

**2013 Knotweed Treatment
In the Cedar River Municipal Watershed**

**Annual Report
Seattle Public Utilities and Neighborhoods Committee
Seattle City Council**



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BACKGROUND

In August, 2010, Seattle City Council, recognizing both the extreme ecological threat posed by the highly invasive species Bohemian knotweed (*Polygonum x bohemica*) and the limited options for treatment, passed an ordinance amending the Cedar River Municipal Watershed Secondary Use Policy Number 6-13 to allow limited application of the herbicide Imazapyr to treat knotweed within the municipal watershed. This ordinance was effective through December 31, 2012. During these three years, 15.9 acres of knotweed were treated with herbicide, with 7.7 acres treated three times (2010-2012), 7.9 acres twice (2011 and 2012), and 0.3 acres once (2012). Of the 15.9 acres treated with herbicide, only 2.1 acres were located on land that drains into the Cedar River, i.e., within the hydrographic boundary.

Total cost to treat this amount of knotweed with herbicide was \$4,800 per acre through 2012. This compares with a cost of approximately \$44,000 per acre to treat small scattered patches of knotweed by covering with geotextile fabric, a treatment we tried experimentally on a total of 4.5 acres from 2004 to 2012. Covering was only marginally successful, with several larger patches still alive after more than six years of continual covering.

Water quality tests were conducted after each herbicide treatment, and no imazapyr was detected in the municipal water supply, at a detection limit of 0.02 parts per billion. A detailed description of the Major Watershed Invasive Species Program, the rationale for the knotweed program, and the three years of herbicide treatment and results can be found in the report, *Knotweed Treatment through 2012, Cedar River Municipal Watershed*, available in the Project plans and reports section of the City of Seattle Habitat Conservation Plan website: (http://www.seattle.gov/util/EnvironmentConservation/OurWatersheds/Habitat_Conservation_Plan/ManagingtheWatershed/StreamRiparianHabitatRestoration/Metrics/index.htm).

NEED FOR CONTINUED TREATMENT, NEW ORDINANCE IN 2013

In early 2010, preliminary data had suggested that three consecutive years of herbicide treatment might be sufficient to kill large patches of knotweed. Subsequent data, however, has indicated that it usually takes at least five years of treatment to achieve greater than 98% mortality. One or two years of herbicide treatment are virtually always insufficient to achieve significant mortality because the huge root mass of knotweed is very difficult to kill. If we discontinued herbicide treatment in 2013, more than eight acres (those which had received only one or two herbicide treatments) and possibly all 15.9 acres would re-grow to knotweed, meaning the effort and resources already expended would have been wasted. In addition, the ecological risk posed by the knotweed would return and would put at risk the extensive and expensive on-going projects to control knotweed along the Cedar River downstream of the Landsburg Diversion Dam (for more information on this lower Cedar River Restoration Program see: http://www.seattle.gov/util/EnvironmentConservation/OurWatersheds/Habitat_Conservation_Plan/ManagingtheWatershed/DownstreamHabitat/CommunityPartnership/index.htm)

Consequently, in May of 2013, Seattle Public Utilities (SPU) requested that the Seattle City Council pass a follow-up ordinance to allow treatment of knotweed with imazapyr for an additional three years (2013 – 2015). Ordinance Number 124191 (Council Bill Number 117765) was passed on May 28, 2013. It was virtually identical to the one passed in 2010, limiting

herbicide treatment to only Imazapyr used on knotweed, with water quality testing after each treatment, ongoing monitoring, and annual reports to City Council.

SURVEYS

As part of the 2013 ordinance process, SPU staff met with interested stakeholders, including representatives of the Sierra Club. They suggested that we conduct extensive off-road surveys to ensure that we had discovered all of the major knotweed patches, so we could be sure to treat them under this current ordinance. SPU management agreed that this was important to the success of the project and allocated additional resources in 2013 to start addressing this issue.

