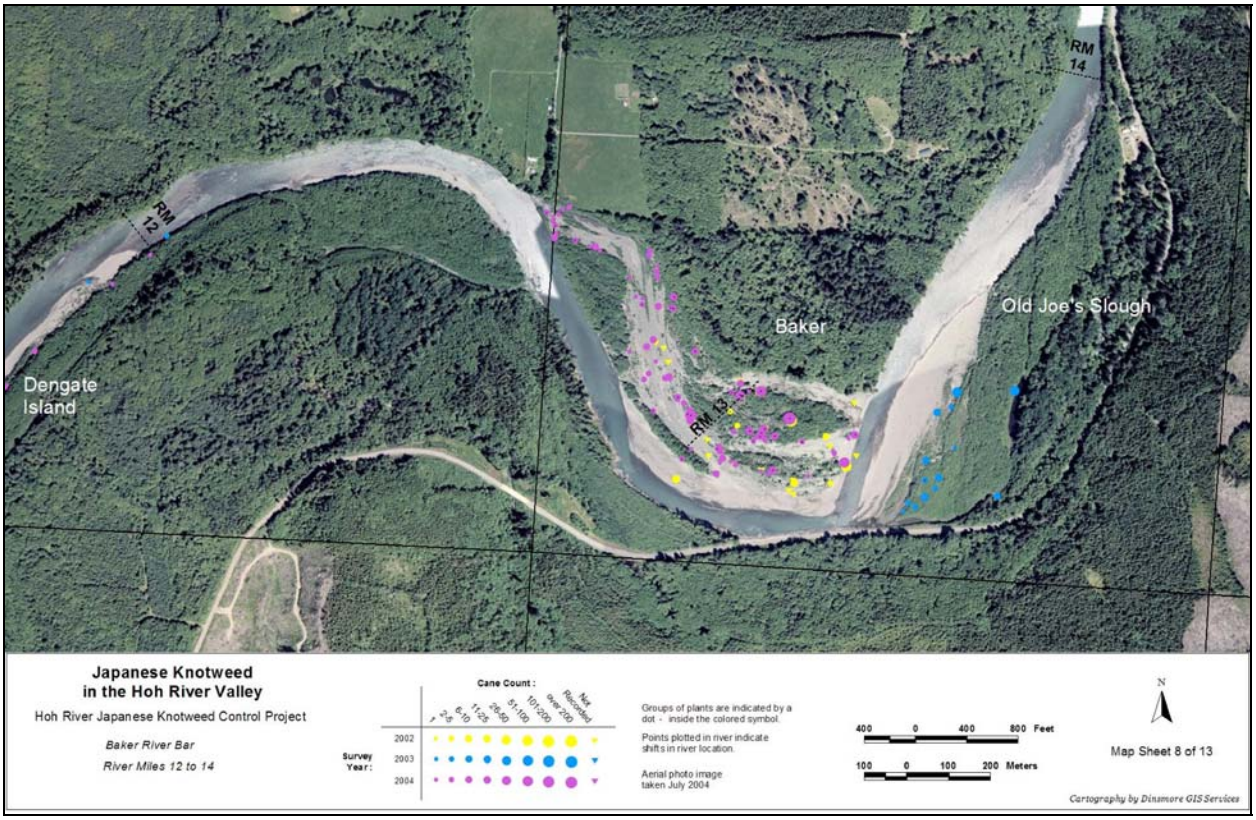
KNOTWEED CONTROL ON THE HOH RIVER:

2005 SUMMARY REPORT



Jill Silver, Watershed Program Manager
10,000 Years Institute
211 Taylor Street, Suite 6
Port Townsend, WA 98368
jsilver@10000YearsInstitute.org
360.385.0715

Martin Hutten
Olympic Botanists
441 Hudson Road
Port Angeles, WA 98363
hutten@olypen.com
360.928.9648

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Contents

Introduction

This report describes the objectives and results of work conducted in 2005 as part of a multi-year project to completely eradicate invasive knotweed species in 29.75 river miles of the active Hoh River channel migration zone and adjacent terraces. Located on the west coast of the Olympic Peninsula in Washington State, the Hoh River is one of the few rivers in the lower 48 states supporting relatively healthy wild salmon populations. Relative to other rivers in the state, invasive plant populations have not been observed to impact riparian or river function.

