

STATEWIDE KNOTWEED CONTROL PROGRAM

2007 Progress Report



June 2008



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Cover Photo: Invasive knotweed in the Entiat River Valley in Central Washington (WSDA).

Extreme care was used during the compilation of the maps in this report to ensure accuracy. However, due to changes in data and the need to rely on outside sources of information, the Department of Agriculture cannot accept responsibility for errors or omissions, and, therefore there are no warranties which accompany this material. Original data were obtained from the Washington State Department of Ecology, Washington State Department of Natural Resources, and program cooperators.

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Executive Summary

Since 2004, the Washington State Department of Agriculture (WSDA) has provided funding, coordination and other resources to county noxious weed control boards, tribal governments, and other organizations and agencies for the control of invasive knotweed. Natives of Asia, the invasive knotweeds targeted by this program include four perennial plant species that are commonly known as Japanese, giant, Bohemian, and Himalayan knotweed.

In 2007, the WSDA Knotweed Control Program budget increased by \$150,000. This allowed WSDA to enter into contracts with 19 cooperators, providing \$512,280 of direct funding to both new and continuing projects. Program cooperators brought approximately \$501,000 of additional local and federal funding to these projects.

The WSDA Knotweed Control Program continued to focus its support to projects that addressed an area where knotweed is not currently widespread and to projects that addressed knotweed populations in riparian areas. In the Pacific Northwest, knotweed usually spreads when roots and stems are moved by flowing water or human activities. Due to these dispersal methods, control projects required coordination with multiple landowners and across jurisdictions.

In 2007, project activities occurred in watersheds of 21 counties, including 16 western Washington counties and five eastern Washington counties. Surveys were conducted to identify the location of knotweed and the source of the infestation. Treatment methods were selected based on site and infestation characteristics according to integrated pest management (IPM) principles. Application of herbicide was the most common treatment method in 2007.

Approximately 1,312.6 acres of knotweed were treated, including all known riparian knotweed in 16 river systems. Project work occurred in 930.6 river miles for 1,256 landowners.

At the program's monitoring sites, after three years of treatment, knotweed populations displayed a 96 percent reduction in stem density and an average visual control estimate of 99 percent. Similar results are being observed at project area sites, allowing many native plants, including tree and shrub species, to colonize areas where they had previously been displaced by knotweed.

Although there have been dramatic reductions, knotweed has not been completely removed from any landscape-scale project area. Due to the large amount of stored energy in its underground biomass, knotweed is very difficult to kill. Project areas must be thoroughly re-surveyed annually with any knotweed re-growth treated.

This progress report describes the 2007 program framework, project selection process, budget, survey and treatment methods, results by region and program cooperator, and plans for 2008.

Introduction

This is a progress report of the Statewide Knotweed Control Program carried out by the Washington State Department of Agriculture (WSDA). It describes the 2007 program framework, project selection process, budget, survey and treatment methods, results by region and program cooperator, and plans for 2008.

The Plants

The invasive knotweed complex is comprised of four herbaceous perennial plant species from the buckwheat family (Polygonaceae) that are native to Asia. They are broadleaf plants that have green stems and swollen reddish nodes (**Figure 1**). The plants were introduced to the United Kingdom and the United States as garden ornamentals.

- **Japanese knotweed** (*Polygonum cuspidatum* Sieb. & Zucc.) has leaves that are blunt at the base and sharply tapered at the tip (**Figure 1**). The stems of this plant usually grow to 7 feet tall. Stem diameter ranges from one-half to one inch.
- **Giant knotweed** (*P. sachalinense* Schmidt) is the largest of the four invasive knotweed species. It has large heart-shaped leaves (**Figure 1**) and stems that can grow up to 12 feet tall with diameters up to 2 inches.
- **Bohemian knotweed** (*P. x bohemicum* Chrtk & Chrtkova) is the hybrid produced by giant and Japanese knotweed. Leaf shape, stem diameter, and stem heights are variable, but are usually within the range of the smaller Japanese knotweed and the larger giant knotweed. This species can spread by seed or vegetatively, and is the most common invasive knotweed species in Washington State.
- **Himalayan knotweed** (*P. polystachyum* Wall) has lance-shaped leaves that make it readily identifiable when compared to the other species (**Figure 1**). The stems of this plant usually reach one-half inch in diameter and four to five feet in height. This species can spread by seed or vegetatively, and is most common in coastal areas of Southwest Washington.



Figure 1. (Top) Image showing bamboo-like green stems with swollen reddish nodes. (Bottom) From left to right, the leaves of giant, Japanese, and Himalayan knotweed.

All four species are designated by the Washington State Noxious Weed Control Board as Class B noxious weeds on the Washington State Noxious Weed List. Class B noxious weeds are not native to Washington State, have a limited distribution, and pose a serious threat to the region. All four species are also included in the Washington State Noxious Weed Seed and Plant Quarantine List (WAC 16-752-610). It is illegal to transport, buy, sell, or trade any of the quarantine species.

The four species are commonly referred to as Japanese, giant, Bohemian, and Himalayan knotweed, and are collectively referred to as knotweed in this report.

Invasive knotweeds have extensive underground rhizome and root systems. They thrive in moist soil or river cobble, in full or partial sunlight, and are most common along rivers, creeks, beaches, and disturbed areas. The aerial shoots of knotweed emerge in spring and reach full height by early summer. The plants flower in late summer or early fall (**Figure 2**) and the aerial shoots die after the first frost. The dead aerial shoots persist through the winter and can remain standing for several years (**Figure 3**). Knotweed reabsorbs nutrients into its root system, which provides resources to the plants for over-wintering and spring shoot emergence.



Figure 2. Flowering knotweed in Skamania County.



Figure 3. Dead aerial stems of knotweed on the East Fork Lewis River in Clark County.

The native habitats of knotweed include the harsh environment of volcanic slopes, where it plays an important role as a colonizing species. The characteristics of a colonizing plant, the absence of natural enemies and diseases, and the reproductive success of knotweed enable these plants to thrive in the Pacific Northwest.

The Problem

Riparian areas are transitional habitats located between terrestrial and aquatic ecosystems such as areas along lakes or rivers. Riparian areas provide shade, nutrients, and large woody debris to both aquatic and terrestrial ecosystems. These functions can take many decades to recover once impacted.

In the Pacific Northwest, knotweed usually spreads when roots and stems are moved by flowing water or human activities (**Figure 4**). Human activities include moving soil that contains knotweed plant material, mowing or cutting knotweed, or discarding knotweed plant material in receptive habitats.



Figure 4. (Left) Knotweed emerging from fragments in flood-deposited soil, and (Right) knotweed stems being transported downstream by flowing water.

Root and stem fragments as small as one inch can produce a new plant. As a result, one patch can be the source of many downstream populations. In river corridors, knotweed can reproduce from fragments and seeds that travel downstream during high-water events, affecting the gravel bars and riparian forests of entire river systems.

Due to this dispersal method, control projects required coordination with multiple landowners. Additionally, when river and watershed boundaries do not correspond with geopolitical boundaries, the coordination between jurisdictions is essential to the successful implementation of a knotweed control project.



Figure 5. Infestation of a riparian forest along North Fork of the Stillaguamish River.

Vegetation communities occupied by knotweed have lower species diversity, richness, and abundance compared to corresponding stands of uninvaded vegetation. Both deciduous and coniferous trees exhibit decreased juvenile populations in areas with high knotweed stem density, decreasing the number of individuals available to replace mature trees following a disturbance. **Figure 5** shows a mature mixed deciduous/conifer riparian forest with an understory of invasive knotweed on the North Fork of the Stillaguamish River in Snohomish County.

The reduction or modification of riparian vegetation is one cause of decreased large woody debris. Large woody debris is important to the rivers and streams of the Pacific Northwest. It creates pool habitats, retains spawning gravels, and provides cover for juvenile salmonids. The loss of large woody debris can disrupt natural processes, leading to channel incision, loss of side channel fish habitat, loss of pool habitat, decreased retention of spawning gravels, and decreased cover for juvenile salmonids and their prey.

Knotweed can affect aquatic invertebrates that compose the basis of the aquatic food chain by disrupting or altering the quality and timing of leaf litter inputs. Invertebrates are the primary food source of juvenile fish species.

Knotweed infestations block river views and limit river access, which can affect recreational opportunities and property values.

A considerable amount of resources have been applied to the protection or restoration of riparian areas in Washington State. Many fish and wildlife habitat restoration or protection projects have been located in riparian areas and the benefits of these projects could be negated by knotweed infestation.

WSDA Knotweed Control Program

The Washington State Department of Agriculture (WSDA) has administered a Knotweed Control Program since 2004 when the Legislature provided an appropriation of \$500,000 for a pilot program in southwest Washington. In 2005, the program was expanded to address knotweed control statewide.

The WSDA Knotweed Control Program provides funding, coordination and other resources to cooperators that conduct knotweed control projects. Program cooperators are encouraged to identify projects that address areas with low-level knotweed infestations, protect functional riparian habitats, or target areas that are in the early stages of invasion. WSDA's support of these projects includes producing required environmental review, providing public notification materials, providing technical training, publishing required notices, and coordinating with program cooperators and federal agencies to leverage state funding to secure additional resources.

In 2007, the WSDA Knotweed Control Program focused on the treatment of knotweed populations in riparian areas, where knotweed exhibits the greatest rate of spread and has the most detrimental ecological, social, and economic effects.

Project Selection

In March 2007, WSDA facilitated two pre-proposal meetings. One meeting was held in Olympia, and the other was held in Yakima. These meetings gave stakeholders the opportunity to interact with WSDA staff and provide input regarding the criteria that would be used to evaluate project proposals. Representatives from county weed boards, conservation districts, tribal governments, Natural Resources Conservation Service, U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, Washington State Noxious Weed Control Board, Department of Natural Resources, Department of Fish and Wildlife, Department of Ecology, and The Nature Conservancy attended one or both of the meetings.

Stakeholders recommended that WSDA support projects that were well underway, could cost-effectively control knotweed populations, could protect large ecologically important areas, and were led by entities committed to long-term monitoring of the treatment area. The advisory panel suggested that the portfolio of projects demonstrate WSDA's commitment to support knotweed control activities throughout the state.

An internal review committee used the recommendations provided by stakeholders to evaluate project proposals. There were 23 proposals submitted, requesting a total of \$708,934. WSDA funded 19 proposals, awarding a total of \$512,280.

Budget

The 2007-09 biennial operating budget provided additional funding to WSDA for knotweed control, designating an additional \$150,000 each year for distribution to counties with weed boards to control Japanese knotweed. With this increase, WSDA had \$650,000 available for knotweed control in the 2008 fiscal year. With the increase in funding, WSDA continued to provide funding to 14 cooperators and, for the first time, directly supported control projects carried out by five other cooperators: Okanogan County, Pierce County, Yakama Nation, 10,000 Years Institute, and the Stilly-Snohomish Fisheries Task Force.

WSDA allocated \$512,280 for contracted knotweed control activities, \$33,000 for herbicide purchases, and \$104,720 for WSDA's coordination activities (**Table 1**). Program cooperators brought approximately \$501,427 of additional local and federal funding to the knotweed control projects. Almost half of the additional funding was associated with the project carried out by members of the Olympic Knotweed Working Group.

All WSDA expenditures directly supported the control work of cooperators, including the purchase of all herbicides used for knotweed control activities. By centralizing the herbicide purchase, the program saved \$18,326 in 2007.

Table 1. Estimated budget activity for the 2008 fiscal year.

