Lower Gales Creek Enhancement Plan

Knotweed and Ivy Mapping and Report
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Prepared by:
Independent consultants:
Jackie Dingfelder
Jason Schmidt
For

Three Rivers Land Conservancy
PO Box 1116
Lake Oswego, OR 97035

I. Introduction

a. Project Overview and Background

The Tualatin River Watershed Council (Council) prepared a Lower Gales Creek Habitat Enhancement Plan (Plan), outlining five years of recommendations for projects in four miles of lower Gales Creek and two miles of Gales Creek tributaries. The purpose of the Lower Gales Creek Invasive Species Mapping Project is to help identify priority areas for stream habitat enhancement projects that will benefit winter steelhead and other anadromous fish species in Lower Gales Creek.

The Three Rivers Land Conservancy (Three Rivers) was hired to conduct a riparian survey to quantify and locate invasive plant species Japanese knotweed and English Ivy in the four-mile project reach of Lower Gales Creek watershed (river miles 10-14). Three Rivers is a non-profit land conservation organization dedicated to preserving natural areas, scenic and recreation areas, wildlife habitat and historic lands in the Portland metropolitan area.

The Gales Creek watershed is one of the many large rural sub-basins of the Tualatin River watershed (see Figures 1 and 2). The 49,481-acre (77.9 sq. mi.) sub-basin is situated on the eastern side of the Coast Range Mountains and is primarily contained within the northwestern edge of Washington County, except for two small portions extending into Tillamook County. The main stem of Gales Creek is 23.5 miles long and flows in a southeasterly direction, entering the Tualatin River about 1.5 miles south of the City of Forest Grove.

The Gales Creek watershed contains a mosaic of native and introduced plant species. The original forest uplands, most of which were logged 40 to 80 years ago or burned in two stand-replacing fires have been replaced with Douglas fir forests that are intensely managed. Douglas-fir, western red cedar, red alder, big leaf maple, vine maple and elderberry are the dominant plant species found in the riparian zone of the upper reaches of Gales Creek. The lower elevation foothills were originally Oregon white oak and Douglas fir but are now dominated by woodland, pastureland, vineyards, Christmas tree farms and orchards. The flat flood plain lands of the watershed are almost exclusively used for agricultural crops, including container nurseries and small livestock operations. Riparian vegetation in the lower reaches includes a mix of native and introduced species: Douglas-fir, western red cedar, willows, red alder, big leaf maple, Oregon ash and black cottonwood. Typical, native under story species are red-osier dogwood, snowberry, hawthorn, ninebark, oceanspray, cascara and sedges. Invasive plant species such as Himalayan blackberry, reed canary grass, English ivy, Japanese knotweed, and Scot's broom are found in patches in the lower reaches of the watershed.

Japanese (*Polygonum cuspidatum)*, giant (*P. sachalinense*) and Himalayan (*P. polystachyum*) knotweeds are highly invasive species on the increase throughout the Portland metropolitan area. Their extent in the Lower Gales Creek is currently unknown;

however, these plants have only been identified recently in the watershed. As a result, addressing these plants early on is a top priority before they take hold like other invasive species. This project proposes to address these threats by surveying and mapping the extent of Japanese knotweed and English ivy in Lower Gales Creek and detailing the results in a report with recommendations for further action.