In 1998, one clump of the invasive knotweed (*Polygonum cuspidatum s. lat*.) was observed at the edge of the river's channel migration zone (CMZ) at river mile (RM) 29.75. In the winter of 1999 or 2000, this one plant was transported downstream during a winter storm event, giving rise to a population of knotweed that rapidly became widely distributed within the Hoh River CMZ to the river's mouth. Recognizing the potential threat to critical habitats, the Hoh Tribe initiated a restoration project in 2002, beginning the comprehensive river surveys, control, and effectiveness monitoring activities that continue today as a partnership between the non-profit 10,000 Years Institute, Hoh Tribe, Hoh River Trust, private landowners, Olympic National Park, and the U.S. Forest Service.

Project objectives, methods, and results through 2004 are described in a previous report available from 10,000 Years Institute:

Knotweed Control on the Hoh River: Summary Report – 2002-2004

Effectiveness Monitoring of 2004 Control Activities

Effectiveness monitoring of 2004 summer/fall control activities was conducted in October 2004 during a boat survey by 10,000 Years Institute and the Hoh Tribe in the upper and middle river; in May and June of 2005 by 10,000 Years Institute in the upper and middle river; and in September and October of 2005 by the Hoh Tribe in the middle and lower river. Appendix 1 contains the survey and control data by year and river bar (see pages 7 and 8).

In October 2004, the boat survey from RM 30 to RM 24 revealed survival rates of previously treated plants at less than 0.05%, but found a few areas that had been missed due to high water or survey inefficiency. At Lewis Channel, one large recently exposed root ball was sprouting a number of dwarfed, chemically-altered shoots; which could not be treated as it was at the edge of the water. Many plants that had been sprayed were re-checked, and all found to be effectively killed.

The Owl Creek floodplain islands and gravel bars were 'clean' in fall of 2004, but a few scattered small re-sprouted plants were found in spring of 2005. Canyon Springs in 2004 had a number of live healthy plants that survived earlier spray treatment, likely due to shaded damp leaves. These were retreated. A few larger plants were found on the left bank of Spruce Canyon which hadn't been surveyed prior; these were treated. One site in Spruce Canyon that was

accessible by a road and trail had been treated in 2004, and all plants were dead when surveyed in 2005 with the exception of one small cane that had sprouted recently.

In May of 2005, a two-person 10,000 Years Institute crew began surveys at the uppermost reach, Brandeberry Lots – RM 29.75. During 2 weeks of fieldwork, this small crew worked in a downstream direction, surveying Owl Creek, Lindner Creek, Canyon Creek, and Spruce Creek. Although the majority of treated plants and plant sites were found to be dead, a number of very small plants and a few plants that were either missed or survived treatment were found in all areas, necessitating extra time for treatment and an intensive level of survey effort. Lindner Creek, a massive and complicated floodplain complex, had a number of large plant clumps that escaped detection in earlier surveys – a humbling finding, as we'd spent four days in 2004 with a crew of 12, 'gridding' the floodplain. Data collected during this time led to the conclusion that control work would also be necessary later in the season lower in the river corridor.

The Clallam County Noxious Weed Crew reported three well-established side-channel knotweed sites at Lindner Creek. Two sites appeared to be new, without a complex crown-root structure. Presence of old canes, a complex root structure, and the diameter of new canes indicated one older patch. In addition, they reported high concentrations of Scotch broom adjacent these sites. Small patches of young knotweed were found in the adjacent upland forest. Flood waters are believed to have moved the knotweed into the upland forested terraces rather than movement by rhizomes or seeds.