Activity	Budgeted Expenditures	
¹ Purchased Services		\$512,280
Clark County/Cowlitz County	\$87,487	
The Nature Conservancy (SW)	\$63,662	
Skamania County/Klickitat County	\$59,450	
The Nature Conservancy (Skagit)	\$45,794	
Pacific County	\$39,514	
10,000 Years Institute	\$37,999	
King County	\$37,550	
Lewis County	\$36,005	
Clallam County/Jefferson County	\$35,824	
Pierce County	\$15,185	
Stilly Snohomish Task Force	\$12,971	
Snohomish County	\$7,790	
Yakama Nation	\$6,427	
Island County	\$6,000	
Yakima County	\$5,125	
Okanogan County	\$5,000	
Skagit County	\$4,000	
Whitman County	\$3,750	
Asotin County	\$2,747	
² Herbicide Purchase		\$33,000
³ WSDA Coordination		\$104,720
	Total	\$650,000

1. Contracts and agreements to carry out control projects in selected watersheds.
2. WSDA provided all herbicide used in the projects.
3. WSDA coordination expenses include salaries and benefits for a full-time coordinator and part-time clerical support, travel, attorney costs, vehicle and equipment costs, printing, agency administration costs, and other goods and services.

Survey and Treatment Methods

The survey and treatment methods vary depending on the types of habitats within each project area, the character of the knotweed infestation, and the treatment history of the project area. The most common habitats that our cooperators work in are rivers, riparian forests, right of ways, and upland populated areas. Work in rivers requires wading and boating river channels, and traversing the riparian forests of the floodplains. Work along right-of-ways and in populated areas is done using a vehicle.

Program cooperators use watershed boundaries or county borders to delimit project areas, with most work occurring in river corridors and their floodplains.

Working in these dynamic systems requires thorough annual surveys of the mainstem of the river system and associated tributaries. If knotweed is not detected in a given tributary during

an initial survey, it is assumed that knotweed was never present in that portion of the watershed, and that area is not necessarily resurveyed in subsequent years. This assumption is based on the observation that knotweed spreads when fragments of rhizomes or stems are moved by flowing water. Knotweed is introduced to an area by human activities and does not typically get moved from one watershed to the next by other vectors. The frequency of site visits to verify that an area remains free of knotweed varies by program cooperator.

Surveys were conducted to identify the location of knotweed and the source of the infestation. Information on the location of knotweed was used to identify the ownership of affected parcels. Landowners were contacted and asked if they would allow knotweed control activities on their property. Landowners were required to sign a permission-to-enter/waiver-of-liability document before any treatment was conducted. Most landowners were familiar with the negative impacts of knotweed and welcomed the assistance provided by program cooperators.

Treatment methods were selected based on site and infestation characteristics according to integrated pest management (IPM) principles. An important IPM consideration of the program in a river corridor is to treat all known knotweed populations, starting at the upstream source of the infestation and working in a downstream direction. This strategy ensures that untreated knotweed plant material will not re-infest treatment sites as it moves downstream during high-water events. It also requires the participation of all affected landowners in the stream corridor.

Application of herbicide was the most common treatment method used in 2007. Treatments were conducted May through October or until the first frost of the year. Manual methods, including digging and hand pulling at large sites, are not ecologically sensible in riparian habitats.

Herbicide applications included foliar applications of imazapyr, glyphosate, or triclopyr formulations, the foliar application of a tank mixture of imazapyr and glyphosate formulations, or the injection of glyphosate formulations. The herbicide products used by the program cooperators at aquatic sites were registered for use in aquatic environments. WSDA required that all herbicide applications be made under the supervision of a licensed applicator.

Foliar application of herbicide was the primary treatment method used by project cooperators. The injection method is labor intensive and inappropriate for large-scale treatments, treatments of Himalayan knotweed, and for infestations with small stems.

WSDA continues to work with weed scientists and others to identify the most appropriate tools for knotweed control.

Results

In 2007, WSDA entered into agreements with 19 program cooperators, including the Yakama Nation, two offices of The Nature Conservancy (TNC), the Stilly-Snohomish Fisheries Task Force, 10,000 Years Institute, and the noxious weed control boards of Asotin, Clallam, Clark,

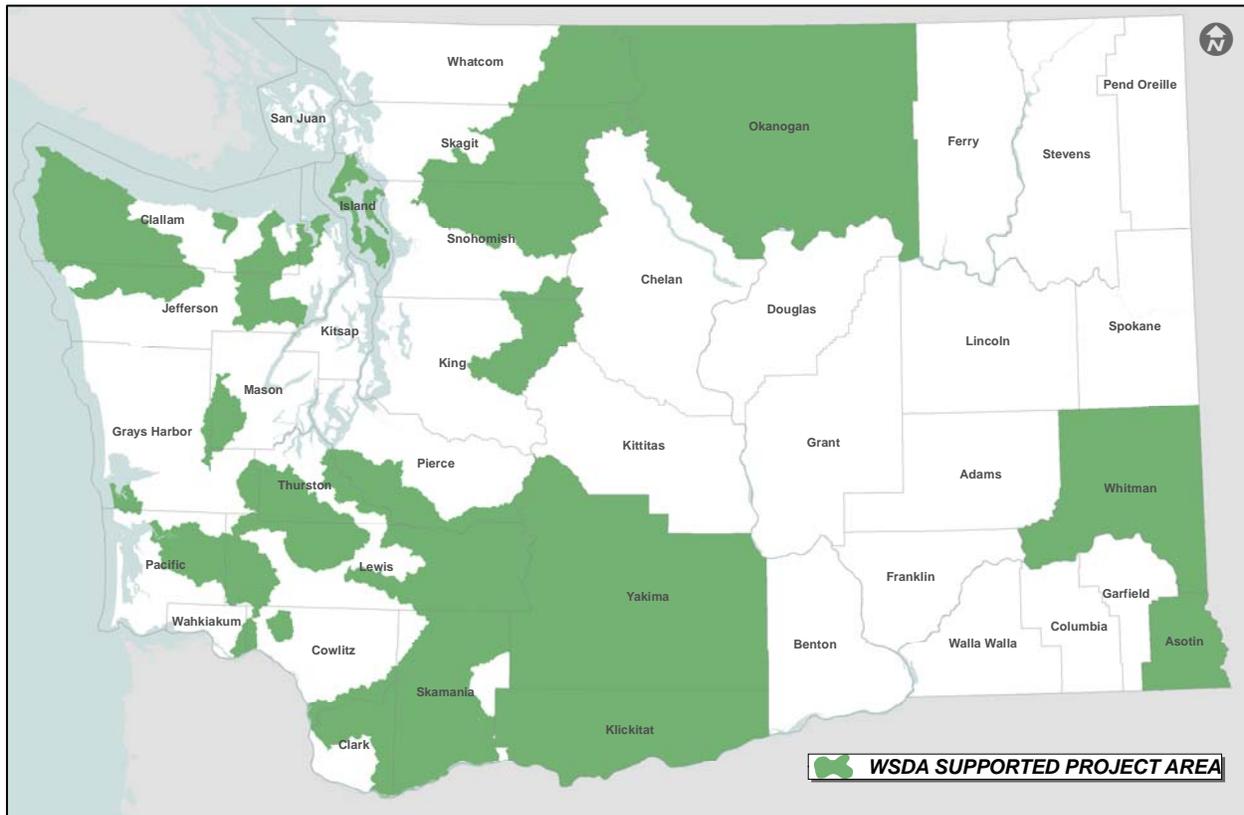


Figure 6. Washington State counties and WSDA’s supported project areas.

Island, King, Lewis, Okanogan, Pacific, Pierce, Skagit, Skamania, Snohomish, Whitman, and Yakima counties. Cowlitz and Jefferson counties received funding through the Clark and Clallam county agreements, respectively. WSDA did not enter into agreements with the Washington State Parks & Recreation Commission, Jefferson County or the Jamestown S’Klallam Tribe in 2007, as the state parks projects were conducted by county noxious weed control boards, and the Jefferson County and the tribe’s projects were part of the larger effort carried out by the Olympic Knotweed Working Group.

Project activities occurred in watersheds of 21 counties, including 16 western Washington counties and five eastern Washington counties: Asotin, Clallam, Clark, Cowlitz, Grays Harbor, Island, Jefferson, King, Klickitat, Lewis, Mason, Okanogan, Pacific, Pierce, Skagit, Skamania, Snohomish, Thurston, Whatcom, Whitman, and Yakima. WSDA also provided educational materials to Stevens and Pend Oreille counties.

Approximately 1,312.6 acres of knotweed were treated in 2007. Details by region and program cooperator are in **(Table 2)**. The number of acres treated in 2007 was more than double the 646 acres treated in 2006. This increase in treated acres was a result of the treatment of populations in previously surveyed areas, as well as the treatment of knotweed in new project areas. All known riparian knotweed was treated in 16 river systems.

Project work occurred in 930.6 river miles in 2007, compared to 1,564 river miles in 2006. The number of participating landowners increased from 1,076 in 2006 to 1,256 in 2007.

The decrease in the river miles where project activities occurred because program cooperators focused their efforts on the treatment of previously surveyed areas that were found infested with knotweed, and they did not resurvey tributaries that were previously found to be free of knotweed. In most cases, tributaries that were free of knotweed never supported any knotweed populations.

Table 2. Results by region and program cooperator for the 2007 control season.

Program Cooperator by Region	Acres Treated	River Miles	Landowners Assisted
Lower Columbia			
Clark County	130.0	96.5	77
Cowlitz County	120.5	5.6	18
Lewis County	18.7	51.0	74
Skamania County	98.4	99.4	195
Coastal			
The Nature Conservancy	18.4	223.6	86
Lewis County	2.7	16.0	9
Pacific County	136.0	27.4	103
Olympic Peninsula and Western Hood Canal			
Clallam County / Jefferson County	635.4	120.1	154
10,000 Years Institute	40.0	10	1
Puget Sound and Eastern Hood Canal			
The Nature Conservancy	3.4	80	80
Snohomish County	67.8	8.2	115
Stilly-Snohomish Fisheries Task Force	4.2	16.7	42
Skagit County	0.9	na	40
Island County	0.6	na	16
King County	21.7	28.5	87
Pierce County	5.3	60.6	12
Middle Columbia			
Yakima County / Yakama Nation	3.2	37	65
Skamania County / Klickitat County	1.6	na	8
Upper Columbia			
Okanogan County	2.7	na	35
Eastern Washington			
Whitman County	1	0	30
Asotin County	0.1	50	9
Total	1,312.6	930.6	1,256

Knotweed spreads when fragments are moved during high water events or in contaminated soil, therefore, areas are not typically surveyed each season if they are upstream from the last known knotweed population, have not been subjected to human activities, or are in a different watershed.

Monitoring

WSDA is using monitoring plots to help gauge the effectiveness of the Knotweed Control Program. In 2007, WSDA staff visited knotweed treatment monitoring plots in Pacific County, Skamania County, and Lewis County between the months of July and September. The sites were initially treated in the summer of 2004, and regrowth at those sites has been treated each of the following seasons. In 2007, stem counts, stem heights, and stem diameters were recorded using the same methodology established in 2005 by Dr. Tim Miller, WSU weed scientist. Stem density, stem height, and stem diameter were compared to the pretreatment measurements and used to evaluate the cumulative effects of treatments over the past three seasons.

Across all sites, knotweed populations displayed a 96% reduction in stem density and an average visual control estimate of 99% (**Figure 7**). The above-ground growth that was present in the monitoring plots displayed an 80% reduction in stem height and an 86% reduction in stem diameter when compared to pretreatment measurements. All knotweed re-growth appeared to come from existing rhizomes or root crowns, and there were no seedlings present at the time of evaluation. One quarter of the evaluation plots had no knotweed present.



Figure 7. (Top) Knotweed patch in Lewis County prior to treatment, and (Bottom) following three years of treatments.

