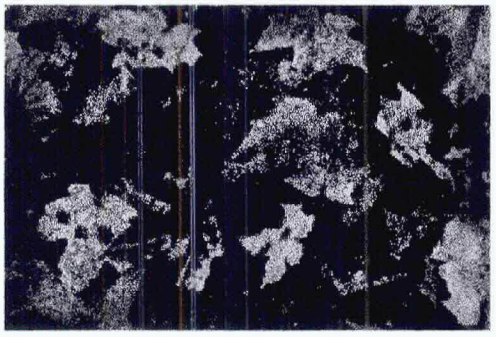
CITY OF HAPPY VALLEY

WETLAND RESTORATION PROJECT 1998

FINAL REPORT



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INTRODUCTION

In 1995 the City of Happy Valley purchased a 24.9 acre parcel of property in the eastern corner of the City with the intention of adding it to the City's park lands. The parcel had been put to numerous uses over time including farming, livestock grazing, and even an airstrip during the 1950's. However, for the past 35 years the property has been rested. When the City originally purchased the property the intention was to use it to build baseball fields, soccer fields, dog exercise areas, a community center, fishing pond, and a large parking lot. Standing as a possible obstacle to those plans was the issue that there could be a large amount of wetland on the site. The County had conducted a wetland determination that showed some 10 acres of wetland on the site. This amount would leave more than enough room for the uses that had been proposed. Yet, there were numerous indications that there could be far more wetland than 10 acres. Realizing this fact, the City proposed development of a revised plan for the enhancement and conservation of the wetland site, beginning with a small restoration project. As a first step in this plan the City applied for assistance from Metro and the U.S. Fish and Wildlife Service to restore a portion of the site that had been degraded.

Using the information that has been gathered during this grant project, the City's intentions are for the site to be the subject of a large multi-year restoration project, trail system and small community center. This effort will emphasize partnerships with groups ranging from Envirocorp to Happy Valley citizens. Happy Valley Elementary School will play a large role in the project. Adjacent to the wetland site, Happy Valley Elementary has played a vital part in not only working on the restoration project, but in incorporating the site work into their curriculum. This partnership gives the students of Happy Valley Elementary the opportunity to utilize a "living lab" for environmental science study, restoration education and observation. Grades K-6 have used the site.

This grant project served to accomplish two goals. First, the City gained as much background information as possible about the site. Although the site had been used for decades by numerous parties, little was known about it's scientific characteristics. Various restoration sites were visited before applying for the grant. It became evident that one of the missing elements in some projects was the lack of a sufficient amount of background data and knowledge about the project site. This often led to a less successful project. Second, the City completed a small planting project to begin the larger restoration effort. The gathered background data guided this smaller initial planting project under the grant.

The project has met with great success, measured on several levels. Good data has been gained, several community and agency partnerships have been formed, a generous amount of media attention was paid to the project, and the survival rate of vegetation was extremely high. The City has received a second grant for the year 1998-99, and there is every indication that this future project will benefit from the groundwork that has been done to this point.

Grant Application and Procedures

The City had initially submitted an application to Metro for a grant that included excavation of certain areas of the project site, a very large planting, installation of water control structures, and large scale study of the project site. After visiting the project site, positive suggestions were made to avoid excavation, refine studies of the site, avoid water control structures, and reduce the size of the planting slightly. These suggestions were heeded, and the project was revised to reflect those changes. The field review of the application was essential in promoting a more successful project.

The revised project outline sought to better prepare the site for future work that would be done with regard to restoration, study and enhancement. The focus of the project was based around several principle objectives that were set as benchmarks. First, a consultant was selected to provide technical assistance in guiding the more technical elements of the project. The first objective that was met was installation of 26 piezometers throughout the wetland park. The consultant met with City staff during the spring of 1997 to best locate these groundwater monitoring devices. (See attachment 1 for schematic) Weeks later, an agreement was reached between the City and Multnomah Youth Cooperative to install the piezometers. This aspect of the project was completed over the course of several days, and proved difficult at times. The piezometers are required to be nearly 5 feet in the ground, which can make digging quite arduous. Adding to this is the fact that most of the site is heavy clay in varying amounts.

Next, surveys of existing vegetation, existing soils, and hydrologic and wildlife considerations were conducted. This information was then gathered together to develop a planting plan for the wetland park, and produce a comprehensive restoration guide for the entire wetland park. Plants were then selected in the fall of 1997 and crews hired to assist in completing the plantings. Envirocorp, Happy Valley Girl Scouts, citizens, and Happy Valley Elementary students all partnered with the City in planting the 1850 plants that were selected.

The budget for the project was revised to reflect the changes that had been made to the work plan. The overall cost of the project dropped from $35,900 to $25,100 after incorporating the suggestions made by the application review board. In the initial application the City's matching percentage was 53% of the total budget amount. However, after the revisions were made, the new budget for the project reflected a higher matching amount from the City at 70% of the project budget. Over 700 volunteer hours played a beneficial role in helping to complete the project.

Project Summary

The City of Happy Valley Wetland Restoration Project was separated into two main components, or phases. First, the City sought to acquire as much information as possible about the project site. Little was known about the project site, wetland characteristics, the actual size of the wetland, hydrologic trends, current vegetation and numerous other ecological factors. Over the course of several months the City gained knowledge about all of these characteristics to help direct the progress of the project. The City used the extensive information gathered about the project site to develop a comprehensive restoration plan. The goal of the restoration plan was to use as much information as possible to ensure optimum survival rates, and choose the ideal locations for proposed plantings and other enhancement projects. The second phase of the project was the completion of a small planting project, using the extensive data collected during the grant cycle.

This project was undertaken as a Habitat Restoration Grant, although it took on the characteristics of an Education Grant. Being located directly adjacent to the project site, Happy Valley Elementary was an important partner in the project and contributed greatly to the overall success of the restoration. Students at Happy Valley Elementary played a role in nearly every phase of the restoration project. The students conducted observations of wildlife and vegetation, helped to install piezometers, planned plantings, and installed several hundred of the 1850 plants that went into the project site. Since the plantings were completed, the students have been responsible for taking readings from specific piezometers, and maintaining weed barriers on the newly planted vegetation.

In May of 1997 the City completed a wetland delineation to determine the extent of wetland that existed on the project site. The results of the delineation showed that 19.7 acres of the site was in fact jurisdictional wetland. (See attachment 2) This amount was quite different from the County wetland determination that had been done years before. The fact that this much wetland was present on the site made it necessary to alter the overall direction that the uses of the site would take. It was clear that future projects on site would be directed towards restoration instead of higher intensity uses such as ball fields, and parking areas.

After the delineation had been completed the City met with consultants from Pacific Habitat Services to mark locations for piezometers. After choosing locations, the City installed 26 piezometers in order to gain data about the water table on the site. Multnomah Youth Cooperative was hired in order to assist in installing the piezometers. Over the course of several days students from the Cooperative worked to install nearly all of the piezometers. City staff completed the remaining work. Data collection from the piezometers began right away. The data showed expected trends of fluctuating water table levels as the rainy season began, but many areas showed a generally stable level of water, with little fluctuation. Although the data gathered is very basic in nature, it provides an important planning tool for future plantings to be coordinated

properly. Additionally, this information will help in determining the best location for trails and other structures that may be built on the site in the future as part of other restoration projects. The readings began in August of 1997, and are ongoing at this time. (The data has been inserted as attachment 3)

Following the placement of the piezometers, Pacific Habitat completed a soils survey, fish and wildlife habitat assessment, existing vegetation community survey, and hydrologic assessment of the project site. This information was used in preparing a planting plan for the restoration that would be completed in this grant cycle. After the planting plan was produced, the information that had been gathered by the consultant was grouped with piezometer data taken by City staff and Happy Valley students into a formal report on the project site. (Attachment 4) This report was produced in an effort to try an guide the future restoration projects that would be taking place on the site. The consensus was that the site should be treated as a whole in planning for any future restorations that would take place.

During the planning process an advisory committee was established with 6th grade teacher Jim Shumaker and Principal Brian Kleiner from Happy Valley Elementary, John LeCavalier from the Inskeep Environmental Learning Center, Steve Morrow from Clackamas County Department of Utilities Surface Water Department, Dan Cary from SRI Shapiro/ AGCO Co., Justin Patterson from the City of Happy Valley and Steve Berliner from Friends of Mt. Scott Creek. This committee served to direct the course of the data and information gathering and subsequent restoration project. The committee provided helpful ideas in deciding what would be most valuable for both Happy Valley students and the project site during the grant cycle.

