Final Report for BIA Watershed Restoration Grant: Riparian Restoration in the Dickey Watershed of the Quillayute River System

Introduction

Non-native invasive plant species have become an increasing problem throughout the landscape in recent years. Control measures by landowners have been non-existent or lacking in many areas, largely due to a lack of dedicated resources. Many of these species are upland varieties and do not impact fish habitat and associated riparian areas. However, Japanese knotweed (*Polygonum cuspidatum*), Giant knotweed (*Polygonum sachalinense*), and other hybridized variations are an exception.

Knotweed is a bamboo-like plant that has been observed to grow up to 12 feet high with leaves 4-6 inches long. (Later photos of herbicide application will show the stem.) It can grow in cluster formations or in large grove-like plantations along a shoreline. It is an herbaceous perennial, strongly rhizomatous, which spreads mainly by fragmentation, but also by the rhizomes. The stems normally die back after the first frost leaving barren soils along the stream-bank.

A knotweed cluster on the Dickey River

Knotweed has been found to inhabit the shorelines and riparian areas of lakes and streams. Left unchecked it has been noted to dominate and out-compete native riparian vegetation and alter natural riparian processes. In summer, it fails to provide necessary shade to protect water temperature. In winter, the vegetation dies back and fails to contain erosion of stream banks during the storm season. Further, it invades laterally and replaces native forests altogether, dominating native tree seedlings.

For the summers of 2003 and 2004, the Quileute Tribe was funded through the BIA to

eradicate knotweed in the Dickey River system, a tributary to the Quillayute River. The Dickey system was chosen as a first priority within the Quillayute Basin, because of the known confinement of the infestation to the lower reaches and the importance of the Dickey River to the tribe's fishery.

Site Description

The project is located on the Dickey River, a large, low gradient system of some 200 square miles, characterized by sandy bank soils and extensive off-channel fish habitat and riparian areas. The Dickey River enters the Quillayute River approximately one mile from the mouth at the Pacific Ocean. A right bank tributary, its mainstem extends for eight miles upstream to the confluence of its East and West Forks, which each (respective main stems) extend some additional 25 RM (these RM don't include tributaries).

The land ownership of the Dickey basin is a mixture of large industrial timberland and WDNR forestlands. Some small private land ownership exists throughout the basin. The final river mile flows through Olympic National Park and is almost completely infested with knotweed (subject of a new grant, along with 4 RM upstream from the Park).

The initiation point of the project was approximately a quarter-mile upstream of the confluence of the East and West forks of the Dickey River. It was the site of an old homestead where knotweed was probably introduced as an ornamental.

Methods

There are several methods of eradicating knotweed. The most effective method for use in riparian areas is one that was developed and used with great success in Clark County, Washington (which eradicated all its knotweed in four years). This method involves stem injection with 5cc of Aquamaster herbicide (approved for this type of ecosystem) into each stem, with the use of a needle and syringe.

In the summer of 2003 Quileute tribal technicians engaged in this method of eradication. A crew of four technicians under the direction of a licensed applicator went to work for four months (June –October) mapping plant locations and injecting each stem.

The mapping provided data on plant size, number of plants, size of patch, shade conditions, and soil conditions. The purpose of mapping locations was to document the extent of the infestation and to provide information as to location for follow-up treatments in those areas where residual plants may have been growing. In some locations, follow-up treatments were necessary both during the initial treatment season and the following season to completely eradicate the plant.

Injection methods were as follows: Each technician was equipped with an awl, a 16 gauge needle, and 60cc syringe and a lidded bucket of 100% solution of Aquamaster. Technicians pierced the stalk of each stem completely at the first or second node of the plant. This allowed easy entry for the needle injection and also allowed water in the stem to be displaced by chemical as it was injected. The chemical is heavier than water and sinks to the bottom of the node, displacing any water within. At a downward angle, approximately 5cc of herbicide was applied to each stem within a patch location.

Quileute technician using injection method on knotweed in Dickey River sub-basin.

In areas where plants may have been growing on woody debris in close proximity to water, the plant was pulled and injected on the shore out of the high water mark. Each treated stem was marked with a waterproof marker, to avoid re-treating the same stem accidentally. Approximately every three weeks technicians would return to treated patch locations to treat any plants that may have been missed on initial treatment. This was a very laborious but effective process.

Plants with stems that were too small for injection were treated with a basal application. This involved scarring the outside of the stem with the point of the awl and then applying a small amount of chemical to the stem with one's fingertips.

Over the winter Quileute's TFW biologist participated in several knotweed working group meetings to compare results and talk about new developments in the field of knotweed eradication. Participants also included County Weed Control Board members from Clallam, Jefferson, and Clark Counties, Hoh tribal biologists, Olympic National Park biologists, USFS biologists, Monsanto Company officials, and interested citizens. Several new developments arose from those meetings and some changes were proposed and made for the following treatment season.

In the summer of 2004 Quileute technicians again under the direction of a licensed applicator engaged in the above process with some changes. Olympic National Park

biologists trained Quileute in use of foliar (spray) application. A foliar application was also used in areas where the possibility of overspray would not enter the water. Further, JK Injection Tools had developed and manufactured a gun for increasing the rate of injection by as much as four times. Ten guns with needles were purchased for this season. Needle injection by use of the new guns with 3cc of herbicide was used in all areas where foliar application was deemed (by our licensed applicator) to be a possible hazard to water. In all other areas a foliar application using backpack sprayers was used. A mixture of Aquamaster and water at 2.5-3% solution was used in the foliar application. A blue dye was added to the mixture to allow for physical observation of the treated areas by technicians. Foliar applications were not implemented during wet/windy days.