Based on the location of known knotweed patches, streams and water bodies, and deciduous forest canopy, initial survey locations were identified on a Geographic Information System map (Figure 1). These areas were classified into high and medium priority based on proximity to known knotweed sources, and were refined throughout the year based on what was found on the ground. The final survey target was 2,335 acres of high priority areas (about 2.5% of the municipal watershed area) and 850 acres of medium priority sites (about 0.9% of the municipal watershed).

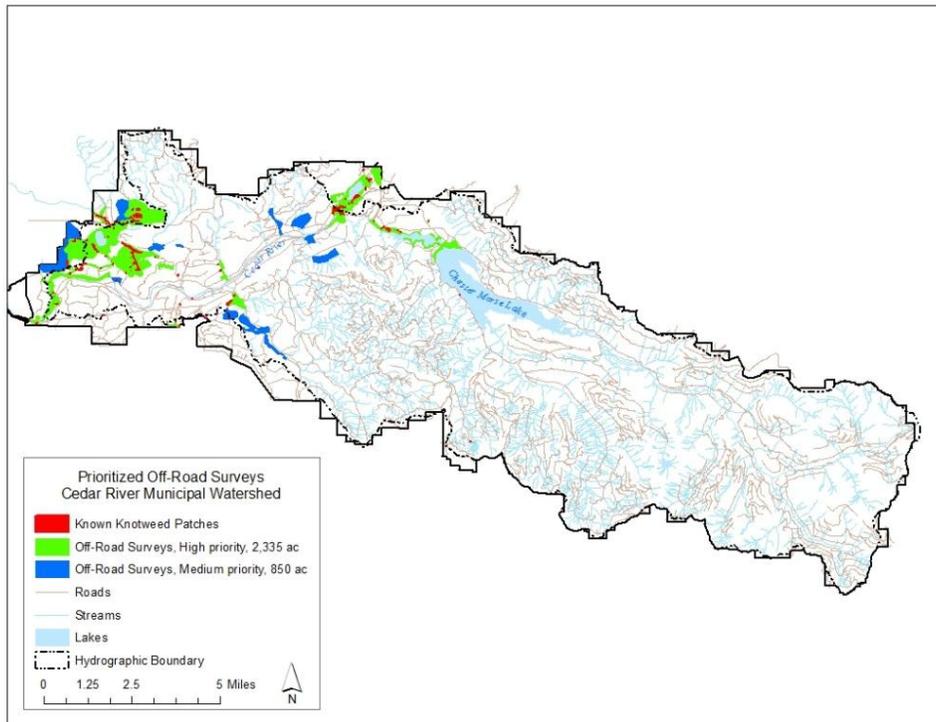


Figure 1. Location of proposed off-road knotweed surveys

A total of 1,311 acres of off-road habitat was surveyed for knotweed in 2013, 1253 acres in high priority areas and 58 in medium priority (Figure 2). We focused on those areas in closest proximity to known knotweed patches in the high priority areas. Surveys in the medium priority areas were done as part of other field work. Areas surveyed from 2010-2012 were not re-surveyed, as it was assumed that any knotweed present would have been found at that time. These totaled an additional 318 acres surveyed. Approximately 1,100 acres of high priority sites

and 800 acres of medium priority remain to be surveyed. We will continue to survey the high priority habitat in 2014 as staffing and funding allow.