Finally, the vegetation plan for the year one restoration planting was drafted and plants were ordered. (Planting plan: attachment 5) The first of the plantings took place in October of 1997, with a subsequent planting taking place in November of 1997. The plants were brought to the site in two forms, both bareroot and one gallon pots. The site was prepared by simply mowing the grasses that existed on the site to the lowest possible level without creating an erosion problem. Once the plants were installed in the restoration area, they were protected by stapling a 2.5'x2.5' high strength woven fabric square around their base. Each plant was watered at installation, with some being watered naturally by a surprise storm in November. Numerous groups were used in completing the plantings. Happy Valley Elementary students, a Happy Valley Girl Scout Troop, Envirocorp volunteers, Cascade Education Corp., Happy Valley citizens and Happy Valley City staff all took part in the plantings.

Since the plantings have been completed, two main activities have continued. The piezometer monitoring has continued, as well as constant checks on the condition of weed barriers and plant condition. As of the date of this report most of the plants have begun to bud for spring. Therefore, the City has been able to determine a survival rate after the first wintering of the newly planted vegetation. It appears that over the entire site there are 32 plants that may have suffered enough over the winter to reach

mortality. Several plants appear to have been subject to a high flow of water at some point which may have contributed to their decline. Nonetheless, losing 32 plants out of 1850 plantings garners a survival rate of 99.9% after the first wintering.

During the summer months staff will walk the site to determine if any weedeating or pulling may be necessary to ensure continued high survival rates. The hope is that the weed barriers, which have done a tremendous job to this point, will continue to keep detrimental weed growth to a minimum.

Media Coverage

Media and local official exposure for the project has been extremely positive for the project. The City understands the importance of drawing attention to these projects in order to gather continued support for funding, as well as similar endeavors. To our benefit there has been coverage of this restoration project by various sources, not just one or two mediums. The following are highlights of media exposure that has taken place.

During the course of the project the Oregonian visited the site to gather information for a possible article, while after their visit they placed a large photo of students making observations on the site in the Metro South section of the paper. A copy of that picture is included.

Channel 2 (KATU) visited the site during October during the first phase of the planting project. A cameraman came on site and filmed Happy Valley Elementary students along with Cascade Education Corp volunteers as they planted vegetation. Later that same day their news helicopter made a low pass over the project site.

On January 9, 1998 three students from Happy Valley Elementary prepared a display of the restoration project for a City Club luncheon at which their work was honored by Metro Chief Mike Burton during his State of the Region Address. Before the luncheon the students answered questions about the project for members of the media and City Club who attended the event.

During February a media group from California visited the site to gather information for an article that would be written describing this and similar restoration projects.

The Clackamas Review recently made a visit to the project site and shot photos which appeared in a later issue of that newspaper. This was one of the most impressive examples of media coverage, as it generated a great deal of local attention in the Clackamas area. The photos appeared over two separate pages of the Review.

In May elected representatives will visit the site in order to examine the work that has been done. The intent will be to garner even more support for this type of project in the future.

Problems/ Successes/ Suggestions

One of the main things that was learned during this project was the need to pre-plan everything you will be doing on any project day. This applies no matter how large or small the project. Here are some of the things that we learned while completing our work on this restoration:

* Make sure that your plant material can be delivered as close as possible to the project site. Don't get it delivered to City Hall or your work yard if it is going to be planted somewhere else. You will get stuck spending the entire day before your planting running plants back and forth when you could be taking care of other loose ends. It will snowball on you, and you will be in a frenzy come planting day. Most nurseries will hold your plants until a certain day, and then deliver them for you. Let those nurseries take care of your plants as long as you possibly can.

* Once you get your plants delivered examine how they will get to the planting spots. Is your drop-off point close enough to the actual planting locations to simply carry the plants there by hand? Or are you going to have to use wheelbarrows or tractors with trailers to move the vegetation? If you are going to use a type of transport like a wheelbarrow or tractor, make sure that the ground will handle it before starting. Usually the planting spots will be damp or remote, and you can get stuck very easily. If you end up carrying them make sure that you have enough time to get them moved before planting day. Also, if you need to water them between delivery and planting have water readily available.

* Before planting it is good to color coordinate the plants with the locations that they will be planted. Place a colored ribbon on a stake near a group of one type of plant, then place the same color on stakes in the locations they are to be planted. Make it as easy as possible for your crew or volunteers. Reduce the number of questions that can be asked to save your sanity on planting day. Also, you can do a lot of good by placing some diagrams on tall wood stakes here and there that show a basic planting schematic. It is a good reminder, especially for kids.

* Work media connections early to get them to come to your site. They usually wont the day of the project if that is when you call them. Give someone a ring a few weeks before and send them a note about the project. This works much better at getting them out to the site for at least a few pictures, if not a full story.

* Keep a notebook handy for matching expenditures. When you make a copy, right it down. When you make a phone call, right it down. The notebook will be pretty ragged by the end of the project, but it will be a central place where many of the smaller matches can be calculated from at the end of the project. They add up when you are looking for that extra $200 in match.

* If you have kids 6th grade and below doing plantings you may want to pre-dig some of

the holes for plantings. It will be a more efficient experience for your project in terms getting work done, plus it will be much more enjoyable for the kids.

* If you use volunteer groups such as Envirocorp or Cascade Education Corp, make sure that you contact them WELL in advance of your planting/ work project. Four or five months is not too early. These groups do really good work and they fill up quickly because of that fact. It is often a good idea to have a crew leader from the organization come out to the site a few days prior to the project or when you book them so that they can have a first hand idea of what will be going on for the project.

* Take pictures of EVERYTHING!!!!! You WILL use them for any number of things.

* If you are doing a planting, try and do your site prep work close to your planting date. If you do it too soon, weeds may grow back up, you may create an erosion problem, or your project may change slightly rendering your hard work a waste.

Future Plans

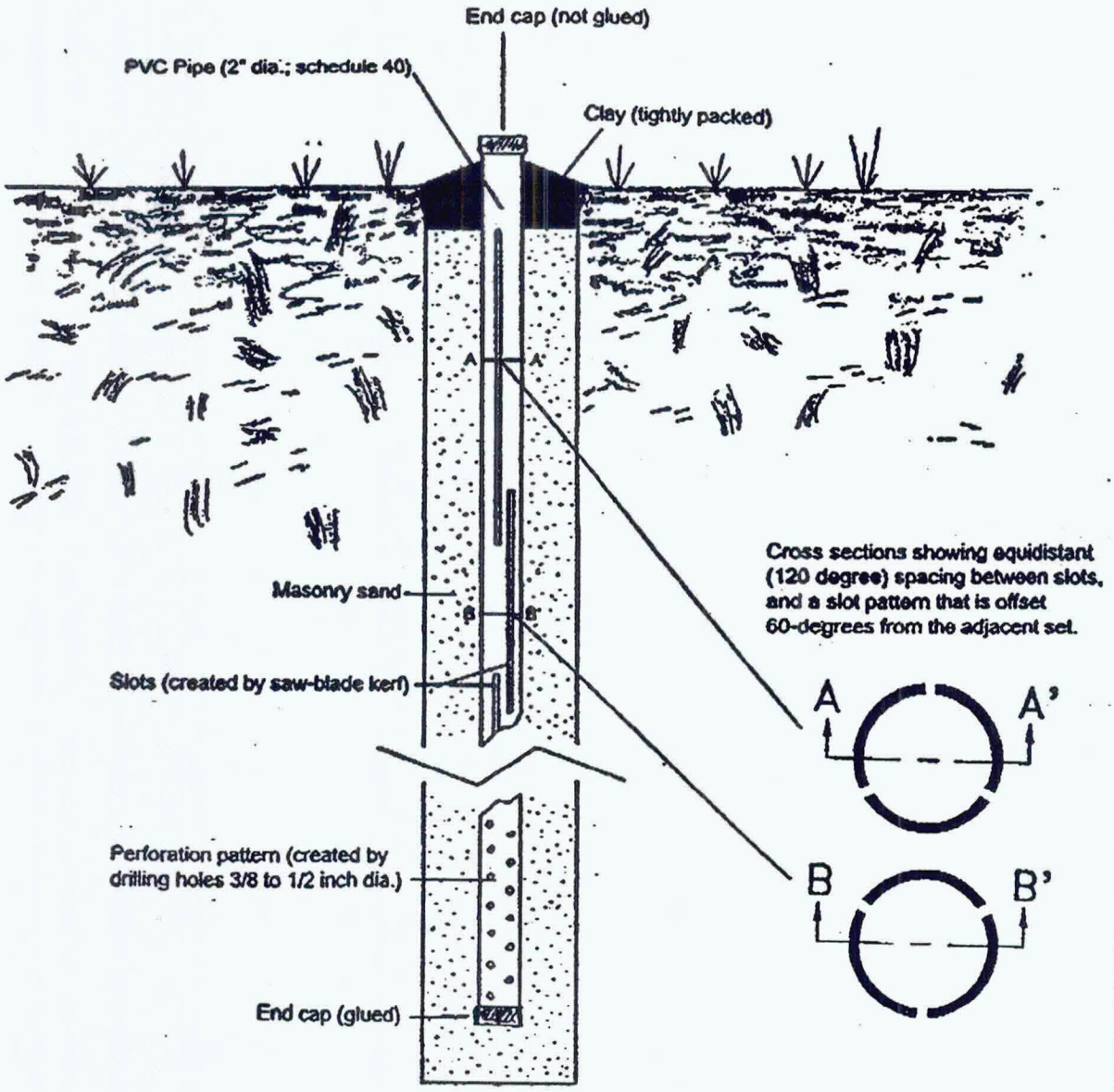
The City was recently awarded a second year grant for the Happy Valley Wetland Park. The intention is to complete a two phase project in the Summer and Fall of 1998.

