plot 3 is recommended to be managed through hand pulling or flame weeding as it consists of a relatively small, isolated area that is more likely to be manageable through a manually intensive management strategy. This was attempted by the original contractor during construction of the dam without success. However, these methods can be effective at controlling Asiatic bittersweet (*C. orbiculatus*) if maintained at an adequate frequency. These methods work by preventing the plants from producing energy through photosynthesis and resulting in carbohydrate starvation, while also removing established root systems. It should be noted that infrequent burning and cutting of Asiatic bittersweet (*C. orbiculatus*) tends to stimulate regrowth without providing adequate control⁴. For this reason, it is recommended that plants should be pulled wherever practicable, making sure to remove as much of the root system as possible. Any plants that cannot be pulled should be flame weeded at a frequency adequate to prevent significant regrowth, which could be as often as every two weeks⁵. The emergence of new leaves must be prevented to the maximum extent possible to exhaust the carbohydrate supply of the plants. The location of test plot 3 on the north side of the dam embankment may impact the growth rate of Asiatic bittersweet (*C. orbiculatus*) due to reduced sunlight exposure as compared to the southern side of the dam embankment. This is not likely to significantly alter the study but should be considered when evaluating the overall effectiveness and practicality of this method.

Approximate Cost: Town labor

3.4 Test Plot 4 – No Management (Control)

Test plot 4 is recommended to be left unmanaged. This will provide a control plot to be used for comparison to the other Test Plots.

Approximate Cost: None

Attachments

- 1 Figures
 - Figure 1 – Site Location Map
 - Figure 2 – Orthophotograph
- 2 Photo Log
- 3 Vastlan® Product Label
- 4 Tighe & Bond Qualifications

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⁴ Noel B.; Leicht-Young, Stacey A.; Grundel, Ralph; Weyenberg, Scott A.; and Mulconrey, Neal, "To Burn Or Not To Burn Oriental Bittersweet: A Fire Manager's Conundrum" (2012). JFSP Research Project Reports. 9. <http://digitalcommons.unl.edu/jfspresearch/9>

⁵ Fryer, Janet L. 2011. *Celastrus orbiculatus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <https://www.fs.usda.gov/database/feis/plants/vine/celorb/all.html> [2024, December 10]

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ATTACHMENT 1

FIGURE 1 SITE LOCUS AND DOWNSTREAM AREA MAP December 2024

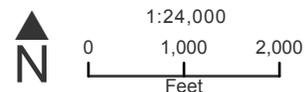
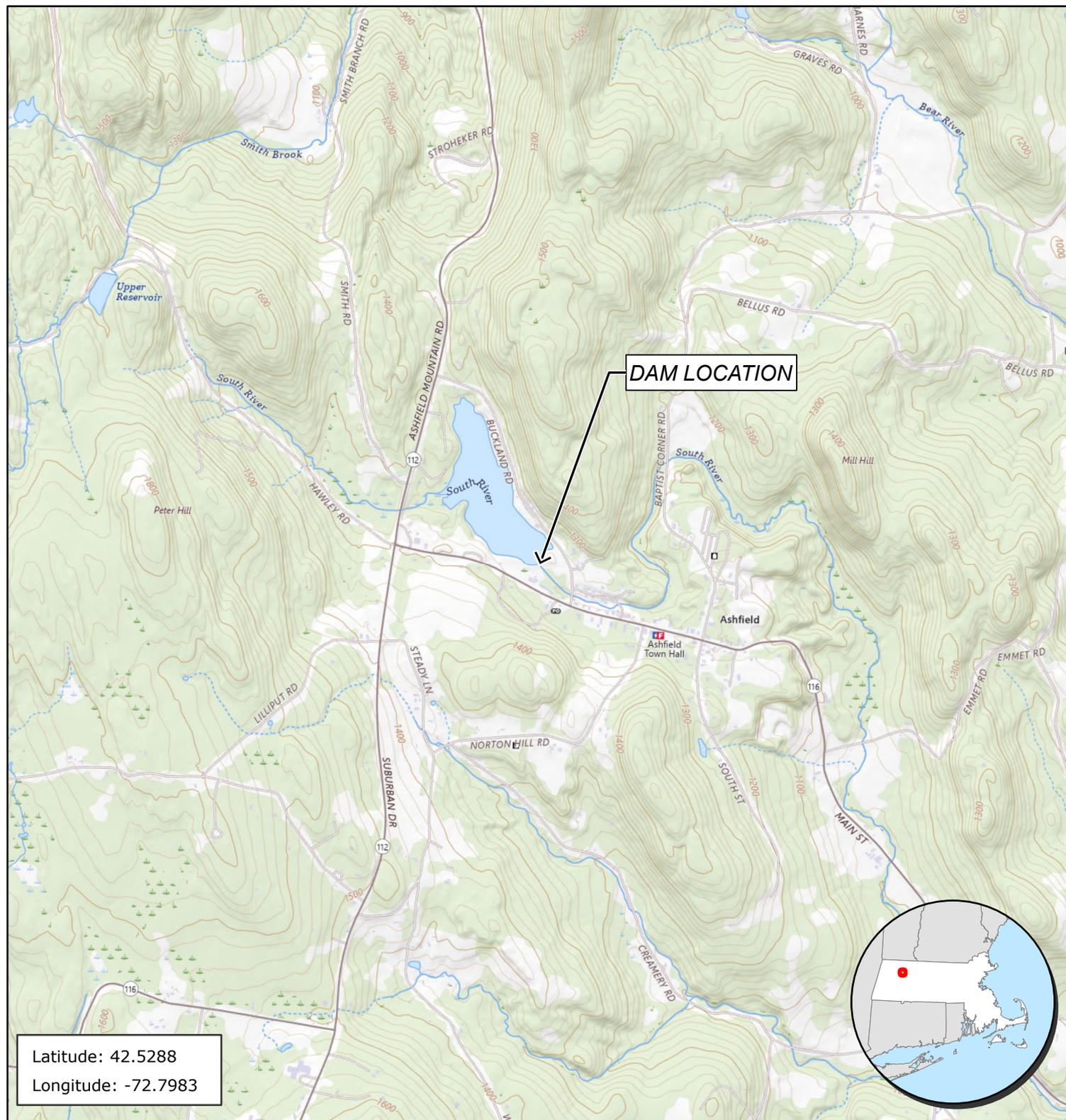


FIGURE 2
AERIAL
January 2025



Latitude: 42.5288
Longitude: -72.7983

- Test Plot #1
- Test Plot #2
- Test Plot #3
- Test Plot #4

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ATTACHMENT 2

Attachment 2 - Photographic Log

Client: Town of Ashfield
Ashfield Lake Dam Vegetation Control Advice
Site: Ashfield, Massachusetts

Job Number: A-0699-0026

Photograph No.: 1	Date: 10/12/2022	Direction Taken: West
Description: Dam embankment and spillway after the construction of dam repairs.		
		

Photograph No.: 2	Date: 05/18/2023	Direction Taken: Northeast
Description: Asiatic bittersweet (<i>C. orbiculatus</i>) recolonizing dam embankment post repair construction.		
		

Attachment 2 - Photographic Log

Client: Town of Ashfield
Ashfield Lake Dam Vegetation Control Advice
Site: Ashfield, Massachusetts

Job Number: A-0699-0026

Photograph No.: 3	Date: 11/13/2024	Direction Taken: North
Description: Test Plot 1 - Herbicide treatment proposed		
		

Photograph No.: 4	Date: 11/13/2024	Direction Taken: Northwest
Description: Test Plot 2 - Smothering proposed		
		

Attachment 2 - Photographic Log

Client: Town of Ashfield
Ashfield Lake Dam Vegetation Control Advice
Site: Ashfield, Massachusetts

Job Number: A-0699-0026

Photograph No.: 5	Date: 11/13/2024	Direction Taken: North
Description: Test Plot 3 - Hand pulling or Flame-weeding proposed		
		

Photograph No.: 6	Date: 11/13/2024	Direction Taken: Southwest
Description: Test Plot 4 - No management proposed (control)		
		

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ATTACHMENT 3

Specimen Label

TRICLOPYR CHOLINE GROUP 4 HERBICIDE



Vastlan®

HERBICIDE

™Trademarks of Corteva Agriscience and its affiliated companies

For the control of woody plant species and annual and perennial broadleaf weeds on

- range and permanent grass pastures, grasses grown for hay, Conservation Reserve Program (CRP) sites;
- forest sites, conifer and tree plantations, and Christmas tree plantations;
- non-crop areas for example, airports, barrow ditches, communication transmission lines or structures, manufacturing and storage sites, electrical power and utility rights-of-way, fencerows, gravel pits, industrial sites, military lands, mining and drilling areas, non-irrigation ditch banks, oil and gas pads, parking lots, petroleum tank farms, pipelines, railroads, roadsides, storage areas, storm water retention areas, substations, unimproved rough turf grasses, vacant lots and other non-crop residential areas, and around farm buildings;
- natural areas (open space) for example, campgrounds, parks, prairie management, trails and trailheads, recreation areas, wildlife openings and wildlife habitat and management areas;
- including grazed areas on these sites; and
- aquatic sites

For use in New York State, comply with Section 24(c) Special Local Need labeling for Vastlan, SLN NY-160004.