The re-colonization of treatment sites by native or non-native plants was noted at all monitoring plots. Where very few mature native plant species were present outside of the monitoring plots, non-native plants such as reed canary grass, Himalayan blackberry, and thistle were present. At locations adjacent to mature native vegetation, native plants such as red elderberry, cottonwood, red cedar, and salmonberry were observed. These results suggest that the need to reestablish native vegetation at treatment sites through planting or seeding will depend upon the vegetation that is present in the surrounding landscape.

Results observed at the monitoring plots are also being observed at project area sites. Across the state, the knotweed populations that persist in project areas exhibit significantly reduced stem density, stem height, stem diameter, and overall vigor. This has allowed many native plants, including tree and shrub species, to colonize areas where they had previously been displaced by knotweed.

Although there have been dramatic reductions in knotweed, program cooperators have not completely removed knotweed from any landscape-scale project area. Knotweed has a large amount of stored energy in its underground biomass and is very difficult to kill. Some program cooperators have seen knotweed growing at treatment sites where there had been no above-ground growth for two seasons. This phenomenon, coupled with the tremendous reproductive capacity of knotweed, reinforces the need for project areas to be thoroughly re-surveyed annually with any knotweed re-growth treated.

Plans for 2008

Since 2004, the Washington State Department of Agriculture has provided resources to county noxious weed control boards, tribal governments, and other organizations and agencies for landscape-scale knotweed control projects.

WSDA's program complements the work of the many other entities involved in knotweed control projects in a number of the state's watersheds. These include the state departments of Fish & Wildlife, Natural Resources and Transportation, public utility districts, U.S. Forest Service, National Park Service, county noxious weed control boards, municipalities, tribal governments, non-governmental organizations, private landowners, fisheries enhancement groups, and conservation districts.

In 2008, WSDA plans to capitalize on current success by focusing on continuing projects that demonstrate significant gains as well as new projects that will protect high-value riparian habitats. Projects in areas with low-levels of knotweed invasion show high returns on modest investment. Treating these areas in the early stages of infestation prevents knotweed from spreading throughout a given riparian system. WSDA will also continue to disseminate current knotweed control information to groups throughout the state and coordinate control efforts with other ongoing projects.

Controlling invasive knotweed is a multi-year effort. Sustained effort and resources are critical to success. Without the resources to revisit and retreat infested sites, knotweed populations could recover to pre-treatment levels in our current project areas.

WSDA's Knotweed Control Program will continue to support cooperators working to protect key components of our watersheds that benefit all the inhabitants of Washington State.

Biological Control Program

Fritzi Grevstad, Ph.D., of the University of Washington has been working with an international group of scientists and the U.S. Forest Service to develop a biological control program for the control of Japanese, giant, and Bohemian knotweed. In biological control, natural enemies from the weed's native range are introduced to provide long-term control of the plant.

Dr. Grevstad has surveyed Washington and Oregon for native insects that utilize knotweed as a host. The results of this survey showed that very few insects utilize knotweed as a host and those that did were generalist species, were never very abundant, and did not have any negative impacts on the health of knotweed.

Several natural enemies from knotweed's native range have been identified as promising candidate biological control agents. These include a sap-sucking psyllid (*Aphalara itadori*), a leaf-chewing chrysomelid beetle (*Gallerucida bifasciata*), a leaf- and stem-feeding moth (*Ostrinia ovalipennis*), and a leaf-spot pathogen (*Mycosphaerella sp.*). In July 2007, Dr. Grevstad traveled to Japan to collect and import the psyllid and chrysomelid into an insect containment facility located at Oregon State University. These insects are currently being tested for host specificity.

Rigorous testing is required to ensure that the insects will not feed on native or economically important non-target plant species in North America. A test plant list of 68 native and economically important species was submitted for review by the Technical Advisory Group for Biological Control of Weeds (TAG) in March 2007. The TAG is an independent voluntary committee that provides advice to researchers and the U.S. Department of Agriculture Animal and Plant Health Inspection Service.

The availability of biological control agents would be a beneficial addition to current control methodologies.

Lower Columbia

The Lower Columbia Region contains portions of Clark, Skamania, Cowlitz, Lewis, and Wahkiakum counties, and contains the population centers of Vancouver and Kelso. Mount Rainier National Park and Gifford Pinchot National Forest are within the Lower Columbia Region. Ecoregions of the area include the temperate conifer forests of the Coast Range, the Puget Lowlands and Willamette Valley in the central portion of the region, and the foothills and high elevations of the Cascades, including the Columbia River Gorge.



2007 marked the fourth year that WSDA has provided resources to the noxious weed control boards of Clark, Lewis, and Skamania counties for the control of knotweed in the Lower Columbia River Basin. This was the second year that the Cowlitz County Noxious Weed Control Board knotweed control project was supported, with funding provided through the Clark County agreement.

Clark County Noxious Weed Control Board

The Clark County Noxious Weed Control Board, in cooperation with local public utility districts, local sport groups, and landowner volunteers, has worked to control knotweed in Clark and Cowlitz County since 2004. In 2007, Clark County continued its work in the Lewis River watershed, and expanded control activities to the Washougal River (Figure 8).



Figure 8. Map of Clark County project area showing the Lewis and Washougal River watersheds.

A total of 130 acres of knotweed were treated for 77 landowners within a focus area of 96.5 river miles. This compares to the 87 acres treated and 134 river miles surveyed in 2006.

All known sites were treated in the Lewis River watershed in both years.

Clark County continues to see high levels of control and an increase in the number of landowners that choose to participate in the control project.

Cowlitz County Noxious Weed Control Board

Cowlitz County began a knotweed control program in 2006 to address the knotweed infestations in the Abernathy Creek and the Delameter Creek watersheds. In 2006, control work was limited to Abernathy Creek, where all known riparian knotweed populations (totaling 85.5 acres) were treated along 4.2 river miles.

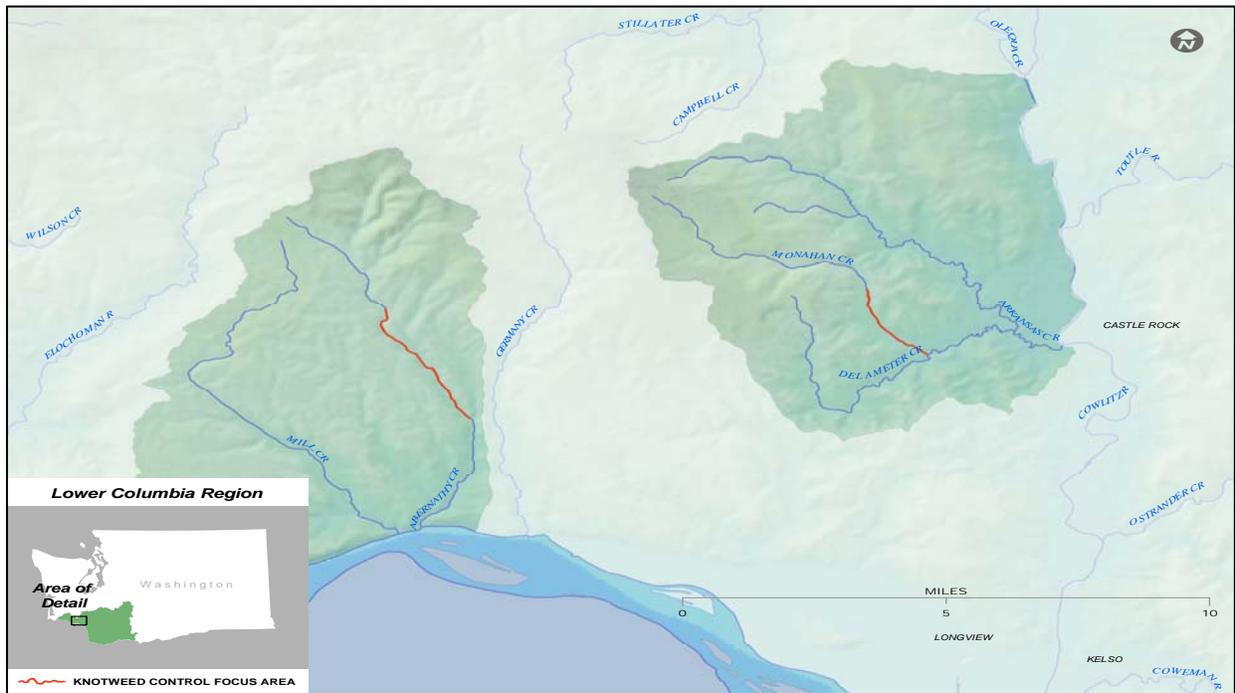


Figure 9. Map of Cowlitz County project area showing the Abernathy Creek and Delameter Creek watersheds.

In 2007, control crews were able to retreat knotweed populations in Abernathy Creek, and perform initial treatments in the Delameter Creek and Monohan Creek watersheds (**Figure 9**). Monohan Creek is a tributary to the Delameter River and was found to be severely infested, requiring the majority of the crew’s time and resources.

Cowlitz County crews surveyed and treated 120.5 acres of knotweed along 4.2 river miles of Abernathy and Monohan creeks. This work was performed for 18 landowners.

Lewis County Noxious Weed Control Board

The Lewis County Noxious Weed Control Board initiated a knotweed control program in the Upper Cowlitz River watershed in 2004 and continues to retreat knotweed populations in this project area (**Figure 10**). Based on previous survey work, knotweed has been found only in areas of the Cowlitz watershed within Lewis County.



Figure 10. Map of the Lewis County project area showing the Upper Cowlitz River watershed.

In 2007, Lewis County re-treated all known sites in the Upper Cowlitz watershed, and performed surveys of two hydroelectric impoundments: Riffe Lake and Lake Scanewa. Over 100 miles of the impoundments' shorelines were surveyed resulting in the detection of one site on Riffe Lake and one site on Lake Scanewa. The presence of only two sites on the shoreline of these two reservoirs, despite being downstream from the moderately infested Upper Cowlitz River, suggests that hydroelectric impoundments or lakes that occur within river systems may impede the downstream dispersal of knotweed propagules. Mayfield Lake has been surveyed during previous seasons, and no knotweed has been discovered along its shoreline. In 2007, 18.7 acres

of knotweed were treated along 51 river miles for 74 landowners. This is up slightly from the 17 acres treated along 41 river miles for 67 landowners in 2006.

Skamania County Noxious Weed Control Board

The Skamania County Noxious Weed Control Board surveyed Skamania County in 2002 and 2003 for the presence of knotweed. In 2004, Skamania County identified the entire county as its project area, and began treating knotweed at select sites.

In 2007, the Skamania County Noxious Weed Control Board surveyed and treated infestations in the Wind, Washougal, Little White Salmon River, and smaller Columbia River tributaries of Skamania County (**Figure 11**). A total of 98.4 acres of knotweed were treated for 195 landowners. Survey or treatment activities took place in 99.4 river miles. In 2006, 88 acres were treated for 154 landowners. All known knotweed populations of riparian areas have been treated in Canyon Creek and the Wind River.