First, in the Summer of 1998 the City will begin to try and locate clay drain tile lines that exist in the southeast corner of the site. The objective will be to find these historic lines and break them in several locations. The lines will be marked using a backhoe to dig several very small pits where the lines are already thought to be located. Once these lines are marked, the lines will be augered to break holes in them. As these lines adjust to being broken apart they will most likely collapse further, helping to restore some of the original hydrology to the project site.

Second, in the Fall of 1998 the City will complete another planting project that will radiate out from this grant cycle's planting area to the area where the drain tiles will be broken. Many of the same tools will be used for this planting as were used during the current grant cycle. The hope is that as the area where drain tiles will be broken adjusts hydrologically, plantings will already be completed up to that area with this new project. Therefore, a progressive wave of planting could pursued into the drain tiled area and further in future projects.

Plans are being made to begin a trail system in the project area during the coming year. Every effort will be made to incorporate several different styles of trail into the project. This could provide a valuable visual resource for other jurisdictions debating how to choose a style of trail for sites with varying site conditions or characteristics such as streamsides or wetlands.

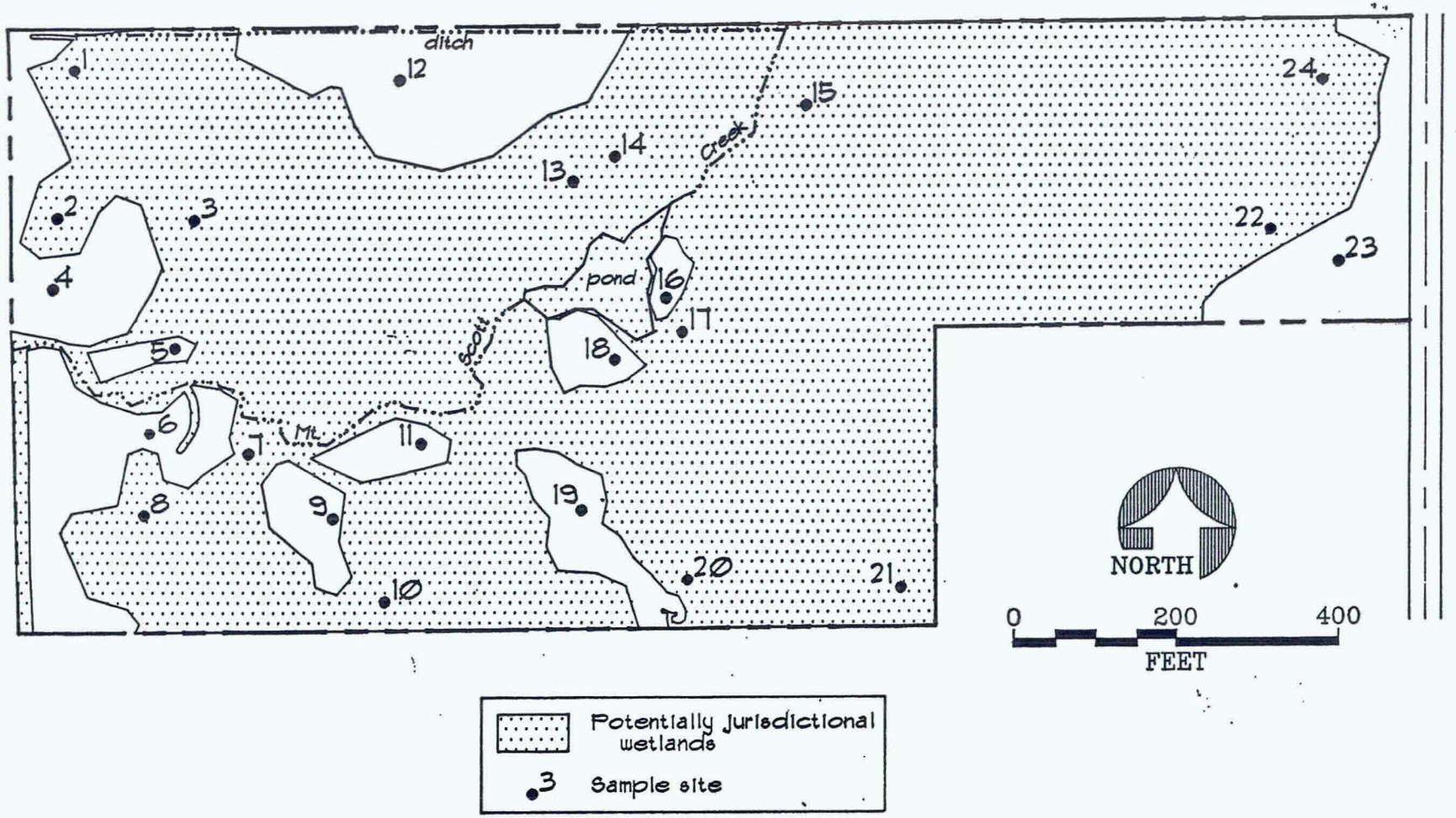
Pacific Habitat Services, Inc.



Individual pipes should have only one perforation style – slots or holes.

Cover the holes/slots on the finished pipe with screening fabric (not shown); nylon stockings work well.

Figure 3: Ground Water Monitoring Well – Design



Base map from Compass Corporation, 1997

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FIGURE 4

Potentially jurisdictional wetlands and sample sites for the Happy Valley Nature Park in Happy Valley, Oregon.

SRI/SHAPIRO/AGCO INCORPORATED

Attachment 2

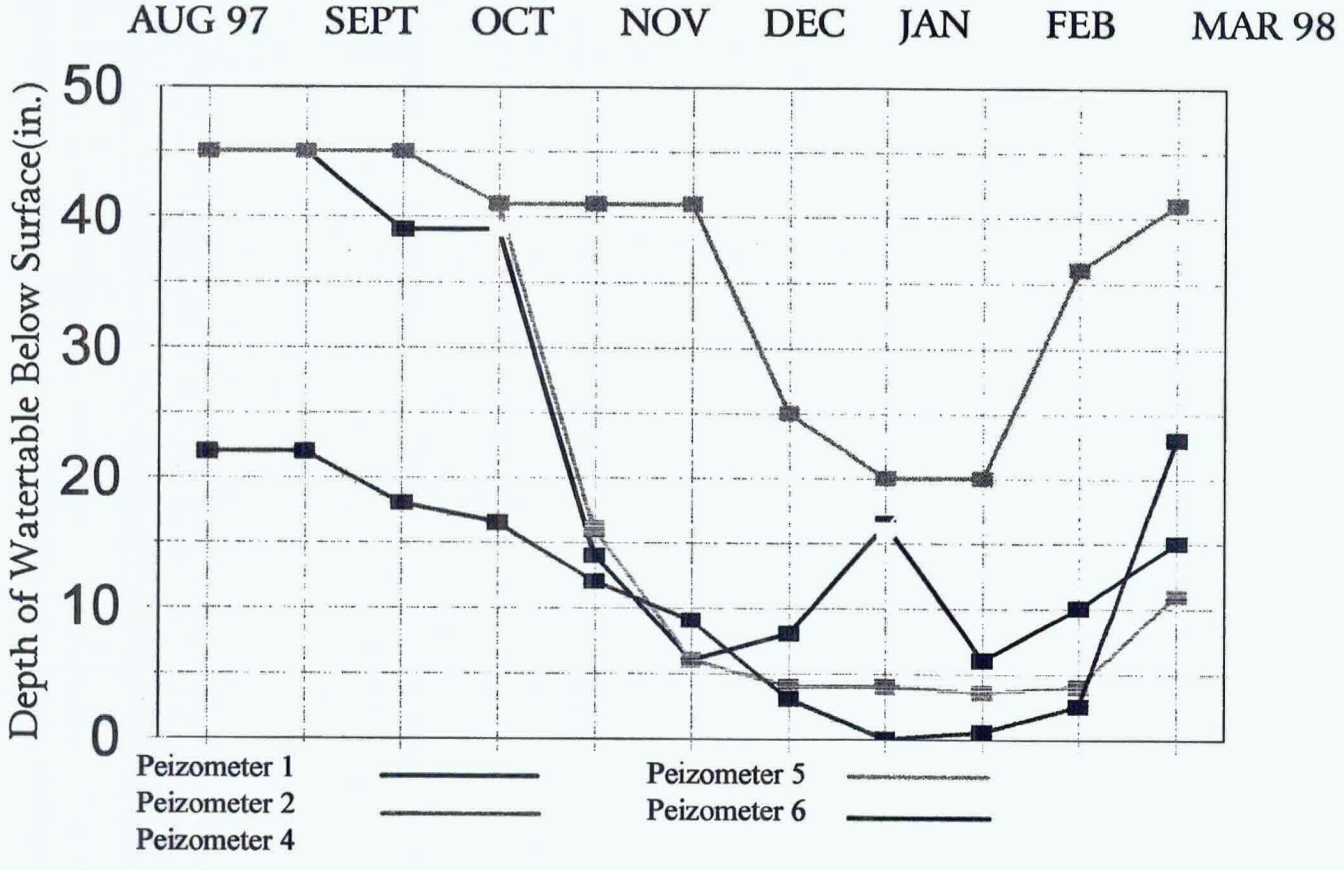
HAPPY VALLEY WETLAND PARK
PEIZOMETER DATA

