

Oregon Fish & Wildlife Office

MAY 19 2004

May 14, 2004

Dear Friend of Natural Areas:

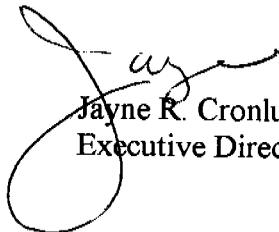
Enclosed please find a copy of Three Rivers' groundbreaking invasive plant removal. This document delivers a cost estimate for removing invasive plant species in a 160 acre area of the West Willamette Wildlife Corridor. Also included is an executive summary for your benefit as well.

This report is the collaboration of many different groups. We want to thank all of those who helped pull this report together.

Three Rivers is in the process of writing grants to begin tackling this incredible challenge.

We hope that you might find it useful in your own battle to conserve your natural area. Please don't hesitate to call me with questions, extra copies, or a presentation to your group.

Sincerely,



Jayne R. Cronlund
Executive Director

**Three Rivers Land Conservancy's
West Willamette Corridor Invasive Species Mapping Report
Executive Summary February 2004**

Oregon Fish & Wildlife Office
MAY 10 2004

Non-native invasive plant species threaten the health of our urban forests and greenspaces. If the removal of invasive species on the landscape is not made a priority, these lands will lose their recreational and wildlife habitat value. The threat to our public lands investment is astronomical. The exact cost of inaction is unknown, but repercussions include the cost of cleaning up landslides, road closures, loss of tree canopy and shading for water quality, replanting costs, houses damaged and power outages caused by falling trees, and other water quality issues.

The West Willamette Corridor (WWC) is described as the area encompassing Forest Park and Tryon Creek State Park and traversing the close-in west side of the Willamette River. 700 hundred acres in the WWC is the focus of Three Rivers Land Conservancy's efforts, of which 160 acres have been studied. While intensive development occurs in this area, thousands of acres are in large lot forested ownership by both private and public entities. The West Willamette Corridor Invasive Species Mapping Report shares the results of a baseline inventory of 160 acres of this area along Terwilliger Boulevard. It is the foundation for developing a coordinated, strategic, long term invasive species eradication program for the area. Three Rivers believes we must develop a program, now, to address the threats to these natural areas.

Three Rivers owns Keller Woodlands, a 40 acre forested parcel, within the WWC along Terwilliger Blvd., and is responsible for maintaining the health of this natural area. Three Rivers is developing a working partnership with other land managers in the WWC such as Oregon Health Sciences University, City of Portland and Friends groups to combat invasive plants. In order to develop an effective eradication program, the groups must understand the extent and costs of methods used to combat invasive species. The WWC Invasive Species Mapping Report provides a comprehensive look at the condition of these urban natural areas and presents several different cost scenarios that will lead to eradication. This information will increase the ability of land managers to successfully combat invasive plants.

Goals and Objectives

Goals:

- Increase capacity and information amongst partners to effectively remove the threat of invasive species to the forest resources in the West Willamette Corridor.
- Increase invasive species awareness in residents of West Willamette Corridor.
- Build awareness in decision-makers about the threat that invasive species pose.

Objectives:

- Collect baseline information on the extent and current infestation levels of invasive plant cover,
- Develop a rapid inventory and mapping methodology which effectively determines infestation levels and one that could be improved over time to be utilized by other land managers,
- Develop cost estimates based on current available data for effective, collaborative control of invasive species,
- Identify and establish partnership opportunities for invasive species removal, public education and outreach, and collaborative research opportunities,
- Coordinate efforts to develop funding proposals to fund invasive species removal efforts,
- Build an effective support and information network.

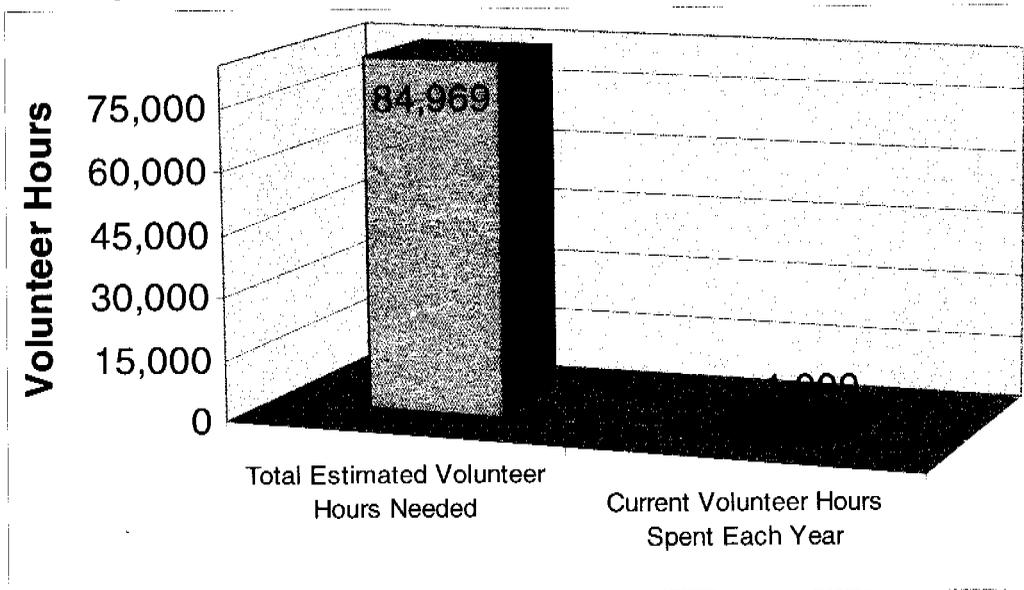
Findings

The results of conducting an inventory of the invasive species on 160 acres revealed that a total of 106.5 acres were infested with English ivy, blackberry and clematis (see Table 1)¹. Also, laurel and holly were inventoried, but are excluded from the suggested eradication program.

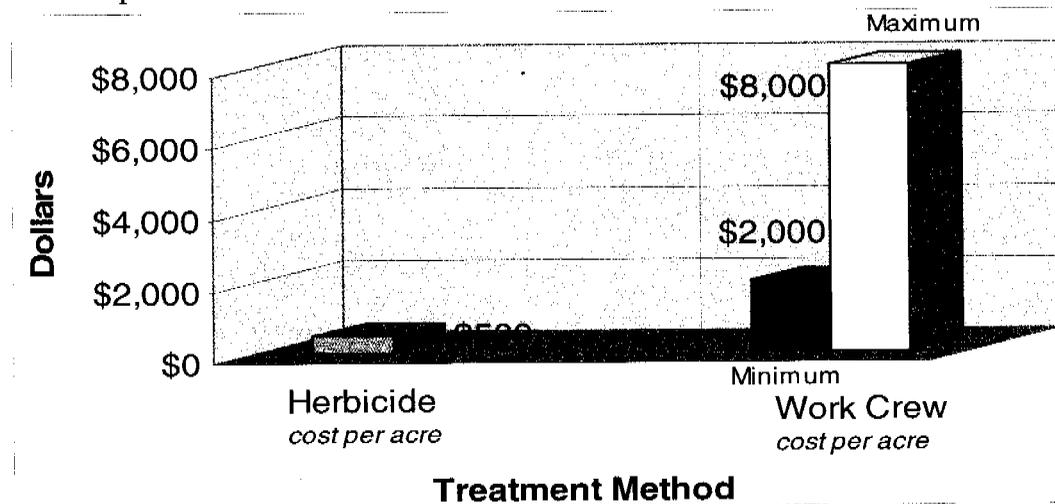
Table 1

Weed Type	Total Acreage	Percentage Of Infested Acreage
Blackberry	13.05	12.3%
Clematis	2.34	2.2%
English Ivy	91.1	85.5%
Total	106.49	