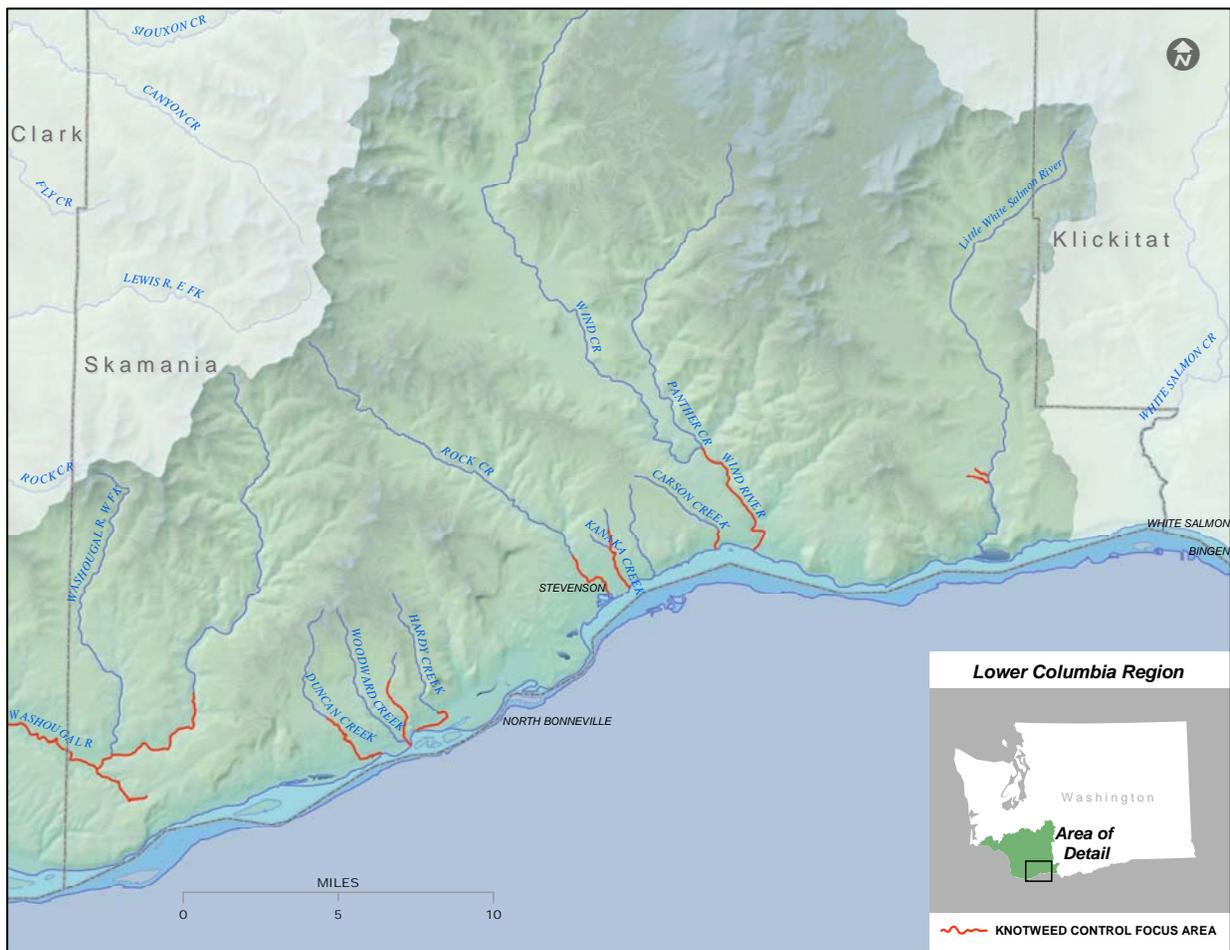
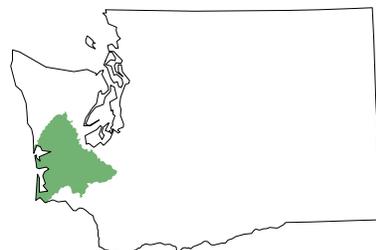


Figure 11. Map of the Skamania County project area showing the Washougal, Columbia River tributaries, Wind River, and Little White Salmon River watersheds.

Coastal

The Coastal region is made up of the Chehalis and Willapa Bay Water Resource Inventory Areas, and contains portions of Grays Harbor, Mason, Thurston, Lewis, and Pacific counties. Population centers include the coastal communities of Aberdeen, Hoquiam, and South Bend, and the inland cities of Centralia and Chehalis. The majority of this region is drained by the Chehalis River and its tributaries, and is characterized by the low-elevation Coast Range.



2007 marked the fourth year that WSDA has provided resources to The Nature Conservancy and the Pacific County Noxious Weed Control Board for knotweed control work in the Chehalis River basin and the Willapa River basin. This was the first year that WSDA provided resources to the Lewis County Noxious Weed Control Board for knotweed control work in the Upper Chehalis River.

The Nature Conservancy

The Nature Conservancy (TNC) is the lead entity of the Chehalis Knotweed Control Project and a member of the Chehalis River Aquatic Weed Group. The Chehalis River Aquatic Weed Group membership includes public agencies, conservation groups and tribes.



The knotweed control project area includes the Chehalis River Basin, with work focused in the Elk, Black, Skookumchuck, North Fork Newaukum, South Fork Newaukum, Mainstem Newaukum, East Fork Satsop rivers, and Scatter and Porter creeks (**Figure 12**).

The Nature Conservancy began treating knotweed populations in the Chehalis Basin in 2004. In 2007, treatments were made to all known knotweed populations in the Elk, Black, Skookumchuck,

Figure 12. Map of The Nature Conservancy Chehalis River project area.

Newaukum rivers and in Scatter Creek on cooperating landowners' property. Initial survey and treatments were conducted in Cedar and Porter Creek and the East Fork and mainstem of the Satsop River. Approximately 18.4 acres were treated and 223.6 river miles were surveyed. Work was performed for 86 landowners.

Lewis County Noxious Weed Control Board

2007 was the first year that the Lewis County Weed Board included the Upper Chehalis watershed in its knotweed control project. Knotweed control crews conducted initial treatments and surveys in the Upper Chehalis and South Fork Chehalis rivers (**Figure 13**). The work in this new project area addressed a low-level infestation and was complementary to the work that was performed by TNC. In all, 2.7 acres were treated in 16 river miles. Work was performed for 9 landowners.

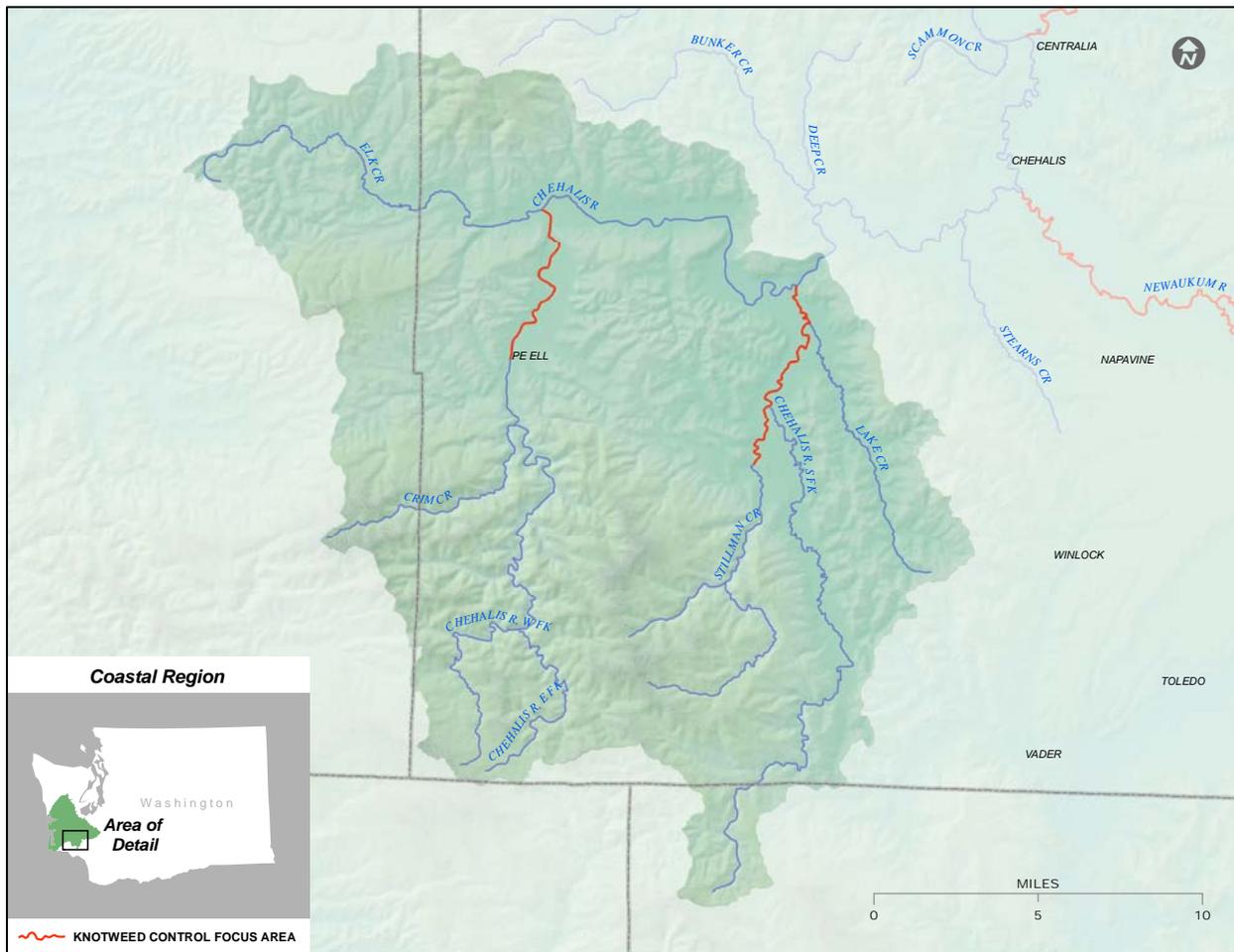


Figure 13. Map of the Lewis County project area showing the Upper Chehalis watershed.

Pacific County Noxious Weed Control Board

The Willapa River Basin is located in northern Pacific County and drains approximately 260 square miles. Land uses in the watershed include agriculture and forestry. Watercourses within the Willapa Valley support chum, coho, Chinook, steelhead, and cutthroat.

The Pacific County Noxious Weed Control Board has partnered with the Pacific County Conservation District to treat knotweed populations in the Willapa River watershed since 2004. The project area includes the North Fork Willapa, South Fork Willapa, and their tributaries (**Figure 14**).



Figure 14. Map of the Pacific County project area showing the Willapa River watershed.

A survey of the South Fork Willapa and its tributaries that was performed in 2006 resulted in the detection of no knotweed in the river corridor or riparian areas. In 2007, crews were able to retreat all known knotweed populations in the North Fork Willapa, and its tributaries. Work was performed in 27.4 river miles and 128 road miles of the Willapa River Basin. In 2007, approximately 136 acres were treated. This control program was able to assist 103 landowners in the Willapa River Basin.

Olympic Peninsula and Western Hood Canal

This region contains all or portions of Clallam, Jefferson, Grays Harbor, and Mason counties, and is characterized by habitats such as high-energy coastal beaches, ancient conifer forests, and alpine areas of the Olympic Mountains. The ecoregions that are present in this area include the Coast Range, Puget Lowlands, and the Olympic Mountains.



Populated areas include the coastal communities of Forks, Port Angeles, Sequim, Port Townsend, and Shelton. This region is home to Olympic National Park and the Olympic National Forest. The economy relies on timber, agriculture, and recreational activities.

WSDA provided resources to the Olympic Knotweed Working group for control work in 14 river basins, including the Hoh, Big, Clallam, Sol Duc, Quillayute, Dungeness, Duckabush, Dosewallips, Dickey, Bogachiel, Calawah, Sekiu, Hoko, and Pysht river basins. Direct funding was provided to the Clallam County Noxious Weed Control Board and the 10,000 Years Institute.

