

KIWANIS RAVINE

SPU Aquatic Habitat Grant Phase II Monitoring & Maintenance Report - Year 3



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Prepared for Heron Habitat Helpers

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Project Background & Goals

In September of 2007 EarthCorps began a fourth year of intensive restoration in the Kiwanis Ravine. This project, made possible through an Aquatic Habitat Grant from Seattle Public Utilities, builds on several years of collaborative restoration work between EarthCorps (EC) and Heron Habitat Helpers (HHH). In 2007, two new sites were restored, one in the west fork of the ravine and another in the east fork, for a combined total of 27,800 square feet of restored area. Work at the selected locations included: invasive plant removal, steep slope stabilization using bioengineering techniques, habitat enhancement surrounding Wolfe Creek including wetland and upland areas, and replanting with appropriate native plants. The initial restoration work was completed in January 2008, and is described in detail in the SPU Aquatic Habitat Grant 2007 Restoration Report – Year 1, dated February 2008.

EarthCorps is contracted by HHH to provide follow-up maintenance and monitoring through 2010. This report details the results of the second round of monitoring conducted in September 2009, describes the maintenance performed in the fall of 2009, and includes recommendations for continuing monitoring and maintenance in 2010.

The restoration goals of this project included the enhancement of forested buffer and associated wetlands surrounding Wolfe Creek to (1) remove aggressive invasive plant species, (2) increase native plant diversity and thus (3) increase stabilization of ravine slopes. This enhancement will aid in improving habitat that has been impacted by urban development and storm water drainage and run-off.

Monitoring Methods

Four monitoring transects (two in each fork of the ravine) were set up during baseline monitoring, conducted on September 10, 2007, prior to the initial restoration. Each transect is fifty feet in length and oriented perpendicular to the stream. Approximate transect locations are described in the Year 1 final report. At each transect the following methods were used to collect data that is consistent and comparable with the previous year's. The same methods will be used to conduct monitoring prior to maintenance work in late summer or early fall of 2010.

- Point Intercept: At ten foot intervals along each transect, the invasive species cover percentage was estimated within a three foot (1 meter) radius.
- Belt Transect: Installed trees and shrubs within three feet of either side of transect were recorded as healthy, stressed or dead.

In addition to these methods, photopoints were established in each fork of the ravine. Photographs documenting the restoration project's progress over the past two years appear on pages 4-5 of this report.

Cover image: East fork site, Kiwanis Ravine AHG Phase II. Looking downhill from the top of the slope.

Monitoring Results

Monitoring was conducted on August 25, 2009. The data on invasive coverage, acquired by the point intercept method, is outlined in Appendix A. On average, invasive species cover was slightly lower this year than in September 2008, the first year after initial invasive removal. The average invasive cover in the east fork site was down to 5.8%, compared to 11.7% in 2008 and 54% in 2007. The average invasive cover in the west fork site was 16.3%, compared to 17.9% in 2008 and 67% in 2007.

Most of the species of invasives present were similar to those found in 2008, including bindweed (*Calystegia sepium*), buttercup (*Ranunculus sp.*) and nightshade (*Solanum dulcamara*) as well as some small regrowth of English ivy (*Hedera helix*) and Himalayan blackberry (*Rubus armeniacus*). On the whole, the original removal of invasives completed in 2007 (mainly English ivy removed) has been tremendously successful, with regrowth limited to a few small strands each year. The major invasive threat at this point is the bindweed (particularly in the east fork), which grows up the native plant stems that have been installed and threatens to choke them out. Bindweed regrowth in 2009 was similar to that of 2008, suggesting that the invasive regrowth has stabilized at a controllable level as long as regular maintenance is performed each year.