	AUG 19	AUG 22	SEP 23	OCT 2	NOV 3	DEC 2	DEC 10	FEB 6	FEB 11	FEB 18	MAR 18
PEIZ. 1	45	45	39	39	14	6	8	16.5	6	10	15
PEIZ. 2	45	45	45	41	16	6	4	4	3.5	4	11
PEIZ. 3											
PEIZ. 4	45	45	45	39	39	39	20	16	26	36	39
PEIZ. 5	45	45	45	41	41	41	25	20	20	36	41
PEIZ. 6	22	22	18	16.5	12	9	3	0	0.5	2.5	23
PEIZ. 7	10	11	6	2	2	1	0	0	0	0	11
PEIZ. 8	24	14	24	22.5	8	0	0	0	0	0	0
PEIZ. 9	16	15	15	14.5	14	15	14	12	13	15	15
PEIZ. 10	10	11	11	4	4	4	3.5	1	2	0.5	1
PEIZ. 11	26	26	26	24.5	19	15	12.5	9.5	15	13	12
PEIZ. 12	33	33	33	33	10	6	5	4	0	5.5	3.2
PEIZ. 13	5	5	5	3	0	0	0	0	0	1.5	0
PEIZ. 14	11	12	5	3	0	0	0	1	1	0	0
PEIZ. 15	19	19	18.5	17	0	0	0	0	0	0	0
PEIZ. 16	18	18	17	16	10	8	5	5	6	5.5	15
PEIZ. 17	3	3	3	2.5	0	0	0	0.5	1	0	0
PEIZ. 18	27	27	26	26	13	11	7	4	0	4	26
PEIZ. 19	6	6	5	3	3	3	3	1	0	1	5
PEIZ. 20											
PEIZ. 21	3	3	3	2	2	0	0	2	0	3.5	2
PEIZ. 22	45	45	45	32	13	11	7.5	4.5	10.5	4	6
PEIZ. 23											
PEIZ. 24											
PEIZ. 25	17	17	17	16.5	9	7	0	0.5	5	5	21
PEIZ. 26	21	21	18.5	18	17	16	16	14	13.5	14.5	14
PEIZ. 27	45	45	45	45	5	3	2	0	1.5	3	12
PEIZ. 28	26	26	25	25	11	8	5.5	5	6	10	14
PEIZ. 29	21	20	21	19.5	0	0	0	0	12	0	0
PEIZ. 30											

Attachment 3

PEIZOMETER DATA

Happy Valley Wetland Park



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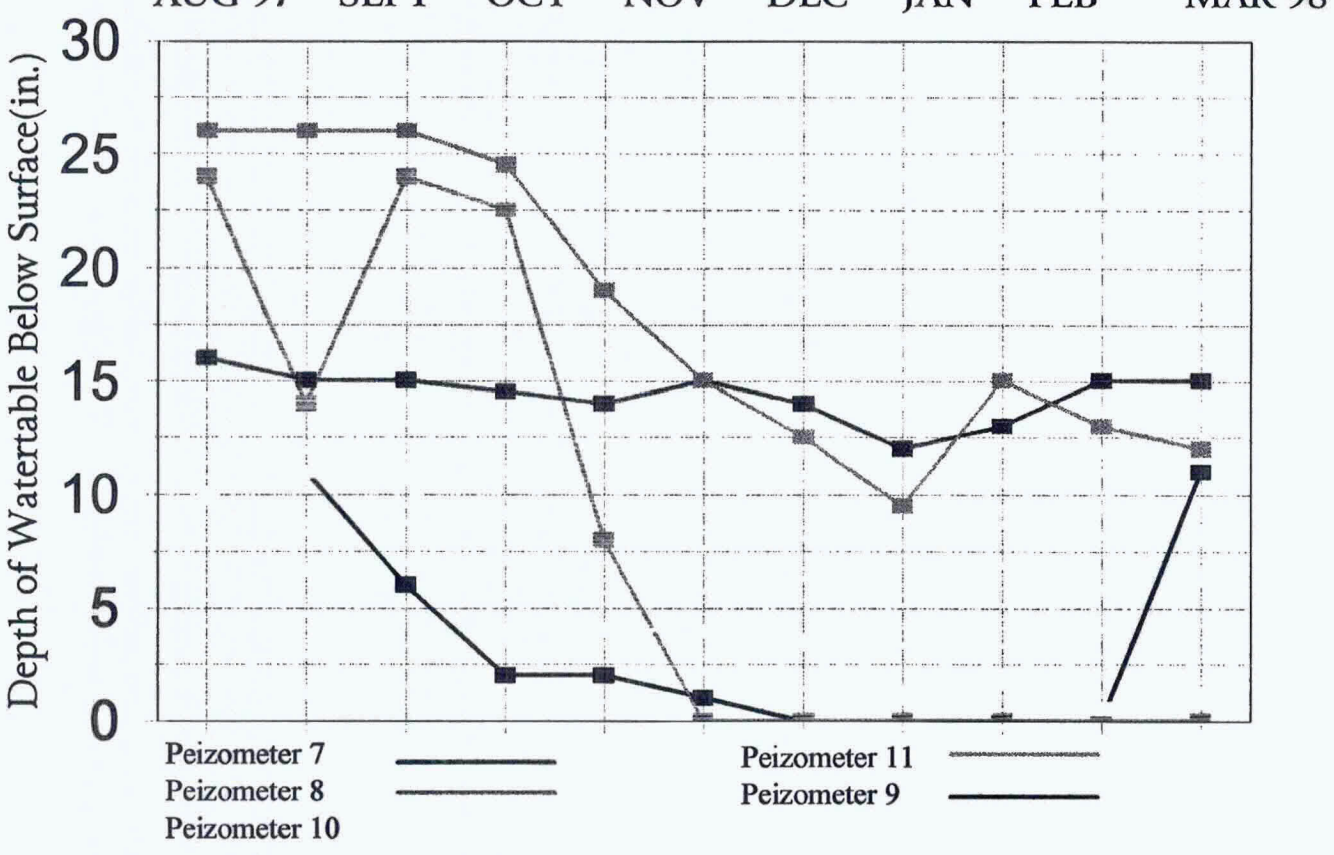