New plant sites were cataloged in GPS dataloggers and treated. Some of the very small plants found on open gravel bars were in areas that had been carefully surveyed the previous summer, and are thus assumed to have sprouted *after* those surveys. Old root crowns were observed in several places, and were assumed to have been deposited by high water or revealed by scour. The root ball found at Lewis Channel showed signs of being treated previously, and was actively sprouting, with hundreds of inch-long green leaves along an exposed root.

Several river floodplains or canyons accessible only by boat or crossing the river in extremely low water had not received any survey or treatment in previous years, including portions of Spruce Canyon and all of the Elk Creek floodplain. The Hoh Tribe donated significant crew time in the late summer and fall of 2005 to access the Elk Creek and reaches on the lower Hoh River, conducting surveying and GIS data collection as well as applying treatment. In September of 2005, Clallam County provided a crew of four for two weeks who surveyed and treated a total of eight river miles above and below U.S. Highway 101.

Results and Discussion

Data collected in late 2004 and 2005 support field observations that the distribution and size of plants has significantly diminished in the watershed. The source location (Brandeberry Lots, RM 29.75) had a cane count of 4,108 in 2003, which was reduced to 69 in 2005. Owl Creek's knotweed population was reduced from 4,517 canes in 2003 to 93 canes in 2005.

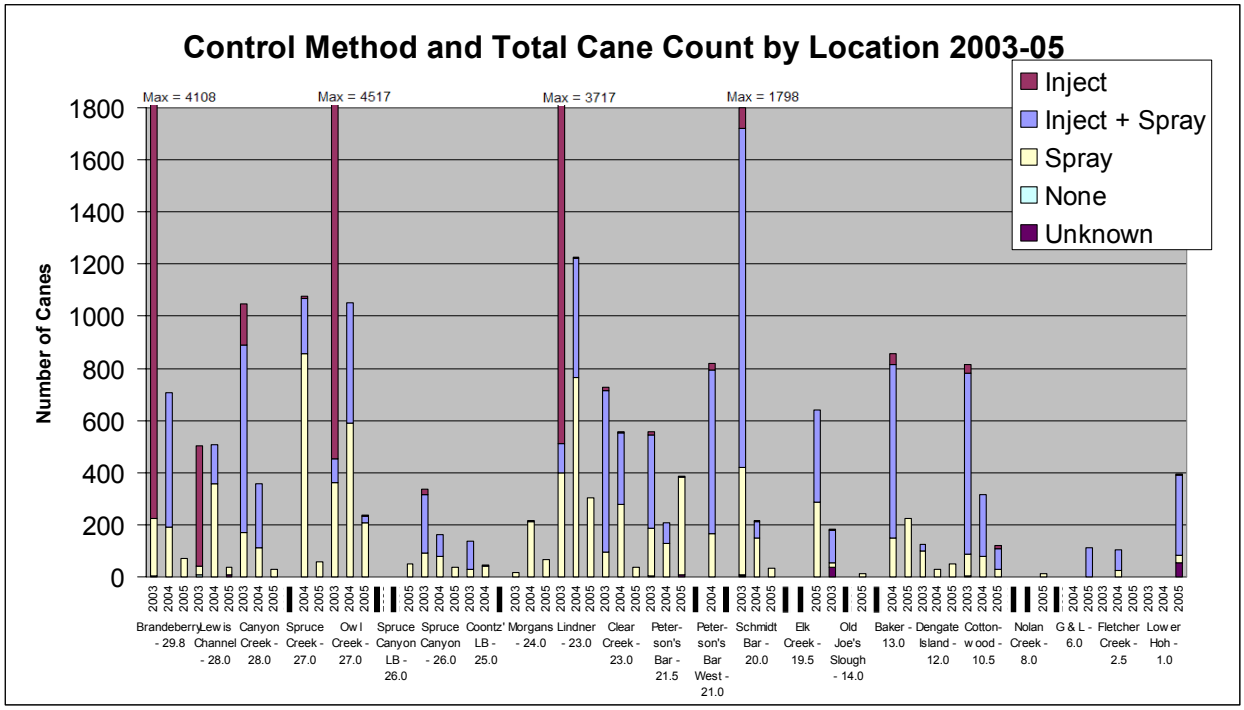
Elk Creek, Nolan Creek, G&L, and the Lower Hoh were surveyed for the first time in 2005. Initial cane counts in these locations were low relative to initial upper river counts. This can be attributed to the distance from large mobile source populations, as well as the influence of a backwater effect in the middle and upper river from the Hoh Oxbow Canyon (RM 17) where the river constricts into a narrow channel which reduces flow velocity above and allows plant material to deposit at Elk Creek and Schmidt Bar.