It should be noted that the averages on the west fork site are somewhat inflated due to intercept points that are located at the very edge of the restoration site, so that the three-foot radius may encompass some area that has not been cleared or maintained as part of this project. For example, the 50-foot point in transect WF-1 (marked with an asterisk in Appendix A) shows inconsistent data over the three year period. This is most likely due to an inconsistent measurement of the location of this point relative to the edge of the restored area. Excluding this point may yield a more accurate depiction of the invasive coverage throughout the main area of the site. However, this point also illustrates the threat posed by invasive creep from adjacent areas. The west fork site in particular is a patchwork of restored areas surrounded by private properties that have not been restored. Most of these properties are densely covered with ivy, cherry laurel and other invasive species. The long-term success of this site will be dependent on continued maintenance of these borders, and hopefully, on bringing more of these properties into restoration.

Japanese or Bohemian knotweed (*Polygonum cuspidatum*, *P. bohemicum*), which was injected with glyphosate herbicide in 2008, was still present in both sites, but with much lower density and smaller canes. The west fork site, in particular, included a large patch of knotweed on the slope to the west side of the bowl immediately north of West Government Way. This patch was greatly reduced by the treatment and showed only small, sparse regrowth. Nonetheless this species should be considered among the highest priorities for continuing maintenance, as it will continue to regrow and will likely require retreatment in coming years.

Data on installed plant survivorship, collected by the belt transect method, is outlined in Appendix B. Since replanting took place in late 2008, between the two monitoring phases, it is possible that the total number of plants in each transect may actually have increased (as in transect EF2). Due to this factor, combined with the low total number of plants in each transect, this data does not provide an accurate measurement of overall plant survivorship on the site. However, both these quantitative data and qualitative observations show that the density of native plants is still somewhat lower than desired. The monitoring

data also provides some insight into success by species. For example, the low survival rate of salmonberry (5 plants in 2009, versus 9 in 2008) suggests that the plant stock type was not ideal. The initial salmonberry planting in 2007 was done with 10" plugs due to a mistake by the nursery delivering plants. The plant list for replanting in fall 2009 (discussed below) took into account these monitoring results to attempt to address such issues, as well as incorporating a larger number of trees and shrubs to increase density.

Qualitative observations of the site show that the success of native groundcovers and emergent plants (not measured in the belt transect) has been very good. The west fork site in particular is primarily wetland, with a large number of sedges and water parsley installed and a relatively lower number of trees and shrubs. The emergent plants have spread rapidly, allowing replanting to focus on trees and shrubs.

Maintenance Summary

Maintenance tasks for 2009 included the following:

- *Implement monitoring plan & adapt restoration accordingly based on plant mortality/success, mountain beaver exclusion success and invasive plant regrowth.*
- *Document and remove any new infestations of invasive plants/weeds*
- *Examine ivy piles for re-growth. Turn piles or place in new location on cardboard.*
- *Remove ivy in select areas where native stakes were installed once they have established.*
- *Treat holly, laurel and knotweed with herbicide pending HHH approval.*
- *Careful monitoring of the bindweed in the east fork.*
- *Pull any re-growth of ivy, bindweed, and blackberry throughout site.*
- *Replant failed plantings adjusted according to monitoring results.*

Invasive plant removal was conducted on September 4nd, October 12th, and October 19th, 2009 (for a total of about one and a half days of crew time). As described above, very little regrowth of English ivy and Himalayan blackberry was found, and these species were easily removed. Compost piles were turned over, and new growth from these piles was also removed. Bindweed, which was widespread particularly in the east fork, once again took up the bulk of the time for maintenance.

Knotweed regrowth was injected with glyphosate herbicide in both sites, though many stems were too small to be injected. Holly and laurel were not treated. The native stakes mentioned in task 4 still have not established to the point where ivy can be removed around them without opening up soil to potential erosion. This task will remain for future maintenance.