Active Ingredient:

Triclopyr choline: 2-[[3,5,6-trichloro-2-pyridinyl)oxy]acetic acid, choline salt.....	54.72%
Other Ingredients.....	45.28%
Total.....	100.0%

Acid equivalent: triclopyr – 39.02% - 4 lb/gal

Precautionary Statements

Hazard to Humans and Domestic Animals

EPA Reg. No. 62719-687

Keep Out of Reach of Children

WARNING

May be fatal if swallowed • Causes substantial but temporary eye injury • Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Protective eyewear
- Long-sleeved shirt and long pants
- Shoes plus socks
- Waterproof gloves

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240(d)(4-6)), the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

First Aid

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

Environmental Hazards

Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Under certain conditions, treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants, which may contribute to fish suffocation. This loss can cause fish suffocation. Therefore, to minimize this hazard, do not treat more than one-third to one-half of the water area in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. Consult with the State agency for fish and game before applying to public water to determine if a permit is needed.

This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours.

Agricultural Use Requirements (Cont.)

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Protective eyewear
- Coveralls
- Shoes plus socks
- Waterproof gloves

Non-Agricultural Use Requirements

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for Agricultural Pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Entry Restrictions for Non-WPS Uses: For applications to non-cropland areas, do not allow entry into areas until sprays have dried, unless applicator and other handler PPE is worn.

Storage and Disposal

Do not contaminate water, food, or feed by storage and disposal. Open dumping is prohibited.

Pesticide Storage: Agitate before use.

Pesticide Disposal: Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

Nonrefillable containers 5 gallons or less:

Container Handling: Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Refillable containers 5 gallons or larger:

Container Handling: Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10% full with water. Agitate vigorously or recirculate water with the pump for two minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times.

Nonrefillable containers 5 gallons or larger:

Container Handling: Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Product Information for All Use Sites

Use Vastlan® for the control of woody plants and broadleaf weeds in range and pasture, grasses grown for hay, Conservation Reserve Program (CRP) sites; forest sites, conifer and tree plantations, and Christmas tree plantations; non-crop areas for example, airports, barrow ditches, communication transmission lines or structures, manufacturing and storage sites, electrical power and utility rights-of-way, fencerows, gravel pits, industrial sites, military lands, mining and drilling areas, non-irrigation ditch banks, oil and gas pads, parking lots, petroleum tank farms, pipelines, railroads, roadsides, storage areas, storm water retention areas, substations, unimproved rough turf grasses, vacant lots and other non-crop residential areas, and around farm buildings; natural areas (open space) for example, campgrounds, parks, prairie management, trails and trailheads, recreation areas, wildlife openings and wildlife habitat and management areas and aquatic sites.

Obtain Required Permits: Consult with appropriate state or local water authorities before applying this product to public waters. State or local public agencies may require permits.

Use Precautions

When making applications to control unwanted plants on banks or shorelines of moving water sites, minimize overspray to open water.

It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands (such as flood plains, deltas, marshes, swamps, or bogs), and transitional areas between upland and lowland sites.

It is the pesticide user's responsibility to ensure that all products in the listed mixtures are registered for the intended use. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

Use Restrictions

For use in New York State, comply with Section 24(c) Special Local Need labeling for Vastlan, SLN NY-160004.

Chemigation: Do not apply this product through any type of irrigation system.

Do not apply Vastlan directly to, or otherwise permit it to come into direct contact with, grapes, tobacco, vegetable crops, flowers, or other desirable broadleaf plants. Do not permit spray mists containing Vastlan to drift onto such plants.

Do not apply to salt water bays or estuaries.

Do not apply directly to un-impounded rivers or streams.

Do not apply where runoff water may flow onto agricultural land as injury to crops may result.

Do not apply with a mistblower.

Irrigation waters:

Do not apply on ditches or canals currently being used to transport irrigation water or that will be used for irrigation within 4 months following treatment. It is permissible to treat non-irrigation ditch banks and the outer banks of irrigation ditches.

Water treated with Vastlan may not be used for irrigation purposes for 120 days after application or until residue levels of Vastlan are determined by laboratory analysis, or other appropriate means of analysis, to be 1 ppb or less.

Seasonal Irrigation Waters: Vastlan may be applied during the off-season to surface waters that are used for irrigation on a seasonal basis provided that there is a minimum of 120 days between applying Vastlan and the first use of treated water for irrigation purposes, or until residue levels of Vastlan are determined by laboratory analysis, or other appropriate means of analysis, to be 1 ppb or less.

Irrigation Canals/Ditches: Do not apply Vastlan to irrigation canals/ditches unless the 120-day restriction on irrigation water usage can be observed or residue levels of Vastlan are determined by laboratory analysis, or other appropriate means of analysis, to be 1 ppb or less.

Restrictions for Potable Water Intakes for Emerged Aquatic Weed Control – Lakes, Reservoirs, Ponds:

See chart below for specific setback distances near functioning potable water intakes.

Note: Existing potable water intakes which are no longer in use, such as those replaced by potable water wells or connections to a municipal water system, are not considered to be functioning potable water intakes. These setback restrictions do not apply to terrestrial applications made adjacent to potable water intakes.

Area Treated (acres)	Vastlan Application Rate			
	1.5 qt/acre	3 qt/acre	4.5 qt/acre	6 qt/acre
4	0	200	400	500
>4 - 8	0	200	700	900
>8 - 16	0	200	700	1000
>16	0	200	900	1300

To apply Vastlan around and within the distances noted above from a functioning potable water intake, the intake must be turned off until the triclopyr level in the intake water is determined to be 0.4 parts per million (ppm) or less by laboratory analysis or immunoassay.

Area Treated (acres)	Concentration of Triclopyr Acid in Water (ppm ae)				
	0.75 ppm	1 ppm	1.5 ppm	2 ppm	2.5 ppm
	Required Setback Distance (ft) from Potable Water Intake				
<4	300	400	600	800	1000
>4 - 8	420	560	840	1120	1400
>8 - 16	600	800	1200	1600	2000
>16 - 32	780	1040	1560	2080	2600
>32 acres, calculate a setback using the formula for the appropriate rate	Setback (ft) = $(800 \times \ln(\text{acres}) - 160) / 3.33$	Setback (ft) = $(800 \times \ln(\text{acres}) - 160) / 2.50$	Setback (ft) = $(800 \times \ln(\text{acres}) - 160) / 1.67$	Setback (ft) = $(800 \times \ln(\text{acres}) - 160) / 1.25$	Setback (ft) = $(800 \times \ln(\text{acres}) - 160)$

Example Calculation 1: to apply 2.5 ppm Vastlan to 50 acres:

$$\begin{aligned} \text{Setback in feet} &= (800 \times \ln(50 \text{ acres}) - 160) \\ &= (800 \times 3.912) - 160 \\ &= 2970 \text{ feet} \end{aligned}$$

Example Calculation 2: to apply 0.75 ppm Vastlan to 50 acres:

$$\begin{aligned} \text{Setback in feet} &= (800 \times \ln(50 \text{ acres}) - 160) / 3.33 \\ &= (800 \times 3.912) - 160 / 3.33 \\ &= 892 \text{ feet} \end{aligned}$$

Note: Existing potable water intakes which are no longer in use, such as those replaced by potable water wells or connections to a municipal water system, are not considered to be functioning potable water intakes. These setback restrictions do not apply to terrestrial applications made adjacent to potable water intakes.

To apply Vastlan around and within the distances noted above from a functioning potable water intake, the intake must be turned off until the triclopyr level in the intake water is determined to be 0.4 parts per million (ppm) or less by laboratory analysis or immunoassay.

Maximum Use Rates

- Apply no more than 6 lb ae of triclopyr (6 quarts of Vastlan) per acre per year on aquatic sites.
- Apply no more than 2 lb ae of triclopyr (2 quarts of Vastlan) per acre per growing season on range and pasture sites, including rights-of-way, fence rows or any area where grazing or harvesting of hay is allowed.
- On forestry sites, Vastlan may be used at rates up to 6 lb ae of triclopyr (6 quarts of Vastlan) per acre per year.
- For all terrestrial use sites other than range, pasture, forestry sites, and grazed/hayed areas, the maximum application rate is 9 lb ae of triclopyr (9 quarts of Vastlan) per acre per year.
- See Maximum Labeled Rate versus Spray Volume per Acre table below for relationship between mixing rate, spray volume and maximum application rate.

Maximum Labeled Rate versus Spray Volume per Acre

Total Spray Volume (gal/acre)	Maximum Rate of Vastlan		
	Range and Pasture Sites ¹ (gal/100 gal of spray)	Forestry Sites ² (gal/100 gal of spray)	Non-Cropland Sites ³ (gal/100 gal of spray)
400	Do not use	0.375	0.57
300	Do not use	0.5	0.75
200	Do not use	0.75	1.125
100	0.5	1.5	2.25

Recreational Use of Water in Treatment Area: There are no restrictions on use of water in the treatment area for recreational purposes, including swimming and fishing.

