# Olympic Knotweed Working Group
# 2007 Report,
# Prepared by
# Clallam County Noxious Weed Control Board

**Knotweed on Lake Creek, 2007**

# CONTENTS

# EXECUTIVE SUMMARY

## Project Goal

The goal of this project is to protect land values, natural resources and ecosystem functions in Clallam and Jefferson Counties by removing invasive knotweed species from riparian areas. The Clallam County Noxious Weed Control Board (CCNWCB), as the lead entity of the Olympic Knotweed Working Group, worked toward this goal by partnering with many entities and supporting multiple knotweed control projects in both counties as part of a large scale, ongoing effort to eradicate knotweed.

## Project Description

This project directly limited the spread of knotweed infestation through on-the-ground control treatments, and indirectly through public education that raised awareness about knotweed impacts to riparian ecosystems. Many landowners now know about knotweed and its impacts, can recognize it and are pro-active in removing it or preventing its spread.

In 2007, we treated knotweed in riparian areas, including the Big River, the Sekiu-Clallam Bay area, the Sol Duc River, Lake Creek, (a major tributary of the Sol Duc), Ennis Creek, Valley Creek, and the Waterfront Trail in Port Angeles. We also treated knotweed in Forks, due to the city's proximity to the Bogachiel River and the high public visibility of infestations within city limits**.**

CCNWCB tracked, monitored, coordinated, acquired landowner permissions and in some cases supplied an aquatic applicator for other ongoing projects in the Calawah, Bogachiel, Dickey, Quillayute, Hoh, Clallam, and Dungeness Rivers. CCNWCB supported efforts by Jefferson County to continue treating knotweed on Snow Creek, Salmon Creek, and the Dosewallips and Duckabush Rivers. All of these rivers were chosen for their high significance to fish and wildlife or their natural resource value to public or tribal entities.

CCNWCB also acquired herbicide from Washington State Department of Agriculture (WSDA) and distributed it to partners.

Training, tools and help were provided to interested landowners who owned property with terrestrial knotweed sites.

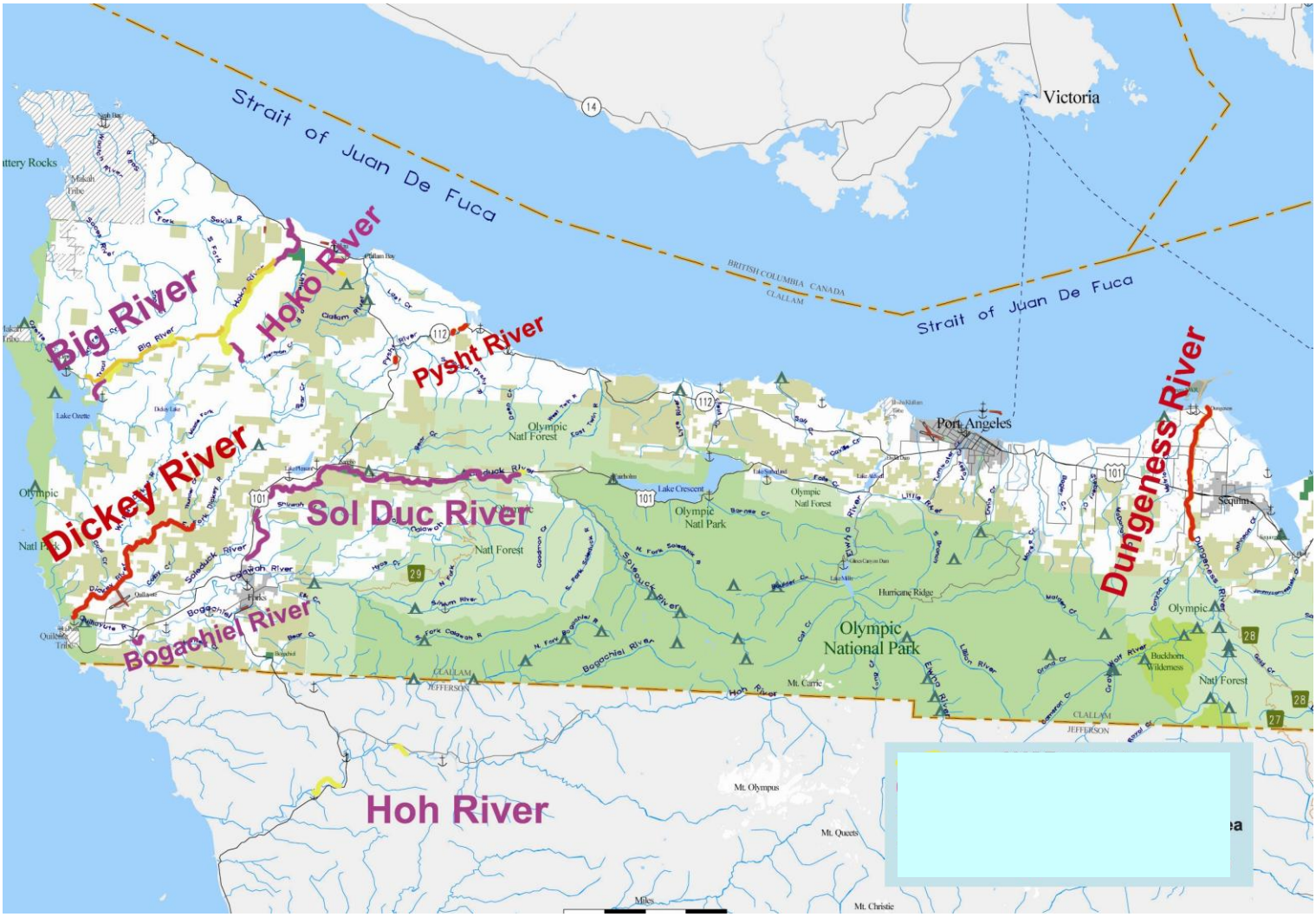
As the program entered its third year, knotweed populations on most rivers had decreased considerably which led to a large decrease in herbicide use. However, crews had to spend large amounts of time searching for smaller plants and regrowth, since treating these is an essential part of controlling and eventually eliminating knotweed.

*These projects were funded by Washington State Department of Agriculture (WSDA), US Forest Service Forest Health Protection Fund, CCNWCB, the National Fish and Wildlife Foundation (NFWF), and separate funding administered by the Makah and the Quileute Tribes.*

## Participating Groups

Clallam County Noxious Weed Control Board
Jefferson County Noxious Weed Control Board
The Makah Tribe
The Quileute Tribe
The Lower Elwha Klallam Tribe
Jamestown S'Klallam Tribe
10,000 Years Institute
The Washington State Department of Transportation (WSDOT)
The Olympic National Park—North Cascades Exotic Plant Management Team

## Overview Map



## 2007 Project Procedures

**1. Surveys**

New surveys were performed this year on the Pysht River, Ennis Creek and the Port Angeles waterfront trail**.** The Big River was re-surveyed on foot to assess the success of the 2006 treatment.

**2. Data Collection & Equipment**

Information was collected on a Trimble GEO XT GIS/GPS instrument, using the data dictionary developed by the Olympic Knotweed Working Group (OKWG). *Pathfinder* software was used for post-processing. See the body of this report for more detail and Appendices I and II for examples. A Thales Mobile Mapper CE equipped with Arc Pad was also used. This unit was especially useful because its maps allowed crews to know whose property they were on. It was also used to record GPS points.

**3. Permits**

A NPDES permit was obtained from WSDA for all water ways of concern. The project followed all posting and notification requirements as outlined in the permit. Total amounts of herbicide used by all crews were submitted to WSDA at the end of the treatment season.

**4. Project Teams**

Teams were typically comprised of 2-4 people.

**Big River and Hoko-Ozette Road** (August to September )
Survey—Carol Cross
Treatment—Marsha Key (licensed aquatic applicator), Rafael Ojeda, Tony Pascua (Makah Tribe licensed aquatic applicator) and the Makah Tribe crew

**Sekiu River** (September)
Treatment—Charles DeVaney (licensed aquatic applicator), Tony Pascua (Makah Tribe licensed aquatic applicator) and the Makah Tribe crew

**Hoko River** (July-August)
Treatment— Tony Pascua (Makah Tribe licensed aquatic applicator) and the Makah Tribe crew

**Sekiu-Clallam Bay and Highway 112** (July to September)
Treatment— Charles DeVaney (licensed aquatic applicator), Marsha Key (licensed aquatic applicator), Rafael Ojeda, Tony Pascua (Makah Tribe licensed aquatic applicator) and the Makah Tribe Crew

**Clallam River** (September)
Treatment-- Marsha Key (licensed aquatic applicator) and the Lower Elwha Klallam Tribe crew

**Pysht River** (August)
Survey—Charles DeVaney and Steve Erickson
Treatment-- Marsha Key (licensed aquatic applicator) and a crew supplied by Merrill and Ring Tree Farm.

**Sol Duc River** (July to October)
Treatment-- Marsha Key (licensed aquatic applicator), Rafael Ojeda and the Quileute Tribe Crew

**Lake Creek** (June to -October)
Treatment-- Marsha Key (licensed aquatic applicator) and Rafael Ojeda

**Forks** (June to August)
Treatment— Marsha Key (licensed aquatic applicator), Rafael Ojeda, the Quileute Tribe Crew and many of the attendees at the June 14th training held in Forks

**Valley Creek, Ennis Creek and the Port Angeles Waterfront Trail** (August)
Survey—Cathy Lucero
Treatment-- Marsha Key (licensed aquatic applicator), Rafael Ojeda and the Lower Elwha Klallam Tribe crew

**Snow Creek, Salmon Creek, Dosewallips River and Duckabush River (Jefferson County)** (July to September)
Treatment—Eve Dixon, Ross McDormann, Erin Moilanen( all licensed aquatic applicators) and Fowler Stratton.

A problem arose during the 2007 treatment season when there was uncertainty as to whether tribal crews could use herbicides under a Public Operator's license. It took a month for this situation to be resolved. During that time CCNWCB supplied licensed applicators to work with the Makah and Quileute tribal crews.

**5. Invasive Species Surveyed or Treated**
Bohemian knotweed (*Polygonum bohemicum*) was the dominant knotweed species of concern. The next most common species was giant knotweed (*Polygonum sachalinense*). Only a few sites contained Japanese knotweed *(Polygonum cuspidatum)*. Himalayan knotweed *(Polygonum polystachyum)* was located in only one site. All four species are class B noxious weeds.

**6. Landowner Contacts/Permissions**
Landowners were contacted for permission to survey or treat prior to any related activity. Landowner permissions were partly handled by two CCNWCB employees (Charles DeVaney and Steve Erickson) who live in the Sekiu-Clallam Bay area. They are acquainted with many of the landowners who live locally, and made personal contact. They or other CCNWCB staff wrote to out-of-town landowners. Standard landowner permission forms, developed by the WSDA, were signed by each landowner when treatment was necessary. Signed copies were submitted to WSDA (See Appendix VII for a sample).

**7. Treatment, Equipment, and Rate**

Treatment in 2007 consisted of injection, foliar (spray) or wipe.

**Injection** for canes >1/2 inches in diameter was applied to the lower internode region
*Equipment* consisted of JK Injection Systems hand injection guns.
*Rate* applied was 3-5 mls of 100% solution per cane (no surfactants or dyes added). Glypro, Aqua Master or AquaNeat were used.

**Foliar** used to treat plants that were too small to inject; or where plant density was great enough to exceed allowable rates per acre with injection
*Equipment* consisted of low pressure, Solo Backpack Sprayers, 4 Gallon capacity
*Rate* applied varied, but was generally in the range of 6-8% solution of Glypro, Aqua Master or AquaNeat, with 1-2% solution of R-11 (on non-riparian sites), Agri-Dex, or Competitor surfactant, and 0.5-1% solution of Blazon Blue (marker dye).

**Wipe**--a 33% solution with 10% surfactant, by volume, (as allowed by label), applied to the surface of leaves and stems with a foam paint brush.

**8. Spray Records**

A pesticide application record, as developed by the WSDA for knotweed, was filled out for each treatment. Copies were sent to the WSDA. (See Appendix IX)

## 2007 Summary

- Organized and coordinated a three-day training in Forks, with presenters from Washington State University, sponsored by WSDA. Participants were able to take pesticide exams on the third day, and this was followed by on-the-ground training. This was attended by **70** people, from **19** different agencies (see body of report for more detail) [CCNWCB].
- Managed **93 existing Landowner Agreements**. Managing agreements included verifying landowner information, contacting landowners to inform them when crews would be arriving to monitor or treat and in many cases adding new parcels to existing agreements [CCNWCB].
- Solicited and obtained **76 new Landowner Agreements** [CCNWCB].
- Helped **154 private landowners** by controlling knotweed.
- Surveyed and re-treated **12.3 miles** of the Big River [Makah Tribe/CCNWCB].
- Surveyed and retreated approximately **18 miles** of the Hoko-Ozette Road [Makah Tribe/CCNWCB].
- Treated or re-treated **4 sites** on the Sekiu River [Makah Tribe/CCNWCB].
- Re-treated sites on **12.5 miles** of the Hoko River [Makah Tribe].
- Treated or re-treated **57 sites** in the Sekiu and Clallam Bay Area and on Highway 112 [Makah Tribe/CCNWCB].
- Treated an additional **13 sites** on the Reservation [Makah Tribe}.
- Trained **4 local landowners** to treat terrestrial sites and provided them with equipment [CCNWCB].
- Treated **4 miles** of the Clallam River [Lower Elwha Klallam Tribe/CCNWCB].
- Controlled **3 sites** on the Pysht River [Merrill & Ring/Burdick/CCNWCB].
- Treated or re-treated **45 miles** of the Sol Duc River [Quileute Tribe/CCNWCB].
- Treated **3 miles** of Lake Creek [CCNWCB].

- Treated and re-treated **18 sites** in Forks [CCNWCB/Quileute Tribe]
- Treated or re-treated **8 miles** of the Dickey River [Quileute Tribe]
- Treated additional sites on the Bogachiel River, the Calawah River, on Highway 101and in Forks [Quileute Tribe].
- Treated **29.8 miles** of the Hoh River [10,000 Years Institute].
- Treated **1 mile** of Valley Creek, Ennis Creek and Port Angeles Waterfront Trail [CCNWCB/Lower Elwha Klallam Tribe].
- Treated or re-treated **8 miles** on the Dungeness River [Jamestown S'Klallam Tribe].
- Treated **12 acres** on the Dosewallips River, Duckabush River, Snow Creek, and Salmon Creek [JCNWCB]
- Distributed herbicide to other Olympic Knotweed Working Group (OKWG) partners. Members of the OKWG used approximately **170 gallons** of herbicide.