Replanting took place in December 2009. Approximately 100 plants were installed, including replacing conifers for mortality on a one-for-one basis. The bulk of the planting was shrub species, including salmonberry (*Rubus spectabilis*) and Pacific ninebark (*Physocarpus capitatus*) in the west fork, and oceanspray (*Holodiscus discolor*), mock orange (*Philadelphus lewisii*), and red elderberry (*Sambucus racemosa*) in the east fork. All shrubs were 1-gallon pots.

East Fork, fall/winter 2007:



East fork, fall 2009:



West fork, fall 2008:



West fork, fall 2009:



Monitoring/Maintenance Conclusions & Recommendations

The second year of restoration under the Aquatic Habitat Grant Phase II in the Kiwanis Ravine was very successful. The restoration goals of this project included the enhancement of forested buffer and associated wetlands surrounding Wolfe Creek to (1) remove aggressive invasive plant species, (2) increase native plant diversity and thus (3) increase stabilization of ravine slopes. Significant progress has been made in the removal of invasive species and the establishment of native plant diversity, and the ravine slopes are effectively protected in the short term, with long term stability coming in the form of native plant establishment.

Maintenance recommendations for 2010 continue to include each of the maintenance tasks listed above. Since 2010 will be the final year of contracted maintenance for this project, the budget will be maximized to include as much maintenance as possible. Maintenance work should especially focus on removal of bindweed in the east fork, injection of knotweed wherever re-growth occurs, and maintenance of the boundaries of the west fork site. Long term success of this site will depend on the un-restored adjacent areas in the west fork also being brought into restoration; otherwise the threat of invasive species moving onto the site from adjacent areas remains very high. The long-term success of this project is also dependent on continuing maintenance of the sites. It is very important to recognize that maintenance will still be needed in 2011 and onward.

Appendix A: Invasive Species Coverage Data, Years 1-3

2007			
Interval (ft)	% Cover Invasive Species	Invasive Species Present	Other Species present
Transect #	EF#1	Sample Date	9/10/2007
0	90	HEHE	-
10	70	HEHE	-
20	40	HEHE	-
30	30	HEHE	MANE
40	30	HEHE	MANE, POMU
50	80	HEHE	-

2007			
Transect #	EF#2	Sample Date	9/10/2007
0	90	RUAR	-
10	80	RUAR	-
20	70	HEHE, RARE, CASE	-
30	40	HEHE, RARE, CASE	-
40	25	HEHE, RARE, CASE	-
50	3	SODU	-

54

2007			
Transect #	WF#1	Sample Date	9/10/2007
0	98	HEHE	-
10	98	HEHE	-
20	98	HEHE, PRLA	-
30	90	HEHE, PRLA	-
40	75	HEHE	-
50*	75*	HEHE	-

2007			
Transect #	WF#2	Sample Date	9/10/2007
0	75	POBO, CASE	-
10	65	POBO, CASE	-
20	65	POBO, HEHE, CASE	-
30	45	POBO, RUAR	RUSP
40	10	POBO	RUSP
50	10	POBO, SODU	misc. grasses

67

2008		
% Cover Invasive Species	Invasive Species Present	Other Species present
EF#1	Sample Date	9/2/2008
1	HEHE	MANE, POMU, SARA
10	HEHE	MANE, POMU
5	HEHE	MANE, POMU
0		MANE
0		MANE, POMU
0		MANE, POMU, SARA

2008		
EF#2	Sample Date	9/2/2008
9	RUAR, CASE, RARE	MANE
60	CASE	-
35	CASE, POBO	Salix sp., LYAM
0		Salix sp., LYAM
0		LYAM, OESA
20	HEHE, RARE	POMU, SARA

11.7

2008		
WF#1	Sample Date	8/22/2008
60	HEHE, POBO	
0		ALRU
5	HEHE	RUSP
0		ACMA, OESA
0		RUSP, COSE
25*	HEHE	COSE

2008		
WF#2	Sample Date	8/22/2008
50	POBO	COSE
0		Salix sp.
5	POBO	Salix sp.
10	RUAR	POMU, Salix sp.
10	CASE	-
50	RUAR	-

17.9

2009		
% Cover Invasive Species	Invasive Species Present	Other Species present
EF#1	Sample Date	8/25/2009
0		POMU, ACCI, SARA
3	SODU	RUSP, MANE
0		MANE, POMU
0		MANE, RUUR
0		MANE, POMU
0		MANE, POMU, SARA