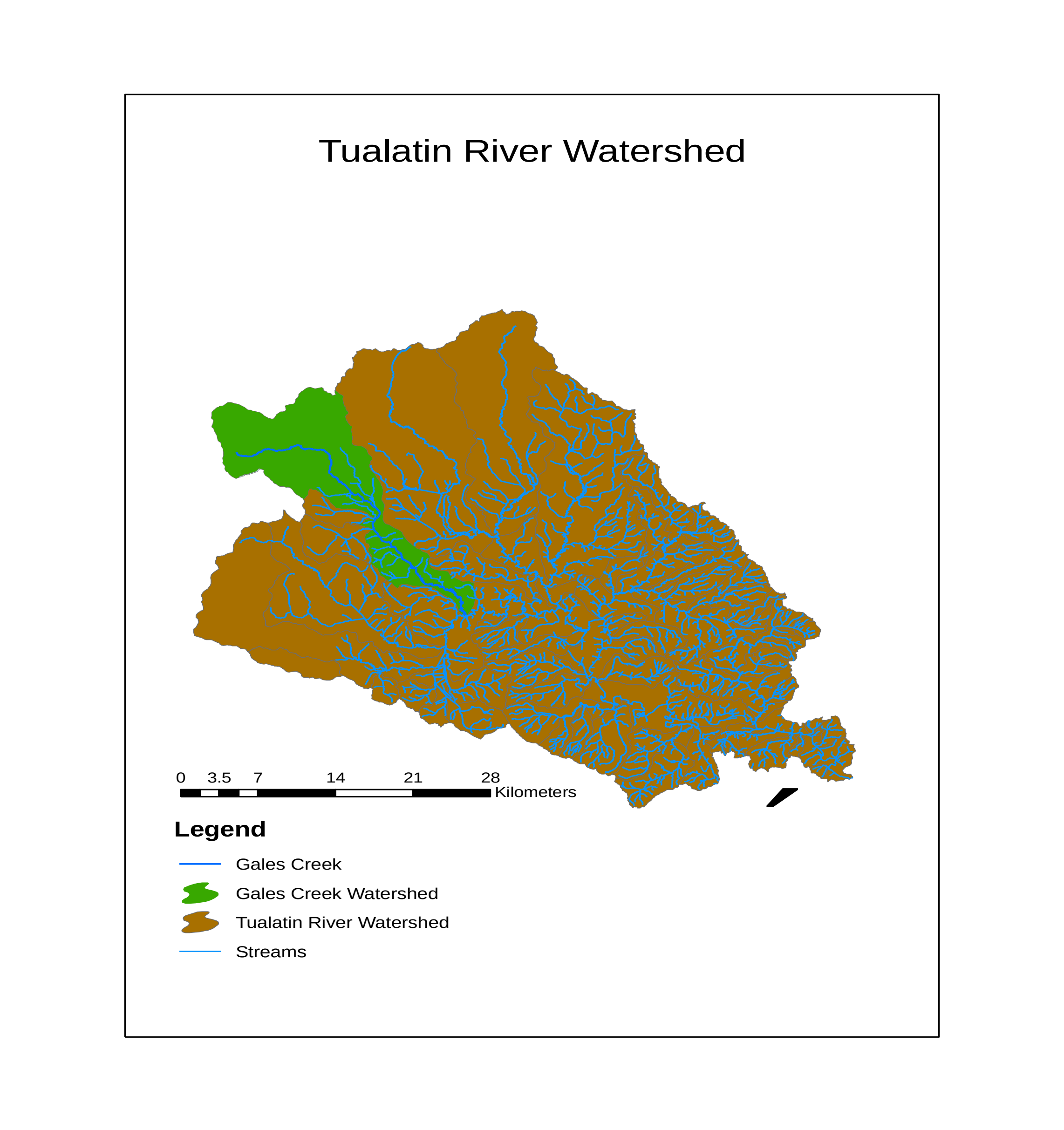

fig. 1 Tualatin River Basin

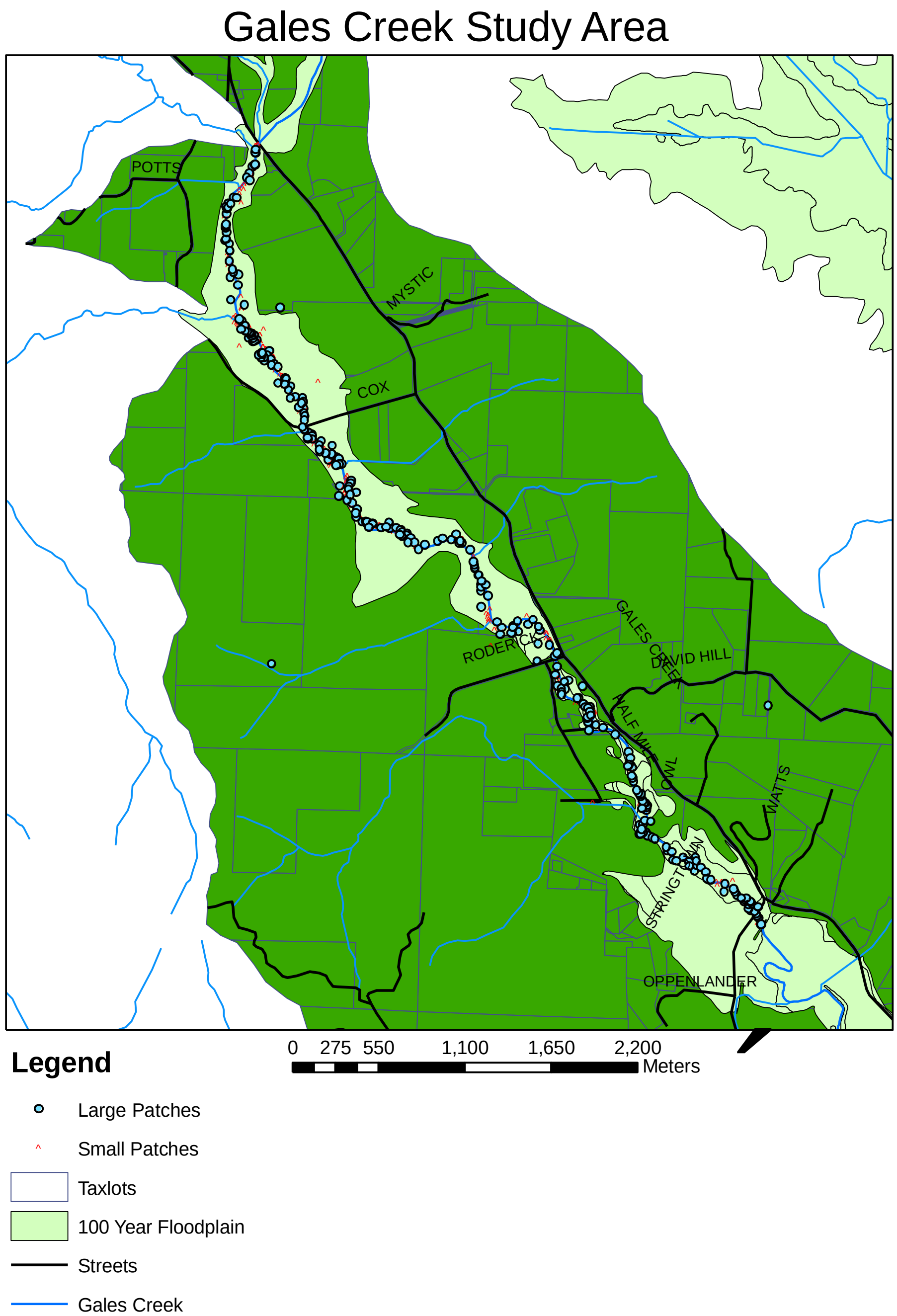

fig. 2 Gales Creek Study Area, river miles 10-14, northwest of Forest Grove

b. Project Goals and Objectives

Listed below are specific project goals and objectives:

Goals:

- Identify areas of knotweed and Ivy infestation along Lower Gales Creek
- Work with landowners to raise awareness about the threat invasive species pose to riparian habitat and eradicate existing knotweed and ivy plants.

Objectives:

- Collect baseline information on the extent and infestation levels of Japanese knotweed and English Ivy.
- Map invasive species distribution and coverage along Lower Gales Creek to help identify priority areas for treatment.
- Develop cost estimates for knotweed treatment based on current available information.

c. Knotweed and Ivy Background

Japanese knotweed is an introduced ornamental plant (see Fig. 3) with bright green heart-

fig. 3 Japanese knotweed

shaped leaves and hollow reddish colored stems. Knotweed grows extremely rapidly, establishes extensive root systems more than 2 meters deep, is shade tolerant, spreads through an extensive network of rhizomes (roots that can sprout) and is capable of propagating from minute stem or root fragments. Any one of these characteristics might make it a tough weed, but the combination of these traits establishes Japanese knotweed as a serious threat to Oregon's native plant communities. Once established, knotweed can form dense forest-like patches more than 10 feet tall.