Graph 1 Volunteer Removal Program



Graph 2 Estimated Treatment Cost Comparison per Acre



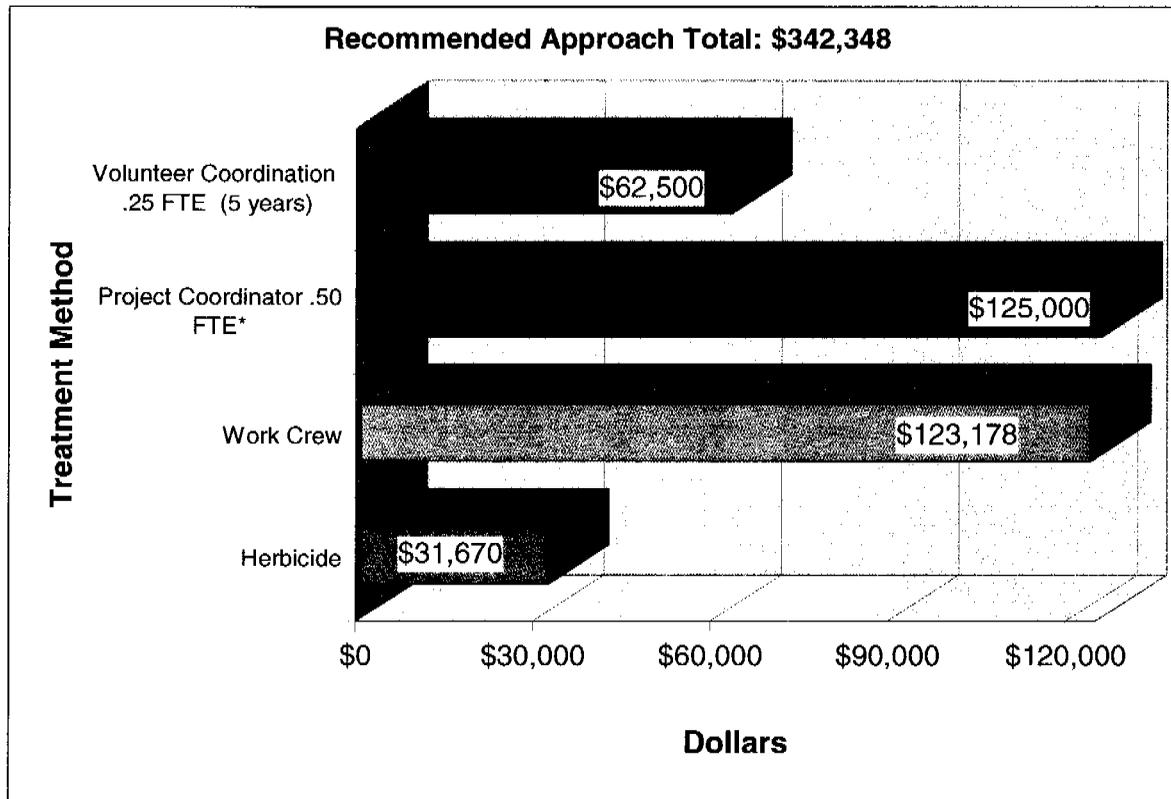
¹ It should also be noted that in producing the number of infested acres the highest diameter of coverage was assumed. This assumes a relatively high level of infestation.

Recommendations

The full report offers three different approaches for treating the invasive plant species in this 160 acre study area. Three Rivers recommended approach (Option B: All Hands on Deck) can be seen in the Graph 3. However, this approach is only a suggestion. We are meeting with all the partners, neighborhood associations and others to garner support for this approach. Currently, few resources exist to implement Option B.

- § TRLC strongly recommends a combination of treatment methods for removing invasive species in the WWC (refer to Graph 3). The methods include some volunteer, some work crew and a predominant use of herbicide.
- § Herbicide is recommended because it radically reduces the cost of invasive plant removal. Trained professionals using an herbicide application can effectively reduce large sections of English ivy at a significantly reduced cost, potentially 10 to 50 times less expensive than manual removal methods (refer to Graph 2).
- § Volunteers are an important part of the program. (See Graph 1) If the ivy stops growing today, it will take 84 years at the current effort to remove all the ivy on the 160 acres. In the long term, volunteers may be most helpful for the follow-up maintenance program, which require spot treatment and replanting efforts. Therefore, it is important to develop a core of volunteers committed to long-term maintenance of this area.
- § This budget is for a one-time removal only. Revegetation and follow-up treatments will need to occur.

Graph 3 Total Estimated Cost by Treatment Method



* A project coordinator is necessary for work crew and herbicide oversight, database management, developing grant funding requests and to ensure long-term project success.

West Willamette Corridor Invasive Species Mapping Report



Three Rivers Land Conservancy
March 30, 2004

Three Rivers Land Conservancy
www.trlc.org 503 699-9825
PO Box 1116
Lake Oswego, OR 97035
Natural Areas Benefit People and the Environment

Non-native invasive plant species threaten the health of our urban forests and greenspaces. If the removal of invasive species on the landscape is not made a priority, these lands will lose their recreational and wildlife habitat value. The threat to our public lands investment is astronomical. The exact cost of inaction is unknown, but repercussions include the cost of cleaning up landslides, road closures, loss of tree canopy and shading for water quality, replanting costs, houses damaged and power outages caused by falling trees, and other water quality issues.

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- Build an effective support and information network.

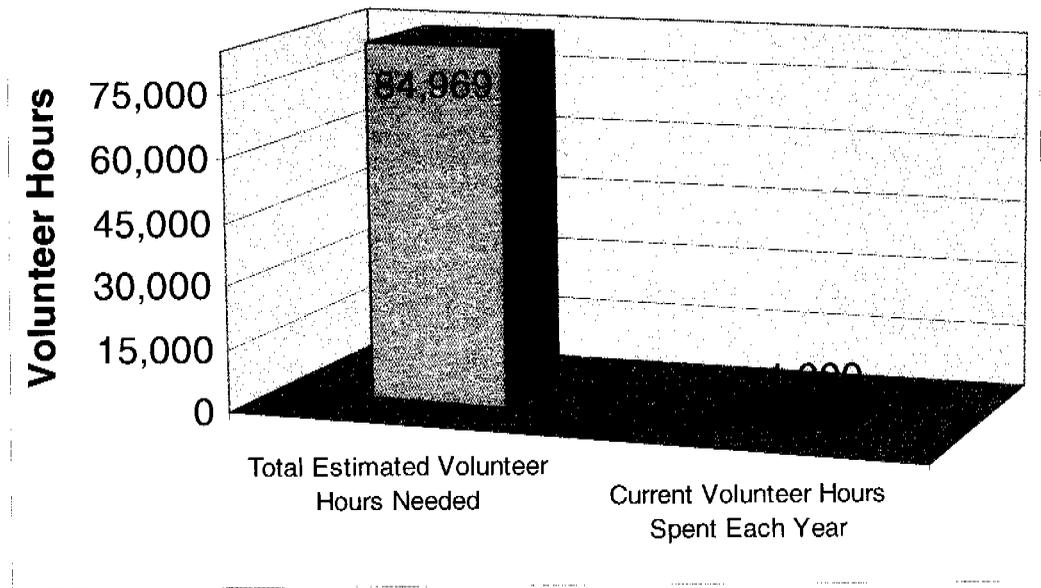
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Table 1