Livestock Use of Water from Treatment Area: There are no restrictions on livestock consumption of water from the treatment area.

Restrictions for Potable Water Intakes for Submerged Weed Control – Lakes, Reservoirs, Ponds:

For applications of Vastlan to control submerged weeds in lakes, reservoirs, or ponds that contain a functioning potable water intake for human consumption, see the chart below to determine the minimum setback distances of the application from the functioning potable water intakes.

Maximum Labeled Rate versus Spray Volume per Acre (Cont.)

Total Spray Volume (gal/acre)	Maximum Rate of Vastlan		
	Range and Pasture Sites ¹ (gal/100 gal of spray)	Forestry Sites ² (gal/100 gal of spray)	Non-Cropland Sites ³ (gal/100 gal of spray)
50	1	3	4.5
40	1.25	3.75	5.63
30	1.67	5	7.5
20	2.5	7.5	11.25
10	5	15	22.5

¹Do not exceed the maximum use rate of 2 lb ae of triclopyr (2 quarts of Vastlan)/acre/year.

²Do not exceed the maximum use rate of 6 lb ae of triclopyr (6 quarts of Vastlan)/acre/year.

³Do not exceed the maximum use rate of 9 lb ae of triclopyr (9 quarts of Vastlan)/acre/year on non-cropland use sites other than rangeland, pasture, forestry, and grazed/hayed areas.

Use the higher dosage rates in the chart when woody plants approach an average of 15 feet in height or when the brush covers more than 60% of the area to be treated. If lower rates are used on hard to control species, resprouting may occur the year following treatment.

Haying Restrictions

Haying (harvesting of dried forage)

- Do not harvest hay for 14 days after application.

Slaughter Restriction: During the season of application, withdraw livestock from grazing treated grass at least 3 days before slaughter.

Avoiding Injurious Spray Drift

Make applications only when there is little or no hazard from spray drift. Small quantities of spray, which may not be visible, may seriously injure susceptible plants. Do not spray when wind is blowing toward susceptible crops or ornamental plants that are near enough to be injured. It is suggested that a continuous smoke column at or near the spray site or a smoke generator on the spray equipment be used to detect air movement, lapse conditions, or temperature inversions (stable air). If the smoke layers or indicates a potential of hazardous spray drift, do not spray.

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment and weather related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

Aerial Application:

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications with aerial applications:

1. The distance of the outer most operating nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees.

Where states have more stringent regulations, they must be observed.

The applicator should be familiar with and take into account the information covered in the following Aerial Drift Reduction Advisory, below.

Aerial Drift Reduction Advisory

Information on Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversions).

For aerial application on rights-of-way or other areas near susceptible crops, apply through a Microfoil† or Thru-Valve boom†, or use an agriculturally labeled drift control additive. Other drift reducing systems or thickened sprays prepared by using high viscosity inverting systems may be used if they are made as drift-free as mixtures containing agriculturally labeled thickening agents or applications made with the Microfoil or Thru-Valve boom. Do not use a thickening agent with the Microfoil or Thru-Valve booms, or other systems that cannot accommodate thick sprays. If a spray thickening agent is used, follow all use directions and precautions on the product label.

†Reference within this label to a particular piece of equipment produced by or available from other parties is provided without consideration for use by the reader at its discretion and subject to the reader's independent circumstances, evaluation, and expertise. Such reference by Corteva Agriscience is not intended as an endorsement of such equipment, shall not constitute a warranty (express or implied) of such equipment, and is not intended to imply that other equipment is not available and equally suitable. Any discussion of methods of use of such equipment does not imply that the reader should use the equipment other than is advised in directions available from the equipment's manufacturer. The reader is responsible for exercising its own judgment and expertise, or consulting with sources other than Corteva Agriscience, in selecting and determining how to use its equipment.

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length: The distance of the outer most operating nozzles on the boom must not exceed 75% of wingspan or rotor diameter.

Application Height: Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2 to 10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential.

Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Applications should not occur during a local, low level temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of the smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas: The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Ground Equipment: To aid in reducing spray drift, Vastlan should be used in thickened (high viscosity) spray mixtures using an agriculturally labeled drift control additive, high viscosity invert system, or equivalent as directed by the manufacturer. With ground equipment, spray drift can be reduced by keeping the spray boom as low as possible; by applying 20 gallons or more of spray per acre; by keeping the operating spray pressures at the lower end of the manufacturer's recommended pressures for the specific nozzle type used (low pressure nozzles are available from spray equipment manufacturers); and by spraying when wind velocity is low (follow state regulations). In hand-gun applications, select the minimum spray pressure that will provide adequate plant coverage (without forming a mist). Do not apply with nozzles that produce a fine-droplet spray.

High Volume Leaf-Stem Treatment: To minimize spray drift, do not use pressure exceeding 50 psi at the spray nozzle and keep sprays no higher than brush tops. An agriculturally labeled thickening agent may be used to reduce drift.

Use Information

Use Vastlan at rates of 0.75 to 9 quarts of Vastlan per acre to control broadleaf weeds and woody plants. In all cases, use the amount specified in enough water to give uniform and complete coverage of the plants to be controlled. Refer to Maximum Use Rates paragraph - follow defined rates restrictions based on use sites and whether or not grazing or haying is involved.

Surfactants

For best results, use a surfactant with foliar applications and apply when woody plants and weeds are actively growing. When hard to control species such as ash, blackgum, choke cherry, elm, maples, oaks, pines, or winged elm are prevalent and during applications made in late summer when the plants are mature or during drought conditions, use the higher rates of Vastlan alone or in combination with Milestone, Opensight, Tordon® or other herbicides to broaden the spectrum of activity.

Tank Mixing

Before using any recommended tank mixtures, read the directions and all use precautions and restrictions on all labels in the tank mix. Prior to large scale batch mixing, conduct a "jar test" for spray mixture compatibility by mixing each component in the required order and proportion in a clear glass jar. **Note:** If tank mixing with glyphosate herbicides, mix the Vastlan with at least 75% of the total spray volume desired and ensure that Vastlan is well mixed before adding the glyphosate herbicides to avoid incompatibility. When using Vastlan in combination with Freelexx, 2,4-D amine (like DMA 4 IVM) or low volatile ester herbicides, generally the higher rates should be used for satisfactory brush control.

A surfactant should be added to the spray tank last or as recommended on the product label. If combined with emulsifiable concentrate herbicides, moderate continuous adequate agitation is required. It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

Broadcast Applications With Ground Equipment

Apply using equipment that will ensure uniform coverage of the spray volumes applied. To improve spray coverage, add a non-ionic surfactant. See Maximum Labeled Rate versus Spray Volume per Acre table below for relationship between mixing rate, spray volume and maximum application rate.

Aerial Application

Aerial sprays should be applied using suitable drift control. (See Use Precautions and Restrictions.) Add a non-ionic surfactant. See Maximum Labeled Rate versus Spray Volume per Acre table above for relationship between mixing rate, spray volume and maximum application rate.

Woody Plant Control With Ground Equipment for Noncropland sites

High Volume Foliage Treatment

For control of woody plants, use Vastlan at the rate of 3 to 9 quarts per 100 gallons of spray solution, or Vastlan at 0.75 to 3 quarts may be tank mixed with Freelexx, 2,4-D (like DMA 4 IVM, or low volatile esters), or products such as Milestone, Opensight, Tordon* and diluted to make 100 gallons of spray solution. Apply at a volume of 100 to 400 gallons of total spray per acre depending upon size and density of woody plants. Applications should be sufficient to provide thorough plant coverage. (See Use Precautions and Restrictions.) Do not exceed maximum allowable use rates per acre.

* Tordon is not registered for use in the states of California and Florida. This product is a restricted use pesticide. Check to ensure tank mix partners are state registered before use. See this product label for more information.

Low Volume Foliage Treatment

To control susceptible woody plants, apply up to 9 quarts of Vastlan in 10 to 100 gallons of finished spray. The maximum volume of the finish spray applied to an acre is limited by the maximum use rate per site type (See Maximum Use Rate section - Range and Pasture, Grazing, Haying sites 2 lb ae, Forestry and aquatic sites 6 lb ae, and all other sites 9 lb ae triclopyr). For best results, a surfactant should be added to all spray mixtures. The spray concentration of Vastlan and total spray volume per acre should be adjusted according to the size and density of target woody plants and kind of spray equipment used. With low volume sprays, use sufficient spray volume to obtain uniform coverage of target plants including the surfaces of all foliage, stems, and root collars (see Use Precautions and Restrictions). Match equipment and delivery rate of spray nozzles to height and density of woody plants. When treating tall, dense brush, a truck mounted spray gun with spray tips that deliver up to 2 gallons per minute at 40 to 60 psi may be required. Backpack or other types of specialized spray equipment with spray tips that deliver less than 1 gallon of spray per minute may be appropriate for short, low to moderate density brush.