## Observations/Conclusions

- Plants treated last year were greatly reduced in above-ground bio-mass, but many areas still had large numbers of small plants. Follow-up treatments will be imperative in subsequent years to avoid losing ground already gained.
- On sites that have already been treated for one or more years, the focus is shifting. Previously, the majority of time was spent treating large, obvious infestations; in the future the focus will need to be on re-visiting sites and searching for new growth or plants that were initially overlooked.
- Some plants which had been treated for two or even three years still had a large root mass, and were sending up small shoots with not enough surface area to effectively treat**.** Additional research on symptomatic plants is becoming urgent.
- As knotweed is removed there is a high potential for other non-native plants such as reed canarygrass or herb Robert to invade.
- Inconsistencies in data collection hamper certain types of data analysis. However, the goal of the data was not scientific research or analysis, but to record the location, quantity and ownership of the infestation and how it was treated.
- Survey crews tended to individualize sites, treatment crews tended to consolidate multiple sites, making analysis and comparison difficult
- Treatments differed slightly this year—remaining stocks of Agridex were used and then crews switched to Competitor. Imazapyr was at times sprayed in conjunction with Gyphosate to increase treatment effectiveness. The results of these changes will be assessed next year.
- There was a shift from injection to more foliar application, because many plants were too small to inject (as a result of previous years treatments).
- As the visual impact of huge knotweed populations is reduced there are concerns that people may think the crisis over, making funding more difficult to get.
- County policy banning herbicide use on county roads hampers effective treatment.
- Hiring locals to handle landowner permission has been very effective.
- It is in the best interest of all knotweed control programs in the area to continue coordinating knotweed control efforts, to share information through a centralized data base and to pool resources through networking. This has been the main function of the OKWG.

## Recommendations

- Re-survey and re-treat all known knotweed sites.
- Modify 2008 treatment prescriptions based on discussion and recommendations at the OKWG spring meeting.
- Continue to work with the Clallam Conservation District on revegetation plans for the Big River and try to do likewise in other watersheds.
- Give crews better training in data collection.
- Work with the OKWG to more clearly define what is meant by "site" and otherwise refine data collection.
- Seek research on the cost-effectiveness of invasive plant treatment versus large scale, reactive restoration projects.
- Pursue permission for CCNWCB employees to treat roadsides.
- Continue to hire local people, especially for landowner contact.
- Annually review knotweed priorities on a landscape scale. Set goals and annual work plan through discussions with partners.

.

# PROJECT DETAILS

## SURVEY METHODS

Surveys were conducted on foot and data were collected on a Trimble GEO XT GIS/GPS instrument, using the data dictionary developed by the Olympic Knotweed Working Group (OKWG). *Pathfinder* software was used for post-processing. The following information was collected: Agency Name, Collector, GIS Projection Reference, Site ID, Species of Knotweed, Cluster Type, Average Stem Height, Stem Count, Phenology, Site Type, Action, Herbicide, Surfactant, Treatment, Ownership, Canopy, Substrate, Plant Erosion Potential, Site Erosion Potential, Area, Unit, Comments, Date, and Time. The same data dictionary was used by all participants in the Olympic Knotweed Working Group, so that data taken in different places by different people could be grouped, summarized and mapped (For an explanation of the terms used in the Data Dictionary and an example, see Appendices I and II.)

A Thales Mobile Mapper CE equipped with Arc Pad was also used. This unit was especially useful because its screen showed maps of the area with parcel information that allowed crews to know whose property they were on. It was also used to record GPS points.

The goal of our surveys was to record the location of knotweed sites and the number and size of plants present, so that owners could be identified and contacted. Crews utilized this information to find sites and document treatments. Our data were not taken with the objective of doing scientific research or analysis.

## LANDOWNER AGREEMENTS

We used the standard Landowner Permission forms produced by WSDA (see Appendix III for an example). In this document the landowner allows crews to monitor and treat knotweed on the property for up to five years. The landowner, WSDA and its agents (CCNWCB) also agree to hold each other harmless in the event of any accident. CCNWCB staff were careful to explain to landowners that they could cancel the agreement at any time.

Many Landowner Agreements had already been signed in previous years. If re-survey or re-treatment was necessary on properties where we already had an agreement, we called the landowner 1-4 days ahead of time to let them know that crews would be on their property. This courtesy was much appreciated; it enhanced our reputation and probably increased our success in getting other landowners to sign agreements.

In 2007 we treated several new areas—the lower portion of the Sol Duc River, all of Lake Creek, some new areas in Sekiu and Clallam Bay, the Clallam River, Forks, Ennis Creek and Valley Creek. We acquired the necessary Landowner Agreements for these areas. Survey data points were added as a layer on the Clallam County parcel map, using ArcView. Parcels with data points were highlighted and contact information was exported into Excel. Columns were added to the spreadsheet for phone numbers, alternative contacts, date permission was given, date landowner was contacted regarding treatment, date of treatment and notes (See Appendix VII, Landowner Spreadsheet).

During the 2007 treatment season CCNWCB had four employees living in the west end of Clallam County (Marsha Key, Rafael Ojeda, Charles DeVaney and Steve Erickson). Often one or more of these people would be personally acquainted with landowners who had knotweed, especially those living locally, and would ask them to sign a Landowner Agreement. Out-of-town landowners received letters and in some cases where there was no response, a follow-up letter was written. (See Appendix VI for Landowner Letter)

Several timber companies own land in different watersheds and because we already had agreements signed with them from previous years, we were able to call or email and ask if we could add new parcels to our agreement with them. The same system was used with Washington State Parks.

## Landowner Agreement Information

| **Watershed** | **Number of Existing Agreements** | **Agreements signed, 2007** | **Number of Parcels** | **Private Landowners Helped** |
|---|---|---|---|---|
| Big River | 16 | 3 | 52 | 17 |
| Sekiu River | 2 | 2 | 6 | 4 |
| Hoko River | 5 | 2 | 24 | 6 |
| Sekiu-Clallam Bay/Hwy 112 | 28 | 19 | 104 | 44 |
| Clallam River | 2 | 7 | 21 | 11 |
| Pysht River | 0 | 8 | 31 | 1 |
| Sol Duc River | 26 | 9 | 78 | 35 |
| Lake Creek/Lake Pleasant/Beaver | 2 | 9 | 22 | 10 |
| Forks | 0 | 13 | 18 | 12 |
| Port Angeles Waterfront/Ennis Creek/Valley Creek | 1 | 0 | 0 | 1 |
| Jefferson County | 11 | 4 | 21 | 13 |
| **Totals** | **93** | **76** | **377** | **154** |

**Ninety-three** existing Landowner Agreements were managed--landowner information verified and landowners notified of impending activity. Also, four different large landowners (three timber companies and Washington State Parks) were re-contacted and a total of 40 new parcels added to our agreements with them.

**Seventy-six** new landowner agreements were signed as a result of personal contact or letter-writing. Many of these agreements covered multiple parcels. We are currently managing agreements on **377** parcels. In 2007 we helped **154** private landowners.

The document "Frequently Asked Questions (FAQ) for Landowners with Knotweed" (See Appendix V), created in 2006, continued to be very useful. It not only prepared employees on how to answer questions, but was appreciated by landowners because it gave them a lot of information they could read at their leisure.

Most landowners were very positive about having their knotweed treated. Newspaper articles in previous years and general word-of-mouth had laid the groundwork for positive interactions. Three years of knotweed treatment had been observed, with little or no negative impacts on animals, other plants, human health or soil or water quality. This, together with the fact that knotweed was obviously decreasing, enhanced our credibility and the likelihood of landowner cooperation.

Very few landowners refused to sign the document or to allow us to treat their knotweed. One landowner on the Big River refused because of concerns about water quality, since the knotweed grew close to his water intake. Four others, on the Sekiu, Clallam or Sol Duc Rivers, had concerns about allowing County employees onto their property.

## TRAINING

CCNWCB organized and coordinated a three-day training event in Forks, June 12th through 14th, sponsored by WSDA. This event was attended by crews and representatives from the Quinault Tribe, the Quileute Tribe, the Makah Tribe, the Jamestown S'Klallam Tribe, the Lower Elwha S'Klallam Tribe, the Hoh Tribe, the North Cascades Exotic Plant Management Team, Washington Conservation Corps, Washington State Parks, Washington State Department of Agriculture, the City of Forks, Hood Canal Salmon Enhancement Group, Olympic Corrections Center, 10,000 Years Institute, Clallam County Roads, Grays Harbor County Noxious Weed Control Board, Mason County Noxious Weed Control Board, Jefferson County Noxious Weed Control Board and Clallam County Noxious Weed Control Board. All told there were at least **70** participants.

The presenters were Carrie Foss, M.S. and Dr. Tim Miller. Carrie Foss is the Urban IPM Coordinator at the WSU Puyallup Research and Extension Center, with a special interest in pesticide safety education. Dr. Miller is a researcher at WSU's facility in Mount Vernon.

The training itself covered two days; on the third day provision was made for attendees to take pesticide exams. All categories were offered and this was of great value to many people since their alternative would have been to drive to Olympia or Everett to take the tests—a nine and a half hour round trip for some participants**.** (A second opportunity to take pesticide tests was also offered in August.)

The afternoon of the third day was devoted to hands-on training. All three application methods were demonstrated and crews had a chance to try them out in a real-world situation, treating knotweed sites in Forks. These sites had been identified by the Quileute Tribe and CCNWCB staff had acquired the appropriate Landowner Agreements. In all, eleven sites were treated in Forks, covering approximately 14.4 acres.

We also produced a six-page document, for use by herbicide applicators, which very specifically describes application methods and how to do them (Appendix VIII). Crews found it extremely useful.

As the OKWG matures we are moving towards helping landowners with terrestrial sites treat their own knotweed. To further this goal we provided explicit technical information, assistance and supplies. Four landowners in the west end of Clallam County took advantage of this and it is hoped that more do so in the future.

## OUTREACH

Our June Pesticide Training was featured in the Forks Forum. (Appendix X)

CCNWCB Coordinator Cathy Lucero gave presentations to both the Forks Chamber of Commerce and the Forks Business Association, about knotweed, knotweed control and our program.

Charles DeVaney made brochures available at the Clallam Bay Library and placed posters and brochures in local businesses. He also worked with landowners to help them control their own knotweed. He and Steve Erickson had many informal meetings with local people regarding knotweed and received many phone calls, which eventually outstripped our capacity to help.

The knotweed control efforts of both the Quileutes and the Makahs were featured in the Peninsula Daily News.

## APPLICATION METHODS

Aqua Neat, AquaMaster, or Glypro, glyphosate-based, aquatic herbicide formulations, were used to control knotweed. Habitat or Polaris AQ, imazaypr-based formulations, were also used in small amounts. Agridex, R-11 (in non-riparian sites), or Competitor were used as surfactants. Blazon Blue marker dye was added in small amounts to the spray mix, to indicate which plants were sprayed. Low fume spray paint was used to mark canes that were injected.

Three methods of herbicide application were used—injection, foliar and wipe.

**Injection**.

Direct injection of 3ml of undiluted glyphosate formulation into the lower node of each cane.

- Canes 1/2 inches and larger were injected except in situations where doing so would have exceeded the maximum legal herbicide use per acre.
- Injection guns were calibrated every time the canister was filled to ensure the correct amount of herbicide was being administered.
- Short needles were used. This solved the breakage and bending problem encountered earlier in the program when only long needles were available. If the crew encountered pressure while trying to inject with short needles, a relief hole was punched with the short needle followed by injecting herbicide below the relief hole.
- Needles were packed into a calibration tube when hiking to avoid any accidents.
- Treated canes were marked with a spot of paint to prevent treating the same cane twice.
- The calibration screw tends to loosen during use. Applying a drop of loctite helps prevent this problem.
- The breathing hole mechanism on the canister sometimes became blocked. Once a vacuum develops the gun fails to dispense herbicide. The latter appears to occur during long application days when there are extended periods between thorough gun cleanings.


**Knotweed Injection Equipment**

**Foliar**

Spraying plants with a low pressure "Solo" backpack sprayer.

- A 6% solution was the most widely used rate, in both aquatic and terrestrial sites.
- An 8% solution was used in some terrestrial upland.
- On some sites 1% of Habitat or Polaris AQ was added to the spray mix, to get better control.
- The spray mixture contained 0.5%-2 % surfactant. Over the season we used Agri-Dex, Competitor or R-11 (on non-riparian sites). It also contained 0.5-1% Blazon Blue marker dye.
- Foliar applications were used primarily to treat sites where cane diameters were too small for injection. In some areas the size of the infestation required foliar application, because injection would have taken too long.

**Wipe**

A 33% solution with 10% surfactant, by volume, (as allowed by label), applied to the surface of leaves and stems with a foam paint brush.

- This method is effective when treating small sprouts or when there is a need to be highly selective.
- It was seldom used in 2007 because it is so labor-intensive, but may be reconsidered in the future when treating hard-to-kill plants that still have viable roots but very little leaf surface area to spray.

## PROJECT ACTIVITIES BY AREA

## BIG RIVER/HOKO-OZETTE ROAD

The Big River is one of several large, low elevation, low gradient streams that drain into Lake Ozette, the third largest natural lake in Washington. Lake Ozette empties, through the Ozette River, into the Pacific Ocean. The Ozette Basin is approximately 88 square miles and Lake Ozette itself lies within the Olympic National Park in western Clallam County. Major land uses within the Big River watershed include timber production, agriculture, recreation and wildlife preservation (in Olympic National Park).

The Ozette basin supports stocks of coho, sockeye, and kokanee (resident) salmon, small numbers of chinook and chum salmon, steelhead and cutthroat trout (sea-run and resident), as well as many other native and exotic fish. Sockeye salmon were listed as threatened under the Endangered Species Act in 1999. It is believed that knotweed infestations, by displacing native vegetation and all of its benefits, are impacting both spawning sites and habitat for juvenile salmonids.