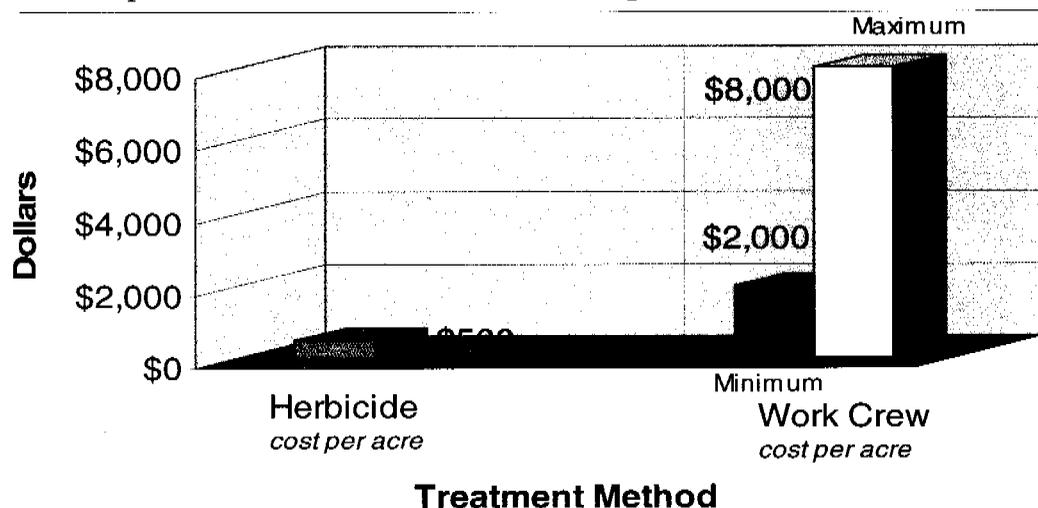
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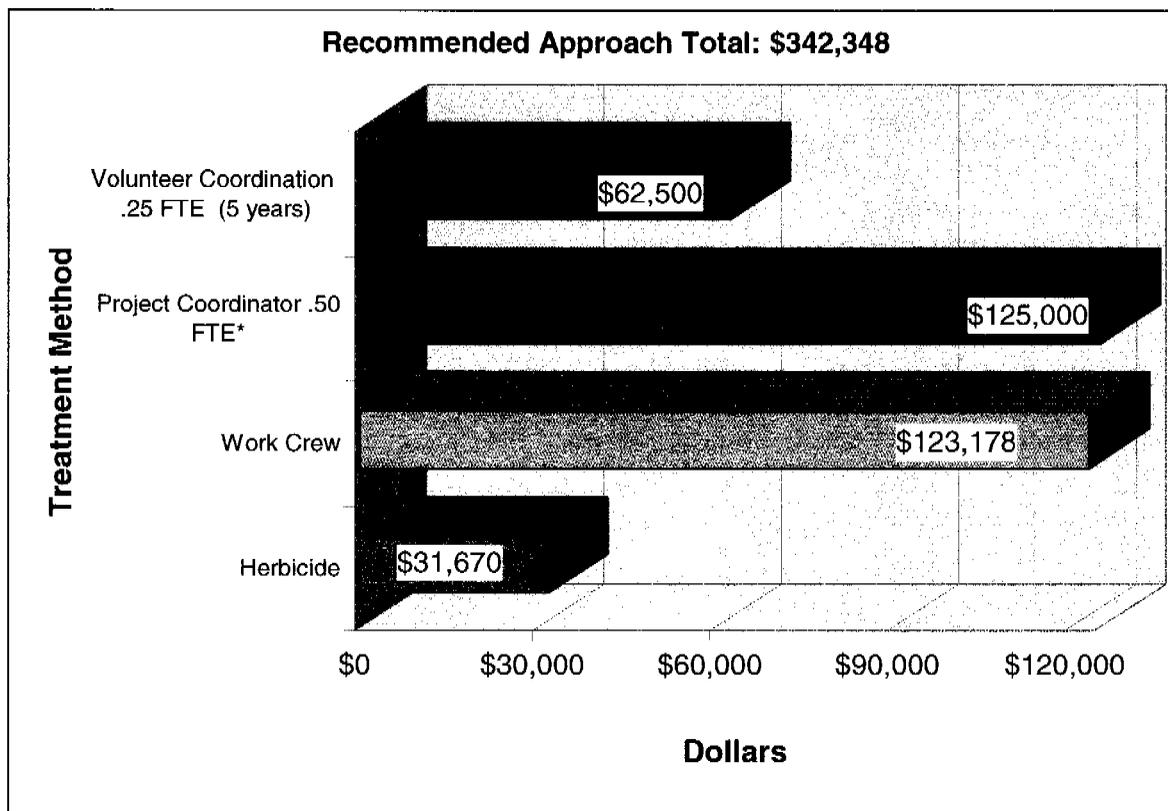


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- A project coordinator is necessary for work crew and herbicide oversight, database management, developing grant funding requests and to ensure long-term project success.

Introduction

Three Rivers Land Conservancy (TRLC) 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 three rivers are the Tualatin, Willamette and Clackamas rivers. Conserving land is a key tool for protecting the water quality, air quality and livability of these three watersheds encompassing the urban and suburban environment. The health and livability of our region is dependent upon preserving open space. With considerable development inside the Urban Growth Boundary, open space and natural areas are at a premium. In order to be strategic and proactive, TRLC developed a Land Conservation Strategies Plan that identified 10 key watersheds in metropolitan Portland that if conserved would provide a healthier, cleaner more livable greater Portland.

Once land is conserved, it must be maintained for long-term health and viability. Good stewardship is a challenge in an urban environment with many human disturbance factors acting upon the land. This report discusses the results of an inventory and management recommendations for one of TRLC's focus areas that it calls the West Willamette Corridor (WWC). The WWC is the forested corridor that extends from Tyron Creek State Park north and connects to Forest Park. The mid section of the WWC contains approximately 700 acres of large forested parcels of land in many ownerships including: Three Rivers Land Conservancy (Keller Woods), City of Portland (Hoyt Arboretum, Washington Park, Marquam Nature Park, George Himes Park, Marshall Park) Riverview Cemetery, Lewis and Clark College, OHSU and Metro Regional Government.

Paralleling downtown Portland and so close to the urban center, this corridor still contains high ecologically valued conifer forests that provide significant benefits in to the City of Portland. When TRLC took ownership of Keller Woods, Three Rivers began to understand the impact of urban development on the forest within the WWC particularly with regard to non-native species of plants overtaking indigenous species. TRLC used The Nature Conservancy's site conservation planning process to develop a natural areas plan. This process found that these forest lands are at risk of ecosystem collapse due to the extensive infestation of non-native invasive species. The primary scourge is known as English ivy (*Hedera helix*). It was listed as a Quarantined Noxious Weed in Oregon in January, 2002. Invasive species are here to stay and they represent one of the most expensive management issues facing land managers today. In the forefront is the issue of prevention, effective control and restoration costs.

Once introduced into a new area, non-native invasive species can spread exponentially, altering their new environment, and converting an area from a variety of species to a simplified, exotic-species dominated coverage of very few species. When these species spread aggressively, they cause environmental and economic harm, as well as diminish habitat values for fish and Wildlife. In response to the growing concern for these urban forests, TRLC saw the need for a strategic, cost-effective, collaborative approach to combating the invasive plant cover. The first step in this approach was to conduct a baseline inventory of the invasive species within the WWC. This report shares the results of the baseline inventory, and is the foundation for developing a coordinated, strategic, long term invasive species eradication plan for this area.

Project Importance

The WWC is a regional natural and recreational resource. Thousands of residents walk, run, bike and hike on the sidewalks along Terwilliger Boulevard that traverses the corridor. Marquam Nature Trail is a haven for walkers and hikers all around the OHSU campus and in the southwest neighborhoods. In addition, as a natural backdrop to downtown Portland, these forests are valued for softening the urban feel of the city. The forests are important habitats and are being used for university studies of wildlife habitat and vegetation. The forested corridor's most important role beyond its aesthetic and scenic value includes preserving air quality and water quality, which translates into preserving the livability and the quality of life Portlanders have grown to revere.

The Project Area

The entire mid section of the WWC contains approximately 700 acres. Due to size and time constraints, Three Rivers had to narrow the scope of its baseline mapping project area. Three Rivers decided on a 160 acre project area including its own Keller Woods (40 acres), 36 acres of natural area owned by OHSU adjacent to Keller Woodlands, Marquam Nature Park (78 acres), and 6.6 acres owned by the City of Portland adjacent to Keller Woods to the south. The mapping project concentrated in this particular stretch of the WWC because of accessibility and continuity among these properties. Also, the area contains a large amount of protected open space. More than half of the area is designated "Conservation" or "Protection" in the City of Portland's environmental zoning ordinance.

The corridor consists of a mix of deciduous and coniferous trees. A recent study conducted by Fiorella Conti from Portland State University lists the plants and wildlife coexisting in the WWC (see references page 16).

Purpose

The purpose of this project was to develop a more collaborative, strategic, and cost-effective approach to eradicating invasive plants than is currently in place for the mid section of the West Willamette Corridor. Currently, there are few invasive species removal events occurring in this area of the west hills. In the 160 acre mapping area, there are three different land owners, the largest being the City of Portland. In 2003, TRLC coordinated a few meetings to discuss the invasive species threat in this area. As a result of these meetings, it was determined that a baseline of the invasive species in the WWC would be necessary to begin work on developing a strategic and collaborative approach to a removal program. The specific goals and objectives are identified below.

Goals and Objectives

Goals:

- Increase capacity and information amongst partners to effectively remove the threat of invasive species to the forest resources in the West Willamette Corridor.
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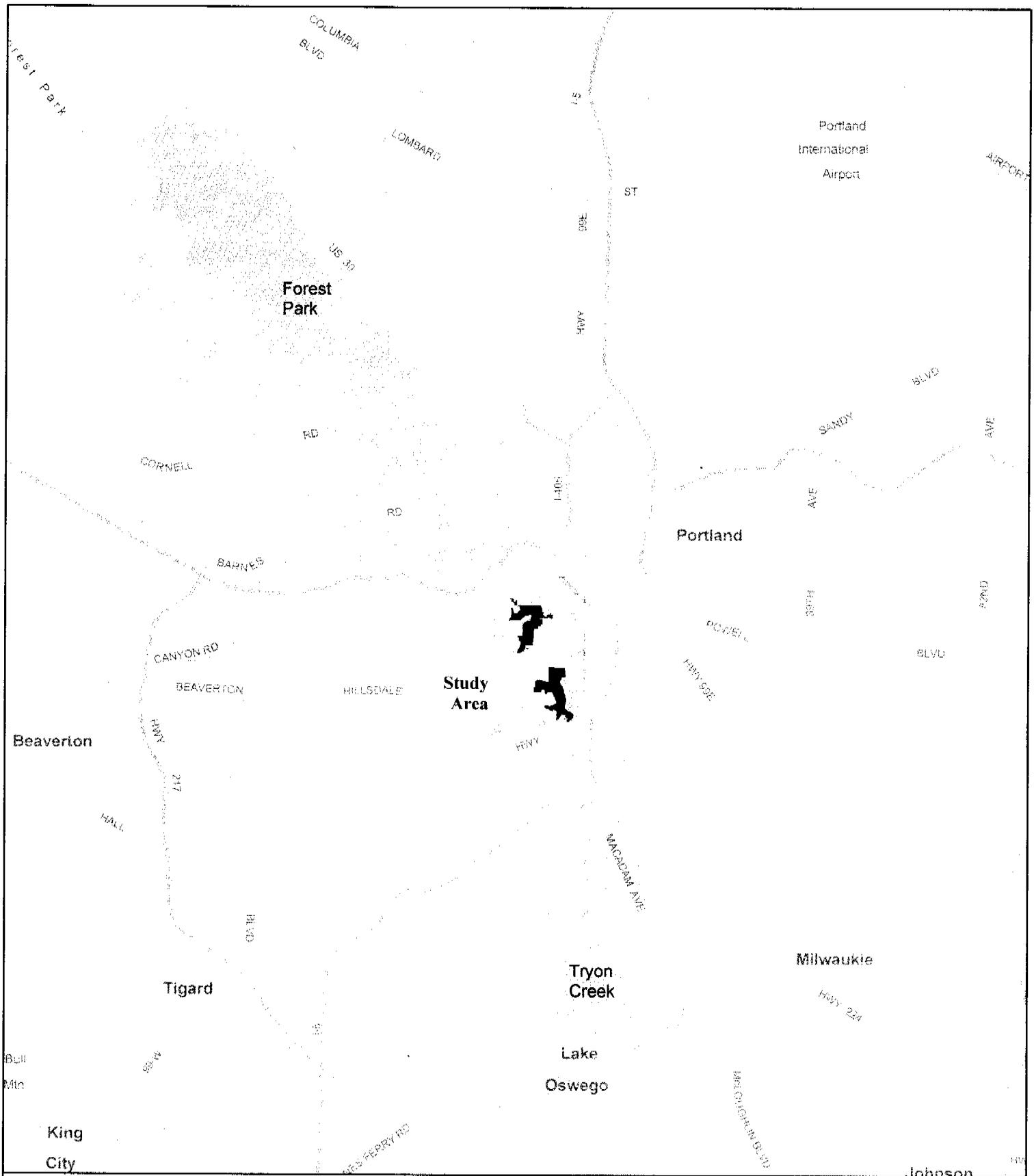
Objectives:

- Collect baseline information on the extent and current infestation levels of invasive plant cover.
- Develop cost estimates based on data for effective, collaborative control of invasive species.
- Use this as model approach to baseline inventory and removal strategies that can be applied throughout metro Portland.
- Develop and distribute informative brochure about English ivy to residents in WWC.

Partners

TRLC worked with the following partners to develop this data and analyze its content:

City of Portland Parks and Recreation Department
Oregon Health Sciences University
Friends of Marquam Nature Park
Friends of Terwilliger
Friends of Tryon Creek State Park
No Ivy League – Friends of Forest Park
The Nature Conservancy



West Willamette Corridor Invasive Species Mapping Report

Three Rivers Land Conservancy

UO InfoGraphics lab, Department of Geography
 Cartography/GIS: Ken Kato, February 2004.
 Source: Base Data - Metro RLIS,
 Study Data - Three Rivers Land Conservancy



-  Study Area
-  Parks and Greenspaces
-  City Limits

The Project – Baseline Inventory

In July, 2003, TRLC completed a baseline inventory of invasive species in 160 acres using a field collection method adopted from The Nature Conservancy. This report summarizes the findings of the baseline inventory and illustrates the occurrences of invasive species on 4 distinct properties within the West Willamette Corridor. The report documents the findings of a 7-month intensive field mapping effort to map, catalog and distinguish each occurrence and type of occurrence of invasive species found on these 4 properties.

The report includes information that was analyzed using data collected in the field. Using three different removal strategies and relating these methods to the size and distribution of each invasive species occurrence, TRLC calculated estimated costs and volunteer hours to achieve eradication. The proposed recommendations used information on removal cost estimates obtained from The Nature Conservancy, as well as volunteer and work crew efforts conducted by TRLC.

General Description of Properties within the Baseline Mapping Area

Keller Woods- owned by Three Rivers Land Conservancy. See Figure # 1. This property is 40 acres and was donated by the Keller Family to The Nature Conservancy in 1983. In 2000, the property was transferred to Three Rivers Land Conservancy to ensure close local stewardship.

Marquam Nature Park- owned by the City of Portland. See Figure # 1. Donations to the City of Portland provided the capital to purchase property piece by piece beginning in the mid to late 1970's. Purchasing continued until the early 1990's. The City of Portland has continued to add a few lots with 26-26 local share beginning in the mid and late 1990's and into 2000's. Total acreage is approximately 78 acres.

OHSU- This is a 36 acre tract of land zoned Open Space. See Figure # 1. This property contains the Marquam Nature Trail which begins on Terwilliger Boulevard. This tract was identified by The Marquam Hill Plan as open space, and is not under consideration for future development.

City of Portland- This is 6.6 acres of vacant open space south of Keller Woods along Terwilliger. See Figure # 1.

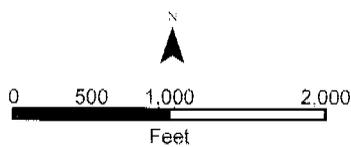
Figure 1: Baseline Mapping Sites



West Willamette Corridor Study
Invasive Species Mapping Report
Three Rivers Land Conservancy

-  Mapping and Inventory Properties
-  Parks and Greenspaces

*UO InfoGraphics lab, Department of Geography
 Cartography/GIS: Ken Kato, February 2004.
 Source: Base Data - Metro RLIS,
 Study Data - Three Rivers Land Conservancy.*



There are two neighborhood associations that fall within the study area. Most of the invasive species mapping occurred in the Homestead Neighborhood, but a small amount of mapping (roughly 10 acres) was in the Hillsdale Neighborhood. Facilities in the area include Oregon Health & Science University (OHSU) and the Veteran's Affairs Medical Center (VAMC).

Terwilliger Parkway is considered to be the premier park in the Homestead Neighborhood and is a significant regional resource. The Terwilliger Parkway Corridor Plan defines the Terwilliger Parkway as "the City of Portland or Parks Bureau-owned property adjacent to and within four hundred (400) feet of Terwilliger Boulevard". The parkway contains over 100 hiking trails and natural areas to picnic and play.

Data Collection Method

TRLC used a data collection method adapted from The Nature Conservancy's Weeds Database. Due to the time constraints, it was important to rapidly assess each weed occurrence, characterize the general condition and prescribe a control method that would be the most appropriate for that site. The Weeds Database was used to store the field data after it was collected in the field by Scott Hoelscher using a hand-held computer with a GPS unit. A protocol for collecting the data was developed as part of this project and can be found in Appendix "1".

TRLC collected the baseline data using a **control method** approach. This means that data was collected with the goal being to:

1. assess the field conditions using the "Treatment Matrix"(see Figure 5a);
2. generate an overall eradication cost estimate based on the associated control method prescribed.

Each occurrence was entered into the database and an estimate of **area** and **density** was recorded. In addition, more detailed information was recorded in the assessment of an occurrence such as whether English ivy was found growing on trees, as well as occurrences of other invasive species including blackberry (*Rubis discolor*), clematis (*Clematis sp.*), holly (*Ilex sp.*) and laurel (*Laurus*). Mapping took approximately 560 hours or 3.5 hours per acre. Like most of the WWC, this area has relatively steep terrain though trails do exist.

The Weeds Database is an adaptive management tool. The mapping technique is intended to be improved over time and/or customized for specific project-based objectives. The information that TRLC collected is designed to be shared and readily available. A site specific map and summary of findings will be available to OHSU and City of Portland, Friends of Terwilliger, Friends of Marquam Nature Park, neighborhood associations and volunteer groups upon request.

Findings

This section takes a closer look at the actual figures that were generated from the mapping of 160 acres. Also, this section provides general numbers about the overall infestation levels, and utilizes the collected field data to estimate removal costs.