As in the previous year, all patches were mapped, in areas where needle injection was used, sites were re-treated after three weeks. In foliar application areas, technicians returned every *two* weeks to apply chemical to those areas that could not be treated on initial application.

Technicians were well equipped with safety gear, including protective eye wear, gloves, first aid kits, rain gear, boots, and face masks. The contract licensed applicator was trained in first aid and response in the event of human exposure to the chemical.

Results

In the summer of 2003 Quileute technicians injected over 73,000 stems in 43 documented locations, covering approximately 1 ½ miles of shoreline along the East and West forks and main stem of the Dickey River. They also started eradication efforts along a 20+ acre off-channel pond connected to the main stem. The off-channel pond and associated riparian zone had been severely overrun with knotweed and provided the best example of the effects this plant can have on the natural condition and function of riparian zones. (See photos below.) The infestation in one stretch of the riparian area along this pond complex measured approximately 430 x 130 feet, or over 10.5 acres.

knotweed-impaired RMZ along pond complex.

This picture shows normal forest floor with native salmonberry.

Scattered knotweed remnants growing in riparian area along Dickey River as seen in Spring of 2004 (Year Two)

Native vegetation re-growing in treated area, spring 04. Horsetail, nettle.

In the summer of 2004 Quileute technicians treated over 344,000 plants in 92 documented locations, covering approximately 3 miles of shoreline and associated riparian area. Results from the 2003 efforts almost completely removed the plants from the treated areas. Only scattered solitary plants were observed growing back in treated areas the following spring of 2004. (See photos below.) These solitary plants were treated the following season and by the end of the treatment season of 2004, knotweed plants were non-existent in these treated areas. Native vegetation including grasses, herbs, and shrubs were observed growing the following spring in all the treated areas. Both the foliar and injection treatment methods proved to be very successful. .

Treated knotweed via injection method along the Dickey River.

Knotweed treated via foliar application method in riparian along Dickey River off-channel pond complex.

Also in 2004, 30'x 30'test plots were established to 1) test variable injection amounts and the subsequent kill rates on knotweed stalks of sufficient size for injection and 2) determine if there was any trans-location of chemical through the rhizomes to adjacent stalks or to adjacent vegetation.

Three plots were set up to test 1,2, and 3cc applications. Application was through the use of JK injection tool guns, programmed to administer the appropriate level of chemical. Each gun was tested before application. All test plots were in sandy soil with 95% alder canopy cover and within the same riparian location. The number of stems injected in each plot was recorded and four weeks later results were documented.

In all test plots there appeared to be no trans-location of chemical through the rhizomes to adjacent stalks. There also appeared to be no evidence of trans-location through the soil to adjacent native vegetation. Only stems that had been treated with chemical appeared to show effects of treatment. (See photos).

All application levels showed effects on treated plants to varying degrees of success. (Table 1).

Table 1. Application rates and % dead stems, after four weeks.

Plot: 30'x 30'	# stems injected	# stems dead	% dead stems
1cc	198	106	54%
2cc	314	298	95%
3cc	170	161	95%

There appeared to be no significant difference between 2cc and 3cc application levels. Both produced kill rates of 95%. (When this happens in the field, we re-treat to kill the remaining plants.) The 1cc application appeared to kill only 54% of the injected stems. The rate that stems exhibited physical signs of treatment did vary between the 2cc and 3cc applications. Within one week of treatment stems in the 3cc plot were turning bright yellow and falling off, while stems in the 2cc plot were just turning a light yellow color with few leaves falling. Stems in the 1cc plot showed no visible signs of application after one week.

These tests were not repeated during the season. Photos follow on the next page.

1cc test plot four weeks after application.

2cc test plot four weeks after application.

3cc test plot four weeks after application.

Discussion

Through the 2-year effort of the Quileute Tribe, over 4 ½ miles of stream and associated off-channel and riparian area were treated successfully. It has provided a good start. However, as noted in the grant, it was not likely that we could reach the mouth of the Dickey in the time allotted for this project. A downstream portion of the river needs to be done in the same manner in order to protect the remaining affected river miles, which include the estuary and the Olympic National Park. The efforts in Clark County, as well as Clallam County within parts of Olympic National Forest, have shown that with determination the problem can be overcome.

Increasing public awareness (private and governmental) has caused knotweed control to become a top priority in many watersheds. The World Conservation Union recently published a booklet of the top 100 "world's worst species" (animals and plants). Knotweed is #9 in this list. The USFS Pacific Region's DEIS of invasive plants lists knotweed species as a serious problem for this region. The most recent OPAC meeting in Olympia (November 19, 2004) dedicated over two hours to discussion of the knotweed problem. The WRIA 20 Watershed Council (including 3 tribes, two counties, and the City of Forks, as well as a public component made up of citizens, private timber growers, and state and federal agencies) also makes knotweed eradication a priority. Efforts within the Quillayute system continue. Olympic National Forest, Olympic National Park and Clallam County Weed Control continue to work towards eradicating knotweed in their jurisdictions. Knotweed workshops and seminars continue and the Quileute tribe will continue to be an active participant in these forums.