Local residents report that knotweed infestations have been present on the Big River since the 1940s but before 2002 it was not present in significant quantities. By 2004 knotweed had spread to become an extensive monoculture along some of the stream banks. It was particularly evident in the lower stretch of the river, including the portion of the river that lies within the Olympic National Park. Our crews do not work on federal land but the North Cascades Exotic Plant Management Team have been treating knotweed in the Olympic National Park since 2004.

In 2004 approximately ½ mile of knotweed on the Big River was chemically treated as a pilot project.

Treatment began in earnest in 2005; 12 landowner permission forms were obtained and all sites on these properties were chemically treated. Four additional sites were found in the fall—the bright yellow fall color of knotweed made the plants more visible and aided in their discovery. The Makah Tribe supplied a four to eight person crew; they worked with a CCNWCB employee, who also managed landowner agreements and public outreach.

Treatment in 2004 and 2005 was complicated by the fact that beaver dams were found on the Big River, constructed from knotweed. Some canes produced new growth in the dam and some washed downstream where there is a high likelihood that they produced new infestations. In 2005 a Joint Aquatic Resource Permits Application (JARPA) was obtained from WSDFW to dismantle and treat a beaver dam constructed of knotweed canes. Hopefully, eliminating knotweed sources will encourage beavers to revert to native materials for future construction projects.


Beaver Dam on the Big River

By the fall of 2005 it was obvious that the knotweed infestation on the Big River, especially the lower portion, was so bad that that it would take a considerable amount of work to control or eliminate it. Consequently, CCNWCB applied for and was awarded a grant from the National Fish and Wildlife Foundation (NFWF) to help with the task.

The funding provided by NFWF was used to pay for a five-person CCNWCB crew to work for several months on the Big River in 2006, and to purchase data collection equipment. Data in previous years had been collected on borrowed equipment which greatly hampered our efficiency.

Other partners were involved, particularly the Makah Tribe who supplied a crew for several years, and Washington State Department of Agriculture, whose funding covered the costs of transportation and supplies such as injection guns, backpack sprayers and herbicides, and some staff time. It also paid for printing a brochure about knotweed and efforts to eradicate it, which was passed out to many landowners in the area.

Other federal money was used in the project—a grant from the US Forest Service's Forest Health Protection Fund paid for a Knotweed Control Specialist during the summer of 2006, who worked on other knotweed projects as well as the Big River. Clallam Conservation District applied for and was awarded a "sister grant" from NFWF to be used for revegetation on the Big River. CCNWCB's involvement in the Big River knotweed removal was part of a large, multi-agency effort to not only remove the invasive knotweed but to restore the Big River to a fully-functioning ecosystem and protect salmon runs by restoring their habitat.

**Hoko-Ozette Road**

Because the Hoko-Ozette Road closely follows the Big River for approximately six miles, and at times comes within a few feet of it, knotweed surveys and control work were undertaken there and considered as part of the Big River project. In 2005 approximately 14.95 miles of the Hoko-Ozette Road were surveyed and over 100 separate sites were treated. During the survey of the road three new knotweed sites were discovered in the upper portion of the Big River and on Boe Creek, an area previously thought to be knotweed-free. All three were treated in 2005.


Hoko-Ozette Road in 2005

Knotweed along the road will continue to re-infest the river if it is not removed. Unfortunately, Clallam County's roadside vegetation management policy does not allow for the use of herbicides. A title search of the Hoko-Ozette Road revealed that many portions/parcels of the roadway were still owned by the landowner and the roadway itself was just" implied" or merely right of use. The County's attorney advised that where the County did not have title or a deeded right of way (not right of use) along the roadway, the landowner retained jurisdiction as long as the landowner's use of the area did not impede the purpose of the road. The attorney advised that if the landowner gave permission to treat knotweed along those particular stretches, the intent of the policy would not be violated.

In addition, deeds that were sold or given to the County for the purpose of a road, were transacted in 1931 (initial layout of the road by the County). At that time, the criteria for road width was different than current requirements and the deeded portion was only twenty feet from center line. In these parcels, current road width standards leave little shoulder that is within the deeded 20 feet. The ability of an affected landowner to give control permission, as interpreted by the County attorney, thus applied here also. This proved to solve the policy dilemma for many areas along the roadway. The road was surveyed, and after obtaining a landowner's permission, (using the form provided by WSDA), the knotweed was treated. Of the 100 plus knotweed sites along the Hoko-Ozette Rd, there were only three where the no-herbicide ban applied and therefore we were not able to treat these sites.

**Outreach**

Prior to this project the local community had little understanding of knotweed, the means of its vigorous regeneration and its detrimental effects, although knotweed had obviously been present for many years. Many were willing to get rid of it once they became aware of its impacts and some homeowners had battled it unsuccessfully for years by mowing (it always came back!). However, many people had concerns about herbicide use and the effects herbicides would have on soil, water and other plants.

We attempted to address these concerns and stimulate public interest in becoming part of the knotweed solution. In 2005 a knotweed brochure (see Appendix IV) was mailed to every landowner

in the entire Ozette watershed. A public meeting was held to answer questions about knotweed and its control, and to answer questions and solicit involvement.

We demonstrated the techniques of spot-spraying, injection and wipe. All of these methods minimize herbicide impacts on the environment and other plants and went some way towards allaying public concerns about herbicide use. We also let people know that current research indicates that, except in the case of very small infestations, herbicide is the only way to get rid of knotweed.

Until the initiation of this project, many landowners had been in the habit of cutting down knotweed canes on their property and throwing them in a trash pile, or even into the river. In either case there was a high risk of starting new infestations. By doing extensive public outreach the knowledge of these potential impacts is now widespread and the understanding of what ***not*** to do is widely accepted.

We worked hard to establish our reputation and build trust by maintaining a respectful attitude toward landowners and providing open communication about our work. Survey and treatment efforts were presented to the local community through newspaper bulletins, community meetings, brochures and posters, mailings, and personal contact. This community outreach directly benefited the project's success. Broad knowledge of the problem and what we were doing about it went a long way to creating local support while allaying concerns about the use of herbicide. Not only did this add to the efficiency of treating where and when it was needed, but also helped address concerns upfront, reducing the likelihood of contentious issues developing later on.

**Survey**

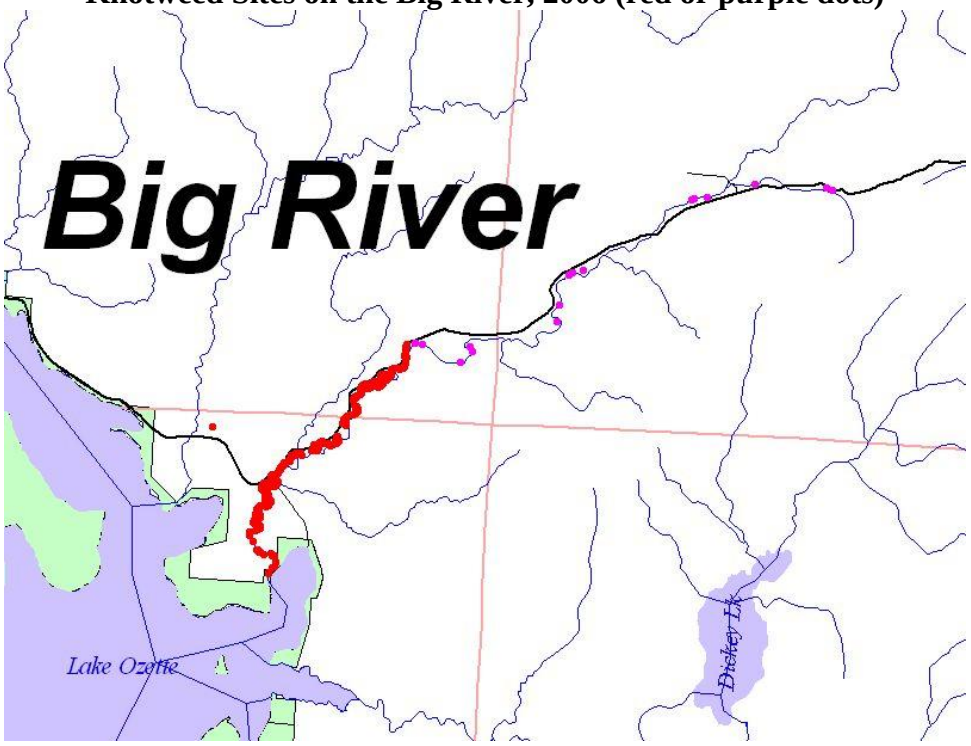
In 2006 the Makah Tribe surveyed six miles of the upper Big River (including one mile of Boe Creek) and in June the same year a Clallam County crew inventoried the knotweed infestations in the approximately six miles of lower Big River.

The Makah surveyors found 16 knotweed sites and 635 were found by the CCNWCB. All knotweed plants found on the Big River were thought to be Bohemian knotweed

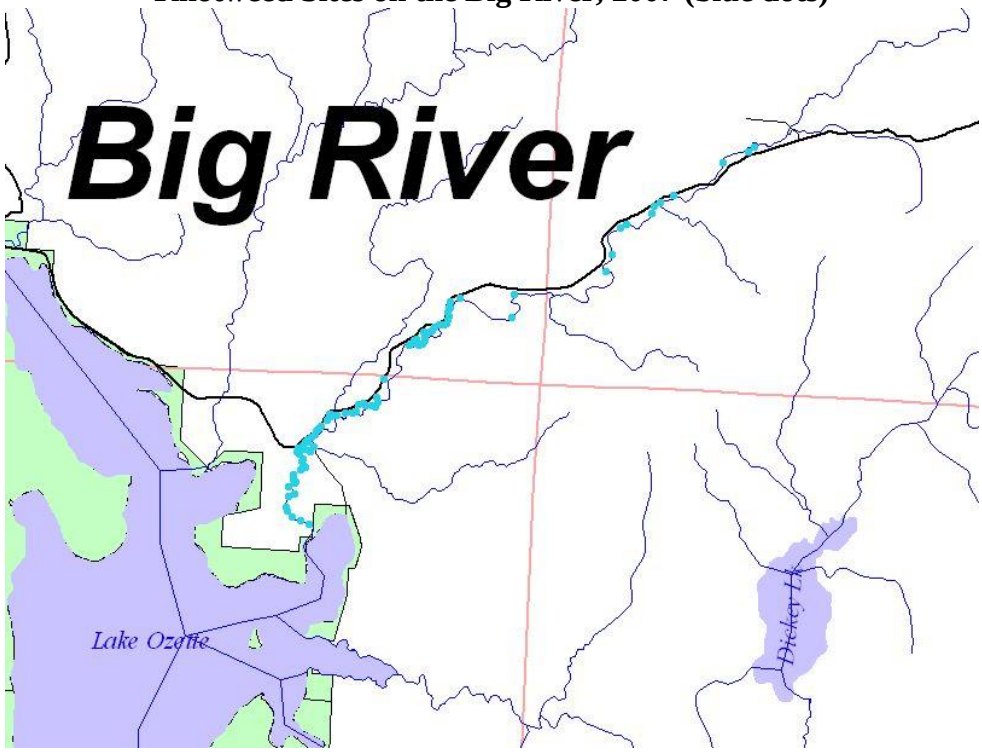
In July, 2007, CCNWCB re-surveyed both the upper and lower portions of the Big River. During the winter of 2006-2007 the river had moved considerably within its flood plain and quite a lot of flooding occurred. Because of the flooding and movement of the river it was difficult or even impossible to find individual sites that had been recorded in 2006. Also, although there has been much discussion within the OKWG as to what constitutes a "site" there is still no clear consensus on how a "site" is determined. Further, the knotweed infestations had been reduced considerably by the treatments given in 2006. For all of these reasons, a different method for determining sites was used in 2007. Fewer readings were taken and they were taken approximately 150 feet apart, or where there was a clearly discernible gap of at least 50 feet between plants. Seventy-nine sites were recorded in July 2007. These sites were obviously larger in area and each one encompassed multiple sites from the previous year.

The data from the surveys were downloaded and added to a GIS map. This allowed us to pinpoint exactly where the knotweed infestations were located. Parcel and landowner information could be extracted, using the County's ArcView system. Mapping also allowed comparison between sites over different years.

**Knotweed Sites on the Big River, 2006 (red or purple dots)**




**Knotweed Sites on the Big River, 2007 (blue dots)**



**Landowner Permissions**
Ed Bowen, a Lake Ozette resident, spent many volunteer hours during the winter of 2005 to 2006 talking to landowners on the Big River and getting 12 Landowner Permission forms signed. CCNWCB staff solicited four more in 2006 and three more in 2007.

Only one landowner with knotweed refused to sign a Landowner Agreement, because the knotweed was close to his water intake and he had concerns about water quality. (In 2007 he allowed a CCNWCB employee to dig and remove the knotweed.)

**Application**
Early in 2006 a five-person crew was hired by CCNWCB. It seemed advisable to hire local people in order to help an economically depressed area and also to draw on local knowledge, so the jobs were advertised and interviews were held in the Big River/Lake Ozette area.

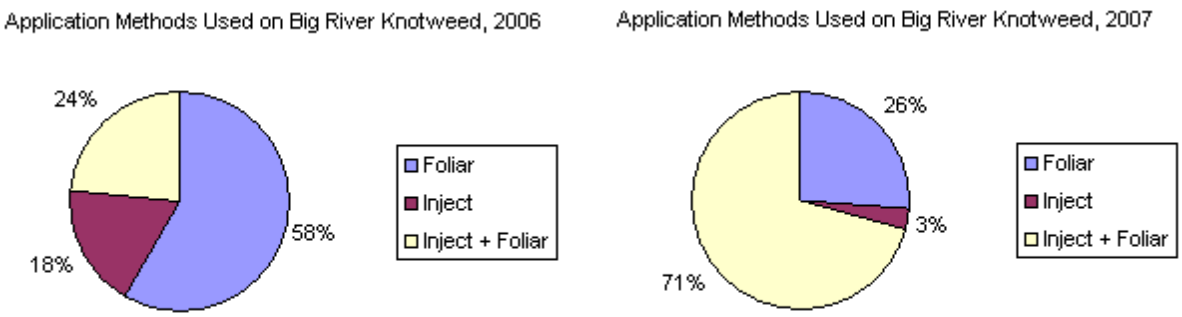
The Makah Tribe also supplied a crew, varying in size from four to eight, who worked with the CCNWCB crew.