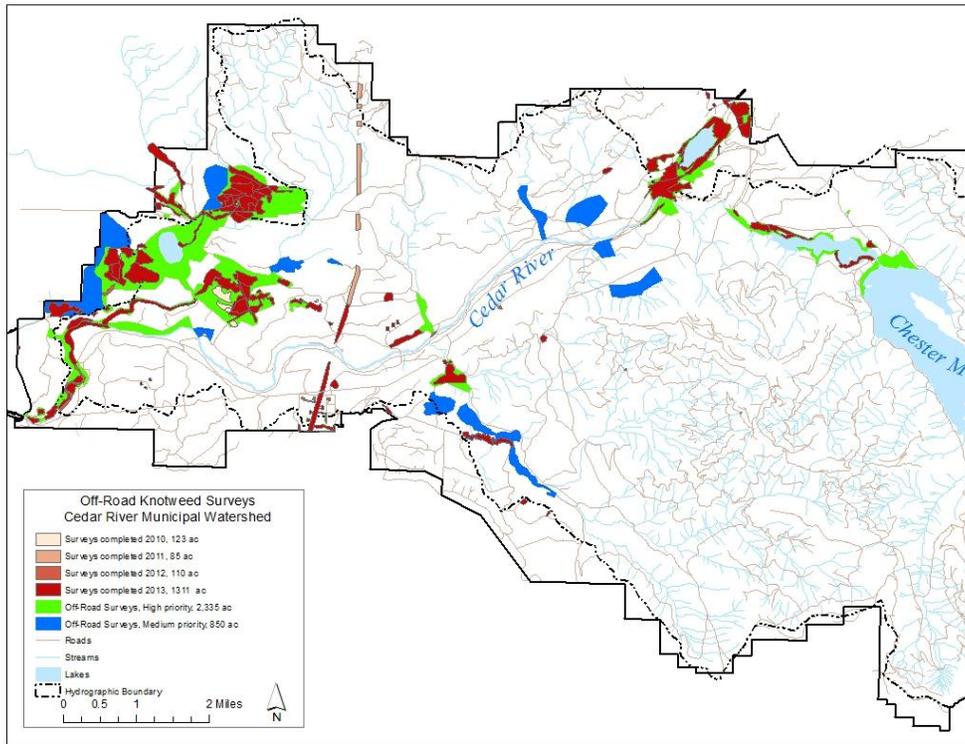


Figure 2. Off-road areas surveyed for knotweed, 2010 – 2013.

Navigating the off-road survey areas was extremely difficult, as much of the area was dominated by salmonberry (*Rubus spectabilis*) and non-native blackberries (*Rubus laciniatus* and *R. armeniacus*). In order to maximize the information obtained for the effort expended, qualified biologists conducted comprehensive surveys, documenting not only knotweed, but other non-native invasive species as well. This took essentially the same amount of time, but yielded far more information that will be useful in future management decisions.

The surveys were very productive and we quickly found several more large patches of knotweed, totaling 2.15 acres, all of which were treated in 2013. In addition, in 2013 we conducted a comprehensive survey of over 380 miles of road as part of the Early Detection/Rapid Response protocol used by the Major Watersheds Invasive Species Program. No new knotweed patches were found during these road surveys.

TREATMENT LOGISTICS

We used the same application method and herbicide concentration as in 2010 – 2012, i.e., a targeted backpack foliar spray of 1% Imazapyr mixed with a 1% modified vegetable oil surfactant and a non-toxic blue dye in water. The same safety procedures were followed, with certified herbicide applicators on site and doing all the mixing of the tank solutions. No spills,

injuries, or any adverse effects were incurred by SPU staff or the contract crew members conducting the applications.

AREA TREATED WITH HERBICIDE

We re-treated all areas previously treated with herbicide in 2010-2012 (7.7 acres for the fourth time, 7.9 acres for the third time, and 0.3 acres for the second time, for a total of 15.9 acres). As a result of the increased off-road survey effort, an additional 2.15 acres of knotweed was treated for the first time in 2013 (seen in purple in Figure 3). Most of the newly discovered patches were in or near the old Taylor Townsite and ditch. In addition, there were three patches near the watershed boundary, one near the western border, one near the southern border, and one near the northern border, north of Rattlesnake Lake. All of these newly discovered sites were outside the hydrographic boundary. Only one newly discovered patch (0.1 acre) was inside the hydrographic boundary, located north of the Masonry Pool in a site where fill from an old dredging project had been placed for storage.

