

2012
New Hampshire Department of Agriculture, Market & Food
Invasive Species Control Project for
Highway Right-of-Ways

Re: ROW Special Permit #SP-163

Introduction

This is the end of the year report for 2012 detailing the results of the invasive species control efforts associated with herbicide applications along highway right-of-ways. The project is being conducted by Douglas Cygan, Invasive Species Coordinator for the NH Dept. of Agriculture, Markets & Food (DAMF) in cooperation with the NH Dept. of Transportation (DOT).

Herbicide applications were conducted from August 8, 2012 through October 24, 2012. The treatment areas include the right-of-ways and medians for the following highway systems: Interstates 93 & 393, Routes 1A & 1B, 3, 4, 11, 25, 106 and 114 (See Aerial Map for locations). The total length of highways canvassed and where treatments occurred was approximately 80 miles. The treatment methods mainly consisted of Low Volume Basal Bark (LVBB) for most woody plants species include Autumn olive-*Elaeagnus umbellata*, Glossy buckthorn-*Frangula alnus*, Honeysuckle-*Lonicera spp.*, and Burning bush-*Euonymus alatus*. Foliar spray applications were used for the control of Japanese knotweed-*Polygonum cuspidatum*, Glossy buckthorn-*Rhamnus frangula* (seedlings and saplings), and Japanese barberry-*Berberis thunbergii* (See table 1 on page 3, and the enclosed Daily Report). Tracking of the treatment locations was documented using a camera with GPS logging capabilities. The photos are uploaded into Google Earth and appear on the maps where they were taken. These photos are stored on my work computer.

Observations

Based on visual inspections within the last few weeks, the results of this project appear to be very positive with approximately 85% of woody invasives treated showing complete mortality (Photo 1), and the remaining 15% exhibiting extensive, but not complete, dieback (Photo 2). The dominant invasive shrubs were large, mature, multi-stemmed Autumn olives with low branching habits. This characteristic appears to have impeded or slowed the immediate efficacy of the treatments. Given time, it is possible that the herbicide will have more of an affect on these plants during the winter months and become evident next spring. Follow up monitoring will continue next year and, where necessary, subsequent treatments will be applied (pending approval of 2013 Special Permit).

Photo 1 – Showing one of many Autumn olive, *Elaeagnus umbellata*, shrubs treated using the Low Volume Basal Bark method that resulted in 100% dieback. This particular shrub is located in the ROW for I-393 heading eastbound where Exit 3 off-ramp (for Rte 106) diverges.



(Photo taken on November 1, 2012)



Photo 2 – Shows one of the few Autumn olive shrubs that comprises the 15% that did not completely die. This example has at least one branch still retaining its foliage, which exhibits yellowing and, therefore, may be symptomatic. This shrub is located in the ROW for Rte 106 heading northbound just past the I-393 interchange.

(Photo taken on November 1, 2012)

Treatment Procedures and Methods

Low Volume Basal Bark – This method proved to be very effective and efficient for the treatment of woody invasive plants. The reason for selecting this method over foliar spray was to avoid and/or minimize off target impacts to desirable vegetation, and to apply the herbicides as quickly as possible. The application rate used was a 20% solution of Garlon 4 Ultra (a.i. triclopyr) mixed with Canola Oil as a diluent, the lowest rate allowed by label. The reason for selecting Canola Oil, versus Diesel or Kerosene as the diluent, was for safety and environmental reasons, and because it's relatively odorless.

Stems greater than ½" and larger were sprayed using a Solo hand pump backpack sprayer equipped with a flat fan nozzle at the end of the wand. The nozzle was angled vertically allowing thorough coverage of all stems. The pressure needed to get a good spray pattern was relatively low with an average of about 15-20 psi, but ranged from 10-40 psi. Both the nozzle and low pressure helped minimize potential drift. The applications were made by spraying the lower 12-18" of each stem on all accessible sides (some ground level branching made it impossible to treat the bottoms) until wet.

Foliar Spray– The majority of invasive plants treated using this method were Japanese knotweed, *Polygonum cuspidatum*. Along I-93 southbound just north of exit 20 in Tilton there are dense populations, essentially a monoculture, of young Glossy buckthorn, *Rhamnus frangula*, occurring in the right-of-way. The majority of which are less than 3-feet in height, but very dense so a foliar spray of glyphosate was used.

In several locations, Japanese knotweed formed very large, tall, dense thickets (Photo 3), and therefore, a mist blower was used to deliver a 4-5% solution of Roundup-Pro (a.i. glyphosate) to thoroughly wet the foliage. Some of the larger populations measured -20' in depth by -50' in length by 7-8' tall. These dense stands made it difficult to treat, even with a mist blower, to ensure full herbicide penetration and coverage all the way to the center. Other smaller populations were treated using a Solo hand-pump backpack sprayer with a flat-fan nozzle. All Japanese knotweed treatments occurred post flowering period to avoid foraging honeybees. Applications done this time of year also coincide with the downward movement of carbohydrates into the knotweed's rooting system for overwintering and spring rejuvenation. However, waiting till after flowering significantly reduces the period of time when Japanese knotweed can be treated (-2-4 weeks), especially when applications are being done on a statewide level.