Invasive Species Coverage

On the 160 total acres inventoried, English ivy was found on approximately 91 acres.² Recorded were 868 individual occurrences of English ivy. One record (field note) was produced for each occurrence found and contains a latitude and longitude (using a GPS unit) of the occurrence and an assessment of the infestation area and density. These occurrences were indexed into four categories: 19.27 acres of light infestation (otherwise noted with a Cover Class 1), 46.71 acres of medium infestation (otherwise noted with a Cover Class 2), 24.96 acres of heavy infestation (otherwise noted with a Cover Class 3), and a polygon exceeding 100 feet in diameter. See Figures 2 and 3 (numbers of acres are rounded).

Figure 2

Weed Type	Distribution Class (i.e., patch size)	Class Number	Number of Acres
English Ivy	Less Than 25' in diameter	1	4
	Between 25' and 75' in diameter	2	28.6
	Between 75' and 100' in diameter	3	39
	Polygons exceeding 100' in diameter		19.3
TOTAL			90.9

Figure 3

Weed Type	Cover Class (i.e., percent cover)	Number of Acres	Percentage Of Acreage
English ivy	Less Than 25% of ground cover	19.27	21%
	Between 25% and 75% of ground cover	46.71	51%
	Between 75% and 100% of ground cover	24.96	27%
TOTAL		90.9	

Also recorded were 2.3 acres of clematis, and 13 acres of blackberry. See Figure 4. The total number of acres infested with English ivy, blackberry and clematis is approximately 106.5 acres. Also, there are 1,381 occurrences of holly and laurel bushes (not shown in table below). Holly and laurel are not the biggest threat to forest resources and therefore is not the priority species to target for eradication. However, the numbers of occurrences indicate that holly and laurel are a significant problem and a separate plan should be developed to address these species.

² It should be noted that in producing the number of infested acres, the highest diameter of coverage was assumed. Thus, in Distribution Class 1 the amount of infestation assumed per occurrence was a 25 feet diameter. In Distribution Class 2 the amount of infestation assumed per occurrence was 75 feet diameter. In Distribution Class 3, the amount of infestation assumed per occurrence was 100 feet diameter. The highest diameter acreage was taken because ivy is growing all the time. This assumes a relatively high level of infestation.

Figure 4

Weed Type	Total Acreage	Percentage of Acreage
Blackberry	13.05	12.3%
Clematis	2.34	2.2%
English Ivy	91.1	85.5%
Total	106.49	

English Ivy is the prevailing invasive species covering approximately 91 acres and making up 85% percent of the total infested acreage.

Cost Estimates to Remove English Ivy, Blackberry and Clematis

The following analysis produces cost estimates for removing English ivy, clematis and blackberry.³ Holly and laurel were not estimated in the overall total acreage or cost scenarios. However, location and number of occurrences of holly and laurel were recorded.

Utilizing a system whereby a control method is assumed for a particular set of conditions found in the field, TRLC used the patch size (distribution class) and the percentage of cover (cover class) information to assign a *likely removal method*.

Figure 5 is the Treatment Matrix, which illustrates the decision making process that became the basis of the cost analysis.

Figure 5 (a) Treatment Matrix

Distribution Class Size of patch?		Cover Class How much of the patch is dominated by the invasive species?	
1	Patch < 25' diameter	1	Weed < 25% of groundcover
2	Patch between 25' and 75' diameter	2	Weed between 25% and 75% of groundcover
3	Patch between 75' and 100' diameter	3	Weed 75% - 100% of groundcover
4	Polygon greater than 100'		

³ Removal estimates developed for English ivy have been applied to clematis and blackberry due to similarities of removal methods (i.e. hand pulling, removing from trees and possible herbicide application.)

Distribution (Class Number)	Cover Class (Class Number)	Likely Removal Method
1	1	Volunteer
1	2	Volunteer
1	3	Work Crew
2	1	Volunteer
2	2	Work Crew
2	3	Chemical
3	1	Work Crew
3	2	Chemical
3	3	Chemical

Figure 5 (b)

Figure 5(b) represents the likely removal method based on the Class Number. The Class Number is the number assigned to an invasive species occurrence, which represents the area and density of the occurrence. The “Likely Removal Method” is also based on the Class Number designation. This field was added for two primary reasons. 1) TRLC wanted to encapsulate a removal method approach to the baseline monitoring method, and 2) for cost purposes, it provides three treatment methods that can be used to determine the overall removal costs. In determining the Cost Option scenarios below, this original recommendation has been altered from Figure 5(b) to reflect various removal options. Three Rivers encourages discussion on these Option Scenarios.

Control Methods

Paid Work Crews

Paid work crews can be an important method for effectively removing invasive plant cover. Americorps work crews have been used in the past and can leverage federal dollars. The future of the Americorps program is currently undecided at this time. Other types of work crews could include a work force hired through a contractor, and work crews available through the work release program at the state correctional institutions.

Chemical

Chemical control options are effective, and can be 10-50 times less expensive than manual removal efforts. Substantial revegetation may be required in the areas where herbicide application is used adding to the cost of using chemical as a treatment method. Preserving existing native vegetation should be a priority. In addition, large amounts of chemical application may not be palatable to residents of the area.

Volunteer Effort

Volunteers can be an extremely important tool in invasive removal efforts (see discussion on Tryon Creek State Park). However, an all volunteer approach is currently underway and at this rate it will take more than 84 years to clear English ivy in this 160 acres (to say nothing of the rest of the 700 acres in the mid WWC). When using volunteers it should be noted that it is necessary to provide supervision (paid or not paid).

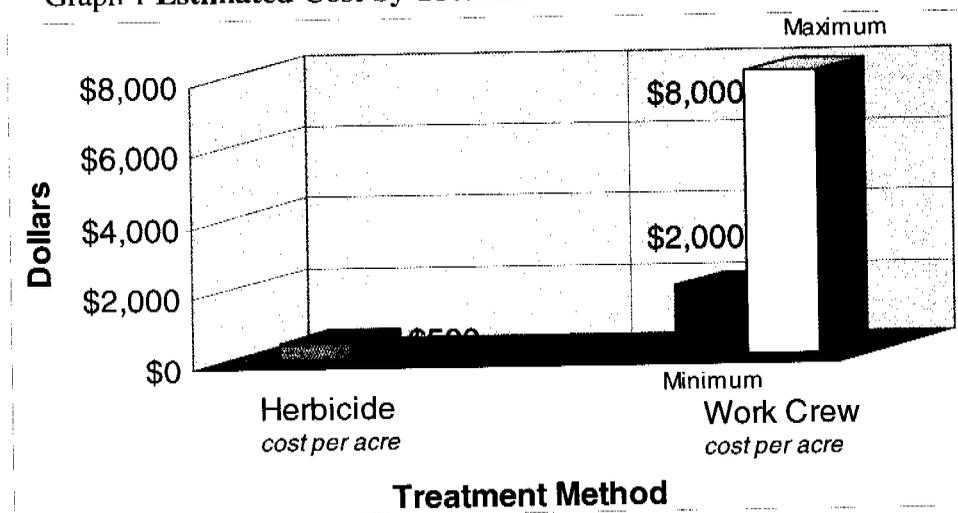
The information in this report as to location and size of infestation will allow groups to strategically allocate areas for volunteer projects. TRLC suggests that volunteers concentrate on trees infested with English ivy, as well as, areas of light infestation that are easy to find and access.

Assumptions about Removal Costs

The numbers used by TRLC for estimating the removal costs of English ivy (see Graph 1).

- Chemical application average cost \$500 per acre
- Volunteer hours average 800 hours per acre (Averaging TNC #'s 300- 1300 hours per acre)⁴
- Work crew average costs \$4,000 - \$6,000 per acre (Averaging TNC #'s \$2000- 8000 dollars per acre)⁵

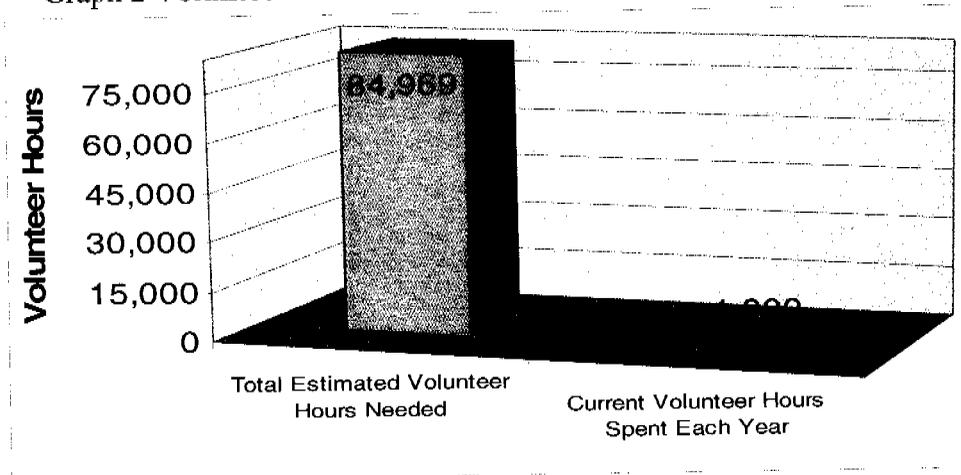
Graph 1 Estimated Cost by Treatment Method



Option A: Volunteer Only

In order to develop cost estimates, Three Rivers took Figure 5(b)'s suggested removal methods and applied removal costs in more likely scenarios of effort. The following chart represents an all volunteer effort to remove English ivy, blackberry and clematis.