Tank Mixing: As a low volume foliar spray, up to 9 quarts of Vastlan may be applied in tank mix combination with Tordon* or Graslan L* in 10 to 100 gallons of finished spray. The maximum volume of the finish spray applied to an acre is limited by the maximum use rate per site type (See Maximum Use Rate section - Range and Pasture, Grazing, Haying sites 2 lb ae, Forestry and aquatic sites 6 lb ae, and all other sites 9 lb ae triclopyr).

* Tordon and Graslan L are not registered for use in the states of California and Florida. These products are restricted use pesticides. See product labels for more information.

Foliage Treatment (Non-Grazed/Non-Hayed Areas)

Use 6 to 9 quarts of Vastlan alone or in a tank mix combination with other herbicides such as Freelexx, 2,4-D (like DMA 4 IVM, or low volatile esters) or Milestone, Opensight, Tordon*, or Graslan L* and apply in a total spray volume of 10 to 30 gallons per acre. Use the higher rates and volumes when plants are dense or under drought conditions.

Interspersed areas in non-grazed/hayed rights-of-ways that may be subject to grazing or haying may be spot treated with this rate if the treated area comprises no more than 10% of the total grazed/hayed area.

* Tordon and Graslan L are not registered for use in the states of California and Florida. These products are restricted use pesticides. See product labels for more information.

Foliage Treatment (Range and Pasture and Grazed/Hayed Areas)

Use 1 to 2 quarts of Vastlan per acre. Apply as a broadcast spray in a total volume of 10 gallons or more per acre. Apply anytime the weeds are actively growing. Tank mixtures can be made with other herbicides registered for use on grazed/hayed sites such as Milestone, Opensight, PastureGard HL, Surmount, Freelexx, or Tordon* or Graslan L*.

* Tordon and Graslan L are not registered for use in the states of California and Florida. These products are restricted use pesticides. Check to ensure tank mix partners are state registered before use. See product labels for more information.

Weed Resistance Management

Triclopyr, the active ingredient in this product, is a Group 4 herbicide based on the mode of action classification system of the Weed Science Society of America. Any weed population may contain or develop plants

resistant to Group 4 herbicides. Resistant weeds may dominate the weed population if these herbicides are used repeatedly in the same field. Such resistant weed plants may not be effectively managed using Group 4 herbicides but may be effectively managed utilizing other herbicides alone or in mixtures from different herbicide Groups that are labeled for control of these weeds and/or by using cultural or mechanical practices. Consult your local company representative, state cooperative extension service, professional consultants, or other qualified authorities to determine appropriate actions for treating specific resistant weeds.

Best Management Practices:

Proactively implementing diversified weed control strategies to minimize selection for weed populations resistant to one or more herbicides is recommended. A diversified weed management program may include the use of multiple herbicides with different modes of action and overlapping weed spectrum with or without tillage operations and/or other cultural practices. Research has demonstrated that using the labeled rate and directions for use is important to delay the selection for resistant weeds. Scouting after a herbicide application is important because it can facilitate the early identification of weed shifts and/or weed resistance and thus provide direction on future weed management practices. One of the best ways to contain resistant weed populations is to implement measures to avoid allowing weeds to reproduce by seed or to proliferate vegetatively. Cleaning equipment between sites and avoiding movement of plant material between sites will greatly aid in reducing the spread of resistant weed seed.

Woody Plants and Weeds Controlled

alder	dogwood	salt cedar ²
arrowwood	elderberry	salmonberry
ash	elm	sassafras
aspen	gallberry	scotch broom
Australian pine	gorse	sumac
bear clover (bearmat)	hazel	sweetbay magnolia
beech	hornbeam	sweetgum
birch	kudzu ¹	sycamore
blackberry	locust	tanoak
blackgum	madrone	thimbleberry
Brazilian pepper	maples	tulip poplar
broom, Scotch, French, Spanish, Portugese	melaleuca (seedlings)	waxmyrtle
cascara	mulberry	western hemlock
ceanothus	oaks	wild rose
cherry	persimmon	willow
chinquapin	pine	winged elm
choke cherry	poison ivy	
cottonwood	poison oak	
crataegus (hawthorn)	poplar	
Douglas fir	Russian olive 1/ salt-bush (<i>Baccharis</i> spp.)	

¹For complete control, re-treatment may be necessary.

²Use cut surface treatments for best results.

Annual and Perennial Broadleaf Weeds

bindweed	lambquarters	Spanish needles/ common
burdock	lespedeza	beggarthicks
Canada thistle	Mexican petunia	tansy ragwort
chicory	plantain	thistle
clover	purple loosestrife 2/	tropical soda apple
curly dock	oxalis	vetch
dandelion	ragweed	wedelia
field bindweed	smartweed	wild lettuce
ground ivy		

Aquatic Weeds

alligatorweed	nuphar (spatterdock)	purple loosestrife
American lotus	parrotfeather [*]	Waterhyacinth
American frogbit	phragmites 3/	Waterlily
aquatic sodaapple	pickerelweed	Waterprimrose
Eurasian watermilfoil	pennywort	Watershield
milfoil species		

*Re-treatment may be needed to achieve desired level of control.

1/ Russian olive

Apply Vastlan at 3 quarts per acre plus Milestone[®] and a non-ionic surfactant at 0.25 to 0.5% v/v or 1 quart/acre of crop oil concentrate or methylated seed oil. Treatments can be made to small (usually less than 6 feet in height) trees or to regrowth of trees after cutting, mowing, or shredding operations. For foliar applications, apply until foliage is wet, but not to runoff. When treating regrowth of mowed trees, allow time for the plants to re-grow and develop adequate leaf area for a foliar application. This may mean the application will need to be done the year after cutting or, at least, in September or October after mowing the previous winter or early spring.

These treatments may need to be re-applied in subsequent years to achieve the desired level of long term control if trees resprout after the initial treatment

2/ Purple Loosestrife

Purple loosestrife can be controlled with foliar applications of Vastlan. For broadcast applications, use a minimum of 4.5 to 6 quarts of Vastlan per acre. Apply Vastlan when purple loosestrife is at the bud to mid-flowering stage of growth. Follow-up applications for control of regrowth should be made the following year in order to achieve increased control of this weed species. For all applications, a non-ionic surfactant should be added to the spray mixture. Follow all directions and use precautions on the label of the surfactant. Thorough wetting of the foliage and stems is necessary to achieve satisfactory control. A minimum spray volume of 50 gallons per acre is needed for ground broadcast applications.

If using a backpack sprayer, a spray mixture containing 0.75% to 1.25% Vastlan should be used. All purple loosestrife plants should be thoroughly wetted.

3/ Phragmites (*Phragmites australis*)

Phragmites can be selectively controlled with foliar applications of Vastlan. For broadcast applications, a minimum of 2 1/4 lb ae of triclopyr (2 1/4 quarts of Vastlan) per acre should be used. For optimum control, apply Vastlan when phragmites is in the early state of growth, 1/2 to 3 feet in height, prior to seed head development. Follow-up applications for control of regrowth may be made the following year in order to achieve increased control of this weed species. For all applications, a non-ionic surfactant labeled for aquatics should be added to the spray mixture. Follow all directions and use precautions on the label of the surfactant. Thorough wetting of the foliage and stems is necessary to achieve satisfactory control. A minimum spray volume of 50 gallons per acre is recommended for ground broadcast applications.

If a backpack sprayer is used, a spray mixture containing 0.75% to 1.25% of Vastlan should be used. All phragmites foliage should be thoroughly wetted.

Aerial application by helicopter may be needed when treating restoration sites that are inaccessible, remote, difficult to traverse, isolated, or otherwise unsuited to ground application, or in circumstances where invasive exotic weeds dominate native plant populations over extensive areas and efforts to restore native plant diversity are being conducted. By air, apply in a minimum spray volume of 30 gallons per acre.

Cut Surface Treatments

Individual plant treatments such as cut surface applications may be used on any use site listed on this label at a maximum use rate of 6 or 9 quarts of Vastlan (6 lb ae on forestry sites and 9 lb ae of triclopyr on other sites) per acre. These types of applications are made directly to ungrazed parts of plants and, therefore, are not restricted by the grazing maximum rate of 2 quarts of Vastlan (2 lb ae of triclopyr) per acre on a grazed site.

To control unwanted hardwood trees such as elm, maple, oak and conifers in labeled sites, apply Vastlan, either undiluted or diluted in a 1 to 1 ratio with water, as directed below.

Tree Injector Method

Apply by injecting 1/2 milliliter of undiluted Vastlan or 1 milliliter of the diluted solution through the bark at intervals of 3 to 4 inches between centers of the injector wound. The injections should completely surround the tree at any convenient height. **Note: No Worker Protection Standard worker entry restrictions or worker notification requirements apply when this product is injected directly into plants.**

Hack and Squirt Method

Make cuts around the tree trunk at a convenient height with a hatchet or similar equipment so that the cuts overlap slightly and make a continuous circle around the trunk. Spray 1/2 milliliter of undiluted Vastlan or 1 milliliter of the diluted solution into the pocket created between the bark and the inner stem/trunk by each cut.