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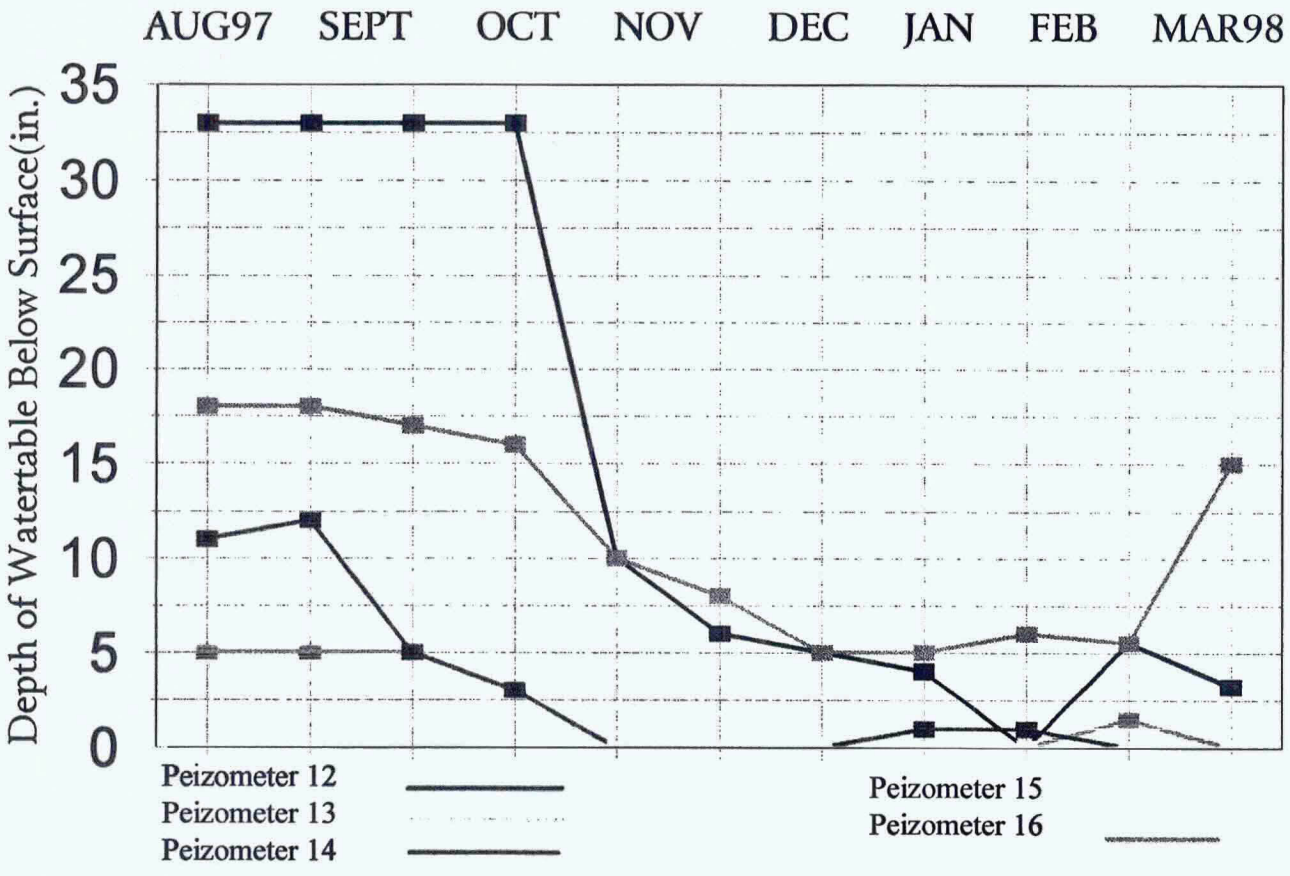

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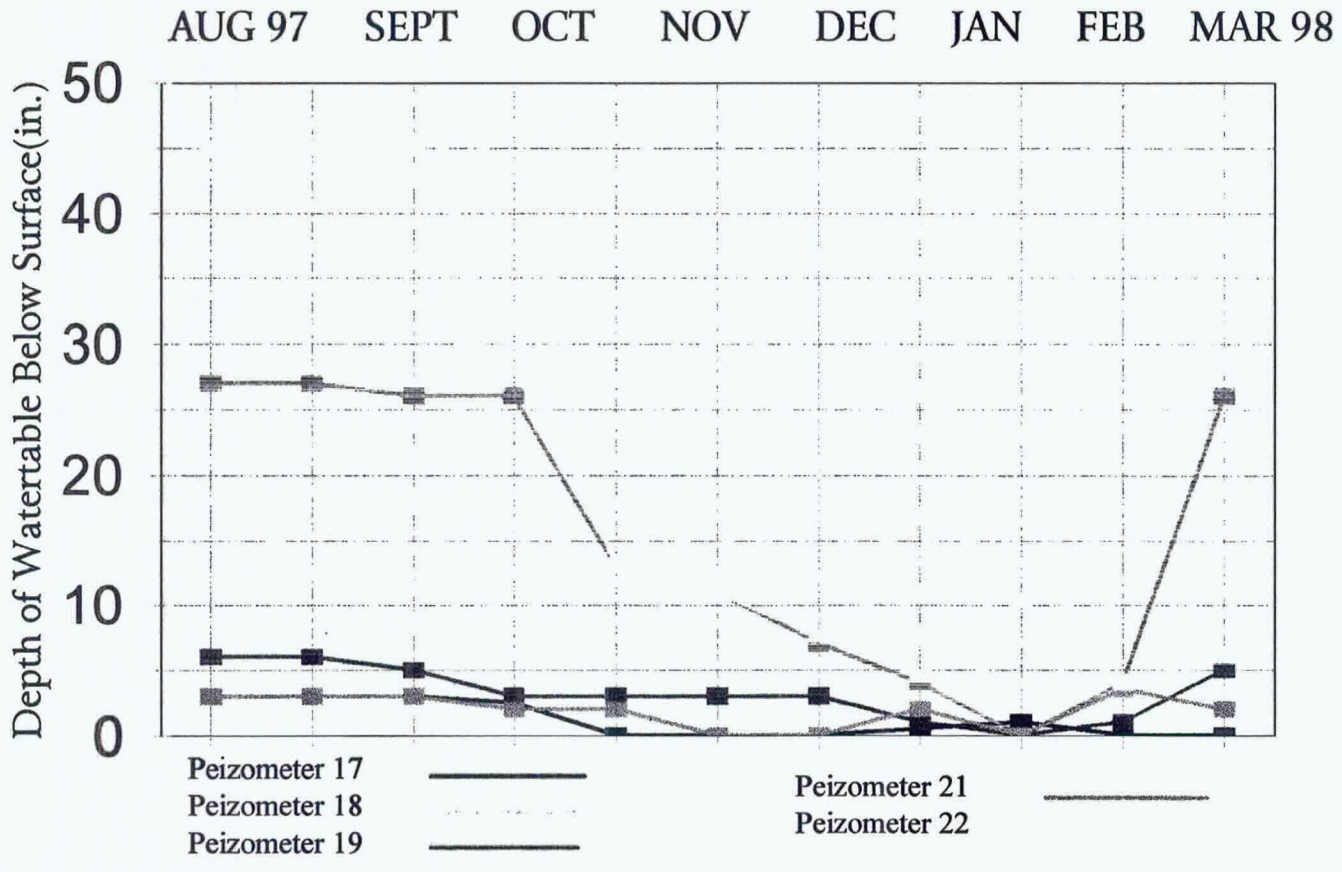

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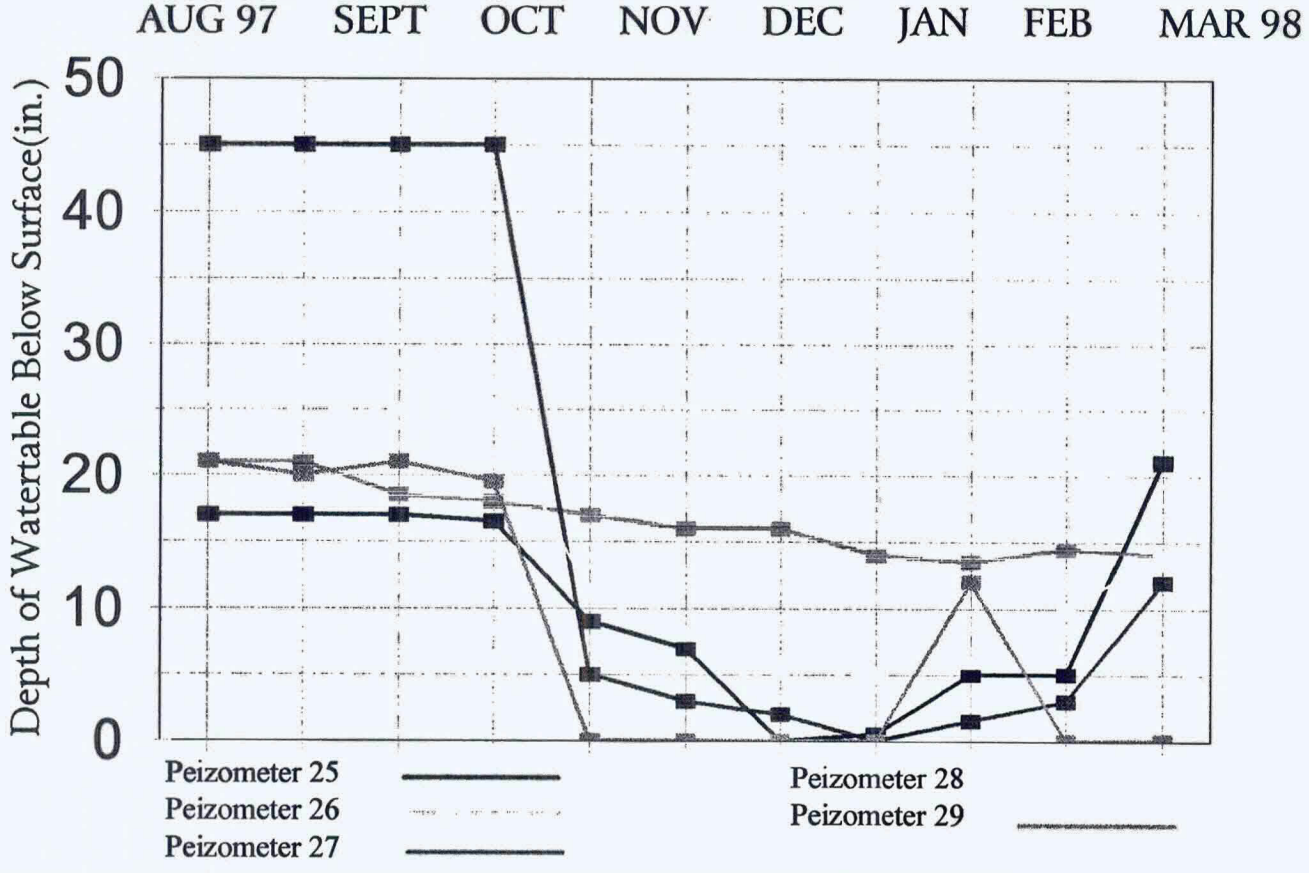