In the lower river below the Hoh Oxbow, most sites exhibited low plant counts. Of these, Old Joe's Slough was not accessible in 2004 due to construction activities by Washington Department of Transportation (WDOT), but the population was significantly reduced between 2003 and 2005. Some soils containing knotweed rhizomes were moved by WDOT, and new populations may still be discovered.

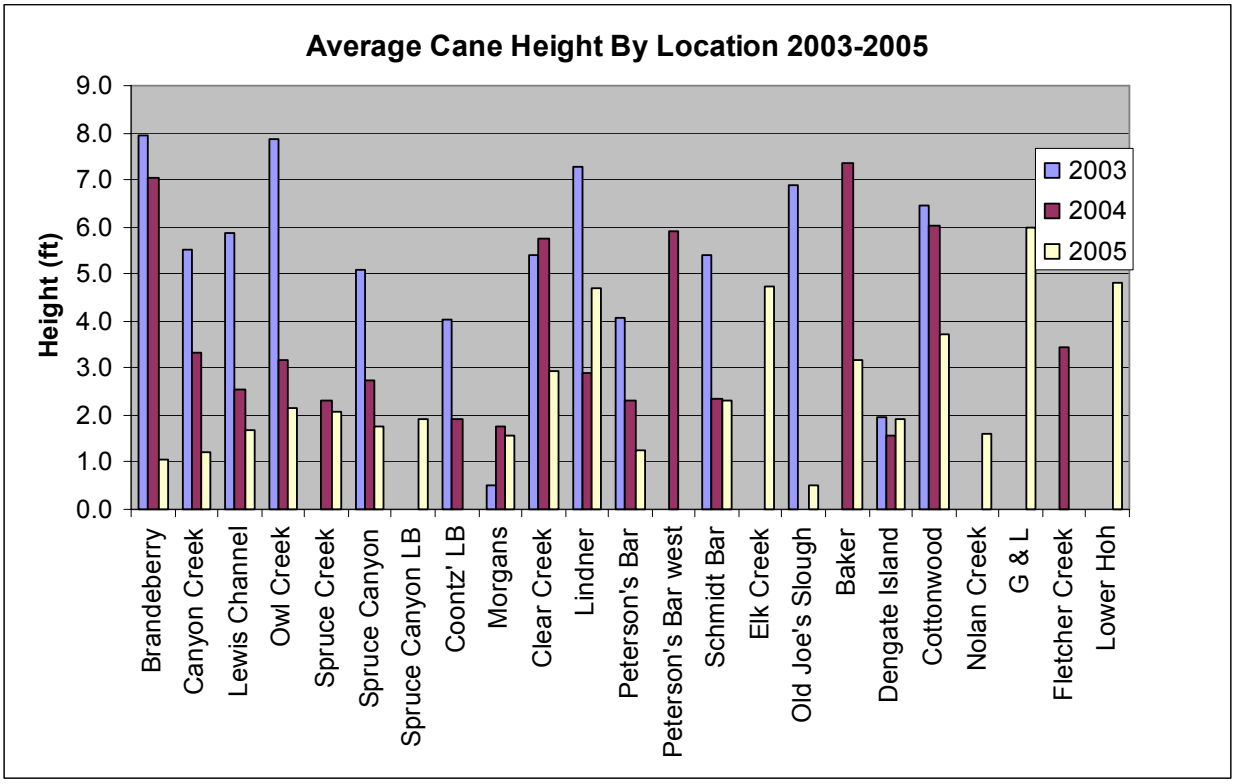
Olympic National Park sprayed approximately 0.03 of an acre of giant knotweed at Oil City on the right bank of the Hoh River in the Olympic National Park Coastal Strip. The size of the infestation is reported to have been reduced from previous years. These data are not included in Appendix 1.