English Ivy (Hedera helix) is an aggressive, invasive, introduced species. It is an alien in Northwest ecosystems and has no natural - biologic or environmental - controls in this or many similar ecosystems. It transforms natural areas into monocultures which do not provide habitat for indigenous wildlife. While it becomes an evergreen ground cover, its landscaping value is otherwise limited and creates undesirable consequences. Its widespread popularity derives primarily from its rapid growth, its suppression of any other plant growth, and its scant requirements in cultivation. These characteristics are major reasons why it is devastating when introduced to land areas populated by native species.

d. How Knotweed Threatens Riparian Areas

Knotweed's threat comes from a peculiar combination of life history features that adapt it perfectly for life in the dynamic riparian and floodplain systems of the Pacific Northwest and allows it to cause fundamental changes in the function of the riparian system. Knotweed can tolerate long periods of submersion and poor soils, allowing it to establish and grow on the lower banks of rivers and creeks where there is little competition. Because knotweed evolved as a primary colonizer of volcanic slopes, it can rapidly colonize fresh sediment deposits and other low nutrient, disturbed sites. It grows rapidly to 3-6 meters in the spring, effectively shading and excluding lower and slower growing native vegetation, including willows and cottonwoods, the typical riparian dominants of our area. Knotweed has an extensive but fragile rhizome network, and reproduces vegetatively via root fragments as small as 1 cm. Finally, it has proven to successfully form dense, apparently permanent monocultures in areas with similar or colder climates.

With the loss of native riparian vegetation and the inability of shade intolerant species (such as many grasses, sedges and rushes, Douglas fir, willows and cottonwoods) to reproduce under a knotweed canopy, it is likely that several types of fundamental changes will begin to occur as knotweed dominance increases. Although knotweed has an extensive root system, it has relatively few fine roots and thus provides very poor bank holding capacity. This will lead to more sediment in the water and broader, shallower, and warmer waterways. Although knotweed can provide dense shade directly along the shoreline, compared to an established forest canopy a knotweed canopy will allow increased solar radiation to penetrate to the water, presumably resulting in higher than normal water temperatures. Because knotweed does effectively exclude reproduction of most tree species, a knotweed-dominated system will eventually be short on large wood, a key component of Pacific Northwest river systems. Finally, a monoculture of any kind is unlikely to be able to provide appropriate habitat for wildlife or support for the aquatic food chain, resulting in loss of aquatic invertebrate biodiversity. *(Nature Conservancy, Sandy River Riparian Habitat Protection Project, Report 2004)*

II. Knotweed and Ivy Field Methods

a. Data Collection Protocol and Methods

Three Rivers contract staff, Rochelle Hohlfeld and Mackenzie Zirk (Fig. 4), conducted riparian field surveys from late September through mid-October 2005. The area surveyed included four river miles, running from the Highway 47 Gales Creek overpass to the Stringtown Road Bridge. The data collected during field surveys were used to create this report describing the location and extent of knotweed and ivy along Lower Gales Creek.

fig. 4, Survey on the banks of Gales Creek

The survey focused on Japanese knotweed and English ivy infestations that occurred in riparian areas, defined in this study as 30 meters on either side of the creek. If a patch began in the riparian area and continued beyond 30 meters, data was collected for the entire patch. Quantitative data was not collected for patches that began outside of the riparian area, but notes were made accordingly.

Data collected includes gross patch area, infested area, percent infested area, stem count, stem height, and location of patch. These parameters can be defined as follows.

<u>Definitions</u>:

Sub-Patch: An individual or cluster of stems.

Non-infested Area: An area where canopy cover is zero.

Gross Patch Area: This parameter includes all sub-patches that were five or less meters apart from one another as well as non-infested areas between sub-patches. A perimeter was drawn around the canopy of the outermost stems or sub-patches, creating an area measured in square meters.

Sub patches greater than five meters apart were measured as discrete patches. Stems or clusters of stems were considered as discrete patches when *less* that five meters apart from one another if physical characteristics made them visually distinct. (For example, a small mowed patch in a jeep trail growing adjacent to a tall thriving patch.)

Infested Area: This parameter measures the total area of infested sub-patches that lie within a single gross patch. An infested sub-patch may be a single stem or a large, multiple stem cluster. The infested area distinguishes between the infested sub-patches and non-infested areas within the gross patch. The infested area is within the Gross Patch Area and is smaller in size.

Percent Infested Area: This parameter measures the total area of sub-patches that lie within a single gross patch area as a percentage of the gross patch area. Canopy cover was estimated visually as a percentage of the gross patch area. The infested area was calculated using this estimate. This is also known as the **Density of Infestation**. The percent is calculated by: infested area/gross patch area

Stem Count: Living stems greater than one half inch were counted to determine the number of knotweed stems growing within a gross patch. Stems less that one half of an inch were recorded as a half stem.