Graph 2 Volunteer Hours as a Control Method



⁴ Friends of Tryon Creek State Park had very similar results for volunteer labor estimates.

⁵ A mid-level cost range was assumed. \$4,000 was assumed for Cover Class 1. \$5,000 was assumed for Cover Class 2 and \$6,000 was assumed for Cover Class 3.

Option A Discussion

It is estimated that it would take 84,969 volunteer hours to remove English ivy, blackberry and clematis in 106 acres. In other words, it would take 2,124 days with 10 volunteers working 4 hours each day.

Option A Budget

Volunteer Coordinator funded at \$50,000 a year and organizing one volunteer work crew (10 people, 4 hours a piece) every other day for 10 years. This would total 7,120 volunteer hours per year (less than the 8,496 volunteer hours needed).

Yearly Budget

Volunteer Coordinator	\$40,000
Overhead	\$10,000
<u>TOTAL</u>	<u>\$50,000</u>
Total 10 year estimated cost	\$500,000

Currently, just 1000 volunteer hours are spent each year removing English ivy in this area.⁶ The proposed amount of volunteer hours represents almost a seven-fold increase over the current activities. While it is difficult to project how many volunteers could be recruited for the project area, a paid volunteer coordinator working full-time will recruit a great deal more volunteer hours to this effort. A review of Friends of Tryon Creek State Park's program makes this proposal seem possible.⁷

Option A may be the least costly, but also the least effective, and as such, has its drawbacks. First, it will take twice as long to complete, and the English ivy will be growing the entire time, therefore the spread of invasive species should also be a major consideration. Even if fully accomplished, it will still not even pull all the English ivy once, unless the volunteer coordinator can attain incredible results beyond those anticipated. This is not TRLC's preferred approach.

⁶ Current volunteer invasive species removal activities in the 160 acre mapping project area:

Friends of Terwilliger- an average of 320 volunteer hours per year.

Friends of Marquam Nature Park - estimated 400 hours per year

Three Rivers Land Conservancy- an average of 240 volunteer hours per year

OHSU- estimated at 40 hours per year

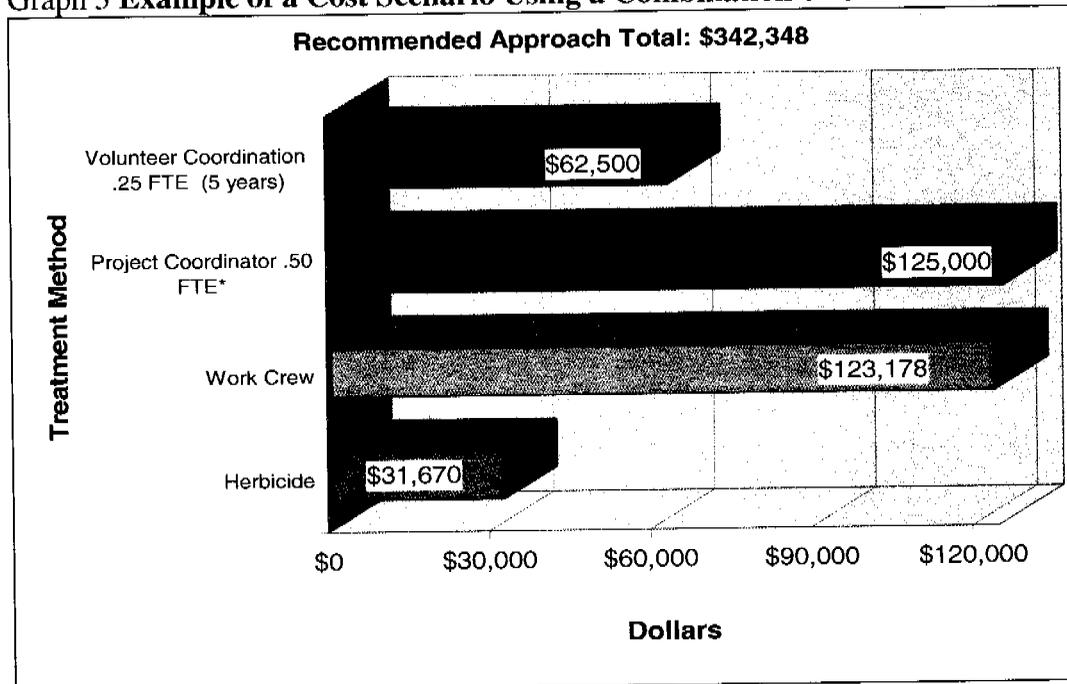
TOTAL Current Volunteer Hours Per Year: 1000

⁷ Friends of Tryon Creek State Park is an excellent example of an effective volunteer program. This program generates 12,000 volunteer hours per year. In 8 years, 150 acres are "under control". There is still another 500 acres to control in Tryon Creek State Park. A variety of circumstances have led to Tryon Creek's ability to recruit such a large volunteer base: 1) two extraordinarily dedicated ivy stewards investing 1,000 hours per year to removing ivy and coordinating the program; 2) a nature center that serves as a base for volunteers; 3) an ongoing educational program; 4) 600 contiguous acres.

Option B All Hands on Deck

The following proposes a combination of volunteer crews, paid work crews, and chemical treatment. This method presents the preferred approach of Three Rivers Land Conservancy.

Graph 3 Example of a Cost Scenario Using a Combination of Control Methods



Cost by Treatment Type (Option B)

*Not enough data exists on the costs of volunteer coordination. However, this chart assumes .25 FTE will be spent on volunteer coordination with a goal to coordinate 13,000 volunteer hours in 5 years. Graph #3 does not reflect the .50 FTE that will be needed to coordinate the work crews, database management, develop and submit grant requests, and continue the ivy eradication program in the West Willamette Corridor.

Option B Discussion

This option breaks the efforts into volunteer, paid work crew and herbicide. The majority of the removal effort will fall on herbicide applications with a little less than 60% of the removal efforts relying on herbicide. Recommended techniques for herbicide use are expected from The Nature Conservancy within a few months of the publication of this report.

If we designate the volunteers to concentrate their efforts on small patches with relatively low percentage of the cover class, the estimated number volunteer hours are more reasonable than Option A. It would still take 13,215 hours to remove all the English ivy, blackberry and clematis in 16.5 acres. In other words, it would take 330 days with 10 volunteers working 4 hour days.

This scenario would require 26.37 acres with paid work crews at a cost of \$123,178 and 63.37 acres of chemical application at a cost of \$31,670. All of this assumes a one-time removal of English Ivy, blackberry and clematis.

Total Estimated Cost for Option B

Project Coordinator (5 years .75 FTE \$37,500 per year)	\$187,500
Work Crews	\$123,178
Herbicide	\$ 31,670
TOTAL	\$342,348

The mapping data's distribution and cover class information allows us to strategically allocate areas for volunteer projects, paid work crew and herbicide projects.

For Option B to work, volunteer hours would need to reach 2,643 hours per year for the five year plan. In all scenarios, a project coordinator salary is required. In this scenario, an estimated 1/3 of the .75 FTE time will be dedicated to volunteer recruitment. The other .50 FTE will be spent: leading work crews, writing grants, maintaining the database, monitoring native regeneration after herbicide treatment, planning similar efforts in the remaining 700 acres.