Photo 3 – Numerous dense stands of Japanese knotweed, *Polygonum cuspidatum*, growing the median of I-93 just north of Exit 24 in Ashland.



(Photo taken on September 17, 2012)

With treatments for Japanese knotweed occurring during the early – mid fall season, winter dormancy starts to have an affect on its growth and appearance. Leaves start turning yellow once temperatures start to drop below 40°F thus making it very difficult to assess the overall effectiveness of herbicide treatments. However, based on observations, the treatments appeared to cause mortality for those plants where herbicide came in contact with the leaves. The larger stands (those that were greater than 10 feet deep) with dense foliage seem to have inhibited the penetration of herbicide mist from reaching the middle of the stands and so those stems retained their greenish foliage for a longer duration, at least 2-weeks following treatment.

Along I-93 north of Exit 20 in Tilton there are dense monocultures of Glossy buckthorn, *Rhamnus frangula*, occurring in the right-of-way and median areas (Photo 4). The majority of which are in the seedling or sapling stage making it somewhat easy to treat them using a foliar application method. Since Glossy buckthorn retains it's foliage longer into the fall than most native species it allowed glyphosate to be used with minimal off target impacts to grasses and other dormant ground covers. Most of these invasive woody shrubs are small, single stemmed saplings. Their relatively young age and short height (<3' tall) made them conducive to being treated using a foliar spray of Roundup Pro Concentrate.

Highway	I-93	I-393	1A	1B	3	4	11	25	106	114
Approximate extent of highways where invasive species control work and surveys occurred (-80 miles in total)	20 miles	4 miles	¼ miles	¼ miles	11 miles	3 miles	1 mile	9 miles	20 miles	11 miles
Autumn olive- <i>Elaeagnus umbellata</i>	✓	✓	✓		✓	✓			✓	
Burning bush- <i>Euonymus alatus</i>	✓	✓				✓			✓	
Glossy buckthorn- <i>Rhamnus frangula</i>	✓	✓			✓				✓	
Honeysuckle- <i>Lonicera spp.</i>	✓	✓	✓						✓	
Japanese barberry- <i>Berberis thunbergii</i>	✓	✓							✓	
Japanese knotweed- <i>Polygonum cuspidatum</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Multiflora rose- <i>Rose multiflora</i>	✓	✓							✓	

Table 1 – The information listed in this table includes the overall distance of the project areas and the type of invasive plants treated within each highway system.



Photo 4 – Monoculture of Glossy buckthorn seedlings and saplings occurring along the I-93 southbound right-of-way. Note that grasses and other native plants have gone into dormancy.

(Photo taken on November 5, 2012)

Herbicides

Garlon 4 Ultra - EPA Registration # 62719-527. During the application period from early August through late October, approximately 2,690 woody invasive plant stems were treated using the LVBB method. Total volume of herbicide used at 20% solution was 345.6 oz (2.7 gal), which when diluted with Canola Oil made 13.5 gallons of tank mix.

2,690 stems
20% solution
2.7 gallons
13.5 gal tank mix

Roundup Pro Concentrate- EPA Registration #524-529. In all, approximately 23 acres of right-of-way (ROW) were treated using 4-5% solution as a foliar spray applied via backpack or mist blower. In total 361.25 oz (2.8 gal) of herbicide was used, which when diluted made 56 gallons of tank mix. An anti-drift adjuvant was added to avoid drift and applications were done primarily when there was no wind or less than 5mph.

23 acres
4-5% solution
2.8 gallons
56 gal tank mix

Conclusion

The results of this year’s herbicide treatment program for controlling invasive species exceeded expectations. The percentage of mortality is estimated to be approximately 85% with the remaining 15% showing significant dieback, but with a small percentage of foliage still retained and non-symptomatic. To help evaluate these results I met with Brandon Dulap, Field Representative for Dow Agrosciences, and another rep from Maine on September 16, 2012., to review and discuss possible reasons why certain stems/branches failed to be affected. Their impression was that there is no logical reason and that the results of the combined application efforts were better than they normally would have expected.

Estimated percent control for observed invasive species treated	Autumn olive	Burning bush	Glossy buckthorn	Honeysuckle	Japanese barberry	Japanese knotweed	Multiflora rose
Garlon 4 Ultra	85%	????	95%	90%	????	N/A	????
Roundup Pro Concentrate	N/A	N/A	????	N/A	N/A	????	N/A

???? = Results not yet known

Off target impacts were minimal and limited to small patches of grass around the base of some of those plants treated. The amount of herbicide used was kept to a minimum for experimental purposes (20% solution of Garlon 4 Ultra and 4-5% solution of Roundup Pro).

During the 2013 growing season, I will continue to monitor the 15% of the plants that didn’t fully succumb to the herbicide treatments. Follow-up treatments will be applied as needed and application rates may be adjusted to increase efficacy.



BEFORE

Large, mature Autumn olive shrub prior to herbicide treatment. Located off of Rte 106 near I-393 interchange.



AFTER

The same Autumn olive as pictured above, but taken 3-weeks following herbicide treatment.

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