In 2006 12 miles of the Big River and 18 miles of the Hoko-Ozette Road were treated. This included all 651 sites that had been surveyed (16 surveyed by the Makahs and the 635 by the CCNWCB). They were treated by the 2-5 person CCNWCB crew in conjunction with the Makah Tribe crew. Some of this work was re-treatment of sites that had already been treated one or more times in 2004 or 2005

Training the Makah Crew on the Reservation

In August 2007 the Makah Tribe crew (with some help from CCNWCB) re-treated all of the sites that had been recorded in the survey earlier the same year.

Knotweed plant size had been considerably reduced by the 2006 treatment. Fifty-five spray records were submitted in 2006 and 34 in 2007. A comparison of treatment methods, based on information from the spray records, is given here because it demonstrates the change in plant size.




There was a large percentage of foliar treatments in 2006 because many of the sites were so large that if injection had been used, we would have exceeded the maximum amount of herbicide per acre. Conversely, in 2007, many of the canes were too small to inject so foliar treatment was used. A high percentage of sites were treated with both foliar and injection in 2007, but in all these cases the majority of the treatment was foliar.

From 2006 to 2007 the presence of knotweed was much reduced. Fewer than 200 canes were big enough to inject (Jon Gallie, Makah Natural Resources, pers. com.), demonstrating a shift from a high percentage of large plants to a high percentage of small plants. However, the numerous small sprouts remaining indicate that continued follow-up treatments will be necessary for many years.

**Application Results**

The different methods of data collection used in 2006 and 2007 make analysis and comparison very difficult. (651 sites were recorded in 2006 and only 79 in 2007). Also, when collecting data our goal was to ascertain the location of knotweed sites so that landowners could be contacted and knotweed treated. We were not attempting to collect data for the purpose of a scientific study and our results should be viewed with that in mind.

Several parameters were used to assess the results of treatment.

**Area Treated**.

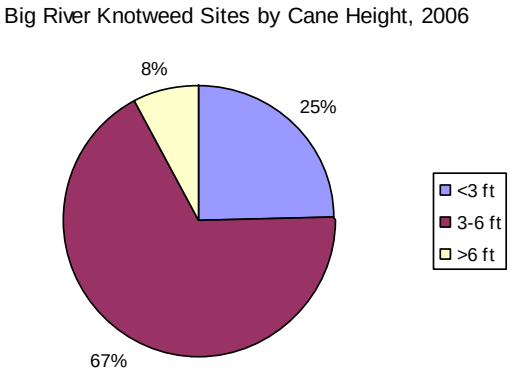
In 2006 the Knotweed Control Specialist estimated that **466 acres** had been treated. In 2007 only **28.17 acres** were treated—the 2007 figure was arrived at by adding up the acreage on all the herbicide records. This is a reduction of 94%.

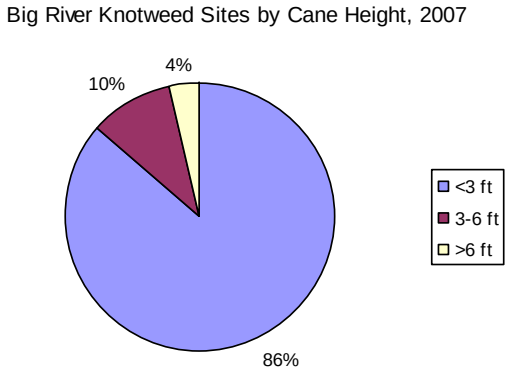
### Number of Canes

It was tricky to calculate the number of canes seen each year because each data dictionary entry covered a range of numbers. The midpoint of each range was selected as the best estimate. For example, for entries in the 11-25 range, 18 was selected as the mid-point and this process was used to arrive at the stem total. The results were a total of **75,398 stems in 2006**, and **45,663 in 2007**, a decrease of **40%.** However, these figures do not truly indicate the reduction in knotweed biomass because in some cases, stands of large canes were replaced by many very small canes or sprouts. (Jon Gallie, Makah Natural Resources, pers. com.) All sprouts were included in the cane count.

### Cane Height.

All data collection was done in the summer months, when canes were already at their full height and an overall height reduction would demonstrate that plants were weakened by herbicide use.



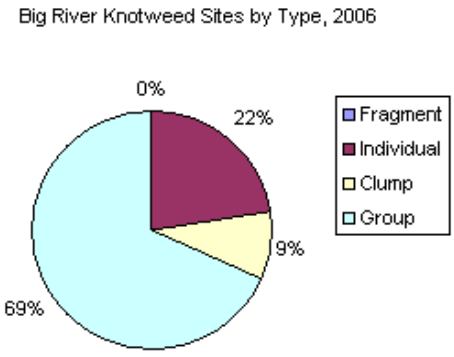



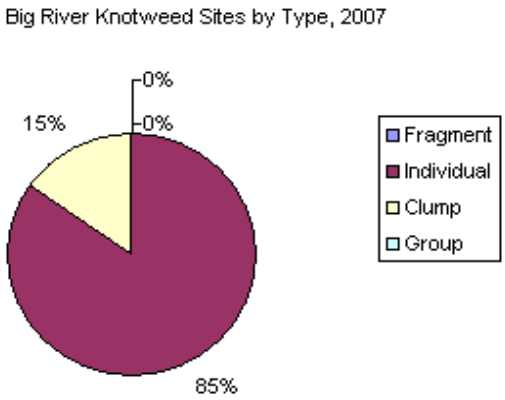

In 2006 8% of the canes were over six feet tall and 25% of the canes were under three feet. In 2007, after extensive treatment in 2006, only 4% were over six feet tall and 86% were under three feet.

Converting these percentages into actual numbers of canes (using the estimates given above) shows that in 2006 there were at least 6,031 canes over six feet tall and by 2007 this number had been reduced to 1,826—a reduction of two-thirds. Conversely, the number of small canes (less than three feet) had increased, from 18,849 to 39,270, or nearly doubled.

### Site Type

This was an important parameter. Sites were categorized as individuals, clumps (more than one stem) or groups (forming a monoculture). Fragment was also a category, but was seldom used.



In 2006 a large percentage of sites were categorized as "group" (monoculture) type but by 2007 there were no sites in this category, indicating that the large monocultures were starting to be controlled. Instead, the bulk of sites were categorized as "individual", the lowest density category.

**Total Herbicide Use**

In 2006 all known sites on the Big River and the Hoko-Ozette Road were treated and 65.39 gallons of herbicide were used by the combined CCNWCB/Makah crew. In 2007 all sites were fully treated and only 3.72 gallons were used—a reduction of 95%!!

This parameter may in fact be the most realistic and it bears out reports from interviews with the Makah crew leader, who said that there were very few large canes left on the Big River, but many small canes.

| **SUMMARY OF 2007 TREATMENTS ON THE BIG RIVER** | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 34 | 28.17 | **AquaNeat**<br>1.24 gal @ 100% | **AquaNeat**.<br>3.3 gal @ 6-6.5%<br>**Habitat**<br>0.6 gal @ 1% | **Agridex** @ 2%<br>or **R-11** @ 1% |

## SEKIU RIVER

The Sekiu is a low gradient coastal river with many small forested, scrub-shrub and emergent wetlands scattered throughout. It flows into the Straits of Juan de Fuca about 10 miles east of the Makah Reservation. Much of the land in the watershed is zoned for commercial forestry. In 2006 it had a dense, yet discrete infestation of knotweed stretching less than a mile from the mouth. The Makah Tribe treated 26 patches ranging from three canes to well over 200. The treated area covered 4.7 acres. Three patches located on one property were not treated in 2006 due to lack of permission.

Treatment in 2006 was very successful. Many dead canes were observed during the fall of that year and only four treatments were necessary in 2007. Two sites, including a new site near the mouth of the river, were treated by CCNWCB. Two other sites on the Sekiu River were treated by the Makahs.

Towards the end of the 2007 season our "Ambassador in the West End", Charles DeVaney, met with the landowner who had refused permission to treat in 2006 and he gave permission.

| SUMMARY OF 2007 TREATMENTS ON THE SEKIU RIVER | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 4 | 1.78 | **AquaNeat**<br>0.1gal @ 100% | **AquaNeat**.<br>0.18 gal @ 6-6.25%<br>**Habitat**<br>0.02 gal @ 1% | **Agridex** @ 2%<br>or **R-11** @ 1% |

Only 0.28 gallons of herbicide were used in 2007, compared with 11 gallons 2006—a sizeable reduction.


**2007 treatments on the Sekiu River (approximate locations only)**

## HOKO RIVER

The Hoko River flows into the Straits at Eagle Point, about a mile and a half east of the Sekiu River. There is a small residential community known as "The Vista" near its mouth, and Washington State Parks own a considerable amount of land, also near the mouth, which will eventually become a State Park.

In early June of 2006 the Makah Tribe conducted a float survey on approximately 12 river miles of the Hoko. Giant knotweed was the dominant species found, mostly in sporadic patches, which were treated by the Makahs the same year.

The Makahs re-surveyed in June 2007 and continued treatment, which is summarized below. Because of the steepness of the river banks, crews had to be ferried by boat from the mouth. One large private landowner with knotweed signed an Agreement early in the year, but then had reservations about herbicide use, so that property still is not treated. Negotiations continue.

| **SUMMARY OF 2007 TREATMENTS ON THE HOKO RIVER** | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 9 | 5.82 | **AquaNeat**<br>1.63 gal @ 100% | **AquaNeat**.<br>2.52 gal @ 6%<br>**Habitat**<br>.075 gal @ 1% | **Agridex** @ 2% |

## SEKIU/CLALLAM BAY

Sekiu and Clallam Bay are small coastal towns about two miles apart, consisting mostly of fishing resorts and residential properties. Knotweed in the Sekiu and Clallam Bay area has a long history, dating back to 1930. Local wisdom identified railroad tracks as the source.

Highway 112 runs east-west near the shoreline and crosses the Clallam, Hoko and Sekiu Rivers. The Hoko-Ozette Road, which heads south-west from Highway 112, runs very close to both the Hoko River and the Big River. Both these roads serve as significant vectors of knotweed through movement of plant parts by vehicles and people.

By 2004 there were large stands of knotweed in both towns and along Highway 112. Many of the infestations were in or close to water (Straits of Juan de Fuca).

In 2006 CCNWCB hired local residents Steve Erickson and Charles DeVaney who educated landowners about knotweed and its effects on the environment. They also collected 36 signed permissions from landowners.

In 2006, the Makah Tribe and CCNWCB treated and re-treated 42 sites in Sekiu and Clallam Bay, comprising over 6 acres. Feedback from the community on this treatment was overwhelmingly positive.

**Before Treatment**

**After Treatment**

The entire area was re-surveyed in 2007 by the Makahs, with help from CCNWCB employees Charles DeVaney and Steve Erickson. They observed a tremendous decrease in the number of canes in both towns. After just one year of treatment most patches went from having 100-200 canes to 11-25. The canes that did return in 2007 were mostly less than 3 ft tall, compared to their original 6-10 feet.

However, several new sites were noted in 2007. Some of these were very small ones that had simply been overlooked in previous years, in some cases the knotweed had spread onto neighboring property and in yet other cases crews realized the knotweed was actually on more parcels than they had previously realized. Nineteen new Landowner Agreements were acquired and treatments are

summarized below. The 2007 treatment included one large site on a slope above the Sekiu Airport, where there were concerns about knotweed spreading down the hill towards the Straits.

| **SUMMARY OF 2007 TREATMENTS IN SEKIU AND CLALLAM BAY AND ON HIGHWAY 112** | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 57 | 5.82 | **AquaNeat**<br>3.5 gal @ 100% | **AquaNeat**.<br>6.06 gal @ 6-6.25%<br>**Habitat**<br>.23 gal @ 1% | **Agridex**<br>@ 2%<br>**R-11**<br>@ 1% |

Additionally, four landowners in Sekiu or Clallam Bay treated their own knotweed, taking advantage of CCNWCB's new policy of assisting landowners with terrestrial knotweed sites. Staff inspected to verify terrestrial sites, provided written and verbal instructions on how to treat knotweed, and provided some equipment and supplies as available. Often staff assisted landowner with treatment.

Herbicide use **on Highway 112** was reduced from **6.28** gallons in 2006 to **0.6** gallons in 2007. (Jon Gallie, Makah Tribe Natural Resources, pers. com). As discussed in the section of this report on the Big River, given certain inconsistencies in our data collection, herbicide reduction seems to be one of the best ways of judging the success of reducing the presence of knotweed. Comparisons could not be made between herbicide use in different years in the towns of Sekiu and Clallam Bay, because different areas were treated.

## CLALLAM RIVER

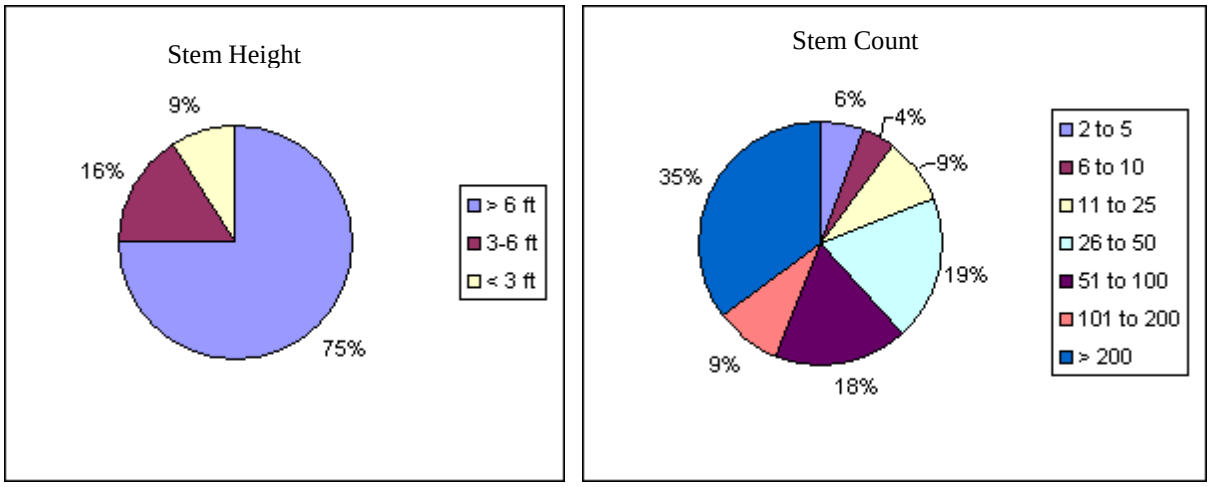
The Clallam is another low-gradient river, flowing into the Straits at the town of Clallam Bay. It is a unique system in that sand and gravel frequently block the mouth of the river. This phenomenon can cause flooding and can trap anadromous fish behind the gravel bar with no way to escape to the safety of the ocean, making them easy prey. In 1998 a channel was excavated to allow fish to escape. It was effective but was only a temporary solution.