Clallam County / Jefferson County Noxious Weed Control Boards

WSDA provided funding to the Clallam and Jefferson County Noxious Weed Control Boards for knotweed control projects on the Olympic Peninsula. Clallam County is the lead entity of the Olympic Knotweed Working Group. Members of this group include: the Quinault Indian Nation, Makah Tribe, Jamestown S'Klallam Tribe, Lower Elwha S'Klallam Tribe, Port Gamble S'Klallam Tribe, Quileute Tribe, National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, Natural Resources, Department of Transportation, Department of Agriculture, Clallam County Conservation District, Merrill and Ring Timber Company, 10,000 Years Institute, and the noxious weed control boards of Clallam, Jefferson, Mason, and Grays Harbor Counties.

This group was formed to address the knotweed infestations in Clallam and Jefferson counties, and focused treatments on the riparian areas of river and lake systems that provide significant habitat needs for fish and wildlife or natural resource value to public or tribal entities.

Clallam and Jefferson County crews worked in the Big, Sekiu, Clallam, and Sol Duc rivers; Lake Creek, Ennis Creek, Valley Creek; and the city of Forks. Clallam County also supported knotweed control activities in the Calawah, Bogachiel, Dickey, Dungeness, Quillayute, Dosewallips, and Duckabush rivers (**Figure 15**).

This is the third season that Clallam and Jefferson Counties have implemented a knotweed

control project. In 2007, the Olympic Knotweed Working Group shared resources to treat 635.4 acres along 120.1 river miles and associated upland areas for 154 landowners. The significant increase in acres of knotweed that were treated in 2007 can be attributed to the work of the Quileute Tribe, and its ability to focus control activities on the treatment of previously surveyed sites.

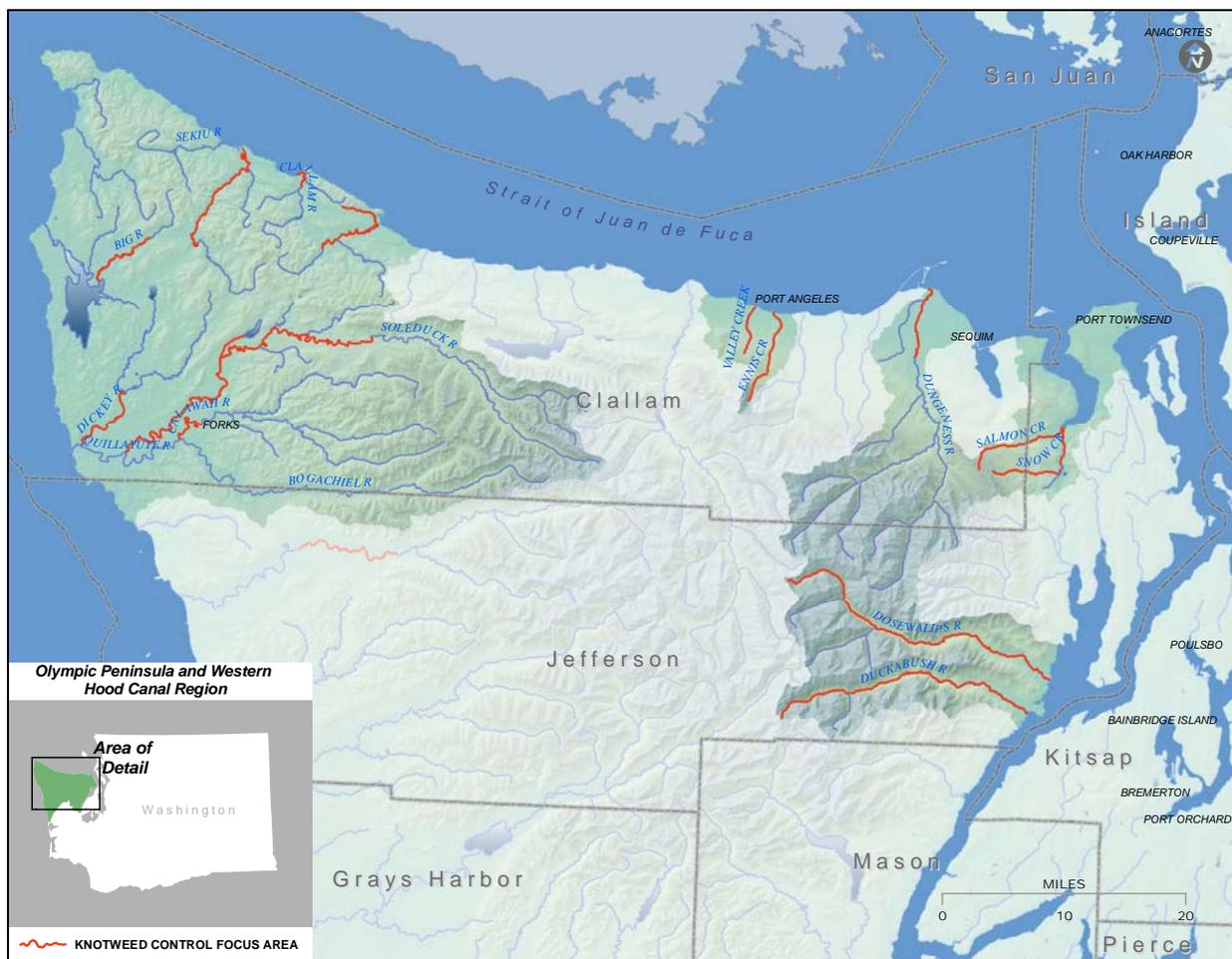


Figure 15. Map of the Clallam County and WSDA-supported Olympic Knotweed Working Group project area, showing the Quillayute, Sol Duc, Big, Sekiu, Dungeness, Dosewallips, and Duckabush River watersheds.

10,000 Years Institute

2007 was the sixth season that the 10,000 Years Institute treated knotweed in the Hoh River watershed in partnership with the Hoh Tribe, Hoh River Trust, private landowners, Washington State Department of Corrections, Washington State University, Olympic National Park, the National Park Service North Coast/Cascades Network Exotic Plant Management Team, and the U.S. Forest Service. 2007 marked the first season that WSDA has provided resources directly to the 10,000 Years Institute.

Surveys were performed along 10 river miles covering 913 acres of the Hoh River floodplain (**Figure 16**). Treatments occurred within 40 acres of that area. The 10,000 Years Institute and WSDA will work to gain permission to treat all remaining sites within the project area in 2008.

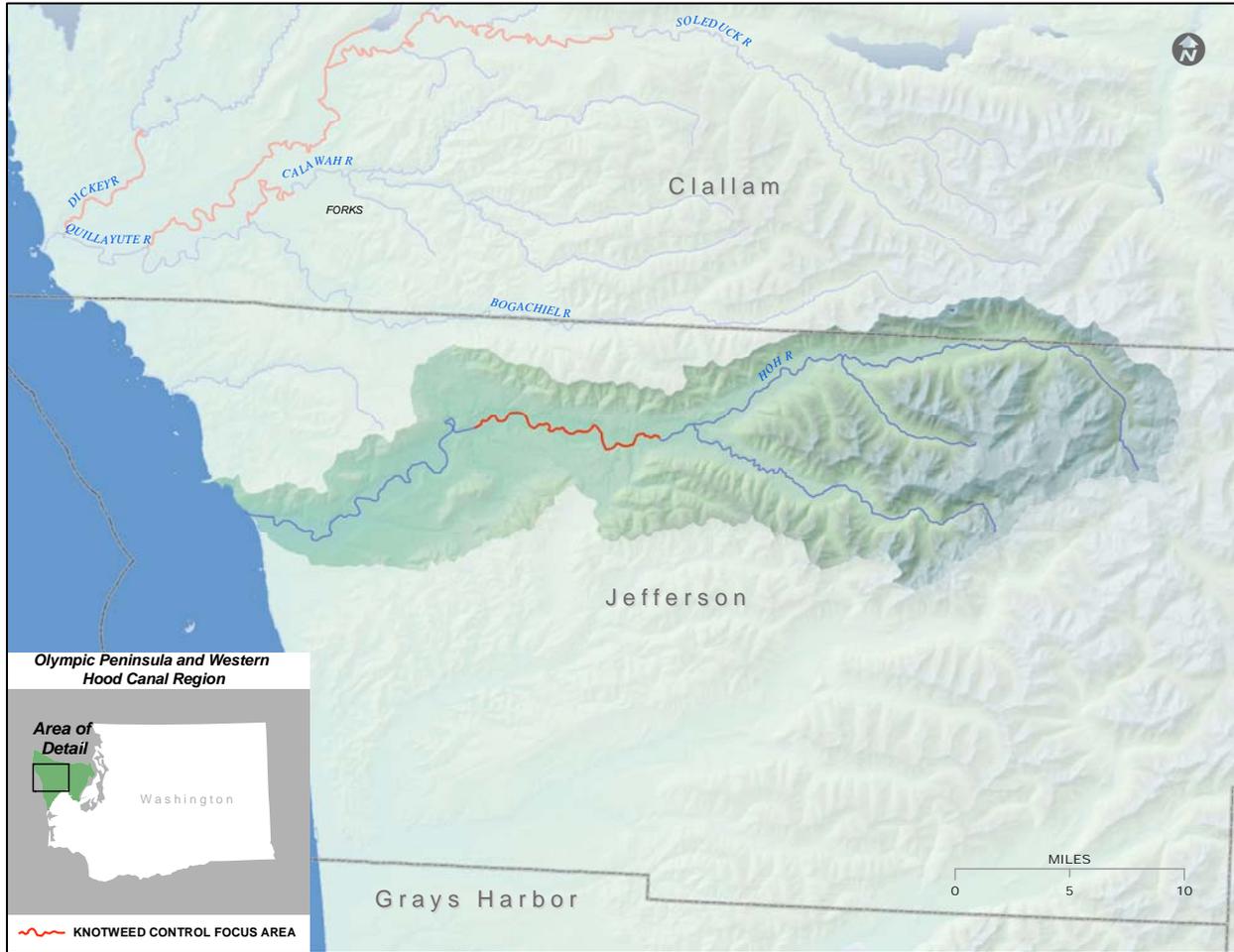
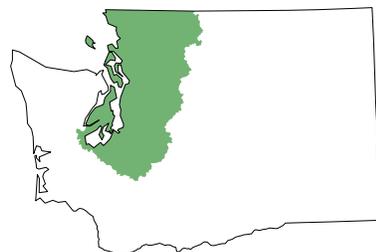


Figure 16. Map of the 10,000 Years Institute project area showing the Hoh River watershed.

Puget Sound and Eastern Hood Canal

This region contains all or part of 10 counties and is home to two-thirds of Washington State's population. The streams of this region drain to Puget Sound and Hood Canal. Puget Sound is the second largest estuary in the United States. The ecoregions of this area include the Cascades, North Cascades, and the Puget Lowlands.



2007 was the third year that WSDA provided support to The Nature Conservancy and the noxious weed control boards of Snohomish, Island, and King counties. 2007 was the second year that WSDA provided support to the Skagit County Noxious Weed Control Board. Work was performed in the Upper Skagit River basin, the Stillaguamish River basin, the Middle Fork Snoqualmie River basin, Skykomish River basin, and Island County.

The Nature Conservancy

The Nature Conservancy is the lead entity of the Skagit Knotweed Working Group. Members of this group include private landowners, non-governmental organizations, and state, federal, and county agencies. The working group has been controlling knotweed in the upper Skagit basin since 2001. In 2007, project activities took place in an area with its downstream boundary at the town of Rockport, extending upstream to the dams in the North Cascades National Park Complex (**Figure 17**).