Attachment 4

Restoration Manual for the Happy Valley Nature Park

Prepared for

City of Happy Valley
Happy Valley, Oregon

Prepared by

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March 4, 1998

Restoration Manual
for the
Happy Valley Nature Park

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PHS Project Number: 6-1323

March 4, 1998

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EXECUTIVE SUMMARY

Pacific Habitat Services, on behalf of the City of Happy Valley, has prepared this document to provide a brief technical framework for future habitat enhancement and restoration activities within the Happy Valley Nature Park. The discussion is limited in describing site hydrology due to a current shortage of data. Ongoing monitoring efforts are being conducted by volunteers (primarily Happy Valley School science students); their data will be periodically reviewed for additional insights into long-term site conditions.

Since site conditions will necessarily change over time as plans are implemented, actual treatments in defined areas have not been specified in this document. Given the fluctuating availability of funding for park projects, treating smaller areas within the larger management framework holds the greatest promise for long-term success. The following management actions may provide the immediate site improvements:

Native Tree and Shrub Plantings

- Appropriate native tree and shrub plantings and where to install them should be based both on their potential wildlife value, and on their likelihood for successful establishment and growth. Appendix B is a list of species that are appropriate for use on the site in different areas, along with their preferred growing conditions. Specific recommendations can be made from this list for targeted areas when funding becomes available for plant material procurement and installation.

- The potential for summer drought requires that plants be installed during the dormant season (late fall to early spring) in order to gain maximum root growth prior to high summer transpiration demands.

- Initial application of added nutrients may be useful for plant establishment, but continued fertilization should not be necessary after the initial growth season.

Hydrologic Improvements

- The breaking of tile lines will significantly influence the hydrology in the eastern part of the park property. Plantings should not be scheduled for the areas affected until well after disruption of the lines, to allow time to monitor changing soil moisture conditions.

- Raising the weir height for the pond by more than 18 inches is not recommended without an engineering study to assess risks of failure.

- Installation of additional water control structures may be warranted in smaller swales in order to slow the rate of runoff. These structures may be as simple as single log dams or earthen berms, and will primarily affect local plant communities.

- Excavating topsoil (to depths of less than one to two feet below the surrounding grade) can create shallow pool habitats in areas now relatively flat and without hydrologic or species diversity.

Control of Nuisance Species

- Frequent trimming of blackberry shoots will provide control, but they will need to be cut at least four times during the growing season to keep the shoots from effectively competing with the grass.

- Another option for control of blackberry shoots is the local use of herbicide. Immediate application of concentrated glyphosate to the surface of freshly cut stems during the month of September will kill the root system through the winter with a minimum of environmental toxicity, and without the necessity of disturbing the soil to dislodge the root system. Refer to the Pacific Northwest (PNW) Weed Control Handbook (1997) for suggested rates and precautions when using herbicides.

- Scots' broom may be controlled by an aggressive cutting program, requiring repeated treatments. However, the topical application of herbicide to freshly cut stems will keep the plants from re-shooting.

- Mowing newly planted areas in October may help control weedy growth, especially of winter annuals through the early spring, until perennial grasses can re-establish cover over the mown sites.

- Covering the soil around each new tree or shrub with a permeable dark weed control fabric will prevent growth of competing grasses and most broadleaf weeds. If the weeds immediately around the mat are taller than the woody plantings, trimming the weeds may be necessary in mid-summer.

- In case of a widespread infestation, an integrated pest management plan (IPMP) should be developed before using control methods. Scheduled mechanical control, release of an approved biological control agent, or closely targeted spot treatment with a wetland-approved herbicide may all be preferred options.

- If beaver predation become a serious problem, new plantings can be protected by three-foot high wire fences around each trunk. The fencing should remain in place until the plants are well established.

- Installing a water level control device (i.e. a bypass siphon pipe) in a dam will lower beaver pond levels, reducing flooding impacts to existing vegetation. Such a device is preferred to simply removing the dam, since beaver would most likely simply rebuild the dam.

Stream Enhancements

- Placement of single or stacked cedar logs, well anchored into channel or swale banks, may be used to help dissipate erosional forces and to create small pools.

- Bioengineering techniques can be used to improve bank stability in areas currently prone to flood scour. Anchoring root wads or brush mats into the bank at locations subject to excessive scour can protect the bank, help stabilize soils, and allow vegetation to become established.

- Placement of logs or brush piles that extend outward from the pond bank can provide cover and organic material for aquatic species as well as sunning spots for turtles, etc.

- Adding game fish to the pond and stream areas is not advisable at this time. Structural enhancements such as alteration of hydrology, along with the existing silty conditions, make the pond and stream more suitable for a variety of warm or slow water species, as opposed to salmonids. While salmonids such as cutthroat may be present further downstream, the pond area is unlikely to support a regenerating population.

- Construction of a trail system may be desirable to aid and/or direct movement of park visitors through sensitive areas while minimizing damage to soils and plant communities. Especially wet areas may warrant a raised boardwalk to lessen impacts. Viewing platforms or blinds can be erected at strategic locations adjacent to the pond and along the creek to allow viewing of wildlife; dense plantings around the platform or blind will help minimize disturbance to resident wildlife.

1.0 INTRODUCTION

The City of Happy Valley ('City') recently purchased a 24.45-acre property that is bounded by SE 145th Avenue on the east, Happy Valley City Park to the north and west, and Happy Valley Elementary School to the south. The property has been subject to agricultural activities for many years, and is currently a mosaic of pastureland, shrub thicket, emergent wetland, and riparian woodland associated with Mt. Scott Creek. Past clearing activities, long-term grazing, and hydrologic manipulations (such as drain tile installations and water control structures) have impacted native plant communities on the site, degrading its former wildlife habitat and water quality functions.

The Metro Regional Parks and Greenspaces program (Portland metro area) encourages environmental education programs in urban natural areas by providing funding for public awareness and stewardship activities. Funds have been awarded to the City for these activities through a grant to Metro from the U.S. Fish and Wildlife Service. Key requirements of each program include:

- Hands-on class and field experiences in a greenspace. Students should be involved in developing educational materials.
- Experiences should lead to an understanding of ecological concepts in urban systems, as well as related values such as value-based appreciation, ownership, and awareness.
- The program should promote public responsibility, stewardship, and informed civic action.

The City has enlisted the aid of local students and environmentally oriented groups to install and monitor groundwater monitoring wells across the site. In addition, localized areas have been planted with native trees and shrubs to enhance species and structural diversity. Pacific Habitat Services, Inc., (PHS) has prepared the following document (which incorporates the limited groundwater monitoring data collected to date, as well as soils and vegetation community observations) as a basis for suggesting activities that will enhance future educational opportunities and restoration efforts on the site.

2.0 ENHANCING WETLAND/ BUFFER PLANT COMMUNITIES

Existing plant communities on the Happy Valley park property are described in Appendix A; native plant communities are present in limited areas only. Due to historic clearing, drainage, and other agricultural activities, extensive areas of the site have been degraded in terms of wildlife habitat. Portions of the site (especially south and east of the pond) that retain wetland hydrologic characteristics are now dominated by non-native plants or have very little structural diversity (lack trees and shrubs). Several options are available for improving both wetland and upland habitats: these include native woody plantings, hydrologic manipulations, and management of nuisance plants and animals.

2.1 Native Plantings

The park property can be enhanced by planting desirable species already present, or new species that will add to the structural and genetic diversity of the habitat. Currently, extensive areas of the site are dominated by introduced pasture grasses or by Himalayan blackberry. Though blackberry thickets have provided greater structure than pastureland in past years, wildlife mobility was limited by the dense growth, and the plants offered food for a relatively small group of species, primarily in fall. Since many of the thickets have been cut only recently, the now open areas have even less value than before. Nevertheless, open fields favor certain species, especially rodents and their predators (i.e. red-tailed hawks, coyotes).