There is a popular County Park at the mouth, and also a large portion of land owned by Washington State Parks.

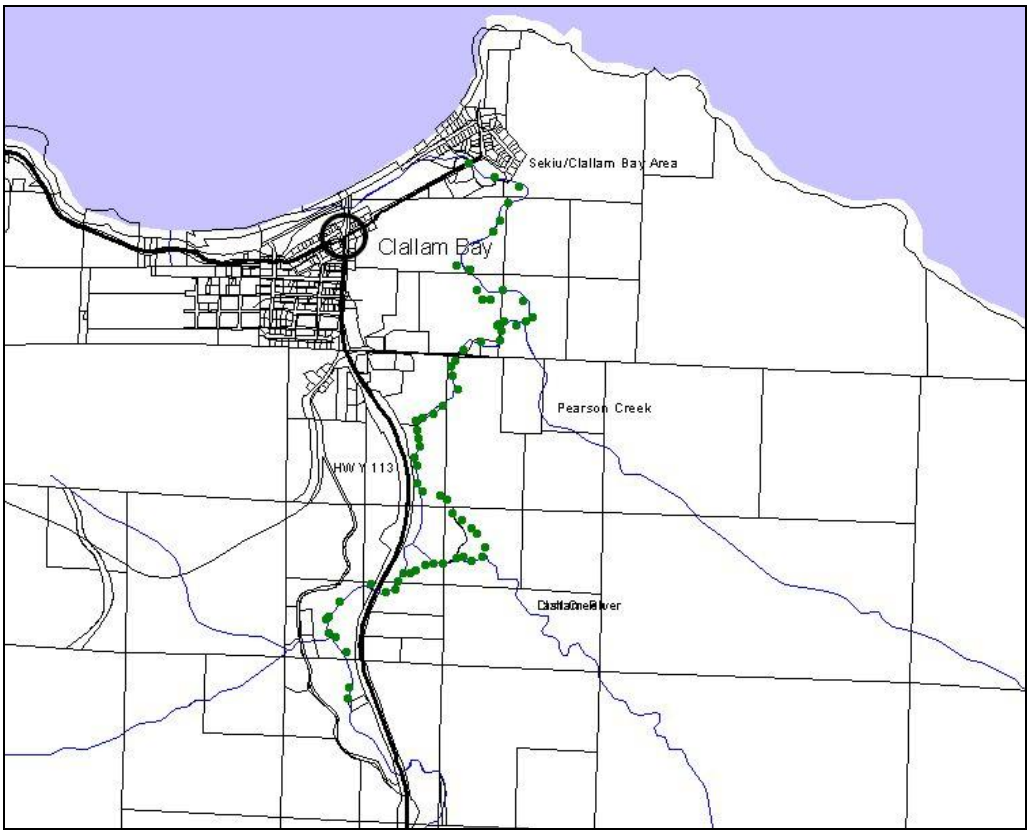
The Clallam River is about 13.4 miles long. Coho and winter steelhead spawn in the mainstem, and in several tributaries. Moderate numbers (500 or less) of chum have been observed in the lower mainstem.

The first reported sightings of knotweed on the Clallam River were around 1998 and it has spread rapidly since then (Mike McHenry, Lower Elwha fish biologist, pers. com), although it is likely to have been present, but unremarked for much longer.

The lower portion of the Clallam River was surveyed by the Makah Tribe in 2006. Sixty-eight knotweed sites were recorded.




The charts above show how the sites were characterized in the survey. Seventy-five percent of sites had mostly canes over six feet tall, and 35% had more than 200 canes. It should be noted that in 2006, when this survey was done, the largest category available in the Data Dictionary was >200. In reality, many of the sites had 1,000, 2,000 or even more canes



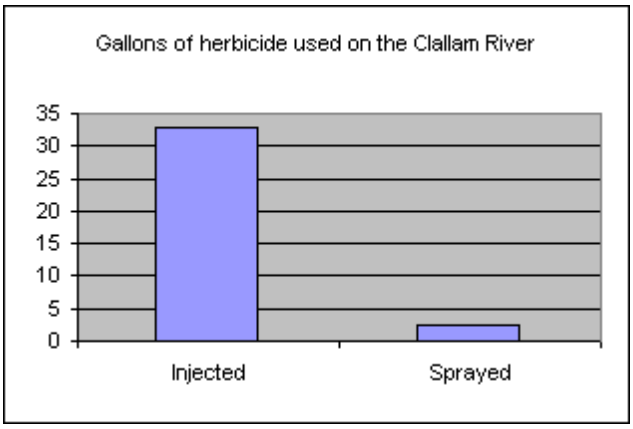

**Knotweed Sites on the Clallam River, 2006**

In 2007 funding from a NFWF grant with the Clallam Conservation District became available for the Lower Elwha Klallam Tribe to treat the knotweed on the Clallam River. This was done with the help of an aquatic licensed applicator from CCNWCB.

Nineteen parcels on the Clallam River had knotweed plants, involving 15 different landowners. One Landowner Agreement had already been signed in 2006, and CCNWCB solicited nine more. We were able to extend our existing agreements with Rayonier Timberlands and Washington State Parks and treat land owned by them on the Clallam River. One owner of a large tract of land refused to sign, saying they did not want County employees on their property.

| SUMMARY OF 2007 TREATMENTS ON THE CLALLAM RIVER | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 21 | 26 | **AquaNeat** 32.95 gal @ 100% | **AquaNeat**. 2.14 gal @ 6% **Polaris** 0.36 gal @ 0.5-1% | **Agridex** @ 2% or **Competitor** @1% or **R-11** @ 1% |

As can be seen from the table above, a far greater amount of herbicide was injected than was sprayed—an indication that there were many large canes.



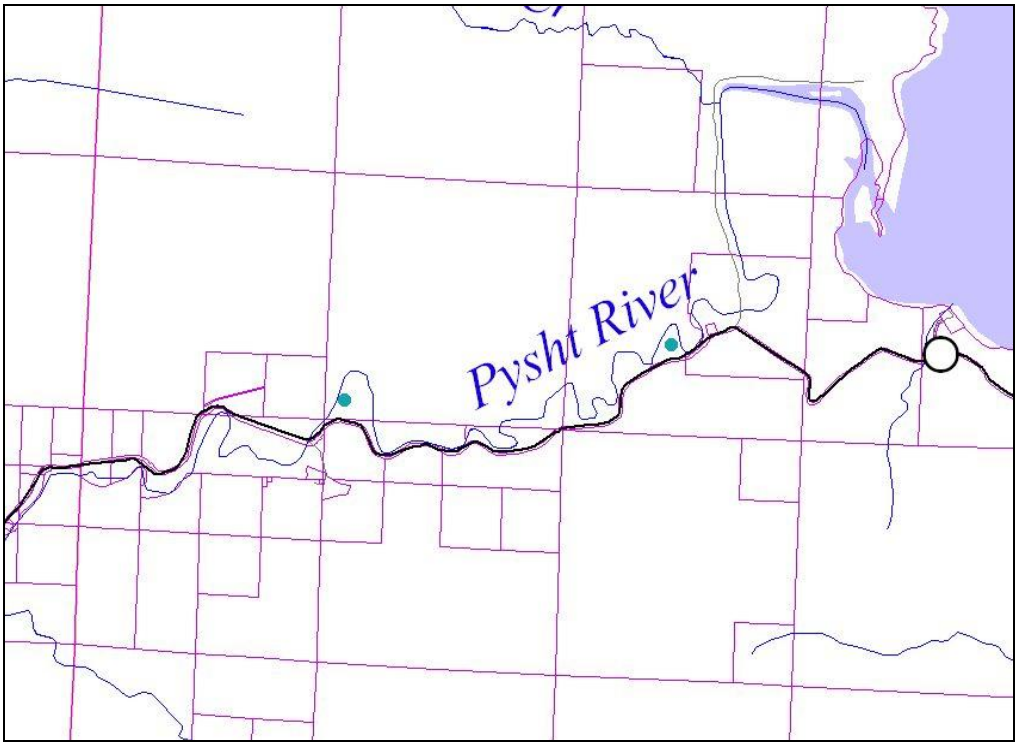
## PYSHT RIVER

The Pysht River is approximately 16.3 miles long and drains into the Straits of Juan de Fuca at Pillar Point, about eight miles east of Clallam Bay. The Pysht supports coho and chum salmon, and winter steelhead.

Knotweed on the Pysht was first observed and treated in 2005. No complete survey was taken that year, but two property owners notified CCNWCB of knotweed infestations. One of these owners was Merrill & Ring, which owns a large amount of land on the Pysht including a tree farm near the mouth. They were enthusiastic about controlling their knotweed and hired a crew to do the work, with help from CCNWCB

In 2006, five Merrill & Ring sites were revisited and re-treated, twice—in August and September. In July 2007 CCNWCB staff visited the sites and all plants appeared dead.

In 2007 the two remaining sites on Merrill & Ring land were re-treated by a crew hired by Merrill & Ring, with help from Marsha Key, a CCNWCB aquatic licensed applicator.




**2007 Treatments on the Pysht River**

| | |
|---|---|
| Total herbicide used on the Pysht | **0.72** gallons GlyPro |

The other landowners who came forward in 2005 were the Burdicks, who had a knotweed infestation covering 80,000 square feet. In 2005, they started manually digging knotweed as an alternative to herbicide use. In 2006, they continued digging the knotweed and worked on it six times, spending three hours each time, with approximately three people. Over the summer, they reported growth of up to two feet a month. In October 2006, the area contained 150 small canes, the majority reaching approximately three inches. This represented considerable success and it seemed that the infestation was contained, and there was practically no chance of the knotweed getting into the river system.

"By May of 2007," Caroline Burdick reported, " the re-growth was daunting, with plants over six feet high and sprouts everywhere." A mountain beaver hole was seen to have a neat pile of knotweed stems at the opening, causing concerns that this may be another way for knotweed to spread.

The Burdicks are still optimistic about controlling knotweed manually and pulling/digging continued through 2007, on five different occasions in May, June and August, with a total of 28 person-hours.

Disposal is becoming a problem. They would like to burn because pulled or dug plants have so much capacity for regeneration. On one occasion they observed about a foot of regrowth had occurred in six days on a pile of discarded material. New leaves were even opening. However, burning is not allowed in the summer and when the ban is lifted the site is difficult to access and the plants are so wet that burning them is difficult. They have decided to be content with covering piles with black plastic, but will cover them extremely well.

In 2007 a foot survey of the Pysht was undertaken by Steve Erickson and Chuck DeVaney, and eight new Landowner Agreements were acquired, in addition to the existing one with Merrill & Ring. However, no knotweed was found except for the two Merrill & Ring sites discussed above, but surveys will continue.

## SOL DUC RIVER

The Sol Duc sub-basin, within the Quillayute watershed, drains over 200 square miles. The Sol Duc River originates within Olympic National Park and stretches for nearly 20 miles before emerging from Park boundaries. It then runs for 45 miles until it joins with the Bogachiel, forming the Quillayute. It contains timber lands, agriculture, and residential development. The Sol Duc supports numerous salmonids such as chinook, coho, chum, sockeye, and steelhead, as well as cutthrout and rainbow trout.

**Sol Duc River, Mid-Section (re-treatment)**

In May of 2005, a float survey for knotweed and Scotch broom was conducted on the mid section of the Sol Duc River (from the Park boundary to Whitcomb-Diimell boat launch). Forty-six sites were recorded. All of them were characterized as having stems five feet or more in height, but the majority of sites were not large—ten to 50 stems was average

In 2006 CCNWCB solicited and obtained 29 landowner permissions through direct contact, phone, fax, or email. Only one landowner would not give permission to use herbicide.

Treatment took place in September and October of 2006, mainly on foot except that one day the Quileute Tribe provided CCNWCB a boat and rower to treat sites that could not be accessed by foot.

Most sites were found exactly where the data points were taken in 2005. There may not have been any major floods between 2005-2006. Data taken on the Sol Duc River are much accurate than data on the Big River due to their relative containment within an area and clear delineation. Seventy-one separate sites were treated on the Sol Duc River; the total area of knotweed treated was 5.24 acres. All plants treated were Bohemian except for one giant knotweed site. (See the 2006 Report for maps of treatments on the Sol Duc.)

In 2007 a combined Quileute/CCNWCB crew monitored and re-treated as necessary all of the sites in the mid-Sol Duc. Crews reported that the knotweed was much reduced—sites that had consisted of 200 to 400 canes were down to 20 or 30. Some spray records reported 90% control from last year's treatment.

In addition to re-treating old sites, several days were spent treating a site in Sappho, owned by Rayonier, on both sides of Highway 101. Three and a half gallons of AquaNeat was used on this site alone.

The Snider Work Center was treated again by a US Forest Service crew. Knotweed there was also much reduced.

The McPherson property on Hilstrom Road, more than two solid acres in 2005, migrating towards the river, was re-treated in 2007—only .01 gallons of herbicide used, indicating a considerable reduction in bio-mass.

Because knotweed had been found in Bear Creek and Swanson Creek in 2006, three new Landowner Agreements were acquired in those areas, and the sites were treated. Also, one site near Swanson Creek was treated.