2009		
EF#2	Sample Date	8/25/2009
10	CASE	POMU, ACMA
45	CASE	THPL
10	CASE, SODU	LYAM, Salix sp.
0		LYAM, OESA
1	HEHE	LYAM, Salix sp., OESA
1	HEHE	POMU, SARA

5.8

Average % Cover Invasive Species, East Fork

2009		
WF#1	Sample Date	8/25/2009
8	HEHE, RUAR	RUSP, Salix sp.
0		RUSP
0		CAOB, ATFI
0		CAOB, ACMA, OESA
3	HEHE	ALRU
92*	HEHE, CASE	

2009		
WF#2	Sample Date	8/25/2009
36	POBO, RUAR	Salix sp.
5	SODU	Salix sp., OESA
0		ATFI, Salix sp., OESA
0		OESA, Salix sp.
8	CASE, SODU	ATFI, SYAL
43	CASE, SODU	POMU, THPL

16.3

Average % Cover Invasive Species, West Fork

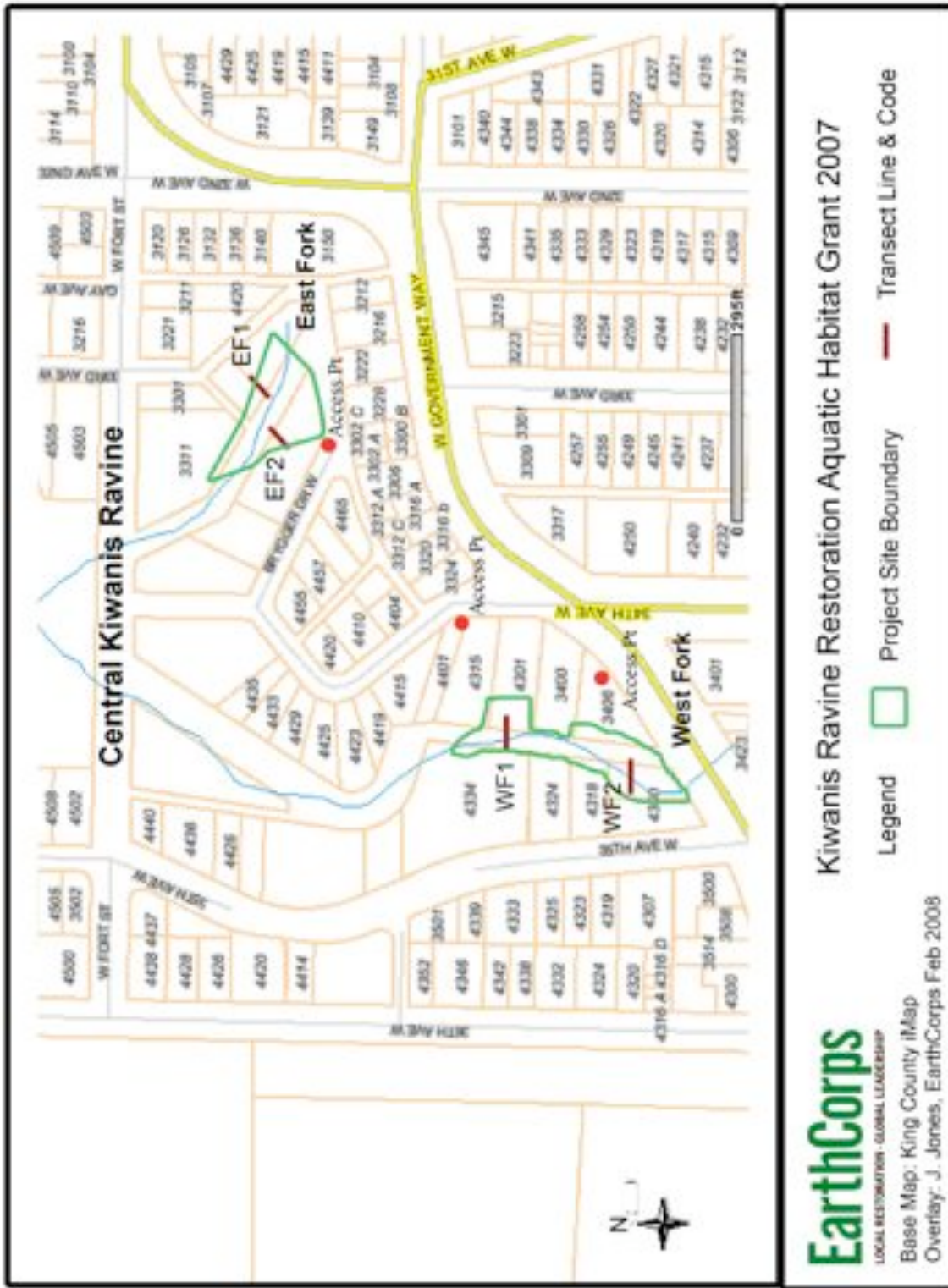
Appendix B – Installed plant survivorship data, years 2-3.