In large patches stem count was estimated by taking visual counts of 3 random, 1 square meter patches within infested sub-patches. The stem count of these 3 patches was averaged and used to estimate the stem count of the entire infested area.

Where less than 10 stems made up a sub-patch, the gross patch area, infested area and percent infested area were not calculated. The location was determined and recorded as a sub-patch of less than 10 stems.

Stem Height: Height was estimated visually for the entire gross patch and the mean height was recorded in meters.

Location: Location was determined by handheld Global Positioning System units with an average accuracy of 6 meters.

b. GIS analysis and mapping

Once the field data was collected, the information was entered into an Excel spreadsheet. (See Appendix B.) Each patch of knotweed was assigned an individual "Patch ID" number, and the attributes outlined above were associated with these specific numbers as well. Three databases were established to distinguish between Large Patches, Small Patches, and English Ivy. This way, when the information is represented on a map, it is easy to differentiate the extent of each kind of infestation.

Additional data attached to the database include:
Site ID (either private, P, or county, C)
Ownership (name of tax lot owner)
Site Type (either Riparian River Right or Riparian River Left)
Previous Spray (yes or no)

Since the GIS only recognizes "decimal-degrees" for position, the coordinates were converted from "degrees decimal-minutes" using a spreadsheet formula and calculation tool.

The survey team collected information at the point scale for a variety of reasons. The difference in accuracy of using the GPS unit to map individual areas was negligible when compared to on-the-ground area calculations. Assigning all the information to points with a longitude and latitude makes it easier to relocate the patches in the field when revisited for treatment or further survey work.

Additional GIS data was collected from the Metro Regional Land Information System (RLIS). This included tax lot information, stream lines, watershed boundaries, and streets.

The maps included in Appendix A show that the extent of Japanese knotweed is equally spread throughout the study area. **Maps 1-9** show the total area infested with knotweed per patch. **Maps 10-18** depict the percent of knotweed infested area, which indicates density. **Map 19** shows knotweed density in categories of Low, Medium, and High. Higher density of knotweed means that there is a greater degree of canopy cover in these infested areas.

The knotweed data was then joined to tax lot information to show average areas of knotweed infestation per tax lot, average number of knotweed stems per tax lot, and average percent of knotweed infestation per tax lot (**maps 19-21**). All of the properties surveyed along the riparian study area have some degree of knotweed infestation.

II. Survey Findings

a. Invasive Species Coverage

Knotweed infestation is significant along the entire reach of Gales Creek surveyed. Data collected showed no general trends in relation to upstream or downstream location; gross patch areas were distributed evenly both upstream and downstream. Knotweed and Himalayan blackberry were equally pervasive, entirely out-competing native plants for most of the reach surveyed. Other prolific invasive species identified include reed canary grass and morning glory. English ivy and scotch broom were identified but sparse. The only area where invasive plants were not found was in fallow farm fields. These fields, along with blackberry mounds appeared to be the only effective barriers to knotweed's advancement into upland areas.

b. Knotweed Control Methods

Knotweed treatment methods vary from site to site. Factors such as patch size, patch location, the time of year, and the landowner determine the treatment at a given site. Some of the more common methods are direct injection, or surficial spraying of the herbicide Glyposate with Li-700 surfacant. This includes "Rodeo" or "Aquamaster" herbicides, and direct contact spraying. Generally, injection is used on larger plants with stem diameters of 3/4" or wider. Up to 5ml of herbicide is injected just below the 2nd to 3rd node from the surface. On smaller patches, and smaller plants, the spray method works just as well.

c. Knotweed Control Method Cost Estimates (from Clean Water Services)

Clean Water Services (CWS), a public utility serving nearly 500,000 residents in urban and suburban portions of the Tualatin River watershed, began a knotweed control project in 2005. Herbicide treatment methods included stem injection and foliar application. By September 2005 CWS's contractor had treated all of the nearly 200 known patches within their service area of the Tualatin Basin. However, outside of this area in largely agricultural and forest lands, the largest known patches remained untreated. To build momentum for knotweed control in those areas, CWS conducted a pilot project with the Tualatin River Watershed Council, treating several large patches along Gales Creek. Treatment included foliar application with 8% Glyphosate and stem injection with 53% Glyphosate (Aquamaster).