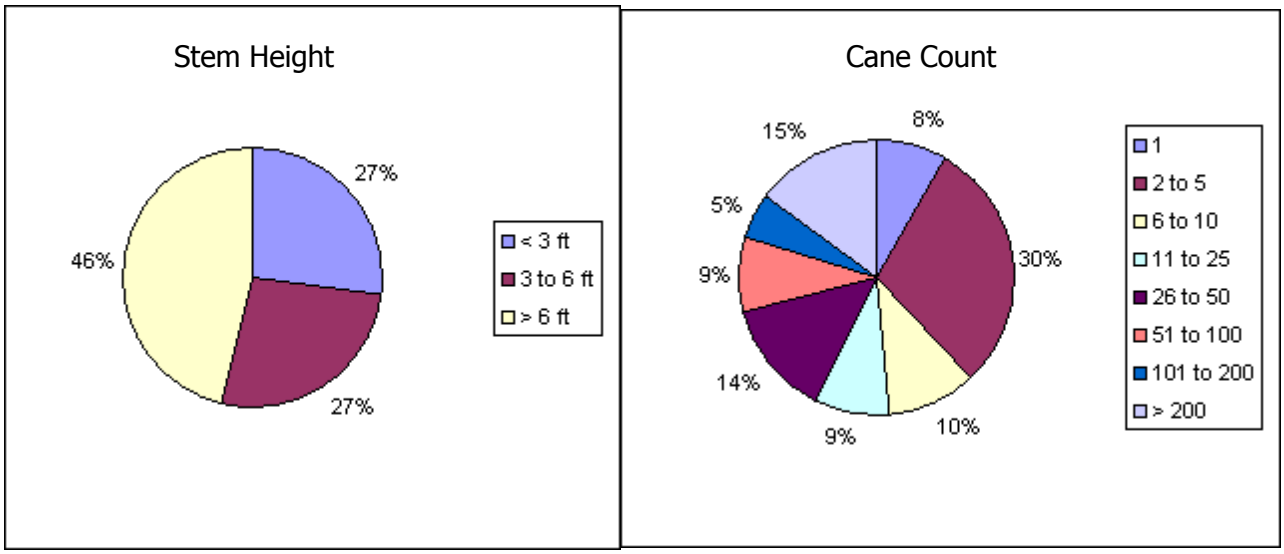
Knotweed was treated in 2007 near the mouth of Wisen Creek, but the upstream landowner refused to sign an Agreement or let County employees onto his property. Crews have expressed concern that the knotweed is moving from this property onto DNR land downstream and it will be important to find some way to work with this landowner in 2008.

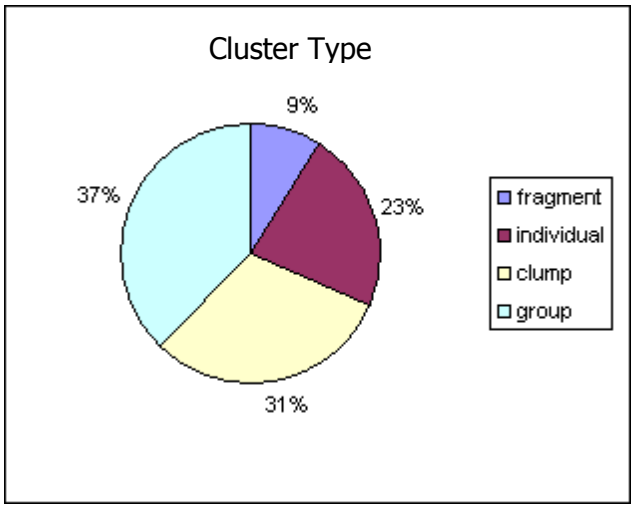
Knotweed was also found on Lake Creek, a major tributary to the Sol Duc. (These sites are discussed in the following section).

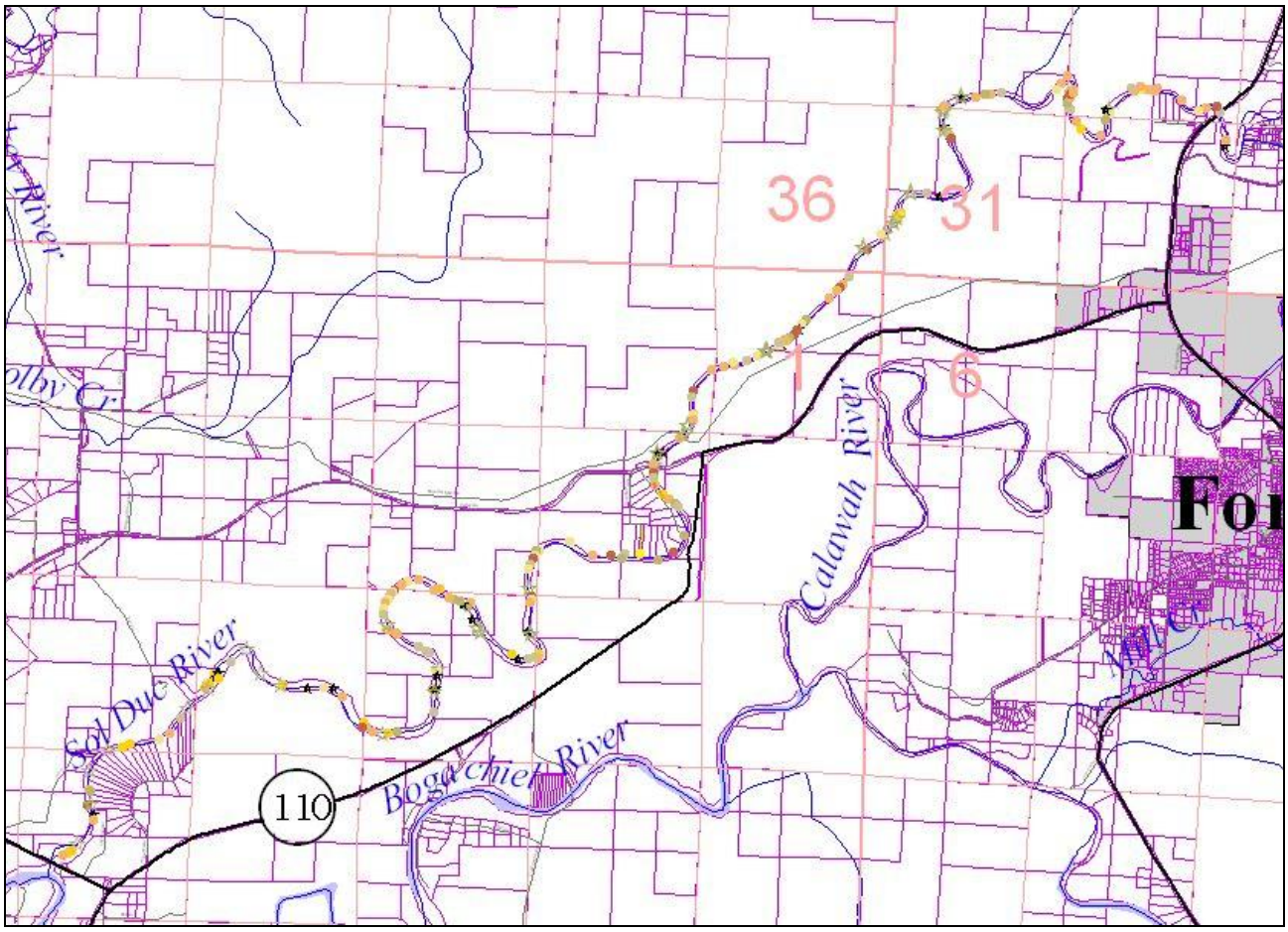
**Sol Duc River, Lower Section (first treatment)**

In June 2006 the Quileute Tribe surveyed the lower section of the river (from Highway 101 to the confluence of the Sol Duc with the Bogachiel). They recorded 447 sites. The characteristics of these sites are shown below. Almost half the sites (46%) had canes taller than six feet. Fifteen percent of sites had 200 or more canes, but it must be remembered that because >200 was the highest category available, some sites probably had many more the 200, possibly even thousands of canes. Many of the sites (31%) had the characteristics of a clump, and 37% were classed as "group", meaning they were starting to form monocultures.

More than half of the sites recorded by the Quileutes in the lower Sol Duc were identified as giant knotweed, in contrast to the mid-section, which was virtually all Bohemian.






**Knotweed Sites on the lower Sol Duc River, June 2006**

Landowner information was extracted from ArcView and six new Landowner Agreements were acquired, for work in the lower portion of the river. A large amount of the land there belonged to Rayonier or Bloedel and we simply extended our existing agreements with them.

The sites on the lower Sol Duc were again treated by a combined Quileute/CCNWCB crew, usually consisting of five people. Rafts were used to facilitate access.

When CCNWCB personnel were present, they kept spray records. When they were not present the Quileutes kept records. During their time without CCNWCB staff, the Quileutes treated **75.4** acres of riparian land, using **6.65** gallons of AqauaNeat.

The table below summarizes work done by the combined Quileute/CCNWCB crew.

| **Summary of 2007 Treatments on the Sol Duc River** | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 27 | 57.84 | **AquaNeat**<br>5.21 gal @ 100% | **AquaNeat**.<br>16.77 gal @ 6%<br>**Polaris AQ**<br>0.35 gal @ 1% | **Competitor**<br>or **Agridex** @ 2% |

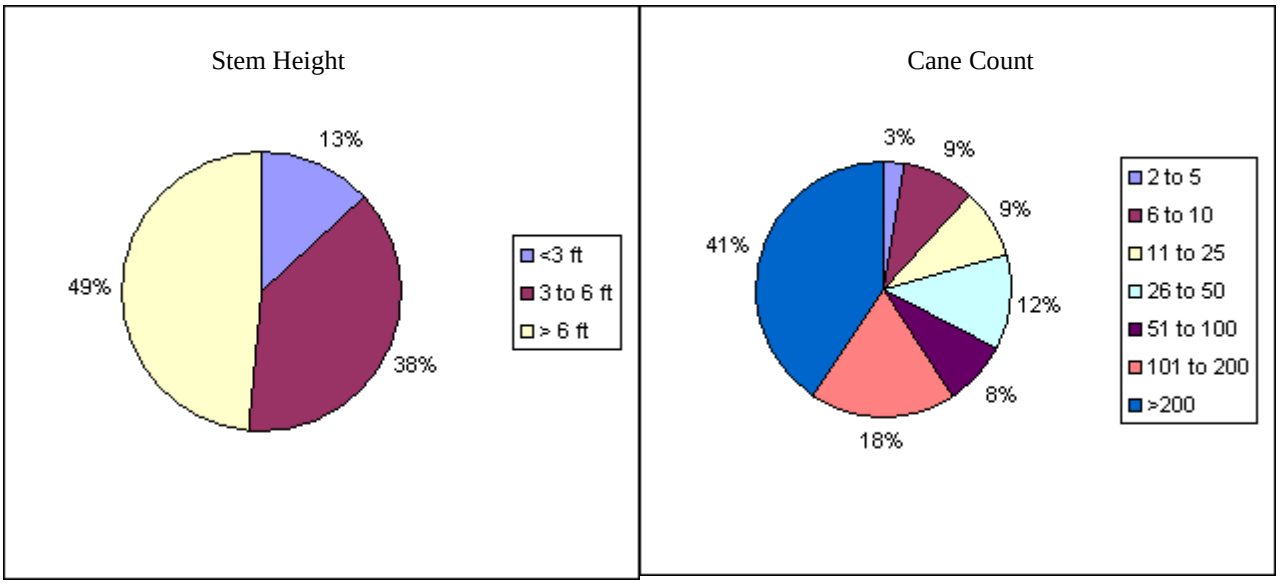
The knotweed infestations on the mid-section of the Sol Duc are coming under control and it is hoped that this year's treatment of the tributaries known to have knotweed will prevent re-infestation. As with all our watersheds, monitoring and re-treatment are vital. If small areas of re-growth are left unchecked, all the time and money spent treating knotweed over the last three years will have been wasted.

## LAKE CREEK/LAKE PLEASANT/BEAVER

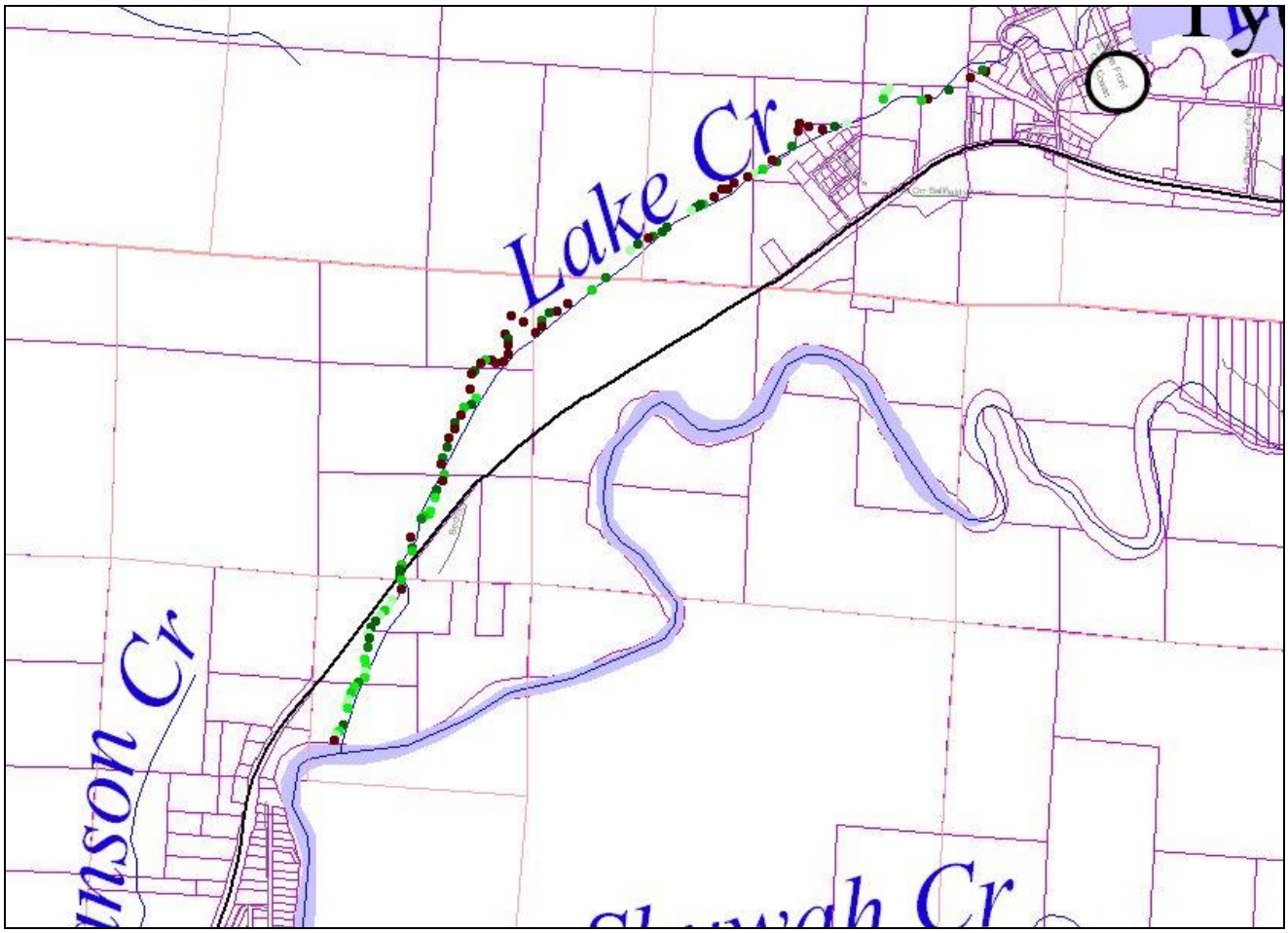
Lake Creek is one of the major tributaries to the Sol Duc and it contains some of most productive coho habitat in the Quillayute system; these coho include a unique, resident population. Also, all of the sockeye in the entire Quillayute system spawn in Lake Pleasant, which they access via Lake Creek

Major knotweed infestations had been seen on Lake Creek for several years and during the 2006 season some control work was done on the lower portion of Lake Creek and on two properties near Lake Pleasant. Both the Lake Pleasant sites were significant in size and had plants over six feet tall.