A few locations in the watershed indicate an increase in plant numbers between 2004 and 2005. While a small number of missed plants contributed, the increase is largely attributable to expanded surveys including completely shaded forested terraces and new river bars formed by river migration.

As plants shift from mature to younger age classes with repeated control, the control method shifts from a predominance of injection to foliar spray, which uses <u>less</u> herbicide per unit area.



As depicted on the following graph, cane height - an indicator of maturity or site productivity - was also significantly reduced between years. Average cane height at Brandeberry Lots was reduced from an average height of 8 feet in 2003 to an average of one foot in 2005. Lindner Creek, described above as a particularly difficult river bar to survey, was found to have an increase in plant height between 2004 and 2005, indicating large plants that were not found and treated in 2004, and then added in 2005.



Application Methodology and Discussion

Application of the herbicide glyphosate was accomplished by two methods in 2005.

The injection method consisted of direct injection of 3 cc of glyphosate into the lower node of each cane using the JK Injection Tool®. All canes ½" and larger were injected. Visible effects to the plants took an average of nine days.

Foliar application used a low-pressure *Solo* backpack sprayer or a hand-held one liter spray bottle. Foliar applications were used primarily to treat canes with diameters that were too small to inject. Backpack sprayers were loaded with an 8% solution of Glypro® or Aquamaster® with the surfactant AgriDex®, R-11®, or LI-700®. The Clallam County crew used Blazon Blue® marker dye as well. 8% is a higher rate than used at other river sites, but was chosen as the crew was unable to return to monitor treated sites to determine immediate effectiveness, and wanted to be sure that one treatment would be sufficient. Spray mixture contained ½ ounce surfactant per

gallon of water, either R-11® or AgriDex®, and normally contained ½ ounce marker dye (either Dynamark® or Blazon Blue®) per gallon of water.

The injection method at 3 cc was reported by the Hoh Tribe to have a reduced effectiveness from the 2003 method that used a nail probe and a veterinary syringe at 5 cc. Some portion of the herbicide was observed to run down the outside of the cane, and some mature canes were believed to survive treatment due to this factor. A shorter needle was used by the Clallam County crew and may resolve this issue in the future.

GIS Mapping and Database Update

The database is finalized with updated information from 2004 and 2005 (Appendix 1). The Geographic Information System (GIS) layer has not been updated as we had no budget for a contractor in 2005. We are working with the WRIA 20 Knotweed Working Group and the Olympic Natural Resources Center to develop a central data repository and GIS where all knotweed projects on the Olympic Peninsula can submit data and receive map files for use in education and reporting. Once that is arranged, we plan to process our data there.

Conclusions and Future Plans

As reported previously, the control methods used have proven highly effective, but due to plant physiology, do not always suffice to eliminate all plants in one application. Large rhizomes hidden in substrates may express only one stem in a season, but retain the ability to resprout after that single stem has been treated and killed.

A huge proportion of living knotweed plants on the Hoh River has been successfully eradicated, shifting the remaining population from large many-stemmed clumps to small single-stemmed plants. While significantly reduced the biomass available to make new plants, this creates another challenge - that of locating widely spaced, very small plants on a wide river floodplain over a distance of 30 miles in length.

Uncertainties remain about how long root and stem fragments persist in soils, the manner by which rhizomes multiply, and whether viable seed is being produced, complicating our ability to predict the length of time. A single missed plant is capable of spreading to many new locations when eroded during a flood event, requiring an entire river and floodplain survey to find the new locations where these fragments have produced new plants.