Number of surviving trees and shrubs with the belt transect is indicated by year and species. Due to replanting in 2008, totals for 2009 may be higher than total for 2008. As a result, plant survivorship is difficult to accurately assess; see discussion above.

Transect # Year:	EF1	EF2		WF1		WF2		
		2008	2009	2008	2009	2008	2009	
ALRU	no plants installed due to existing native density	2	2	1		1	1	
PSME			1					
THPL		4	3				1	
ACCI		1	2	3	1	3		
OECE			1				1	1
RUSP		1	1	8	3			1
TOTAL			8	10	12	4	5	4

Vegetation Key for Appendices A and B

	Code	Scientific Name	Common Name
Native Species	ACMA	<i>Acer macrophyllum</i>	Bigleaf maple
	ALRU	<i>Alnus rubra</i>	Red alder
	PSME	<i>Pseudotsuga menziesii</i>	Douglas fir
	THPL	<i>Thuja plicata</i>	Western red cedar
	ACCI	<i>Acer circinatum</i>	Vine maple
	OECE	<i>Oemlaria cerasiformis</i>	Indian plum
	POMU	<i>Polystichum munitum</i>	Sword fern
	OESA	<i>Oenanthe sarmentosa</i>	Water Parsley
	MANE	<i>Mahonia nervosa</i>	Dull Oregon grape
	RUSP	<i>Rubus spectabilis</i>	Salmonberry
	SARA	<i>Sambucus racemosa</i>	Red Elderberry
	LYAM	<i>Lysichiton americanus</i>	Skunk Cabbage
	COSE	<i>Cornus sericea</i>	Red Osier Dogwood
Invasive Species	CASE	<i>Calystegia sepium</i>	Bindweed (morning glory)
	POBO	<i>Polygonum bohemicum</i>	Knotweed
	RUAR	<i>Rubus armenicus</i>	Himalayan Blackberry
	HEHE	<i>Hedera helix</i>	English Ivy
	SODU	<i>Solanum dulcamara</i>	Nightshade
	PRLA	<i>Prunus laurocerasus</i>	Cherry Laurel
	RARE	<i>Ranunculus repens</i>	Buttercup



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LOCAL RESTORATION - GLOBAL LEADERSHIP

Kiwanis Ravine Restoration Aquatic Habitat Grant 2007

Base Map: King County iMap
 Overlay: J. Jones, EarthCorps Feb 2008