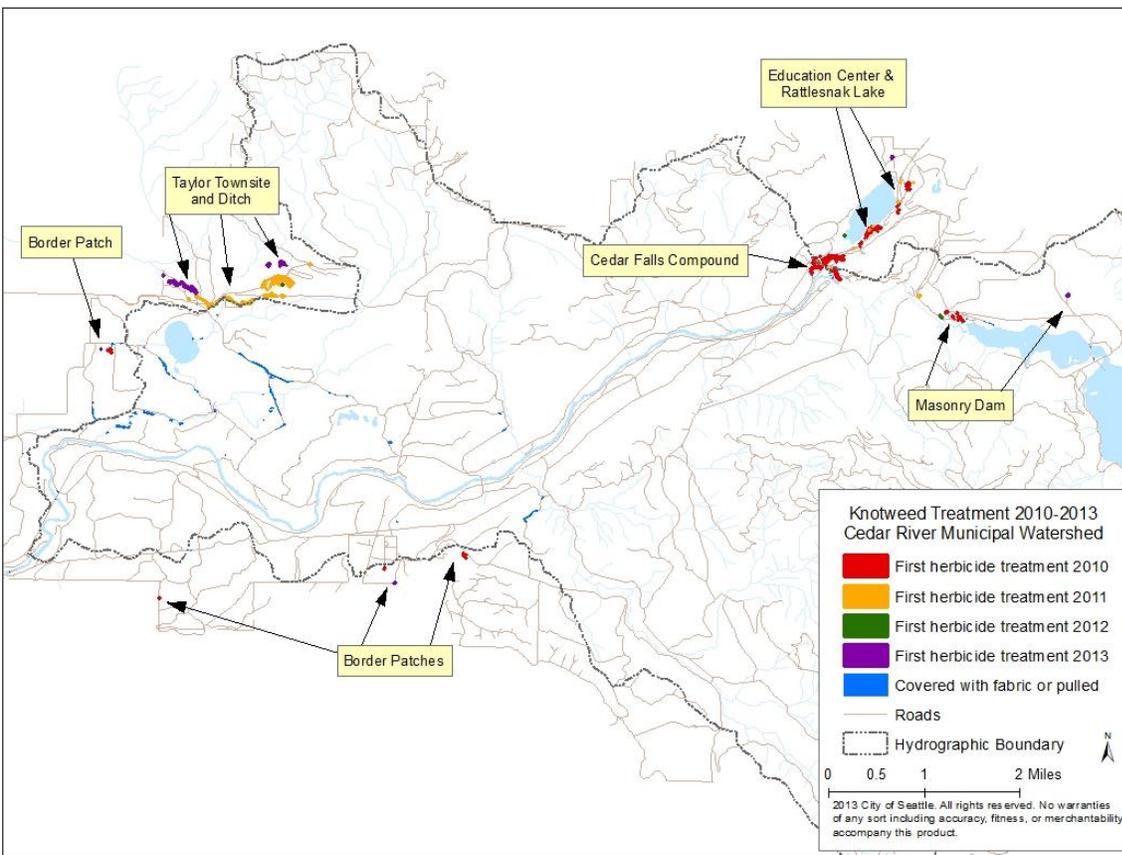


Figure 3. All known knotweed by treatment year in the Cedar River Municipal Watershed

In summary, a total of 18.0 acres of knotweed was treated with herbicide in 2013, of which only 2.23 acres were within the hydrographic boundary of the Cedar River (Table 1). As in previous years, areas that had no previous treatments were pre-treated by bending the canes approximately two months before the herbicide application. No pre-treatment was required for any of the patches that had received one or more treatments.

Table 1. Number of knotweed-infested acres treated with Imazapyr by site and year

Cedar River Hydrographic Boundary	Site	Number acres	Treated in 2010	Treated in 2011	Treated in 2012	Treated in 2013	Total Treatments through 2013
Inside		0.31	X	X	X	X	4
	Masonry Dam	0.08		X	X	X	3
		0.19			X	X	2
		0.10				X	1
	Cedar Falls	1.55	X	X	X	X	4
	Total Inside	2.23					
Outside	Cedar Falls	1.71	X	X	X	X	4
		0.04		X	X	X	3
	Ed Center/Rattlesnake Lake	3.04	X	X	X	X	4
		0.06		X	X	X	3
		0.08			X	X	2
	Border	0.11				X	1
		1.11	X	X	X	X	4
		0.02		X	X	X	3
		0.31				X	1
	Taylor	7.66		X	X	X	3
		0.01			X	X	2
1.63					X	1	
	Total Outside	15.78					

IMAZAPYR TREATMENT RESULTS

All sites that had received three previous treatments still had numerous small to medium knotweed plants scattered throughout the site (Figures 4 and 5). Results at sites after one or two treatments were similar to those seen in 2012 (see the 2012 Knotweed Report referenced earlier for photos illustrating the amount of growth seen after fewer treatments).