According to Peter Guillozet, Water Resources Project Manager at Clean Water Services, treatment during the second year will consist of injection at previously untreated patches between June and September and foliar application to previously treated patches in September. Following completion of the second season of treatment, CWS will replant treated riparian sites on public lands with fast growing native trees and shrubs. During the third year the contractor will return to treated sites and, where necessary, repeat the foliar application. CWS will monitor and treat knotweed on an ongoing basis with the goal of eradicating these species from the basin.

Peter Guillozet estimated that contractor costs in the first year included a significant amount of time for "discovery" of patches. Mr. Guillozet anticipates much lower costs during the second and third years. He is also exploring a promising alternative herbicide that would be more appropriate for large patches (e.g., on Gales Creek) where the injection method would exceed allowed herbicide rates per acre. Injection will continue to be part of the treatment toolbox, but foliar application in late summer is likely to be the primary control method. Table 1 details Clean Water Services' knotweed treatment efforts and costs in 2005.

Table 1: Estimated knotweed treatment costs in the Tualatin River Basin including Gales Creek

Number of treated Patches (throughout entire watershed including Gales Creek)	***Combined Area of Patches***	***Herbicide Cost***	***Labor Cost (includes scouting and data recording)***	***Estimated cost per patch***
196	7,168 sq meters	$1,624.50	$34,677.50 ($39/hr.)	$185.00

IV. Conclusions, Recommendations and Next Steps

This knotweed and ivy mapping project covered river miles 10-14 of Gales Creek within 30-meters on either side of the stream. Altogether, this project mapped a total of 92,925 square meters of Gales Creek riparian area. Table 2 provides a summary of the total mapped area, the total area infested with knotweed, and the average density of knotweed infestation.

Table 2: Japanese knotweed coverage and density

Total Mapped Area	***Total Infested Area***	***% of Total Infested Area/Total Mapped Area***	***Average density (%) of knotweed coverage per individual patch***
92,925 sq meters	44,268.41 sq meters	47.64%	70.91%

Nearly half of the total study area is infested with Japanese knotweed. Within this area of infestation, the average density of infestation is just over 70%. The next step was to determine if there were any spatial trends in the spread of knotweed across the study area.

We found that high density knotweed patches tend to cluster together. This means that areas with a high percentage of infestation tend to influence surrounding areas. We assigned 3 categories of knotweed density (Table 3). Map 19 (see Appendix A) displays the information presented in Table 3.

Table 3: Japanese knotweed Density Categories

	Low Density (0%-24.99%)	***Medium Density (25%-74.99%)***	***High Density (75%-100%)***
# Of Patches	23	90	176
Average Density	12.13%	50.11%	89.23%

Based on these results, we can conclude that as knotweed establishes itself throughout the basin, areas of high density will continue to spread to less infested areas. Appendix B indicates the tax lots where the average density of infestation is greater than or equal to 50%. It is recommended that treatment be targeted to properties containing medium to high density coverage, with the owners' approval. Contacting these property owners is essential to limiting the spread of knotweed throughout Gales Creek.

Survey results identified 289 large patch locations and 231 small patch locations along Lower Gales Creek. Using Clean Water Services cost estimates, the projected cost for treating all large patch locations in Lower Gales Creek would be approximately $53,000 (289 x $185/per patch). Small patches consisted of less than 10 knotweed stems, whereas any patch with more than 10 stems is considered a large patch. The large patches with higher densities indicate that there is a greater canopy cover in these areas. Focusing treatment first on the areas of high density infestation is highly recommended.

Recommended next steps for the Tualatin River Watershed Council would be to locate sources of funding for knotweed treatment and work with Clean Water Services to expand treatment in Lower Gales Creek. The cost estimates outlined in this report is based on costs incurred during knotweed treatment in the Tualatin Basin in 2005.
A partnership with Clean Water Services to eradicate knotweed in Tualatin Basin would leverage their technical and geographic expertise as well as funding for additional treatment in Lower Gales Creek.

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Project Staff

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Project Oversight and Review

Jayne Cronlund, Executive Director, Three Rivers Land Conservancy
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Information sources used for this report:

Lower Gales Creek Enhancement Plan, March 2003
Sandy River Riparian Habitat Protection Project, The Nature Conservancy, February 2005
West Willamette Corridor Invasive Species Mapping Report, Three Rivers Land Conservancy, March 2004
Metro Regional Land Information System (RLIS), http://www.metro-region.org/article.cfm?articleid=671