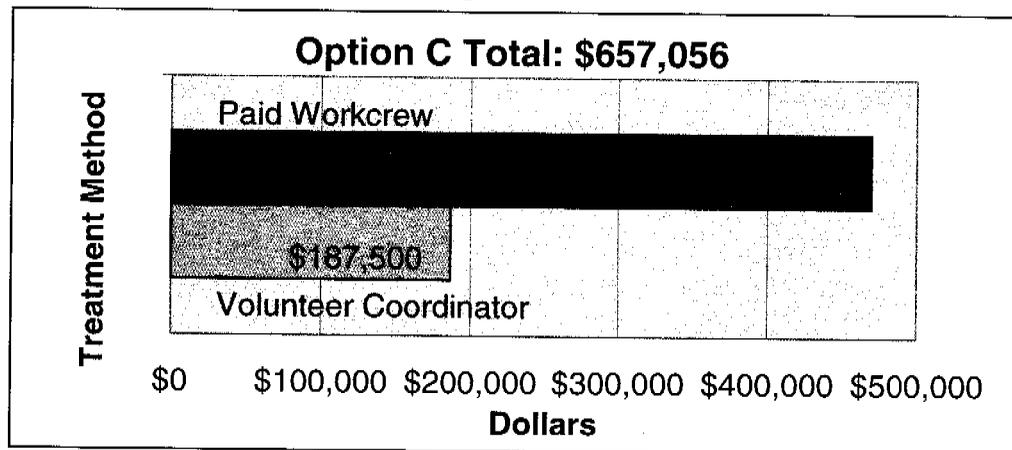
The work crew column illustrates the cost when a work crew is paid. While the labor of a volunteer work crew is free, Three Rivers estimates that a volunteer coordinator will cost an estimated \$3,787 per acre assuming .25 FTE will be spent for 5 years. Some effort spent on volunteer coordinating is important for a long-term maintenance strategy. These volunteers will be able to do follow-up spot removal work in the treated areas.

The distribution and cover class information allows us to strategically allocate areas for volunteer projects, paid work crew and herbicide projects.

Option C No Herbicide

Option C looks at a combination of volunteer crews, and paid work crews with no herbicide treatment.

Graph 4 Cost Estimates Using No Herbicide



Option C Discussion

Using this matrix, in which volunteers concentrate their efforts on small patches, it would take 13,215 volunteer hours to remove all the English ivy, blackberry and clematis in 16.5 acres. In other words, it would take 330 days with 10 volunteers working 4 hour days.

Option C would leave 89.7 acres that would require paid work crews in those areas where volunteers would not likely to be the most effective. It would cost \$469,556 dollars to pay a work crew to do a one-time removal of English Ivy, blackberry and clematis in this area.

Although TRLC does not encourage chemical application, significant reduction in the overall costs can occur by using this control method where appropriate. For example, Option B proposes to use a chemical control on 29.66 acres, whereas Option C does not include a chemical application component. A potential difference of as much as \$164,812 illustrates that chemical control should be considered as an option to reduce costs.

<u>Total Estimated Cost for Option C</u>	
Project Coordinator (5 years .75 FTE \$37,500 per year)	\$187,500
Work Crews	\$469,556
TOTAL	\$657,056

Three Rivers Land Conservancy's Recommendations

The options presented in this report are for discussion purposes. The actual control method will vary depending on the coordination effort and ability to secure funding. This report is intended to be used for future discussion of the appropriate actions needed to preserve the natural area in the WWC.

Three Rivers Preferred Approach: All Hands on Deck Option B

TRLC is recommending Option B as the best approach for eradicating invasive plants. This approach combines the variety of tools available and begins to build a volunteer program. As noted below, this volunteer program will be vital for a long-term maintenance effort once initial eradication work is complete. Work crews and some use of herbicide will yield a much faster and efficient approach though it will require a more significant outlay at first.

Project Coordinator

A project coordinator for this area would be an excellent first step even if funds for work crews could not be secured. This position could coordinate volunteers, lead work crews, manage the database, and educate the landowners in the area about invasive plants.

Other Cost Considerations

Revegetation

It is clear that in all options some manual revegetation will need to occur. However, it is difficult to determine how much revegetation will be necessary. It is important to note that these costs have not been included in the project removal costs estimates provided in this report. According to a price list developed by the Watershed Revegetation Program at the Bureau of Environmental Services, (Appendix 2) revegetation costs can be as much as \$13,600 per acre.

Follow-up Maintenance

It is important to note that all the cost estimates represent a one-time removal event. English ivy, blackberry and clematis will require follow-up removal efforts to achieve total eradication. The proposed time period for removal efforts is 5 -10 years. Once initial work is complete, the area will need an ongoing maintenance strategy to adequately address the invasive species control. It is expected that this will be much reduced. An effective volunteer team may be able to adequately monitor and maintain a site after the infestation has been effectively reduced.

Additional Cost Considerations

Cost of Inaction

Three Rivers recommends more work documenting the cost of inaction. Such things as the cost of landslides, road closures, possible loss of life and resulting lawsuits, replacing the tree canopy and shading, replanting costs, houses damaged and power outages could all result from falling trees brought down by invasive plant cover.

By some estimates, we have another 15- 20 years before the WWC sees a serious loss of canopy cover.

Forest Destruction

At the current pace of invasive species removal, forest health is likely to decline to a level in which the entire forest ecosystem of this area will lose its highest and best function. These functions include providing forest resources for wildlife habitat, air quality and scenic and recreational value. TRLC does not currently have an estimate as to when total forest collapse will occur in this system under current conditions and allocation of resources. This document only provides the baseline. Another study in 10 years compared to this one will reveal the pace of destruction. At the current rate using volunteers, it would take more than 84 years to pull all the English ivy, once, in the 160 acre study area.

Next Steps

The WWC has many different players. Partnerships will be key to securing funding to successfully combat the invasive plant threat. Three Rivers recommends biannual meetings with all the partners from Tryon Creek to Forest Park to coordinate funding requests and removal strategies. June and December are proposed months for these meetings.

TRLC will hold a brainstorming meeting with key partners and interested parties on January 16, 2004 to discuss how to move this proposal forward.

Acknowledgements

Three Rivers Land Conservancy would like to thank the following people for their contribution to this report:

Project Staff

Jim Closson
Jayne Cronlund
Scott Hoelscher

Project Development, Review, Editing

Jennifer Thompson	Jonathan Soll
Mart Hughes	Sandra Diedrich
Stephanie Wagner	Phillip Way
Phil Hamelton	Sandy Wright
Pam Hayden	

Technical and Analytical Support

Barry Lavine
Steve Buttrick
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Jeff Lucas

Maps

Ken Kato, University of Oregon InfoGraphics lab, Department of Geography

The cover photo was taken by Jim Closson from Jay Minor's airplane.

This report was printed in Portland by Rhino Digital Printing on 100% post consumer waste paper.

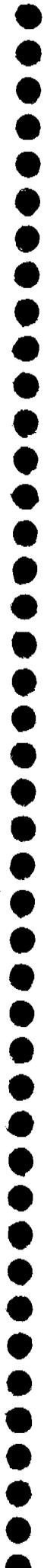
Sources of information used for this report

Westside Willamette Wildlife Corridor Resource Assessment; Maria Fiorella Conti

Watershed Revegetation Program/ 2004 Revegetation Standard Price List; Bureau of Environmental Services

The Nature Conservancy Invasive Weeds Database

Terwilliger Parkway Corridor Plan, 1983; City of Portland Bureau of Planning



GPS Palm Pilot Protocol & Explanation

Background

The decision to invest staff resources to map invasive species gained considerable support from several meetings coordinated by Three Rivers in the summer and fall of 2002. Our partners indicated an interest and support for an inventory technique that could effectively generate baseline information about the location and infestation type and levels of invasive species within the WWWC. As a result of these meetings while also considering the time and resource intensiveness of mapping invasive species, it was important to Three Rivers Land Conservancy to develop and use a rapid assessment approach for collecting invasive species baseline information.

At the time Three Rivers decided to move ahead with its mapping project, The Nature Conservancy (TNC) was refining a system in which they had recently adopted and modified. TNC was making progress in utilizing a palm pilot with a GPS attachment that could be synchronized with a corresponding Microsoft Access database called Invasive Weeds Database. Three Rivers expressed interest in learning the method and asked for assistance. TNC staff provided the preliminary technical training in exchange for testing the method and providing feedback for making improvements or modifications to the Invasive Weeds Database. Three Rivers data collection method was ultimately adopted from a method developed by Joy Trimble, an Americorps participant in 2001-2002.

Three Rivers Land Conservancy is undergoing an effort to map invasive plant species within conservation target areas in the Portland metro area. Currently, a method involving the use of a palm pilot, GPS companion, and the WEEDS 1.5 database adopted by the Nature Conservancy of Oregon is a primary focus. The following is a step-by-step explanation of how to record data for the method.

- I. Prior to field work, several details should be addressed:
 - Acquisition of detailed property maps
 - Notification of property neighbors (if applicable)
 - Supplies
 - * palm pilot, Visor, Magellan GPS Companion, weather guard, pen/pencil, notebook, maps, measuring rope, rain gear, AAA batteries

- II. Methods for palm pilot/GPS companion - Through the use of maps containing grids and/or contour lines, properties will be covered in a sequence. Determine a starting point that allows you to cover the area in rows consisting of 100' x 100' portions. Utilization of a rope is helpful in maintaining consistency. This method is most useful when you are working in areas with very unclear boundaries, few patches of thick shrubs, and few natural or man-made features for reference (pathways, streams, rocks, fences, etc.). When working in areas that have some or all of these features, they can be utilized instead of the 'gridwork' method described. Features can create an imaginary portion within which you can work until it is entirely mapped. After substantial field time, you will become more comfortable with visually estimating distances and patch sizes. Within each portion, identify weed occurrences. You are now ready to record each occurrence. Make sure GPS Companion is inserted into the back of the palm pilot before proceeding.