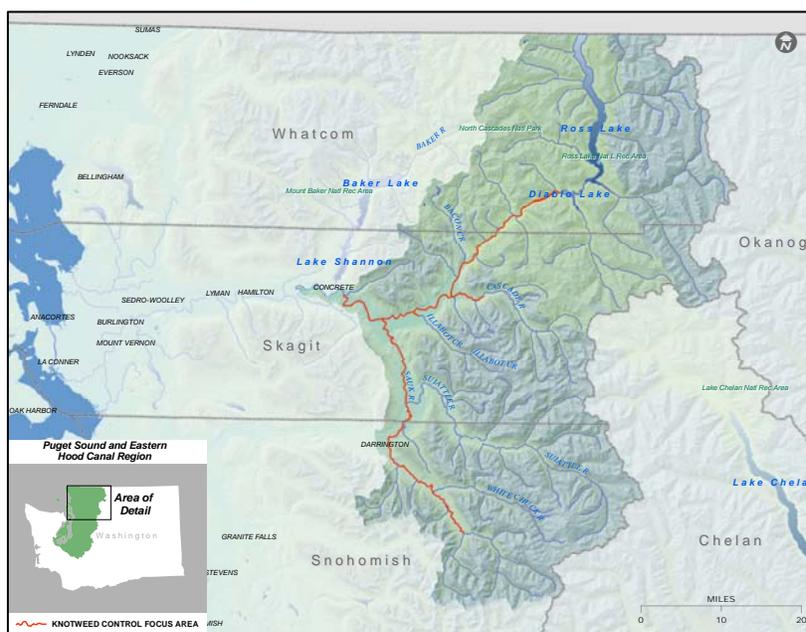


Figure 17. Map of The Nature Conservancy's Upper Skagit River project area.

The project area includes spawning grounds for the Upper Skagit Chinook, Upper Cascade Chinook, and Upper and Lower Sauk Chinook. There are four additional species of anadromous salmonids that utilize the area for spawning, migration, and rearing. The Sauk and Suiattle River system's off-channel aquatic habitats support the globally-rare Salish Sucker and include amphibian breeding sites. The project area also supports the largest wintering bald eagle

concentration in Washington State, which is one of the four largest in the lower 48 states.

Similar to all of the knotweed control projects, The Nature Conservancy has experienced high levels of control and has observed the complete removal of 55% of the knotweed patches from the project area. In 2007, the Nature Conservancy treated 3.4 acres of upland and riparian knotweed in a project area that contained 500 river miles of the Skagit and Sauk Rivers. Survey and treatment activities occurred along 80 river miles of the watershed. Work was performed for 80 landowners.

Snohomish County Noxious Weed Control Board

The Stillaguamish River basin includes three main subwatersheds: the North Fork Stillaguamish, South Fork Stillaguamish, and mainstem Stillaguamish rivers. The basin drains approximately 700 square miles and includes more than 3,112 miles of stream, river, and marine shore habitat for salmon. Chinook, coho, chum, pink, steelhead, sockeye, native char, and sea-run cutthroat depend upon the habitats in the Stillaguamish watershed.

The Snohomish County Noxious Weed Control Board, as a member of the Stillaguamish Cooperative Weed Management Area, has worked with regional partners to control knotweed

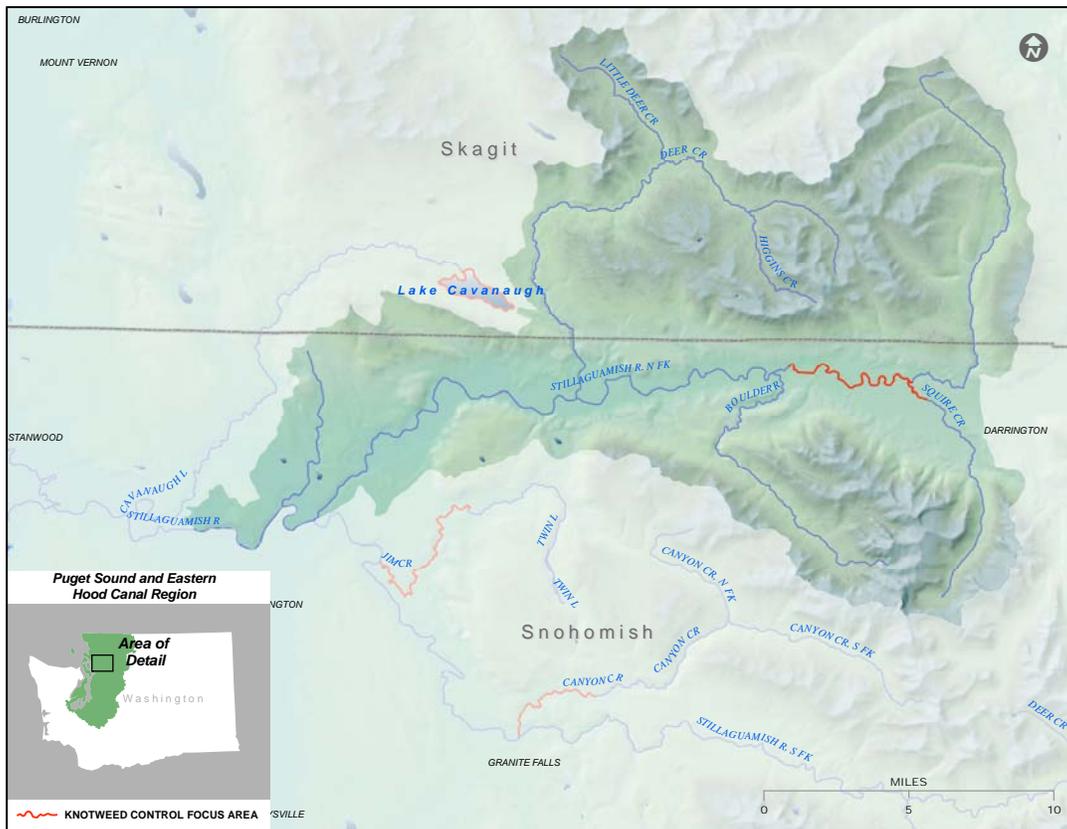


Figure 18. Map of the Snohomish County project area and the North Fork Stillaguamish watershed.

and other noxious weeds. The regional partners include the Department of Fish and Wildlife, Department of Natural Resources, U.S. Forest Service, Snohomish County Surface Water Management and Parks Department, Stillaguamish Tribe of Indians and Stilly Bank Savers Project, Snohomish Conservation District, and the Stilly-Snohomish Fisheries Enhancement Task Force.

The Snohomish County Noxious Weed Control Board has focused its knotweed control activities on the North Fork Stillaguamish River (**Figure 18**). Select sites in the South Fork Stillaguamish River, tributaries to the North Fork Stillaguamish, and upland areas were also treated.

In 2007, the Snohomish County crew treated 67.8 acres of knotweed for 115 landowners in the project area. Work was performed in 8.2 river miles.

Skagit County Noxious Weed Control Board

The Skagit County Noxious Weed Control Board also worked in the Stillaguamish River Basin, and focused control activities on properties in Lake Cavanaugh. Lake Cavanaugh is located at the headwaters of the Pilchuck River and is in southern Skagit County (**Figure 19**).

Skagit County, as a member of the Stillaguamish Working Group, initiated control activities in the Lake Cavanaugh watershed in 2006. This work was performed with the assistance of the Stillaguamish-Snohomish Fisheries Task Force, which donated resources to conduct outreach activities. In 2007, 40 landowners participated in the project, enabling the Skagit County control crew to treat 0.9 acres of knotweed.

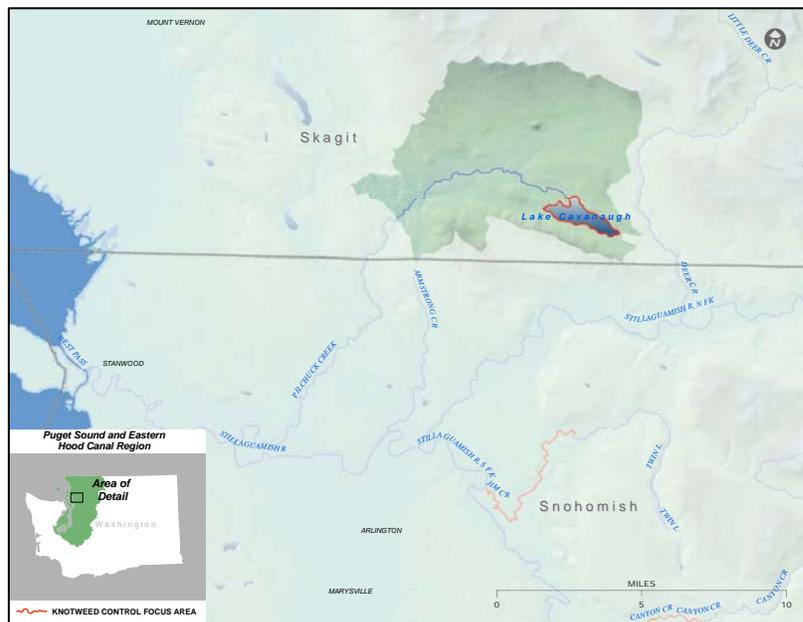


Figure 19. Map of the Skagit County project area and the Lake Cavanaugh watershed.

Stilly-Snohomish Fisheries Enhancement Task Force

The Stilly-Snohomish Fisheries Enhancement Task Force focused knotweed control activities on Jim Creek, Turlo Creek, and Canyon Creek, tributaries to the South Fork Stillaguamish River

(Figure 20). These watercourses provide important habitat needs for chum, coho, and pink salmon, as well as steelhead, cutthroat, and native char. Land uses adjacent to these tributaries include rural-residential and agriculture production. Knotweed control crews treated 4.2 acres for 42 landowners in a focus area of 16.7 river miles. This project addresses knotweed infestations in tributaries of the lightly-infested South Fork Stillaguamish River.



Figure 20. Map of the Stilly-Snohomish Fisheries Enhancement Task Force project area within the South Fork Stillaguamish watershed.

Island County Noxious Weed Control Board

The Island County Noxious Weed Control Board worked with a commercial applicator to survey and treat knotweed populations in Island County (Figure 21). The knotweed control work in Island County addressed a low-level knotweed infestation, with 2007 efforts focused on the southern portion of Whidbey Island. Most sites are not near any water bodies and provide Island County with the opportunity to address this low-level infestation at an early stage of invasion. There were 0.6 acres of knotweed treated in 2007, compared to 2 acres in 2006. The reduction

of treated acres occurred despite the expansion of the project area to include all of Island County. Island County assisted 16 landowners.



Figure 21. Map of the Island County showing the location of all known knotweed sites.

King County Noxious Weed Control Board

The King County Noxious Weed Control Program implemented knotweed control projects in the Middle Fork Snoqualmie River, the South Fork Snoqualmie River, and the South Fork Skykomish River (**Figure 22**). There are three distinct Cooperative Weed Management Area (CWMA) groups that have formed as a response to the knotweed infestations on each river. The CWMA's membership includes private landowners, municipalities, state agencies, federal agencies, and community-based conservation organizations. This is the second year that WSDA has supported work in the Middle Fork Snoqualmie River, and the first year of support for the projects in the South Fork Snoqualmie and South Fork Skykomish rivers. Knotweed control crews treated 21.7 acres along 28.5 river miles.

All of the work was conducted by crews comprised of county staff, Washington Conservation Corps members, and members of Earth Corps. Work was performed for 87 landowners.