We will be evaluating the possibility that some plants are propagating from seeds in the coming year. Our crews will be trained to look for the tiny cotyledon leaves which are indicative of origin by seed. We also need to develop a strategy for treating or removing the large rhizomes found at water's edge.

Based upon new information about the ecology and persistence of plant fragment in floodplain deposits and the ability of plants to maintain very slow growth in completely shaded areas

coupled with the difficulty of locating every plant on the expansive Hoh River channel migration zone (CMZ), knotweed plants are expected to be present in the river corridor for at least another eight to ten years, during which periodic surveys will be necessary to verify that the river remains free of knotweed.

Finally, a crew of at least ten well-trained and motivated members is necessary to adequately cover the entire floodplain, all the vegetated bars, and the upland terrace forests.

Funding will be sought in 2006 to implement another complete river survey and control effort, engaging partners and additional crew where possible.

Appendix 1

River Mile	River Bar	Year	# Stems	Inject	Inject + Spray	Spray	None	Unkwn
29.75	Brandeberry - 29.8	2003	4108	3883		221	4	
		2004	707		517	190		
		2005	69			69		
28	Lewis Channel - 28.0	2003	505	464		33	8	
		2004	509	1	150	358		
		2005	36			28		8
28	Canyon Creek - 28.0	2003	1046	156	720	169	1	
		2004	357		246	111		
		2005	31			31		
27	Spruce Creek - 27.0	~~2003~~						
		2004	1078	11	212	855		
		2005	58			58		
27	Owl Creek - 27.0	2003	4517	4063	93	361		
		2004	1053	1	461	591		
		2005	238	4	27	207		
26	Spruce Canyon LB - 26.0	~~2003~~						
		~~2004~~						
		2005	48			48		
26	Spruce Canyon - 26.0	2003	336	18	225	93		
		2004	162		81	81		
		2005	39			39		
25	Coontz' LB - 25.0	2003	136		107	28		1
		2004	47		6	41		
		~~2005~~						
24	Morgans - 24.0	2003	15			15		
		2004	215		3	212		
		2005	67			67		
23	Lindner - 23.0	2003	3717	3206	110	401		
		2004	1227	3	461	763		
		2005	303			303		
23	Clear Creek - 23.0	2003	729	12	623	94		
		2004	556	3	274	279		
		2005	36			36		
21.5	Peter- son's Bar - 21.5	2003	559	14	358	183	3	1
		2004	206		77	129		
		2005	387		3	376		8
21	Peter- son's Bar West - 21.0	~~2003~~						
		2004	821	29	624	168		
		~~2005~~						
20	Schmidt Bar - 20.0	2003	1798	78	1302	409	6	3
		2004	217	3	63	151		
		2005	35			35		
19.5	Elk Creek - 19.5	~~2003~~						
		~~2004~~						
		2005	639		353	286		

Appendix 1, con't.

14	Old Joe's Slough - 14.0	2003	181	1	127	15		38
		~~2004~~						
		2005	14			14		
13	Baker - 13.0	~~2003~~						
		2004	857	41	668	148		
		2005	224			224		
12	Dengate Island - 12.0	2003	125		26	99		
		2004	31			31		
		2005	50			50		
10.5	Cottonwood - 10.5	2003	813	30	696	84		3
		2004	318		237	81		
		2005	119	9	82	28		
8	Nolan Creek - 8.0	~~2003~~						
		~~2004~~						
		2005	11			11		
6	G & L - 6.0	~~2003~~						
		~~2004~~						
		2005	113		113			
2.5	Fletcher Creek - 2.5	~~2003~~						
		2004	102		76	26		
		~~2005~~						
1	Lower Hoh - 1.0	~~2003~~						
		~~2004~~						
		2005	394	3	306	32		53

Strike-outs in the Year column indicate that no surveys occurred in that area in that year.