Frill or Girdle Method

Make a single girdle through the bark completely around the tree at a convenient height. The frill should allow for the herbicide to remain next to the inner stem and absorb into the plant. Wet the cut surface with undiluted or diluted solution.

Both of the above methods may be used successfully at any season except during periods of heavy sap flow of certain species - for example, maples.

Stump Treatment

Spray or paint the cut surfaces of freshly cut stumps and stubs with undiluted Vastlan. The cambium area next to the bark is the most vital area to wet.

Chemical Mowing

Vastlan may be applied to the cut surfaces of weed or brush stubble under the deck of a rotary mower such as the Brown Brush Monitor or other equipment that is designed to uniformly apply the herbicide. This method of application may be used for control of annual and perennial broadleaf weeds and for suppression and stem density reduction of woody species. Apply when growing conditions are favorable and there is active plant growth.

Application

Broadleaf Weed Control: Apply at labeled rates for Vastlan under the section "Broadcast Applications with Ground Equipment - Broadleaf Weed Control". Apply the specified rate in a minimum spray volume of 3 gallons per acre. Follow label directions for herbicides that may be applied in tank mix combination with Vastlan to improve weed control or broaden the spectrum of weeds controlled.

Woody Plant Control: For suppression and stem density reduction of woody species, use 2.25 to 4.5 quarts of Vastlan in a minimum spray volume of 5 gallons per acre. Follow label directions under the woody plant control for herbicides that may be applied in tank mix combination with Vastlan to improve control or broaden the spectrum of woody plants controlled.

Tank mixing: For possible increased effectiveness of this treatment, Vastlan may be tank mixed with other herbicides such as Milestone, Tordon*, Graslan L* or imazapyr. Follow all product use directions and do not exceed maximum labeled use rates.

* Tordon and Graslan L are not registered for use in the states of California and Florida. These products are restricted use pesticides. See product labels for more information.

Forest Management Applications

For best control from broadcast applications of Vastlan, add a surfactant and use a spray volume which will provide thorough plant coverage. Recommended spray volumes are usually 10 to 25 gallons per acre by air or 10 to 100 gallons per acre by ground. For spray volumes less than 50 gallons per acre the addition of a non-ionic surfactant will improve spray coverage. Nozzles or additives that produce larger droplets of spray may require higher spray volumes to maintain brush control.

Forest Site Preparation

Use up to 6 quarts of Vastlan alone and apply in a total spray volume of 10 to 30 gallons per acre or Vastlan may be used in a tank mix with other herbicides such as Graslan L*, Freelexx, or 2,4-D amine or low volatile ester in a total spray volume of 10 to 30 gallons per acre. Use a non-ionic surfactant for all foliar applications.

*Graslan L is not registered for use in the states of California and Florida. This product is a restricted use pesticide. Check to ensure tank mix partners are state registered before use. See product label for more information.

Note: Conifers planted sooner than one month after treatment with Vastlan at less than 4 lb ae of triclopyr (4 quarts of Vastlan) per acre or sooner than two months after treatment at 4 to 6 lb ae of triclopyr (4 to 6 quarts of Vastlan) per acre may be injured. When tank mixtures of herbicides are used for forest site preparation, labels for all products in the mixture must be consulted and the longest waiting period before conifer planting must be used.

Directed Spray Applications in Tree Plantations such as for Conifer Release

To release conifers or desirable trees from competing vegetation, mix 3 to 6 quarts of Vastlan in enough water to make 100 gallons of spray mixture. To improve spray coverage, add a non-ionic surfactant. The spray mixture should be directed onto foliage of competitive vegetation using knapsack or backpack sprayers with flat fan nozzles or equivalent any time after vegetation has reached full leaf size, but before autumn coloration. When treating woody plants, it is best if the majority of treated plants are less than 6 feet in height to ensure adequate spray coverage. Use care to direct spray away from contact with foliage of conifers and desirable vegetation as injury or death could occur.

Note: Spray may cause temporary damage and growth suppression where contact with conifers occurs; however, injured conifers should recover and grow normally. Over-the-top spray applications can kill pines.

Broadcast Applications for Conifer Release in the Northeastern United States

To release spruce, fir, red pine and white pine from competing hardwoods, such as red maple, sugar maple, striped maple, alder, birch (white, yellow or gray), aspen, ash, pin cherry and *Rubus* spp. and perennial and annual broadleaf weeds, use Vastlan at rates of 1.5 to 3 quarts per acre alone or with Freelexx, 2,4-D (like DMA 4 IVM), or a low volatile ester to provide no more than 4 lb ae per acre from both products. Apply in late summer or early fall after conifers have formed their over wintering buds and hardwoods are in full leaf and prior to autumn coloration.

Broadcast Applications for Douglas-fir Release in the Pacific Northwest and California

To release Douglas-fir from susceptible competing vegetation such as broadleaf weeds, alder, blackberry, or Scotch broom, apply Vastlan at 1 to 1.5 quarts per acre alone or in combination with other herbicides to broaden the spectrum of activity. Apply in early spring after hardwoods begin growth and before Douglas-fir bud break ("early foliar" hardwood stage) or after Douglas-fir seasonal growth has "hardened off" (set winter buds) in late summer, but while hardwoods are still actively growing. When treating after Douglas-fir bud set, apply prior to onset of autumn coloration in hardwood foliage. **Note:** Treatments applied during active Douglas-fir shoot growth (after spring bud break and prior to bud set) may cause injury to Douglas-fir trees.

Christmas Tree Plantations

Use Vastlan for the control of woody plants and annual and perennial broadleaf weeds in established Christmas tree plantations. For best results, apply when woody plants and weeds are actively growing. Vastlan does not control weeds which have not emerged at the time of application. If lower rates are used on hard to control woody species, resprouting may occur the year following treatment. Brush over 8 feet tall is difficult to treat efficiently using hand equipment such as backpack or knapsack sprayers. When treating large brush or trees or hard to control species such as ash, blackgum, choke cherry, elm, hazel, madrone, maples, oaks or sweetgum, and for applications made during drought conditions or in late summer when the leaves are mature, use the higher rates of Vastlan or use cut surface applications (see Cut Surface section above). For foliar applications, use a surfactant and apply in enough water to give uniform and complete coverage of the plants to be controlled. Applications made under drought conditions may provide less than desirable results.

Use Precautions:

- Newly seeded turf (alleyways, etc.) should be mowed two or three times before treatment with Vastlan.
- Use Vastlan where legumes, such as clover, are present only if injury and possible control of legumes can be tolerated.

Use Restrictions:

- Do not use on newly seeded grass until well established as indicated by vigorous growth and development of secondary root system and tillering
- Do not reseed Christmas tree areas treated with Vastlan for a minimum of three weeks after application.
- Apply Vastlan only to established Christmas trees that were planted at least one full year prior to application.
- **Do not apply with 2,4-D containing products.**

Application

Apply in late summer or early autumn after terminal growth of Christmas trees has hardened off but before leaf drop of the target weeds. Apply at a rate of 0.75 to 1.75 quarts of Vastlan per acre as a foliar spray directed toward the base of Christmas trees. Use sufficient spray volume to provide uniform coverage of target plants (20 to 100 gallons per acre). Application rates of Vastlan directed for Christmas trees will only suppress some well established woody plants that are greater than 2 to 3 years old (see table below). Broadcast sprays may also be applied in bands between the rows of planted trees. Use spray equipment that will ensure uniform coverage of the desired spray volume.

Vastlan can cause needle and branch injury to Christmas trees.

To minimize injury to Christmas trees, direct sprays so as to avoid or minimize contact with foliage. Blue spruce, white spruce, balsam fir, and Fraser fir are less susceptible to injury than white pine and Douglas-fir.

Application Rates and Species Controlled (or also see list above):

Vastlan		
0.75 quart/acre	1.25 to 1.5 quarts/acre	1.75 quarts/acre
clover	bindweed, field (TG)	arrowwood (SDL)
dandelion	blackberry ¹	aspen
dock, curly	chicory (s)	beech (SDL)
lambquarters	fireweed	birch (SDL)
lespedeza	ivy, ground	chinquapin
plantain, broadleaf	lettuce, wild	cottonwood (SDL)
plantain, buckhorn	oxalis	elderberry
ragweed, common	poison ivy	grape, wild
vetch	smartweed (TG)	mulberry (SDL)
	thistle, Canada (TG)	poplar (SDL)
	violet, wild	sassafras (SDL)
	Virginia creeper ¹	sumac (SDL)
		sycamore (SDL)

(TG) Top growth control, retreatment may be necessary

(S) Suppression

(SDL) Seedlings less than 2 to 3 years old

¹Use 1.5 quarts per acre rate

Directed Applications

To control hardwoods such as red maple, sugar maple, striped maple, sweetgum, red and white oaks, ash, alder, birch, aspen, and pin cherry, mix 0.19 to 1 pint of Vastlan in enough water to make 3 gallons of spray mixture. For directed applications, do not exceed 6 quarts of Vastlan per acre per year. To improve coverage, add a non-ionic agricultural surfactant to the spray. This spray mixture should be directed onto foliage of competitive hardwoods using knapsack or backpack sprayers with flat fan nozzles or equivalent any time after hardwoods have reached full leaf size, but before autumn coloration (when plants are actively growing). The majority of treated hardwoods should be less than 8 feet in height to ensure adequate spray coverage. **Note:** To prevent Christmas tree injury, care should be taken to direct spray away from contact with Christmas tree foliage.