- A. From main menu:
 1. 'SmartList'
 2. 'tinyOccurs'
 3. Add Record
 4. Determine Weed
 - a. For the purposes of our weed control goals, there are presently 5 species of focus: English ivy (*Hedera helix*), Himalayan blackberry (*Rubus discolor*), Clematis (*Clematis* sp.), Holly (*Ilex* sp.), and Laurel (*Laurus*). All weeds are listed by Latin botanical names. If they are not in alphabetical order, tap the 'AZ-ZA' icon at the bottom center of the screen.
 - b. Tap dumbbell icon next to 'Weed'. Scroll down to chosen weed and tap.
 5. Determine Primary Area
 - a. Tap dumbbell icon. Choose correct name of property/area.
 6. Determine Location
 - a. Tap dashes next to 'Location'
 - b. Tap 'abc' icon on bottom of gray panel. This creates a typewriter icon that allows you to type a word(s) that further identify the area of your occurrence (e.g., SW corner, North quadrant, etc.). Hit OK when finished.
- B. Main Home icon
 1. 'GPS Comp' icon
 2. Wait for a '2D' or '3D' acquisition. A '3D' acquisition will result in a more accurate reading, but is frequently unavailable.
 3. Main Home icon
- C. 'SmartList' icon
 1. 'get GPS data' - wait for lat/lon reading
 2. 'Links'
 3. 'Add/View Assessments'
 4. New page icon (bottom of screen)
 5. 'Record Lat/Lon'
 - a. The Weeds program requires you to record your location a second time, creating a link between your first reading and the assessment of a specific weed occurrence.
 - b. 'Type' - Hit 'Point'. (If you happen to be in an occurrence that is extremely large, you may want to record it as a polygon. Before doing so, make sure the occurrence's percent cover is uniform throughout. Hit 'Polygon'.)
 - c. 'get A' - This will create another reading. (If doing a polygon, you will need to walk around the perimeter of the patch and collect a sequence of Lat/Lon readings. At the second point you collect a reading, hit 'get B', at the third, hit 'get C', etc., until you arrive back at the location where you took your 'get A' reading. Take a reading. You have now completed a polygon.)
 - d. Hit OK. Screen shows the date and map type you just created.
 - e. Hit back arrow (top left corner).
- D. You are now back in tinyAssess mode and ready to characterize the occurrence.
 1. 'Stat'
 - a. If you are recording the occurrence of a weed that is a single plant, there is no need to characterize it. If it is a patch, then it must be

characterized. If a patch, tap 'LongT'.

b. Choose description of infestation of patch

*Mature (ground) means plant is vegetative and confined to ground

*Mature (tree or shrub) means plant is vegetative and extending from ground into canopy

c. Record 'Dist'

*1 means patch is \leq to 25' diameter

*2 means patch is \geq 25' & $<$ 75' diameter

*3 means patch is \geq or $>$ 75' diameter

Note: If patch extends beyond the 100'x100' portion you are in, you will record a new occurrence when you arrive in the adjoining portion. This applies only if you are adhering to a gridwork method described above. If you are assessing a polygon, choose a '3' to describe the patch size.

2. 'Cover'

a. After tapping 'Cover', hit 'Class'. This will create a list of the estimated percent of the ground (and/or canopy) that the weed covers. Use one of the bottom three classifications (weed ...) to assess the coverage.

b. 'OK'. Screen shows assessment date for record you just created.

c. Hit back arrow

E. Your final detail to record is a treatment recommendation for the occurrence.

1. Hit 'Treatment'.

a. Tap new page icon.

b. Hit 'Type'

2. You can now select a treatment method. This is very subjective, but there are several criteria to keep in mind:

a. All occurrences of Holly and Laurel require chemical treatment.

b. A chemical treatment of Blackberry, Clematis, and Ivy is recommended when the occurrence has a 'Cover' assessment of 3 and is accessible for a professional carrying an applicator pack. However, occurrences such as these near water sources should be reserved for manual removal.

c. A manual removal of the weeds mentioned in E2b is dependent on accessibility. Areas within 150' of an access point and with a 'Cover' assessment of 1 or 2 are best reserved for volunteer groups. Areas at a greater distance from access points, on difficult terrain, and with 'Cover' assessments of 2 or 3 are best reserved for paid work crews.

d. Hit 'OK'. Screen will show date and treatment recommendation for the record you just created.

3. You have now completed an occurrence, assessment, and treatment for one weed. Alterations or additions to these can be made by accessing them from the home icon under 'SmartList'.

a. Hit back arrow

b. Hit home icon to return to main menu of 'SmartList'. You are ready to create a new weed occurrence.

III. Miscellaneous

A. Within most screens in the 'SmartList' program, there are comment options. Feel

free to utilize these if there are additional data items you deem necessary to record.

B. Any item can be deleted. For example, if you are in tinyAssess and realize you have created a duplicate assessment, hit the garbage can icon. Tap the item you wish to be deleted, hit the 'Done' icon, then hit delete. Your record is now removed.

Appendix 2

Watershed Revegetation Program/ 2004 Revegetation Standard Price List

Phase	Item	Mo-Yr	FY	Units/Acre	TotalCost/ Acre	Acres Treated	Project Cost
Site Preparation	Cut Site Prep	May-03	FY 03	1	\$947.21	1	\$947.00
Site Preparation	Seed	May-03	FY 03	28	\$1,512.83	1	\$1,513.00
Site Preparation	Spray Site Prep. Hand	Jun-03	FY 03	1	\$359.84	1	\$360.00
Site Preparation	Spray Site Prep. Hand	Jun-03	FY 03	1	\$359.84	1	\$360.00
Planting	Native Plants	Feb-04	FY 04	1640	\$1,386.98	1	\$1,387.00
Planting	Bare root Installations	Feb-04	FY 04	1640	\$815.55	1	\$816.00
Planting	Live Stakes	Feb-04	FY 04	400	\$193.31	1	\$193.00
Planting	Pole Cutting Installations	Feb-04	FY 04	400	\$124.33	1	\$124.00
Planting	Mycorrhizal dip	Feb-04	FY 04	1640	\$99.07	1	\$99.00
Planting	Bamboo Stakes Large	Feb-04	FY 04	1640	\$277.40	1	\$277.00
Planting	Bamboo Stakes Small	Feb-04	FY 04	840	\$81.19	1	\$81.00
Planting	Tubes	Feb-04	FY 04	840	\$570.36	1	\$570.00
Planting	Tube Installation	Feb-04	FY 04	840	\$584.81	1	\$585.00
Planting	Mulch	Mar-04	FY 04	0.5	\$89.10	1	\$89.00
Planting	Mulch Application	Mar-04	FY 04	1640	\$406.47	1	\$406.00
Establish 1	Cutting Maintenance	May-04	FY 04	1	\$705.57	1	\$706.00
Establish 1	Spray maintenance Spot	Jun-04	FY 04	1	\$410.59	1	\$411.00
Establish 1	Spray Maintenance Spot	Sep-04	FY 05	1	\$410.59	1	\$411.00
Establish 1	Watering	Aug-04	FY 05	500	\$289.96	1	\$290.00
Establish 2	Cut Maintenance	May-05	FY 05	1	\$726.74	1	\$727.00
Establish 2	Spray Maintenance Spot	Jun-05	FY 05	1	\$422.90	1	\$423.00
Maintenance 1	Cut Maintenance	May-06	FY 06	1	\$784.54	1	\$749.00
Maintenance 1	Spray maintenance Spot	Jun-06	FY 06	1	\$435.59	1	\$436.00

Maintenance 2	Cut Maintenance	Jun-07	FY 07	1	\$771.19	1	\$771.00
Interplanting	Native Plants	Feb-06	FY 06	250	\$224.31	1	\$224.00
Interplanting	Bare root Installations	Feb-06	FY 06	250	\$131.89	1	\$132.00
Interplanting	Tubes	Feb-06	FY 06	125	\$92.32	1	\$92.00
Interplanting	Tube Installation	Feb-06	FY 06	125	\$89.72	1	\$90.00
Interplanting	Mulch	May-06	FY 06	0.149	\$28.13	1	\$28.00
Interplanting	Mulch Application	May-06	FY 06	1	\$262.94	1	\$263.00
					\$13,595.27		\$13,560.00