In October, 2006, the Quileutes surveyed Lake Creek and recorded 106 sites. The characteristics of these sites are summarized below.




Almost half of the sites had canes taller than six feet, and 41% had 200 or more canes. It must be remembered that >200 was the largest category available at the time the survey was taken. In some cases the surveyor wrote a better estimate of the number in the "Comments" column. Fifteen sites were estimated to have between 200 and 1,000 stems; ten were estimated to have 1,000 to 2,000 and 11 were thought to have over 2,000.




**Knotweed Sites on Lake Creek 2006**

Landowner information was obtained from the County records and nine new Landowner Agreements were acquired, some through face-to-face contact and some by mail. Much of the land on Lake Creek is owned by Rayonier so we simply amended our existing Agreement.

All of the surveyed sites on Lake Creek were treated in 2007 by CCNWCB employees Marsha Key (licensed aquatic applicator) and Rafael Ojeda. Some additional sites on Lake Pleasant were added and treated as well as a site in the nearby community of Beaver.

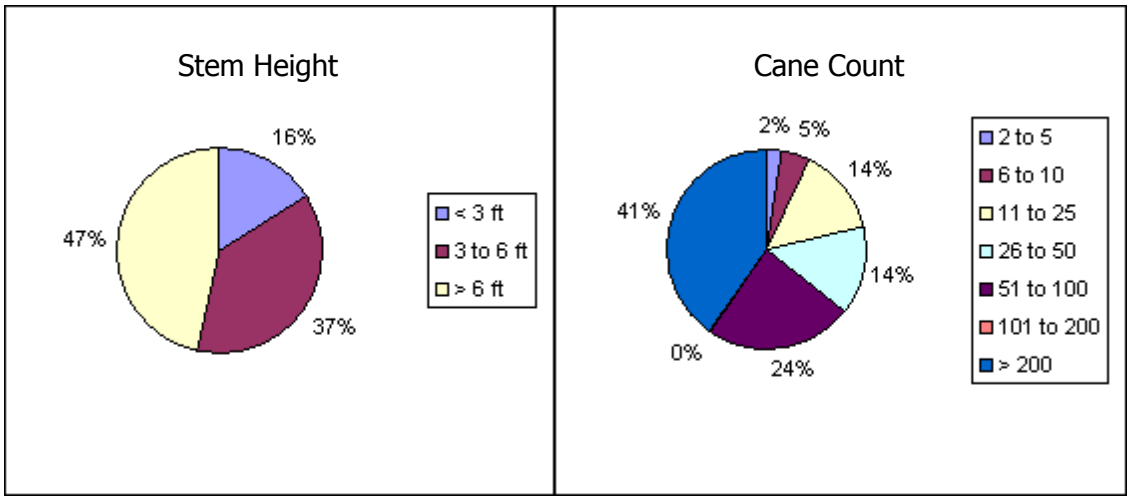
| **Summary of 2007 Treatment on Lake Creek, Lake Pleasant and in Beaver** | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 42 | 38 | **AquaNeat**<br>15.93 gal @ 100% | **AquaNeat**.<br>11 gal @ 6-8%<br>**Polaris AQ**<br>0.16 gal @ 1% | **Agridex**<br>or **Competitor** @ 2% |

## FORKS

Knotweed has been observed in the city of Forks for several years and it is of concern because Forks is close to both the Calawah and the Bogachiel. One tributary to the Bogachiel passes through Forks and close to some of the knotweed sites. The Calawah and Bogachiel are major waterways in the Quillayute System. Both rivers have knotweed which the Quileute Tribe is trying to eradicate and there is fear of re-infestation if the Forks sites go unchecked.

In 2006 it was brought to the attention of the CCNWCB that there was a large Bohemian knotweed infestation in a gravel pit at the County Shop in Forks. This site was treated twice in 2006.

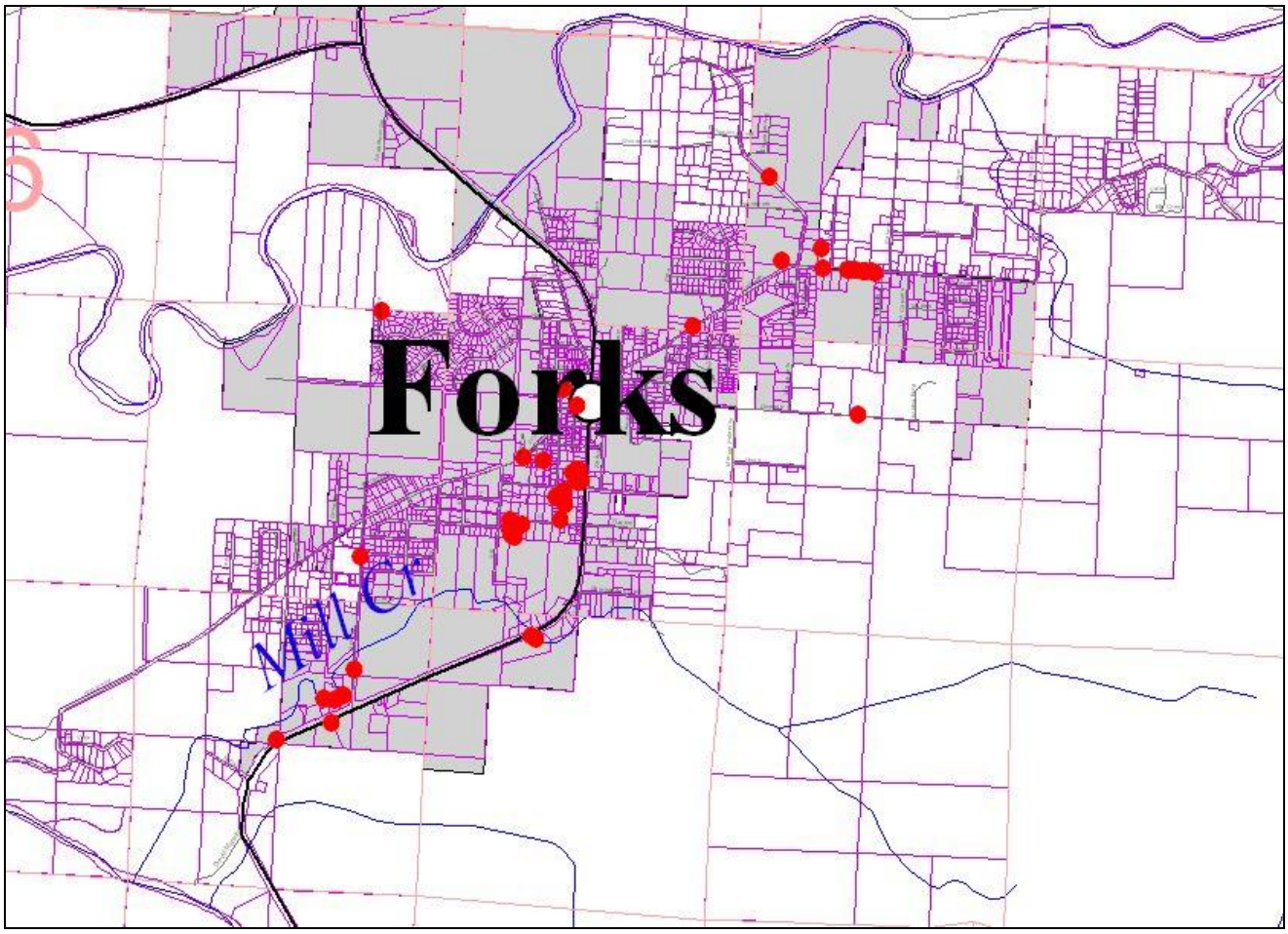
In June of 2006 the Quileutes surveyed knotweed in Forks and recorded 51 sites.




The charts above show that a large number—47% of knotweed stems seen in Forks were taller than six feet and that many of the sites (41%) had more than 200 canes.

As discussed previously, CCNWCB coordinated a herbicide training session in Forks in June and on the afternoon of the third day four crews went out and treated at least 10 sites.

Monitoring, treatment and re-treatment continued throughout the summer. CCNWCB crews and the Quileutes treated Forks sites on several occasions, including the County Shop mentioned above, Rayonier Gravel Pit, Forks Industrial Park and several other commercial sites in and around Forks




**Forks Knotweed Sites, 2007**

| Summary of 2007 Treatment in Forks | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 12 | 38 | **AquaNeat**<br>1.48 gal @ 100% | **AquaNeat**.<br>2.75 gal @ 6-8%<br>**Polaris AQ**<br>0.02 gal @ 1% | **Agridex**<br>@ 2% |

## QUILLAYUTE RIVER SYSTEM

The Quillayute system is composed mainly of the Sol Duc, Calawah, Bogachiel and Dickey.

### Dickey River

The Dickey is a large, low gradient river, draining 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 Quillayute's mouth at the Pacific Ocean, at La Push. The Dickey mainstem extends for 8 miles upstream to the confluence of its east and west forks. Knotweed infestation levels in the Dickey were and possibly still are the worst in WRIA 20 and the Olympic Peninsula. Surveys indicated the source was probably an old homestead approximately a quarter of a mile upstream of the East and West Fork confluence.

In 2002, the Dickey system was chosen as a first priority for knotweed control because of the known (although extensive) confinement of knotweed infestations to the lower reaches, and the importance of the Dickey River to the Quileute Tribe's fishery. In 2003 and 2004, the tribe treated over 4.5 miles of stream and associated off channel and riparian areas (417,000 knotweed stems on 135 sites). Each site was monitored and retreated as necessary in 2005. Additionally, the North Cascades Exotic Plant Management Team with the National Park Service treated the remaining mile of knotweed within the Park boundary at La Push.

In 2006, Quileute Natural Resources (QNR) worked on knotweed control on the Dickey from June to October. CCNWCB provided QNR with herbicide for treatment.

QNR worked with University of Washington Graduate student, Lauren Urgensen, helping in her study through treatment of certain plots she established and by staying out of her control plots. They also helped the Olympic National Park in 2006 in their efforts to control within their ownership in the lower Dickey River.

In 2007 the Quileutes did a follow–up treatment where they saw plants along the entire stretch from the East/West Fork confluence to the National Park Boundary. This included at least eight miles of riparian area along the river covering some estimated 140 acres of previously treated sites, using 12.65 gallons of Imazapr and AquaNeat, mostly Imazapr. The Quileutes feel they have got a handle on the problem in the Dickey although some patches seem to be stubborn. There are now very small, deformed and dwarfed plants where before there were large ones. That is why they applied Imazapr this season and they are interested in seeing how well it worked.

### Calawah River

On the Calawah River and its associated tributaries the Quileutes treated an estimated 38,500 stems, covering approximately 202 acres of riparian area along the river, using 11.12 gallons of AquaNeat and AquaMaster.

### Bogachiel River

Not much work took place on the Bogachiel in 2007. The Quileutes are hoping to get a grant next year to begin a major project there. Approximately 4.1 acres were treated using 0.65 gallons of AquaNeat.

**Terrestrial Sites**
The terrestrial sites covered this season by the Quileutes included the Bear Creek area of Highway 101, Sappho and some sites in Forks. Treatment of terrestrial sites covered over 100 acres, using 19.55 gallons of AquaNeat and AquaMaster.

All sites treated last year were drastically reduced in size. In some instances there appeared to be very little re-growth, particularly sites that were treated with injection. In those that were sprayed there seemed to be about a 10% re-growth rate. The plants are much smaller in size than the previous year with some deformity and dwarfing.

| | |
|---|---|
| Total herbicide used by the Quileute Tribe | **43.97** gallons (combined total for AquaNeat, AquaMaster and Imazapyr, both sprayed and injected.) |

**QNR Treating the Dickey River**

For more information about the Quillayute River System, please contact Frank Geyer at (360) 374-2027 or frank.geyer@quileutenation.org

## HOH RIVER

The Hoh watershed consists of 300 square miles and is famous for wild stocks of winter steelhead, fall coho, and spring/summer and fall run Chinook salmon. Loss of large woody debris in the mainstem river channel and tributaries has contributed to numerous habitat impacts including significant land sliding and sedimentation through toe-cutting of riverbanks as well as considerable loss of pool structure. Restoration of a functional mature riparian forest is considered a primary component of fish habitat restoration by the Hoh Tribe and the WRIA 20 watershed planning group.