Aquatic and Wetland Sites

Use Vastlan for control of emersed, submersed and floating aquatic plants in aquatic sites such as ponds, lakes, reservoirs, non-irrigation canals, and ditches which have little or no continuous outflow, marshes and wetlands, including broadleaf and woody vegetation on banks and shores within or adjacent to these and other aquatic sites.

Obtain Required Permits: Consult with appropriate state or local water authorities before applying this product to public waters. State or local public agencies may require permits.

Aquatic Application Methods

Use a non-ionic surfactant in the spray mixture to improve control with foliar applications. Follow all directions and use precautions on the aquatic surfactant label.

Surface Application

Use a spray boom, handgun or other similar suitable equipment mounted on a boat or vehicle. Thorough wetting of foliage is essential for maximum effectiveness. Use 20 to 200 gallons per acre of spray mixture. Special precautions such as the use of low spray pressure, large droplet producing nozzles, or addition of a labeled thickening agent may minimize spray drift in areas near sensitive crops.

Aerial Application (Helicopter Only)

Apply with a helicopter using a Microfoil or Thru-Valve boom, or a drift control additive in the spray solution. Apply in a minimum of 10 gallons of total spray mix per acre. Do not apply when weather conditions favor drift to sensitive areas. See label section on aerial application directions and precautions.

Floating and Emerged Weeds

Apply when plants are actively growing. For control of waterhyacinth, alligatorweed (see specific directions below), and other susceptible emerged and floating herbaceous weeds and woody plants, apply 1.5 to 6 quarts of Vastlan per acre as a foliar application using surface or aerial equipment. Use higher rates in the rate range when plants are mature, when the weed mass is dense, or for difficult to control species. Repeat as necessary to control regrowth and plants missed in the previous operation, but do not exceed a total of 6 quarts of Vastlan per acre per annual growing season.

Aquatic Weeds

- | | | |
|-----------------------|----------------------------|--------------------|
| alligatorweed | parrotfeather ¹ | purple loosestrife |
| aquatic sodaapple | phragmites | waterprimrose |
| Eurasian watermilfoil | pickerelweed | |
| milfoil species | pennywort | |

¹Re-treatment may be needed to achieve desired level of control.

Alligatorweed

Apply Vastlan at 2 to 6 quarts per acre to control alligatorweed. It is important to thoroughly wet all foliage with the spray mixture. For best results, add an approved non-ionic aquatic surfactant to the spray mixture. Alligatorweed growing outside the margins of a body of water can be controlled with this treatment. However, alligatorweed growing in water will only be partially controlled. Top growth above the water will be controlled, but the plant will likely regrow from tissue below the water surface.

Restrictions for Potable Water Intakes for Emerged Aquatic Weed Control – Lakes, Reservoirs, Ponds:

See chart below for specific setback distances near functioning potable water intakes.

Note: Existing potable water intakes which are no longer in use, such as those replaced by potable water wells or connections to a municipal water system, are not considered to be functioning potable water intakes. These setback restrictions do not apply to terrestrial applications made adjacent to potable water intakes.

Area Treated (acres)	Vastlan Application Rate			
	1.5 qt/acre	3 qt/acre	4.5 qt/acre	6 qt/acre
4	0	200	400	500
>4 - 8	0	200	700	900
>8 - 16	0	200	700	1000
>16	0	200	900	1300

To apply Vastlan around and within the distances noted above from a functioning potable water intake, the intake must be turned off until the triclopyr level in the intake water is determined to be 0.4 parts per million (ppm) or less by laboratory analysis or immunoassay.

Recreational Use of Water in Treatment Area: There are no restrictions on use of water in the treatment area for recreational purposes, including swimming and fishing.

Livestock Use of Water from Treatment Area: There are no restrictions on livestock consumption of water from the treatment area.

Submerged Weeds

For control of Eurasian watermilfoil and other susceptible submerged weeds in ponds, lakes, reservoirs, and in non-irrigation canals or ditches that have little or no continuous outflow, apply Vastlan as either a surface or subsurface application. Select rates according to the rate chart below to provide a triclopyr concentration of 0.75 to 2.5 ppm ae in treated water. Use higher rates in the rate range in areas of greater water exchange.

These areas may require a repeat application. However, total application of Vastlan must not exceed an application rate of 2.5 ppm of triclopyr for the treatment area per annual growing season.

Apply in spring or early summer when Eurasian watermilfoil or other submersed weeds are actively growing.

Areas near susceptible crops or other desirable broadleaf plants may be treated by subsurface injection applied by boat to avoid spray drift.

Surface Application

Apply the desired amount of Vastlan as either a concentrate or a spray mixture in water. However, use a minimum spray volume of 5 gallons per acre. Do not apply when weather conditions favor drift to sensitive areas.

Average water depth (feet) x 0.678 x target concentration (ppm) = gallons of Vastlan per surface acre treated.

Example: to achieve a 2 ppm concentration of triclopyr in water averaging 4 feet deep

$$4 \times 0.678 \times 2 \text{ ppm} = 5.4 \text{ gallons of Vastlan per surface acre treated}$$

Water Depth (ft)	Concentration of Triclopyr Acid in Water (ppm ae)				
	0.75 ppm	1 ppm	1.5 ppm	2 ppm	2.5 ppm
	Gallons of Vastlan per Surface Acre at Specified Depth				
1	0.5	0.7	1.0	1.4	1.7
2	1.0	1.4	2.0	2.7	3.4
3	1.5	2.0	3.1	4.1	5.1
4	2.0	2.7	4.1	5.4	6.8
5	2.5	3.4	5.1	6.8	8.5
6	3.1	4.1	6.1	8.1	10.2
7	3.6	4.7	7.1	9.5	11.9
8	4.1	5.4	8.1	10.8	13.6
9	4.6	6.1	9.2	12.2	15.3
10	5.1	6.8	10.2	13.6	17.0
15	7.6	10.2	15.3	20.3	25.4
20	10.2	13.6	20.3	27.1	33.9

Subsurface Application

Apply desired amount of Vastlan per acre directly into the water through boat-mounted distribution systems. When treating target plants that are 6 feet below the surface of the water, trailing hoses should be used along with an aquatic approved sinking agent (except California).

Restrictions for Potable Water Intakes for Submerged Weed Control – Lakes, Reservoirs, Ponds:

For applications of Vastlan to control submerged weeds in lakes, reservoirs or ponds that contain a functioning potable water intake for human consumption, see the chart below to determine the minimum setback distances of the application from the functioning potable water intakes.

Area Treated (acres)	Concentration of Triclopyr Acid in Water (ppm ae)				
	0.75 ppm	1 ppm	1.5 ppm	2 ppm	2.5 ppm
	Required Setback Distance (ft) from Potable Water Intake				
<4	300	400	600	800	1000
>4 – 8	420	560	840	1120	1400
>8 – 16	600	800	1200	1600	2000
>16 – 32	780	1040	1560	2080	2600
>32 acres, calculate a setback using the formula for the appropriate rate	Setback (ft) = $(800 \times \ln(\text{acres}) - 160) / 3.33$	Setback (ft) = $(800 \times \ln(\text{acres}) - 160) / 2.50$	Setback (ft) = $(800 \times \ln(\text{acres}) - 160) / 1.67$	Setback (ft) = $(800 \times \ln(\text{acres}) - 160) / 1.25$	Setback (ft) = $(800 \times \ln(\text{acres}) - 160)$

Example Calculation 1: to apply 2.5 ppm Vastlan to 50 acres:

$$\begin{aligned} \text{Setback in feet} &= (800 \times \ln(50 \text{ acres}) - 160) \\ &= (800 \times 3.912) - 160 \\ &= 2970 \text{ feet} \end{aligned}$$

Example Calculation 2: to apply 0.75 ppm Vastlan to 50 acres:

$$\begin{aligned} \text{Setback in feet} &= (800 \times \ln(50 \text{ acres}) - 160) / 3.33 \\ &= (800 \times 3.912) - 160 / 3.33 \\ &= 892 \text{ feet} \end{aligned}$$

Note: Existing potable water intakes which are no longer in use, such as those replaced by potable water wells or connections to a municipal water system, are not considered to be functioning potable water intakes. These setback restrictions do not apply to terrestrial applications made adjacent to potable water intakes.

To apply Vastlan around and within the distances noted above from a functioning potable water intake, the intake must be turned off until the triclopyr level in the intake water is determined to be 0.4 parts per million (ppm) or less by laboratory analysis or immunoassay.