A desirable condition from the standpoint of wildlife habitat on the site would include dense plantings of native trees and shrubs interspersed with open grassy areas; a savannah-like mosaic. Existing stands of Himalayan blackberry can be gradually removed and replanted with shrubs that are more desirable. Open pastureland can be planted in some areas to recreate the thicket-grassland mosaic. In addition, riparian plantings along Mt. Scott Creek can ultimately replace the blackberry thickets that currently dominate the streambanks.

- Appropriate native tree and shrub plantings and where to install them should be based both on their potential wildlife value, and on their likelihood for successful establishment and growth. Appendix B is a list of species that are appropriate for use on the site in different areas, along with their preferred growing conditions. Specific recommendations can be made from this list for targeted areas when funding becomes available for plant material procurement and installation.

The following section includes information on soil water and nutrient conditions as they affect planting success.

2.1.1 Soil Conditions for Optimum Plant Growth

Soil Water

Soil water capacity will not vary greatly in the surface soils across the site, but the water tension during dry periods will be higher in areas of Borges silty clay loam, relative to areas of Powell silt loam. The Borges soil is mapped throughout the central portions of the site (including the northeastern corner) while the Powell soil is found in the northwest and southeast portions of the site (see SRI/SHAPIRO report, 1997). Plantings in clay-rich surface soils (Borges) should be species, which can tolerate low soil water potentials. Plants installed in silt loam overlying silty clay loam (Powell) will not be so affected by low pressures, provided they are growing in moist soil above the clay-rich horizons. Some species (e.g. *Crataegus douglasii*) which are adapted to seasonally wet environments may be especially suited to life in the clay-rich areas.

Areas where the clays maintain water content above the shrink-swell threshold are tighter and less fractured than areas with seasonal drying. Plant root growth within this soil will be slower than in the more fractured soils developed under shrink-swell conditions, but plant roots will not be subjected to the mechanical strain of shrink-swell which makes establishment of many woody plants difficult in such soils.

Portions of the site west of the pond generally have a flatter water table than the areas to the east, and most likely experience lower seasonal water table changes. The smaller seasonal fluctuations in these areas (along with relatively low soil water tensions for a given water content) will allow a variety of woody plants to thrive.

- The potential for summer drought requires that plants be installed during the dormant season (late fall to early spring) in order to gain adequate root growth for survival. Plantings should be installed as early as possible to permit maximum root growth prior to high summer transpiration demands.

Soil Nutrients

Soil acidity in the Borges silty clay loam is generally in the 5.0-6.0 range, favoring a high cation exchange capacity. Nutrient deficit around the plant roots will not be a long-term problem for these soils if there is a sufficient initial quantity to support woody plants. Continued growth of grass cover on the revegetated areas will keep the important nutrient cations within the shallow soil horizons where they can be seasonally available to woody plants during the fall to spring period.

The Powell silt loam has generally less cation exchange capacity and more cation mobility within the soil profile than in the tighter clay soils. Many woody plants are more easily established in these soils than in the clays. Much of the loess is weathered deeply enough to have some clay illuviated within the soil profile. Some iron and manganese movement is evident near drainage swales, but most of the soils examined do not appear to have highly cemented layers, which would retard the flow of soil water or growth of plant roots. Exchange of nutrients within the soil will occur over a scale of several feet.

- Initial application of added nutrients may be useful for plant establishment, but continued fertilization should not be necessary after the initial growth season.

The existing grass cover will form an important buffer for plant nutrients within the upper horizons of the soil, but will also compete with small installed woody plants for available light.

- Covering the soil around the plants with a permeable dark fabric will prevent growth of most competing grasses and weeds. It will also effectively increase the radiation absorption to the soil around the planting and accelerate root growth during the low soil temperatures typical of the dormant season. Higher soil temperatures in the summer will encourage growth of plant roots deeper into moister and cooler soil.

2.2 Enhancing Site Hydrology

Currently, site hydrology is subject to relatively extreme seasonal variations, with groundwater levels dropping rapidly as the summer dry season progresses. This rapid transition is most pronounced in areas with a near-surface hardpan, which can limit the availability of regional groundwater to the surface, despite an often saturated surface layer during wetter periods. Portions of the site having old drain tile lines are also subject to premature dewatering of the surface soil horizons, putting additional stress on plant communities.

2.2.1 Disruption of Drain Tile Lines

Several areas of the field south of the Mt. Scott Creek drainageway are currently subject to partial drainage from old drain tile installations. These areas contain hydric soils, but have been sufficiently altered hydrologically to marginalize wetland plant communities.

- The breaking of tile lines will significantly influence the hydrology in the eastern part of the site. The effect will be most pronounced near the downstream edge of the outcrop of the Borges silty clay soils. Water flow near the dipping clay layer may be higher than at any other region of the site. When the lines are broken, the water level will rise toward the surface, reducing water level fluctuations over time.

- Plantings should not be scheduled for the areas affected until well after disruption of the lines, to allow time to monitor changing soil moisture conditions.

2.2.2 Water Control Structures

Enhancing the existing weir/dam on Mt. Scott Creek below the pond would involve raising its height to impound more water. Backing additional water behind the dam may have limited effect along steeply banked portions of the pond, though shallow areas on the south and east sides would be inundated.

- Raising the weir height by more than 18 inches is not recommended without an engineering study to assess risks of failure.

Greater open water area may attract a variety of waterfowl, especially during migration. Greater water depths may also favor certain aquatic plant and animal species. It is unlikely, however, that the greater depth would provide a distinctly different aquatic habitat for fish, given the seasonal fluctuation of streamflows, lack of flushing stormwater flows, and the silty substrate. Slight cooling of water temperatures may result from the increased depth, especially after additional shading from new plantings becomes a factor.

- Installation of additional water control structures may be warranted in smaller swales in order to slow the rate of runoff. These structures may be as simple as single log dams or earthen berms, and will primarily affect local plant communities.

2.2.3 Shallow Excavations in Existing Wetlands

Shallow excavation activities in hydric soils can enhance limited areas of the site, especially in the southeastern field, depending on the success of drain tile disruption.

- Excavating topsoil (to depths of less than one to two feet below the surrounding grade) can create shallow pool habitats in areas now relatively flat and without hydrologic or species diversity.

Areas that pond for longer periods during the growing season will support a different community of plants (typically of FACW to OBL wetland status), which can enhance the diversity of wildlife making use of the site. The control of nuisance weedy species may constitute a significant management problem, however, following site disturbance of this nature.

2.3 Nuisance Plant and Animal Control

Most of the site has been subject to past agricultural activities, negatively affecting its structural and species diversity. In addition, extensive areas have become dominated by nuisance non-native plants such as Himalayan blackberry. Though much of the area has been recently cleared of former thickets, long term management of these plants is required to prevent their continued dominance of the plant community. In addition, dominant grassland plants are typically non-native and strongly competitive; measures may occasionally be necessary to keep them from outcompeting newly installed trees and shrubs.

2.3.1 Management of Woody Vines

Much of the site has suitable seasonal hydrology and soil conditions for the establishment of Himalayan blackberry plants. Canes may become established as small clumps in open areas between larger groups of woody plants.

- Frequent trimming of the shoots will keep blackberries under control, but they will need to be cut at least four times during the growing season to keep the shoots from effectively competing with the grass.

- Another option for control of blackberry shoots is the local use of herbicide. Immediate application of concentrated glyphosate to the surface of freshly cut stems during the month of September will kill the root system through the winter with a minimum of environmental toxicity, and without the necessity of disturbing the soil to dislodge the root system. Refer to the Pacific Northwest (PNW) Weed Control Handbook (1997) for suggested rates and precautions when using herbicides.

2.3.2 Management of Invasive Shrubs

Drier areas of the site are likely to be invaded by Scots' broom. Seed production from these plants is so prolific that any healthy plants in the area are likely to provide a source for other portions of the site if not removed. Seed dispersal occurs early in the season so that cutting and killing the plants should be done before the seedpods mature in midsummer.

- These plants may be controlled by an aggressive cutting program, requiring repeated treatments. However, the topical application of herbicide to freshly cut stems will keep the plants from re-shooting. Refer to the PNW Weed Control Handbook (1997) for suggested rates and precautions when using herbicides.

2.3.3 Management of Grassland Communities

Local disturbance of the turf and the addition of fertilizer from the container plants will probably induce the growth of weedy species near the plantings. Local temperature changes caused by weed mats placed around the new plantings may also affect the growth of weedy species in the immediate vicinity of the mat.

- Mowing newly planted areas in October may help control weedy growth, especially of winter annuals through the early spring, until perennial grasses can re-establish cover over the mown sites. Since mowing will alter competition among the established grasses, the site should not be mown after the desired plants are established.

- Covering the soil around each new tree or shrub with a permeable dark weed control fabric will prevent growth of competing grasses and most broadleaf weeds. This weed control fabric is readily available from nursery suppliers, typically in 3 or 4 foot squares.

- If the weeds immediately around the mat are taller than the woody plantings, trimming the weeds may be necessary in mid-summer. We recommend that the weeds are cut, rather than disturb the root zone around the plantings, which would likely encourage the growth of additional weeds.