The Hoh River knotweed infestation was traced to a single source in 1998. By the end of 2003, 18,000 canes in 1,247 sites widely disbursed over 20 river miles had been documented and treated, and more canes documented in the 10 river miles to the mouth. The Hoh Tribe provided funding for surveys and treatment in 2002 and 2003. Subsequent follow-up surveys and retreatments of the entire 30 mile river corridor in 2004 were conducted by the 10,000 Years Institute in partnership with the Hoh Tribe, US Forest Service, Olympic National Park, and the Department of Natural Resources. In 2005, CCNWCB provided crew, equipment, and supplies to treat 8 river miles surveyed by Hoh staff.

In 2006, the 10,000 Years Institute and the Hoh Tribe treated 29.8 miles of the river, down to the river mouth. Equipment and supplies were provided to the 10,000 Years Institute by CCNWCB. Jefferson County's Department of Corrections was contracted with for a crew of 6-10 inmates who conducted intensive grid-surveys of the wide river floodplain and adjacent terraces. The project used a total of 2.4 gallons of AquaMaster in their treatment. Most of the plants found and treated were only 1-3 feet tall due to previous treatments. Five new sites with fairly large knotweed patches were treated.

In 2007, river miles 27 to 17 (913 acres) were surveyed and treated. A total of 1.23 gallons of spray mix containing 6% Aquamaster, 1.5% AgriDex surfactant, and 0.5% Blazon Blue marker dye were used. Data collected in 2007 supports the observation that the downward trend in size and distribution of the knotweed infestation continues. Lindner Bar has been highly successful with 3299 stems in 2002 to 303 stems in 2007; a 91% decrease from the original infestation. Lewis Channel is down 82% from its original infestation in 2002 of 505 stems to 95 stems in 2007. Sites such as Spruce Creek showed no significant decrease in stem count in the previous 2 years but decreased 80% since 2003. Spruce Creek sites contained 1-5 stems and all were less than 3 feet tall. A slight increase in plant numbers from 2005-2007 in some sections of the surveyed reaches can be attributed to plants missed the previous season, expanded survey areas, and new gravel bars and deposition sites formed by winter river migration.

Due to significant landowner discomfort with the WSDA landowner agreement, as well as some discomfort with application of herbicide, only one private landowner, Hoh River Trust, signed the access agreement. The Trust owns approximately 50% of the upper watershed, and a number of reaches from previous years were treated. However, the primary source areas – Brandeberry Lots and Owl Creek were not. These sites will be sources of infestation downriver during winter and spring flood events.

For more information about the knotweed treatment on the Hoh River, please contact Jill Silver at (360) 385-0715 or jsilver@10000yearsinstitute.org

| | |
|---|---|
| Total herbicide used on the Hoh River | **0.07** gallons AquaMaster |

## VALLEY CREEK/ENNIS CREEK/PORT ANGELES WATERFRONT

### Valley Creek

Valley Creek is a small stream which empties into Port Angeles Harbor. Salmon and steelhead have probably been extinct from the creek since the late 1940's, when the final sections of the approximately 2,000-foot culvert at the mouth were installed. Recent surveys of fish in this system revealed numerous resident cutthroat trout up to 11 inches in length.

The section of the creek by Valley Street has been heavily infested with knotweed for some time. At one point, the knotweed was so enormous that residents could barely get into their driveways and the United States Postal Service refused to deliver mail since the road was taken over. Treatment of knotweed on Valley Creek has been ongoing for several years. In 1999, CCNWCB and the Boy Scouts manually removed knotweed from a small section of the road and revegetated the area with native plants. This treatment was extensive, but temporary and only partially successful. In 2006, this site proved useful as training grounds for new employees. The site was visited 3 times in the season. It was injected and sprayed with 2.3 gallons of herbicide.

In 2007 CCNWCB re-treated the Valley Creek site, spraying or injecting 1.52 gallons of herbicide.

### Ennis Creek

Because the headwaters of Ennis Creek are at 6000', in the Olympic National Park, it is significantly affected by both snowmelt and runoff. This type of system typically has the highest stock diversity of anadromous fish. Historically Ennis Creek supported stocks of coho, steelhead, and chum. Currently coho stocks are highly degraded. Steelhead and cutthroat numbers are higher.

The lower reaches of Ennis Creek flow through urban areas of Port Angeles where water quality is impacted by stormwater runoff. An old Rayonier mill site is at the mouth of Ennis Creek and this portion of the creek had been rocked, channelized and the riparian corridor highly degraded. The old mill site has had a bad knotweed infestation for several years and this was treated in 2007 by CCNWCB and the Lower Elwha Klallam Tribe. 0.68 gallons of herbicide was sprayed or injected.

### Waterfront Trail

The Port Angeles Waterfront Trail runs from downtown past the old Rayonier mill site and on towards Sequim. It has long been infested with knotweed and a survey in 2007 recorded nine patches in a three and one-half mile section from Port Angeles, east. Patches up to the Rayonier site were treated by CCNWCB. 0.47 gallons of herbicide was injected.

| **Summary of 2007 Treatment on Valley Creek, Ennis Creek and the Port Angeles Waterfront Trail** | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed | Adjuvants |
| 4 | 6.65 | **AquaNeat**<br>2.03 gal @ 100% | **AquaNeat**.<br>0.63 gal @8%<br>**Polaris AQ**<br>0.1 gal @ 1% | **Competitor** @ 2% |

## DUNGENESS RIVER

The Dungeness River, which is in the eastern portion of WRIA 18, drains 198 square miles. The mainstem extends 31.9 miles and its primary tributary, the Gray Wolf River, adds another 17.4 miles. There are an additional 256 miles of tributaries in the basin. Historically, the Dungeness was highly productive and diverse containing 11 individual salmonid populations. The Dungeness has experienced significant decreases in stock productivity levels and has been the subject of extensive habitat restoration and conservation for many years. In many cases, the Jamestown S'Klallam Tribe, in partnership with other local agencies has been instrumental in implementing restoration efforts.

It has been hard to determine when knotweed was first introduced to the Dungeness, but it has obviously been spreading at an alarming rate in recent years. Currently, there are few large patches of knotweed, most infestations being small clumps and sporadic individual canes, widely disbursed across the flood plain and side channels.

In 2004, the Jamestown S'Klallam Tribe located the uppermost knotweed infestation in the Dungeness mainstem. With some technical assistance from the CCNWCB, the tribe surveyed and treated 8.3 river miles of the Dungeness and most of the adjacent flood plain areas for knotweed. 1,272 sites were located and treated in 2004-2005; most of these sites were very small. It appeared that over 95% of known knotweed sites had been eliminated.

In 2006, Jamestown S'Klallam Tribe continued monitoring and treating knotweed on 8.3 miles of the river. **A total of 357 sites were treated along the Dungeness with a median cane density of 1,808 stems. This is a decrease from median cane densities of 8,616 in 2005, and 17,067 in 2004.**

**Monitoring and re-treatment continued in 2007, with surveys conducted over approximately 400 acres of floodplain along 8 river miles. Only 127 plants were found in 2007 with a median cane density of 631 stems, requiring less than two gallons of herbicide to treat. That is down from median cane densities of 1,808 stems in 2006; 8,616 in 2005; and 17,067 in 2004.**

For more information, please contact Hilton Turnbull at (360) 681-4603 or hturnbull@jamestowntribe.org.

## DOSEWALLIPS RIVER, DUCKABUSH RIVER, SNOW CREEK, AND SALMON CREEK (JEFFERSON COUNTY)

### Dosewallips

The Dosewallips River is one of the largest rivers in Jefferson County. It flows east from the Olympic Mountains into the Hood Canal at the town of Brinnon, located at the mouth of the river. It drains approximately 130 square miles and includes close to 132 miles of streams and tributaries. Out of the 130 square miles, 93 % is contained within the Olympic National Park and Olympic National Forest. Land use of the remaining 7 % is rural residential, commercial, and private forested land.

Prior to 2006, there had been limited data and treatment of knotweed in Jefferson County. In 2006 Clallam County provided training, herbicide, and equipment and Jefferson County Noxious Weed Control Board (JCNWC) hired a knotweed specialist.

The Dosewallips River was surveyed on foot in August and September, 2006. Eight knotweed sites were recorded and seven Landowner Agreements were acquired. Many properties on the Dosewallips are vacation rentals or second homes, making landowner contact difficult. It was especially difficult to contact Carol Goodwin, the owner of a knotweed site covering several acres, very close to the National Forest boundary. All sites with Landowner Agreements in place were treated in September, 2006.

Early in 2007 contact was made with Carol Goodwin and she was extremely willing to have her knotweed treated. This site was treated twice in 2007 by a combined JCNWCB/CCNWCB crew and all other sites on the Dosewallips were surveyed and re-treated where necessary.

### Duckabush

A windshield and foot survey was conducted in September, 2006, on the Duckabush River with no plants located. Survey began within the U.S. Forest Service boundary where a vehicle had access on Duckabush River Road. Further downstream, a foot survey was conducted at the mouth, where again no plants were located.

In 2007 information was received from an interested citizen about a knotweed infestation near the mouth of the Duckabush. A Landowner Agreement was acquired and the site was treated by JCNWCB.

### Snow Creek and Salmon Creek

Snow Creek and Salmon Creek both drain into the south end of Discovery Bay.

Three sites on Snow Creek were treated by JCNWCB in 2006. These were monitored in 2007 and one was re-treated. An additional two Landowner agreements were acquired, based on information from the Jefferson County Conservation District. These two sites were treated. Towards the end of the season, a Landowner Agreement was received for a large infestation between Highway 101 and Snow Creek. Treatment of this should be a priority for 2008.

Just one site has been found on Salmon Creek. It was treated in 2006 and re-treated in 2007.

#### SURVEYS NEEDED

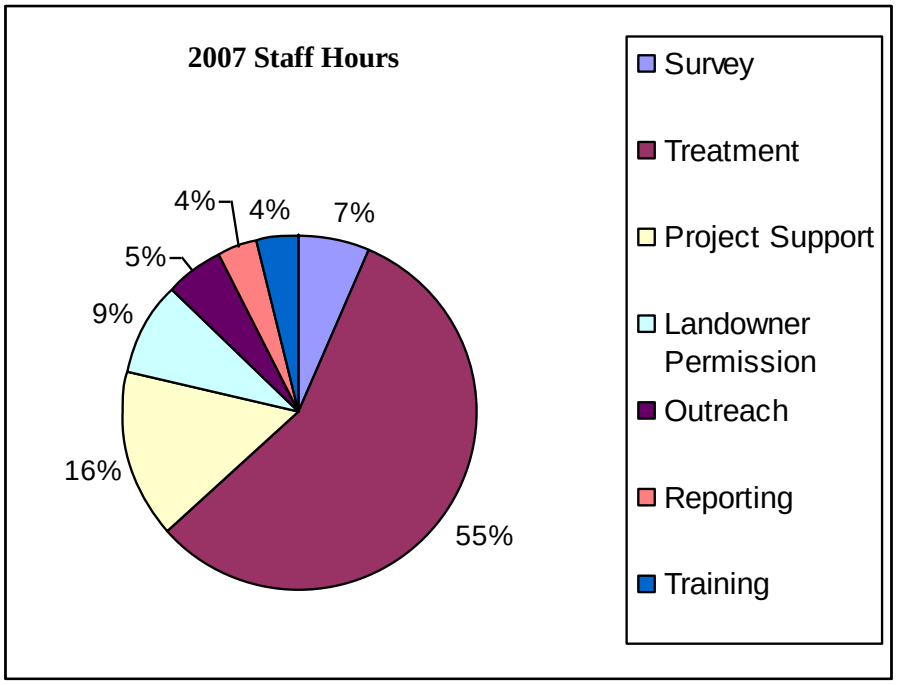
| Summary of 2007 Treatment in Jefferson Countys | | | | |
|---|---|---|---|---|
| Number of Spray Records | Acres Treated | Herbicide Injected | Herbicide Sprayed or Wiped | Adjuvants |
| 11 | 12.43 | **AquaNeat** 4.05 gal @ 100% | **AquaNeat**. 3.9 gal @ 6.5%,8% or 33% | **Agridex** @ 2% or 10% |

For more information, please contact JCNWCB at (360) 379-5610 ext 205 or noxiousweeds@co.jefferson.wa.us.

## Program Hours

CCNWCB staff spent a total of 2,665 hours completing knotweed projects in 2007. Staff hours were categorized:

- **Survey** includes driving time and data collection
- **Treatment** includes driving time, actual application periods, setup before, and cleanup afterwards
- **Project Support** includes driving time, office work, phone contacts, licensing, and acquisition of supplies and equipment
- **Landowner Permission** includes driving time, the time it took to establish an agreement with the landowner, time beyond normal treatment to address special needs of the landowner, and updates with the landowner as the project proceeded
- **Outreach** includes driving time, time spent preparing presentations or printed materials for handout and mailings, posting notices, travel time to and from a presentation, the presentation itself along with question periods afterwards, and any follow-up with citizens/agencies afterwards.
- **Reporting** includes documentation review and reporting
- **Training** includes time spent learning data collection, treatment methods, and any other necessary job tasks




**CCNWCB 2007 STAFF HOURS**

| Survey | Treatment | Project Support | Landowner Permission | Outreach | Reporting | Training | Total Hrs |
|---|---|---|---|---|---|---|---|
| 177 | 1500 | 416 | 232 | 140 | 100 | 100 | 2665 |

## Appendix I--Using the Data Dictionary

(This document was developed in 2006 for the Olympic Knotweed Working Group, in an attempt to standardize data collection and was refined in 2007)

## Appendix II—Sample of Data Dictionary

**Appendix III—*Permission to Enter Private Land and Waiver of Liability***
(Standard document prepared by Washington State Department of Agriculture, for use when chemically treating knotweed)

**Appendix IV—Knotweed Brochure**
(Originally prepared in 2005 and updated annually since.)

**Appendix V—*Frequently Asked Questions for Landowners with Knotweed.***
(Prepared in 2006 and used for outreach in all of the knotweed projects.)

## Appendix VI—Sample Landowner Letter

## Appendix VII—Landowner Spreadsheet

**Appendix VIII—Draft Knotweed Control Recommendations**
(Prepared early in 2007 and used extensively by crews and landowners.)

## Appendix IX—Example of a Spray Record

## Appendix X—Newspaper Articles

## Appendix XI—Photographs