Wetland Sites

Wetlands include flood plains, deltas, marshes, swamps, bogs, and transitional areas between upland and lowland sites. Wetlands may occur within noncropland, rangeland, pastures, forests, wildlife habitat restoration and management areas and similar sites as well as areas adjacent to or surrounding domestic water supply reservoirs, lakes and ponds.

For control of woody plants and broadleaf weeds in wetland sites, follow use directions and application methods on this label for terrestrial sites.

Note: Consult local public water control authorities before applying this product in and around public water. Permits may be required to treat such areas.

Terms and Conditions of Use

If terms of the following Warranty Disclaimer, Inherent Risks of Use and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. To the extent permitted by law, otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitation of Remedies.

Warranty Disclaimer

Corteva Agriscience warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. To the extent permitted by law, Corteva Agriscience MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

Inherent Risks of Use

It is impossible to eliminate all risks associated with use of this product. Crop injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Corteva Agriscience or the seller. To the extent permitted by law, all such risks shall be assumed by buyer.

Limitation of Remedies

To the extent permitted by law, the exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Corteva Agriscience's election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used.

To the extent permitted by law, Corteva Agriscience shall not be liable for losses or damages resulting from handling or use of this product unless Corteva Agriscience is promptly notified of such loss or damage in writing. To the extent permitted by law, in no case shall Corteva Agriscience be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer, Inherent Risks of Use and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Corteva Agriscience or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

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Corteva Agriscience LLC
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Indianapolis, IN 46268

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Replaced Label: CD02-409-020
EPA accepted 12/06/17

Revisions:

1. Related to change of company name and contact information for company 62719 accepted by EPA January 5, 2021:
 - Legal entity updates.

Tighe&Bond

ATTACHMENT 4



DANIEL BUTTRICK, PE

SENIOR PROJECT MANAGER

Daniel Buttrick is a civil engineer with a background in dam engineering, water resources engineering and management, and environmental compliance in Connecticut, Massachusetts, and New York. His experience extends to a wide-variety of water resources projects, including dam investigation, repair, and maintenance; environmental impact assessment and documentation; watershed planning; environmental permitting; and industrial, municipal, and utility regulatory compliance and pollution prevention. He has performed numerous Phase I dam safety inspections in Massachusetts and served as primary project engineer on Phase II dam inspections and evaluations. He is a member of the Easthampton, Massachusetts Conservation Commission and served as a member of the City's ad-hoc stormwater committee.

EXPERIENCE

19 Years

SPECIALTIES

Dam Engineering

Water Resources Engineering

Sediment Management

Environmental Compliance

EDUCATION

Bachelor of Science

Civil and Environmental Engineering
University of Massachusetts Amherst

Master of Science

Environmental Engineering
University of Massachusetts Amherst

LICENSES & REGISTRATIONS

Professional Engineer
MA #48155

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers

Boston Society of Civil Engineers

Association of State Dam Safety
Officials

DAMS

WELSH POND DAM REMOVAL—MASSACHUSETTS

Project Manager for removal of this dam which was part of a warm-water fish hatchery in Massachusetts. The dam crest carried a public roadway, so the project included replacement of the dam's outlet structure with a larger culvert. The work also included replacement of a culvert at the inlet to the former pond, providing new culverts for two private residential driveways, and protection of a natural gas pipeline that crosses below the stream.

PUTNAM POND DAM REMOVAL—SUTTON, MA

Project Manager for the removal of Putnam Pond Dam, a failing dam upstream from Welsh Pond in Sutton, Massachusetts. The work will include construction of a new culvert to carry flow below the roadway on the dam crest and daylighting nearly 90 feet of steeply-sloping stream channel that is now underground.

LYMAN POND DAM REMOVAL—SOUTHAMPTON, MA

Project Manager for final design of this dam removal project on the Manhan River in Southamton, with the Massachusetts Division of Ecological Restoration. The work will include removal of the dam structure and shifting the channel away from a historical mill building. Once completed, the work will reconnect 27 miles of stream in the upper reaches of the Manhan River.

WINCHELL RESERVOIR DAM REMOVAL—GRANVILLE, MA

Served as project engineer for the removal of this unused water supply dam in Granville, Massachusetts. The design and permitting of dam removal projects typically require several years to complete, but this project proceeded from the beginning of investigation to the completion of construction in nine months, making it the fastest non-emergency dam removal in recent history.

TEKOA RESERVOIR DAM REMOVAL—MONTGOMERY, MA

Provided technical support for the removal of this unused water supply dam in Montgomery, Massachusetts.

UPPER FLINT POND DAM REHABILITATION—BOSTON, MA

Project Manager for rehabilitation of the dam that supports Upper Flint Pond, an inland pond that supports extensive waterfowl habitat in suburban



metropolitan Boston. The work included hydrologic and hydraulic modeling that was calibrated to observations recorded during the 2006 Mother's Day Storm, design of a combination of a replacement spillway and overtopping protection, and extensive support with abutting landowners for obtaining an easement.

BAXTER GRIST MILL DAM RESTORATION—YARMOUTH, MA

Designed restoration of the dam at this National Register of Historic Places-listed site in Yarmouth, Massachusetts, including a new fish ladder, with finishes to mimic the historical character of the existing dam. The fish ladder was designed to serve as both a high-flow spillway and low-flow conveyance.

MASSACHUSETTS DIVISION OF FISHERIES AND WILDLIFE—MASSACHUSETTS

Assists this state agency to prioritize and implement projects at the dams in its ownership portfolio to make use of limited funding as it becomes available. Work has included prioritization of repairs at the Significant-hazard dams that it owns; coordination tree removals; geotechnical investigation; development of alternatives for dam rehabilitation; and design, permitting, and construction administration of limited-scope repair projects at several dams. Helped agency develop a better funded capital program and continue to assist with its execution.

HIGH-HAZARD POOR CONDITION PRIVATE DAMS STUDY—MASSACHUSETTS

Project manager for an evaluation of the status of 14 High-hazard, Poor-condition dams for the Massachusetts Office of Dam Safety at the request of the Governor. The work included interviews with the dam owners, when known, and the communities where the dams are located to help determine why no progress on compliance is being made and evaluate options for bringing the dams into compliance with the dam safety regulations. The work was completed in less than 3 months.

MCTAGGART'S POND DAM EVALUATION—FITCHBURG, MA

Managed a feasibility evaluation that will assist the City of Fitchburg determine whether to remove or rehabilitate this aging dam.

LOWER POND DAM EMERGENCY RESPONSE

Provided emergency response to development of a sinkhole on the upstream face of this High-hazard dam. Tasks included assessment of the situation under cover of darkness, coordination notifications to the Office of Dam Safety and the local emergency management director, repair design development and permitting, bidding assistance, and construction observation.

ASHFIELD LAKE DAM REPAIRS—MASSACHUSETTS

Served as project manager and engineer for repair of this dam that provides swimming and boating opportunities for this rural community in western Massachusetts. Performed the Hydrologic/Hydraulic analysis, developed repair and upgrade recommendations, prepared design plans and specifications, obtained required permits, and provided grant assistance and construction administration services.

EMERGENCY ACTION PLAN UPDATES

Developed Tighe & Bond's current High-hazard Emergency Action Plan (EAP) format for consistency with FEMA's Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners, and prepared dam breach analyses and Emergency Action Plans for high-hazard dams in Massachusetts to meet Office of Dam Safety requirements. Projects since the beginning of 2012 include work on 35 EAPs across the state.





LUCAS ACABA, EIT, CERPIT

PROJECT ENVIRONMENTAL SCIENTIST

Lucas Acaba is an environmental scientist with experience in ecological restoration, wetland delineation and permitting, wetland replication, and natural resource assessment. He also has environmental engineering expertise specializing in industrial wastewater treatment and hazardous waste management. He holds certificates in wetland delineation from Rutgers University, invasive plant management from UMass Amherst, botany through the Native Plant Trust, and is a Certified Ecological Restoration Practitioner in Training through the Society for Ecological Restoration.

EXPERIENCE

6 Years

SPECIALTIES

Ecological Restoration
Invasive Species Management
Wetland Delineation
Regulatory Compliance

EDUCATION

Bachelor of Science
Environmental Engineering
Worcester Polytechnic Institute

LICENSES & REGISTRATIONS

Engineer-in-Training
MA #27005
Wastewater Treatment Operator 4I
MA #19149

PROFESSIONAL AFFILIATIONS

Society for Ecological Restoration
Society of Wetland Scientists
Native Plant Trust

WETLANDS AND ECOLOGICAL SERVICES

WETLAND DELINEATION AND PERMITTING

Conducted wetland delineations and prepared permit submissions in accordance with local, state, and federal regulatory programs to support a wide variety of projects.

WETLAND RESTORATION AND REPLICATION

Prepared wetland replication plans, supervised the construction of wetland restoration and replication areas, and monitored sites to determine corrective actions.