AMOUNT OF IMAZAPYR APPLIED

As reported in 2012, we averaged about 15 to 20 ounces of imzapyr per acre on sites receiving a second treatment and about 10 ounces on sites receiving a third treatment. Sites receiving a fourth treatment averaged three to six ounces per acre. Sites receiving a first treatment in 2013 averaged 40 to 64 ounces per acre. Total amount of imazapyr applied was 163 ounces spread over 18 acres. Of this, a total of nine ounces was applied inside the hydrographic boundary spread over 2.2 acres.



Figure 4. Knotweed growth after three treatments, near the Education Center



Figure 5. Small knotweed plants seen in a forested border patch after three treatments

WATER QUALITY TEST RESULTS

As in previous years, water samples were taken both before (baseline) and after (post-treatment) the herbicide application. All water samples were analyzed for Imazapyr at Pacific Agricultural Laboratory (PACLAB) in Portland, Oregon. PACLAB specializes in analysis of all types of

pesticides and has an extremely low detection limit for Imazapyr (0.02 ug/L, or 0.02 parts per billion). No Imazapyr was detected in any of the water samples from the municipal water supply in the Cedar River (either at the point closest to a knotweed patch = 250 feet away from a patch or at the Landsburg water supply intake facility), or from Rattlesnake Lake.

As in previous years, the sample from the small creek at the Taylor Townsite, which flows into the Taylor Overflow Ditch and eventually reaches Issaquah Creek (does not drain into the Cedar River system) did contain small amounts of Imazapyr. In 2013, there was a peak reading of 0.46 ug/L (parts per billion). This is somewhat higher than found in 2011 and 2012, likely because the sample was taken just downstream from a culvert that drained directly from the large new patch that received its first treatment. This level is still many orders of magnitude below levels that have been proven to have no adverse effect on humans or animals.

As in previous years, the creek went surface dry further downstream from the sample site. A sample taken two months after the patch was treated had declined down to the detection limit (0.02 ug/L).

2014 PLANNED MONITORING, TREATMENT, SITE RESTORATION

We plan to monitor all the knotweed patches and re-treat with Imazapyr as needed in 2014. We anticipate that those sites that have received three or fewer treatments will require similar amounts of herbicide to that seen in the past three years. We will not know the results of treatment number four until late summer, and may or may not need to treat these sites in 2014. We will continue to conduct off-road surveys in high priority areas as funding and staffing allows, and will continue to monitor for knotweed patches during our annual road and gravel pit surveys. If we find any additional knotweed patches, we treat them in 2014 under the current ordinance.

In 2013 the Friends of the Cedar River Watershed, in conjunction with SPU, received a 5-year King Conservation District grant to restore the area near the Education Center to native trees and shrubs. The grant funds a total of 12 volunteer events and four weeks of Washington Conservation Crew time spread over the five years. These groups will aid in clearing the site of invasive blackberry, ivy (*Hedera helix*), locust (*Robinia pseudoacacia*), and bindweed (*Convolvulus arvensis*) that have begun to invade the area formerly dominated by knotweed. In addition, the grant will purchase approximately 2800 native trees and shrubs that will be planted, mulched, and tended by the volunteers and crews.

SPU will clear other invasive plant species and plant native trees in the other knotweed sites as needed, with the goal of restoring these sites to a naturally functioning ecosystem. In 2014 we plan to plant about 1300 native conifer trees at the old Taylor Townsite. We will plant the other large knotweed sites as needed and as funding and staffing allows.