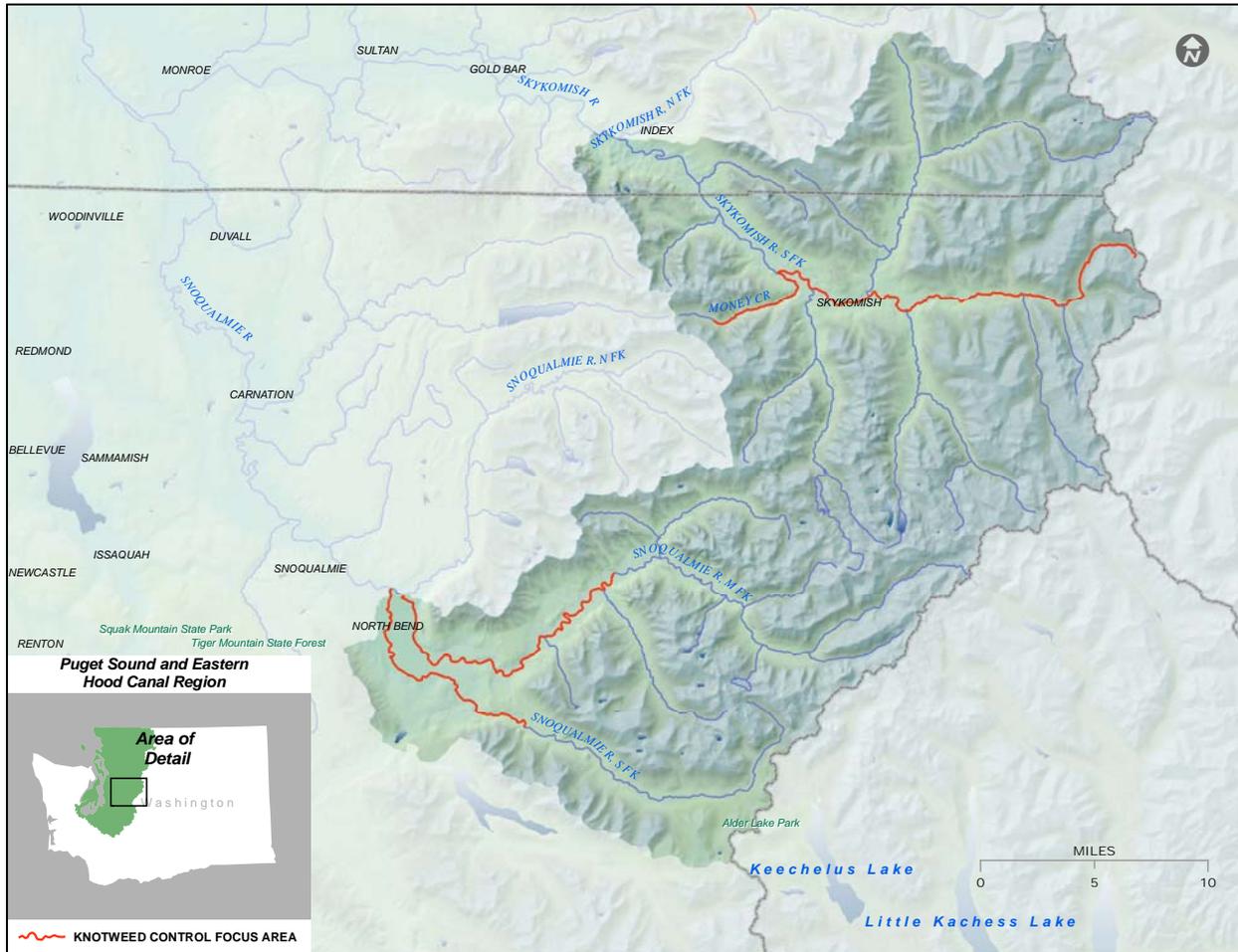


Figure 22. Map of the Upper Snohomish River watershed and the King County project areas of the Snoqualmie and Skykomish Rivers.

Pierce County Noxious Weed Control Board

2007 was the first year that WSDA supported the Pierce County Noxious Weed Control Board knotweed control project in the Nisqually River watershed. A Cooperative Weed Management Area (CWMA) was formed to facilitate control efforts, with members from the National Park Service, U.S. Department of Defense, U.S. Fish and Wildlife Service, U.S. Forest Service, Nisqually Tribe, Natural Resources, Parks and Recreation Commission, Tacoma Power, Nisqually River Council, Nisqually Land Trust, and the county noxious weed control boards and conservation districts of Pierce, Lewis, and Thurston counties.



Figure 23. Map of the Nisqually River watershed, the Pierce County knotweed project area.

Pierce County acted as the lead entity of the CWMA and conducted survey and control work in the Nisqually River watershed (Figure 23). The Nisqually River is separated by the Alder-LaGrande Dam Complex. This separation creates very different river characteristics above and below the dams, including knotweed infestation severity.

The knotweed distribution in the lower watershed is sparse compared to the upper watershed. County crews discovered 3.1 acres in the lower 38.4 river miles below the dam, compared to the 352 acres of knotweed discovered in the upper 12 river miles below the National Park on the mainstem Nisqually River. It appears that the reservoirs are acting as a major impediment to downstream knotweed dispersal, and that the source of the knotweed infestation of the lower watershed is located downstream of the reservoirs.

All known knotweed was treated in the lower river, and select sites were treated in the upper watershed. Pierce County crews treated 5.3 acres of knotweed in 60.6 river miles for 12 landowners. Pierce County will prioritize the treatments of the upper watershed and tributaries in 2008.

Upper Columbia

This region includes Okanogan, Chelan, and Douglas counties, and is characterized by the North Cascades, Columbia Plateau and Northern Rockies ecoregions. Public lands of the Okanogan and Wenatchee national forests, North Cascades National Park, and Lake Chelan National Recreation Area are within the boundaries of the Upper Columbia Region. Populated areas include the cities of Wenatchee, Omak, and Chelan.



This is the first year that WSDA has supported any knotweed control projects in this region.

Okanogan County Noxious Weed Control Board

2007 was the first year that WSDA supported the Okanogan County Noxious Weed Control Board's knotweed control program. Survey and treatment efforts were limited to upland areas

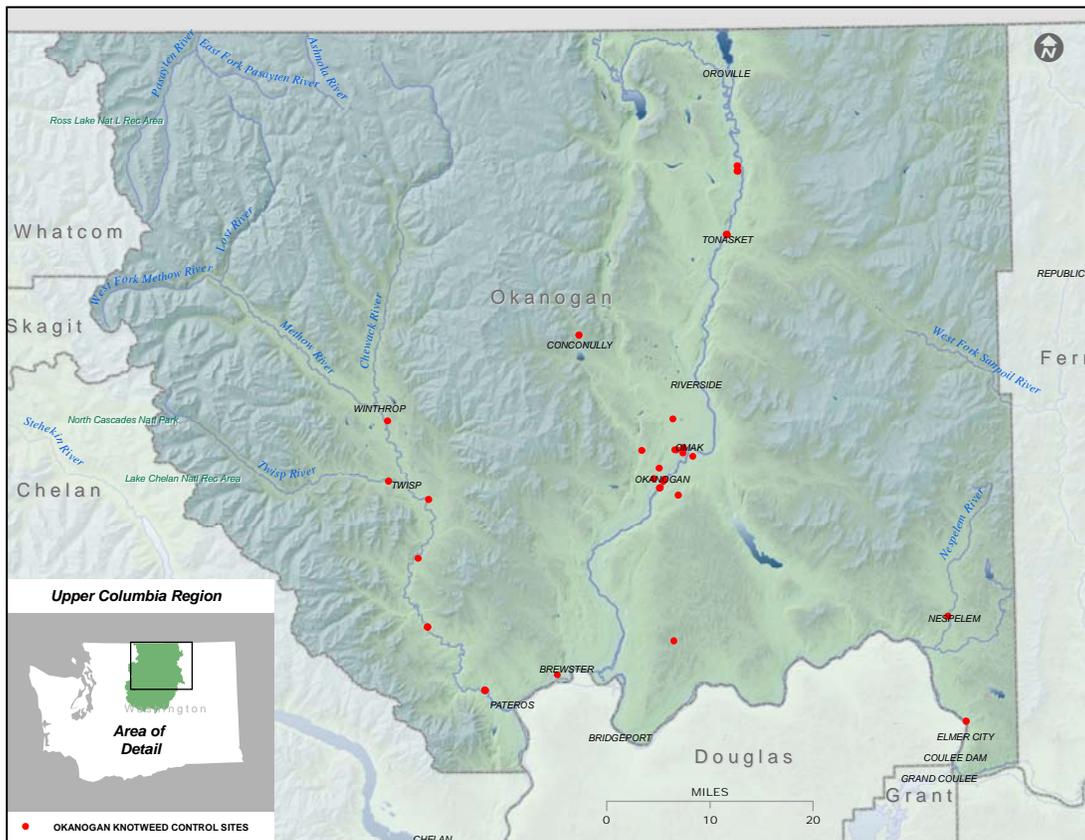


Figure 24. Map of Okanogan County and all known upland knotweed populations.

within the county (**Figure 24**). Okanogan County survey crews found that most knotweed infestations were associated with residential areas. The county worked with a commercial applicator to treat 35 sites, totaling 2.7 acres. Thirty-five landowners were assisted in 2007. The treatment of knotweed in residential areas, the sites of their initial introduction, will reduce the potential that the natural areas of Okanogan County become infested.

Middle Columbia

The Middle Columbia Region is located in Central Washington and is comprised of the eastern slopes of the Cascades and the sagebrush steppe of the Columbia Plateau. This region contains Kittitas, Yakima, Klickitat, Benton, and portions of Chelan County, and the population centers of Yakima and the Tri-Cities area.



WSDA provided resources to the Yakima County Noxious Weed Control Board and the Yakama Nation to perform knotweed control activities in the Naches and Yakima rivers. This was the third year that WSDA supported this project.

Yakima County Noxious Weed Control Board / Yakama Nation

The Yakima County Noxious Weed Control Board and the Yakama Nation surveyed for and treated knotweed in Yakima County (**Figure 25**). This work was a continuation of the project

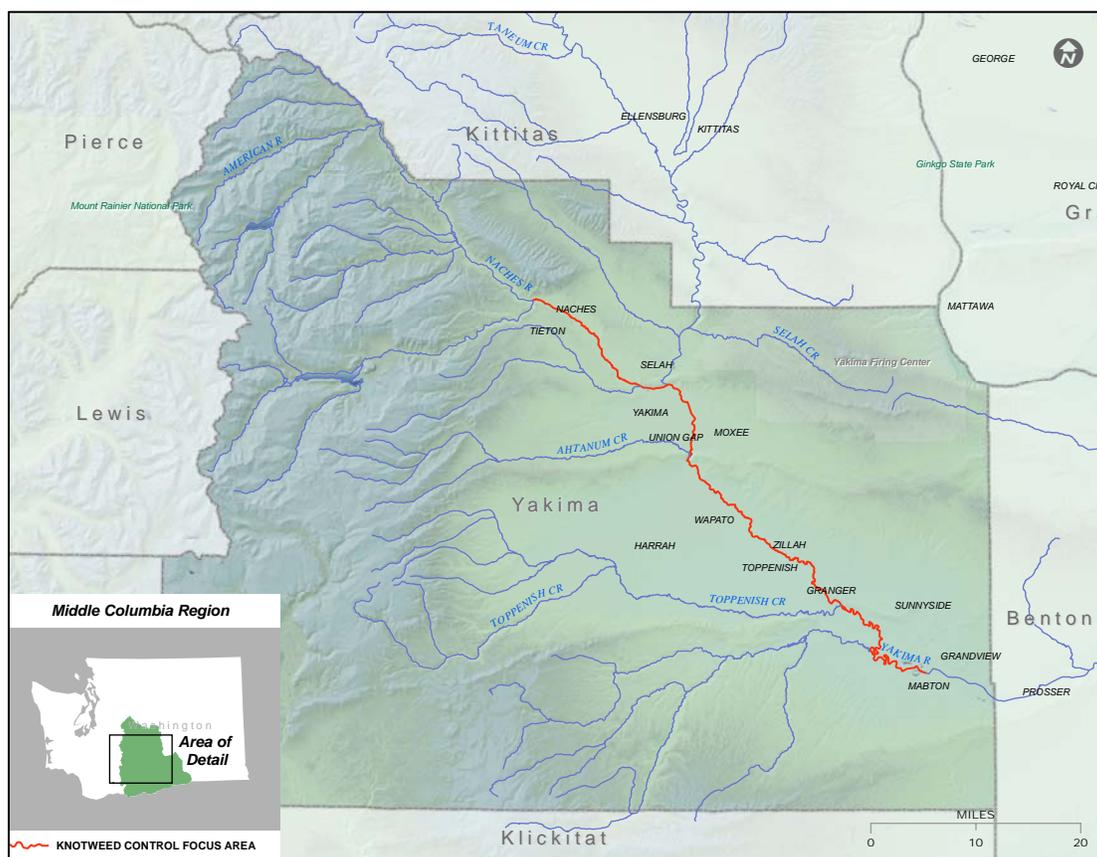


Figure 25. Map of Yakima County, the Yakima County Noxious Weed Control Board and Yakama Nation knotweed project area.

that identified Yakima County as the project area, with a focus on the Naches and Yakima rivers. In 2005, approximately 8.5 acres were treated within 18 river miles. In 2006, crews treated 5.4 acres of knotweed along 37 river miles of the two rivers, and surveyed an additional 45 river miles within the river basin. In 2007, approximately 3.2 acres were treated along 37 river miles. Work was performed for 65 landowners.