ECOLOGICAL RESTORATION

Prepared land management proposals and performed field work to manage invasive plants and restore native vegetation on a variety of projects including pollinator gardens/meadows, floodplain, and salt marsh restoration.*

NATURAL RESOURCES INVENTORY—MOUNT WASHINGTON, NH

Conducted vegetation surveys and Ecological Integrity Assessments for natural communities on the Mount Washington summit. Included the development of rare, native, and non-native alpine plant identification guides.

BERKSHIRE NATURAL RESOURCES COUNCIL CR BDR—MONTEREY, MA

Field inspection of boundary markings, site conditions, and natural resources for ~450 acres of property newly under Conservation Restriction on behalf of Berkshire Natural Resources Council.*

ARLINGTON INVASIVE PLANT MAPPING—ARLINGTON, MA

Created maps and reports for ~25 parks and small conservation areas documenting invasive plant species, densities, and management strategies for the Town of Arlington.*

REGULATORY COMPLIANCE

RCRA HAZARDOUS WASTE PROGRAM

Maintained a written RCRA compliance program detailing hazardous waste management requirements and best practices to be implemented at various manufacturing and engineering facilities.*

**With previous firm*



DRY BRIDGE ROAD WATER TREATMENT PLANT RIVERFRONT AREA IMPROVEMENTS WESTFIELD, MA

OWNER City of Westfield



Tighe & Bond assisted the City of Westfield, Massachusetts Department of Public Works (DPW) with the development and execution of a Riverfront Area Improvements Plan to meet a Special Condition of a permit issued by the Westfield Conservation Commission associated with construction of the Dry Bridge Road PFAS Water Treatment Plant. The project site, located at Westfield's water supply Well Number 2 near the bank of Pond Brook, a perennial stream, was degraded by remnant building foundations as well as two large stands of invasive Japanese Knotweed (*Fallopia japonica*). The Riverfront Area Improvement Plan approved by the Conservation Commission consisted of the removal of concrete foundations and treatment of Japanese Knotweed by smothering.

Use of the smothering method was selected over the application of herbicides due to the site's proximity to a public drinking water supply well. Plants were cut to the ground in early June after the period of spring growth. A layer of mulch was subsequently applied over the plant stubs to prevent puncturing of the smothering tarp. Thick black plastic tarps (7mm) were installed, extending 5 to 10 feet beyond the management area on all sides. The tarps were then secured with riprap around the borders and along tarp seams.

Formal monitoring of the project site and tarped areas was conducted by a Tighe & Bond Environmental Scientist each May and October for a period of five years. Monitoring reports summarizing observations and including site photographs were prepared and were provided to the DPW and Conservation Commission following each event. Individual Japanese Knotweed plants observed outside the smothering areas were spot-treated with herbicides or removed mechanically by DPW staff to prevent spread. No growth of Japanese Knotweed through the tarps was observed.

The smothering tarps were removed at the end of the prescribed five-year treatment period. The upland site was re-seeded with grass and the riparian area was replanted with native seed mix and shrubs. No growth of Japanese Knotweed was observed in the month following tarp removal.

The Conservation Commission assessed the project's compliance with their specified conditions and issued a Certificate of Compliance, closing the permit under the Massachusetts Wetlands Protection Act and Westfield Wetlands Protection Ordinance for the water treatment plant construction project.

SERVICES

Development of Riverfront Area Improvements Plan

Invasive Species Monitoring and Reporting

MILE-A-MINUTE VINE CONTROL

SHELTON, CT

OWNER

Eversource Energy



SERVICES

Invasive Species Management

Tighe & Bond provided construction stormwater and environmental support to Eversource Energy in the rebuilding of electric transmission lines, including the replacement of tower structures and conductor and ground wires. During the development of the project for construction, areas of Mile-a-minute vine (*Persicaria perfoliata*, MAM) were identified.

Tighe & Bond worked with Eversource and licensed herbicide applicators to treat approximately 1.3 acres of right-of-way during construction activities. Work included field mapping of plant locations with GPS, preparing mapping of the extent of MAM for the project team, field marking areas for herbicide treatment, monitoring plant survival/regrowth and mapping for a second treatment, and construction contractor training.

The goal of the work was to reduce the seed production of MAM during construction to limit the potential spread to construction areas. The contractor training was developed to avoid the potential spread of seeds by the project. Areas disturbed by construction were seeded to vegetate open soils and reduce the opportunity for MAM regrowth.

MILL POND SWITCH YARD AND L117 TRANSMISSION LINE

PORTSMOUTH, NH

OWNER

Eversource Energy



SERVICES

Invasive Species Monitoring

GPS Survey

Species Management

Tighe & Bond provided invasive species assessment, management, monitoring, and reporting services for the Public Service Company of New Hampshire (PSNH) d/b/a Eversource Energy for the construction of the Mill Pond Switch Yard and L117 Transmission Line Project in Portsmouth, New Hampshire. The New Hampshire Department of Environmental Services (NHDES) required baseline surveys of the project area to document invasive plant presence and relative density in order to document whether construction activities upon project completion contributed to the establishment or spread of invasive plants.

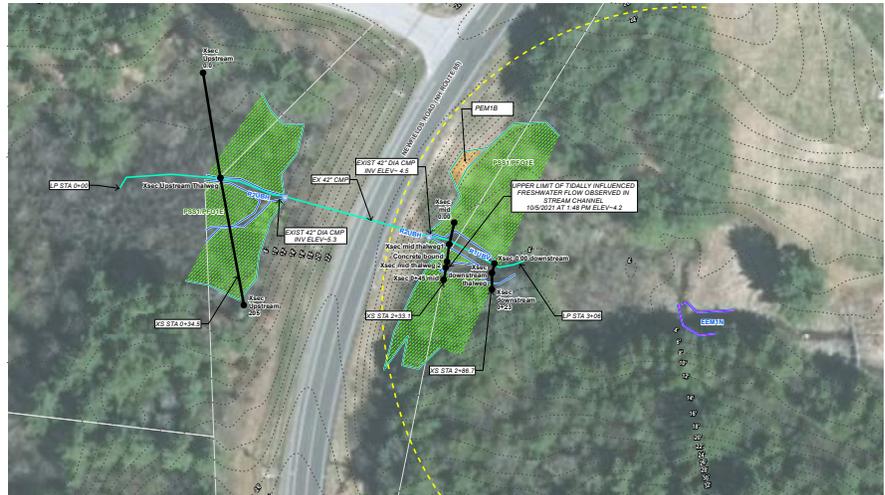
Tighe & Bond conducted a field assessment of existing invasive plants, identified plants to species level, documented their relative density, and completed a GPS survey of the location of each plant or population. Using this information, Tighe & Bond developed GIS-based site plans showing the extent and density of invasive plants at the site and drafted a Wetland Invasive Species Control Plan (WISCP) to guide PSNH through recommended best management practices to minimize the spread of invasive plants during construction. The WISCP also provided appropriate management options for the species observed, and established a framework for two years of post-construction monitoring to detect the spread of any invasive plants as a result of construction. Tighe & Bond conducted monitoring events at the end of each growing season for two years, surveyed any changes in the plant populations, and provided revised mapping and management recommendations for PSNH following each event.

NHDOT ON-CALL COASTAL WETLAND AND ENVIRONMENTAL SERVICES

VARIOUS, NH

OWNER

New Hampshire Department of Transportation



SERVICES

Coastal Functional Assessments and Vulnerability Assessments

Wetland Delineation

Assessment of Coastal, Tidal, Resiliency, and Wetland Functions

Permitting

Environmental Documentation Development

Wetland Mitigation Construction Monitoring

Wetland Mitigation Monitoring Reports

Invasive/Endangered Species and Rare Plant Identification

Natural Resource Agency Coordination

Tighe & Bond has an ongoing on-call contract with the New Hampshire Department of Transportation to perform wetlands and environmental services. Some key projects part of this contract include:

Wetland Assessment of the Rocky Hill Brook Culvert Repair — NH

Route 85 — Exeter, NH: Tighe & Bond provided wetland delineations along Rocky Hill Brook within and adjacent to the NH Route 85 right-of-way in accord with New Hampshire Department of Environmental Services (NHDES) Wetland Rules and Corps of Engineers Manuals. Tighe & Bond also provided classification and assessment of wetlands, identification and location of potential vernal pools, location of jurisdictional limits of surface waters of the State of New Hampshire within the project area, and determination of proposed culvert work within 250 LF of tidal wetlands. In addition, the work included completion of the NHDES Stream Crossing Worksheet for the Rocky Hill Brook in proximity of the culvert repair.

Invasive Species Management Plan Exit 4 I-292 North Off-Ramp to Queen City Avenue — Manchester, NH:

Tighe & Bond mapped and documented site features associated with an invasive management plan, including vegetation types, concentration of invasive plant and native species, wetlands, and water bodies. Wetlands were delineated in accord with NHDES and Corps of Engineers. Potential vernal pools were identified, and surface waters of the State of New Hampshire were delineated. Alternation of Terrain Permit requirements were also identified. Tighe & Bond worked with NHDOT to prepare an Invasive Species Management Plan with removal and protection strategies, along with a review of wells and public water supply intakes associated with a Watershed Special Permit.