All known knotweed infestations in Yakima County and the Naches River Basin were treated during the 2007 season.

Skamania County Noxious Weed Control Board

In 2006, the Klickitat County Noxious Weed Control Board surveyed Klickitat County for knotweed and found that most sites were small, isolated, and located at upland areas (**Figure 26**). The Klickitat County Noxious Weed Control Board partnered with the Skamania County Noxious Weed Control Board to begin treatments of the surveyed areas using Skamania County crews and WSDA resources. This partnership has allowed for the efficient treatment of knotweed sites soon after they are detected and the necessary permission is granted by the landowner. In 2007, 1.6 acres were treated for 8 landowners.

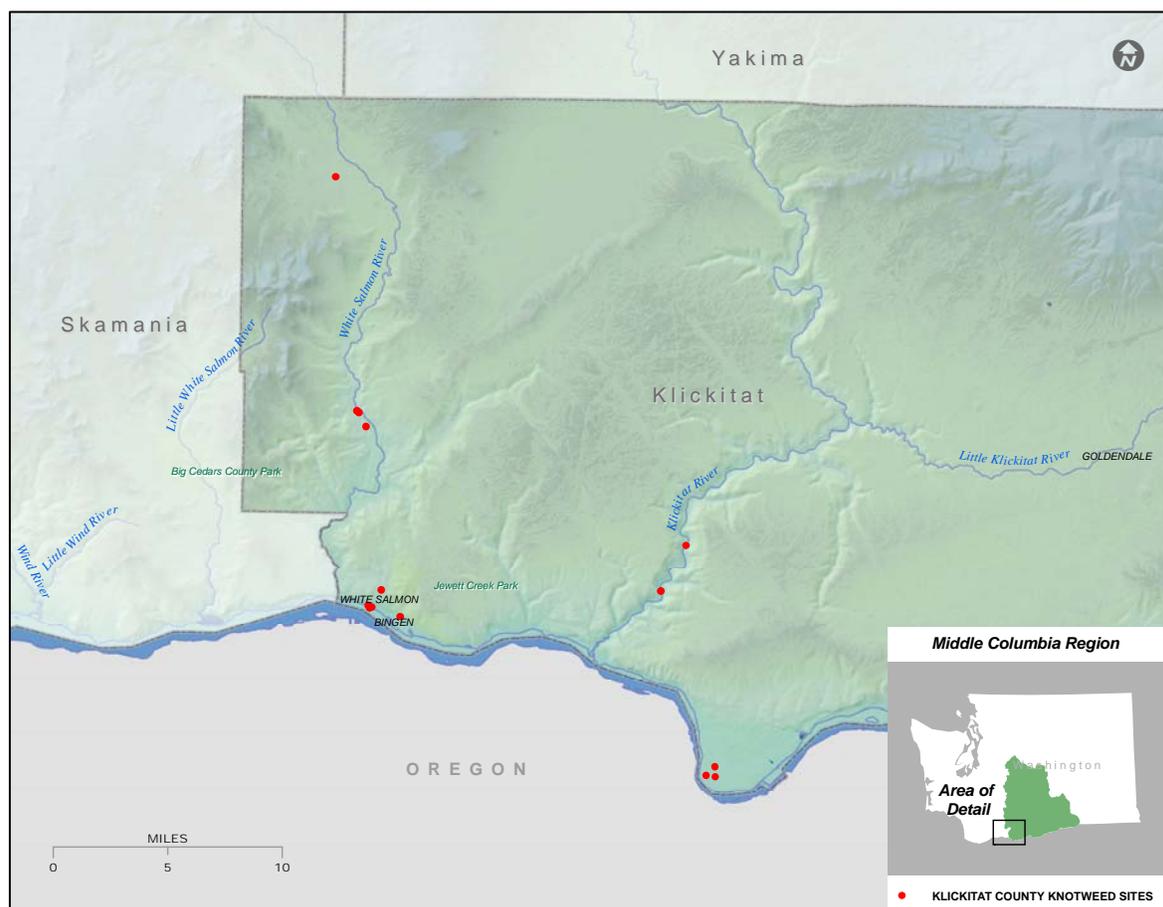


Figure 26. Skamania County project area showing the location of knotweed treatment sites in Klickitat County.

Eastern Washington

This region contains all or portions of 13 counties and the Colville and Umatilla National Forests. The ecoregions of the area include the Northern Rockies in the north and the Columbia Plateau and Blue Mountains to the south. This region includes the Northeast Washington and Snake River Salmon Recovery Regions. Population centers include Spokane, Clarkston, and Pasco.



2007 marked the second year that WSDA provided resources to the noxious weed control boards of Whitman and Asotin counties. Both of these project areas have very few knotweed populations, and represent an opportunity to address project areas with low-level infestations. WSDA also provided educational materials to the noxious weed control boards of Stevens and Pend Oreille counties.

Whitman County Noxious Weed Control Board

The Whitman County Noxious Weed Control Board partnered with local municipalities and a private contractor to survey and treat knotweed in Whitman County and the Palouse River Basin



Figure 27. *Map of Whitman County, the Whitman County Noxious Weed Control Board knotweed control project area. Knotweed locations are based on surveys performed in 2006.*

(Figure 27). 2006 was the first year that the noxious weed control board was able to address the knotweed populations in Whitman County, and it was the first year that WSDA provided resources to the noxious weed control board and local municipalities of Whitman County. This partnership continued in 2007.

The Whitman County Noxious Weed Control Board contracted with a commercial applicator to treat 1 acre of the infestation. Due to high levels of control, local municipalities were able to retreat all knotweed in their jurisdiction without any assistance from Whitman County. All known knotweed populations were treated in Whitman County this season. The work was performed for 30 landowners.

Asotin County Noxious Weed Control Board

This was the second year that WSDA supported the knotweed control activities of Asotin County. This project focused on the high priority riparian areas of Asotin County, where 15 river miles of Asotin Creek were found to be affected by knotweed (Figure 28). Asotin Creek is the only known riparian infestation in Asotin County.

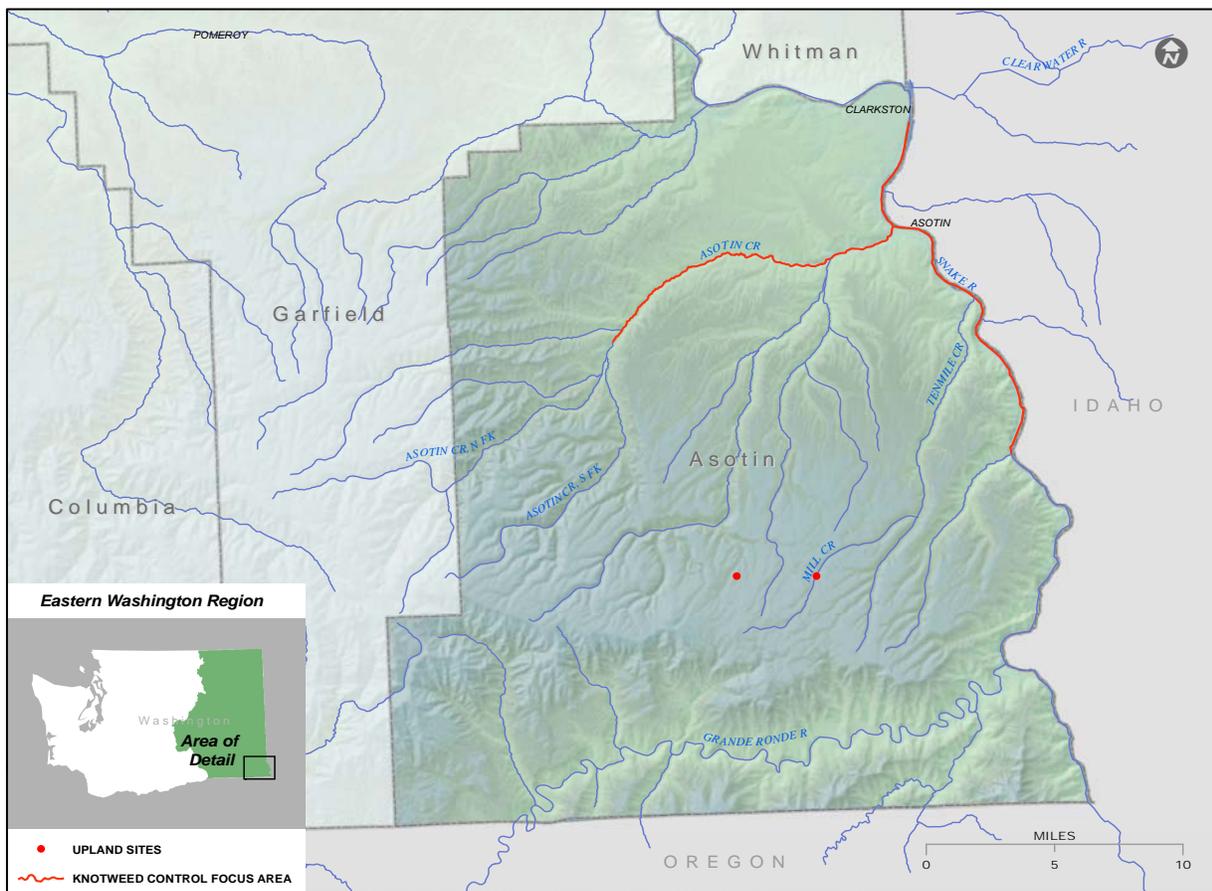


Figure 28. Map of Asotin County, the Asotin County Noxious Weed Control Board knotweed project area.

The Asotin County Noxious Weed Control Board re-treated known knotweed sites and carried out surveys in Clarkston, Asotin, and 35 miles of the Snake River. The Asotin County Master Gardeners assisted the weed board with the survey efforts.

In 2007, the Asotin County Noxious Weed Control Board treated 0.1 acres of knotweed for nine landowners. In 2006, 15 acres were treated in the same project area. These results demonstrate the value of investing resources into an area in the early stages of invasion before the knotweed population expands into all potential habitats.

The Asotin County Noxious Weed Control Board plans to increase survey efforts in 2008, with a focus on two additional drainages in Asotin County.