This type of low-intensity management will help the undisturbed turf species around the planting to restabilize the locally disturbed soils following planting. If not dislodged by wind, weed mats can remain in place until the woody plants reach a height of twice the mid-summer growth of the surrounding vegetation. The only possible hazard with the continued presence of the weed mats is the excellent cover they provide for small rodents, which may nibble the cambium of the trees and shrubs during colder weather. In this grassy field, the difference in cover between the mats and the usual grass thatch is probably too small to be noticeable under most conditions.

2.3.4 Management of Broadleaf Weeds [Weedy Biennials and Annuals]

In the absence of mowing, soil disturbance, or added nutrient supply, infestation by annual or biennial weeds within well established pasture areas is unlikely to be a major problem. Where the established turf is freshly disturbed for restoration plantings, however, these weeds are more likely to compete with the new plant community. Control measures may be necessary to aid establishment of the native community, a process that may take several seasons.

- Selective cutting of the taller weeds when these plants are at full height, but before the seeds mature (probably in mid to late June) will keep these plants from becoming a major competition to the desired plants.

- In case of a widespread infestation, an integrated pest management plan (IPMP) should be developed before using control methods. Scheduled mechanical control, release of an approved biological control agent, or closely targeted spot treatment with a wetland-approved herbicide may all be preferred options. Refer to the PNW Weed Control Handbook (1997) for suggested rates and precautions when using herbicides.

2.3.5 Management of Potential Rodent Impacts on Plants

Mice are now abundant in the grassland and will probably continue to thrive on the abundant seed supply. They may nibble on some cambium of the plantings, but the effects will probably be minor. Aquatic rodents will have a much greater effect on vegetation around the wetter areas. If present, nutria will eat emergent plants near the pond, but are not likely to bother with woody vegetation.

Beaver, however, could have a much greater effect on trees and shrubs, newly installed or otherwise. Though not known to be active in the area at present, they may be in downstream areas and could recolonize the area in the foreseeable future. Their predation can be lethal to newly installed plantings within the first growing season, but are less likely to have a lasting effect on plantings with an established root system, since their preferred food plants are ones which will re-shoot from an existing root system (i.e. willows, alder, cottonwood).

- If the predations become a serious problem, the new plantings can be protected from beaver predation by three-foot high wire fences around each trunk. The fencing should remain in place until the plants are well established.

Another consequence of beaver activity can be the abrupt changes in water table depths resulting from ponding behind dams. New plantings in the immediate vicinity of the pond may respond quickly (and negatively) to the rising water table.

- Installing a water level control device (i.e. a bypass siphon pipe) in a dam will lower the pond level, reducing the impacts to existing vegetation. Such a device is preferred to simply removing the dam, since beaver would most likely simply rebuild the dam.

In any case, the presence of beavers along the Mt. Scott Creek drainage could have desirable consequences for hydrologic control and water quality functions in the Happy Valley area.

3.0 ENHANCING STREAM AND POND HABITATS

As previously discussed, the presence of beavers could significantly enhance the site's riparian values by retaining water behind dams. Beaver ponds can benefit riparian systems by raising water tables, moderating stormwater pulses, and providing additional aquatic habitat. In the absence of beaver, however, similar benefits can be attained by raising the weir height that controls water levels in the existing pond (previously mentioned in Section 2.2.2). Smaller water control structures may also be considered at both up- and downstream locations to slow runoff rates and provide local areas of ponding. These structures can be effective even when simple in design and/or materials.

- Placement of single or stacked cedar logs, well anchored into channel or swale banks, may be effective to dissipate energy and create small pools. To maintain a clear channel path and avoid siltation and failure of the log structure, a partial gap or separate log tines extending out from each bank may be preferable at some locations.

- Bioengineering techniques can be used to improve bank stability in areas currently prone to flood scour. Anchoring root wads or brush mats into the bank at locations subject to excessive scour can protect the bank, help stabilize soils, and allow vegetation to become established. Live willow stakes can be used directly on streambanks, or installed in tight rows across a shallow swale, to provide resistance to floodwaters and add vegetative structure.

- Installation of structural elements into the existing pond can enhance fish, herptile, and invertebrate habitat. Placement of logs or brush piles that extend outward from the pond bank can provide cover and organic material for aquatic species as well as sunning spots for turtles, etc.

- Adding game fish to the pond and stream areas is not advisable at this time. Structural enhancements such as alteration of hydrology, along with the existing silty conditions, make the pond and stream more suitable for a variety of warm or slow water species, as opposed to salmonids. While salmonids such as cutthroat may be present further downstream, the pond area is unlikely to support a regenerating population.

- Construction of a trail system may be desirable to aid and/or direct movement of park visitors through sensitive areas while minimizing damage to soils and plant communities. Especially wet areas may warrant a raised boardwalk to lessen impacts. Viewing platforms or blinds can be erected at strategic locations adjacent to the pond and along the creek to allow viewing of wildlife; dense plantings around the platform or blind will help minimize disturbance to resident wildlife.

4.0 REGULATORY CONCERNS

Activities in the park that require the removal, filling or movement by artificial means (alteration) of material within wetlands or the bed or banks of Mt. Scott Creek or any of the wetland areas requires a permit from the Oregon Division of State Lands (DSL) and the US Army Corps of Engineers (COE). DSL does not require permits if less than 50 cubic yards of material is removed or filled in a wetland. The COE has no such threshold.

The Oregon Division of State Lands regulates wetlands and water resources in Oregon under the Removal-Fill Law (ORS 196.800-196.990) and the US Army Corps of Engineers through Section 404 of the Clean Water Act.

For restoration projects that require the removal or filling of wetlands, the state has authorized a general authorization (GA). The GA is an expedited permit process, intended to encourage applicants such as the City of Happy Valley to create, restore, or enhance wetlands. The process requires less regulatory scrutiny than the usual individual permit issued by DSL. Coordination is required with the local representative of the Oregon Department of Fish and Wildlife and the application must be mailed to other state agencies. However, permits will usually be granted in 3 to 4 weeks.

The COE issues two forms of permits for wetland projects: the Nationwide Permit (NWP) and the Individual Permit. There are 35 Nationwide Permits generally issued for specific activities in wetlands such as utility line construction, minor road crossings, mining activities, etc. NWP 27 is for Wetland Restoration and Creation Activities and is a parallel to the state's GA process. This Nationwide Permit requires a similar amount of documentation as the GA and usually takes a similar amount of time for the COE to issue.

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Appendix A
Technical Report

1.0 TOPOGRAPHY AND SOILS

The park site is located near the eastern edge of Happy Valley, a broad gently sloping terrace formed in hilly terrain east of Portland. The park lies at an elevation of approximately 460 to 470 feet mean sea level (msl), above the upper limits of the multiple Pleistocene flood events (the last occurring over 11,000 years ago) which deposited massive volumes of fine silts and clays at lower elevations in the Portland Basin. The soils on the site are primarily formed in windblown silt or *loess* (derived from glacial rock flour) which probably originated from these Pleistocene flood deposits.

Alluvial clay horizons found at greater depths in the soil profile may represent weathering products from the Boring basalts, formations which constitute the dominant rock in the hills directly east of the site. These clays tend to be at greater depths than would be expected from downward movement of in-situ clays within the present surface soils. The alluvial clays may represent periods of intense weathering or perhaps volcanic activity during the period of glacial loess deposition.

1.1 Soil Sampling Methodology

Site soils were sampled at eleven points along three transects; the approximate location of each sample pit is shown on Figure 1. Each sample pit was cored using a 3-inch diameter bucket auger, which provided soil profiles to depths of up to 76 inches.

1.2 Site Soils Description

The Natural Resources Conservation Service (formerly SCS) has mapped both the Powell silt loam and Borges silty clay loam on the site (Figure 1). The Powell soils are Typic Fragiumbrepts (mapped in the northwest and southeast portions of the site) which have formed in the silty loess which blankets much of the region. These soils have horizons of densely packed silt fragipan variously arranged within the loess. Detailed examinations of the silt mineralogy and stratigraphy elsewhere in the region suggest that the silt deposition may have occurred in several distinct episodes, with intervening periods of weathering. The Borges soils (Typic Humaquepts) occupy a broad concavity extending southward to Mt. Scott Creek in the eastern reaches of the site. These alluvial silty clay deposits typically form belts of low permeability within the surrounding Powell loess soils. Onsite examination of near-surface clay layers suggests that the Borges soil does not extend onto the site as far as previously mapped by the NRCS (Figure 1).

The silty surface horizons are essentially uniform throughout the site; however, depths to clay-rich layers (when present) can vary considerably. Differential erosion of clays from the nearby hills to the east is responsible for the clay horizon varying in thickness, and possibly in clay mineralogy as well, throughout the site. The permeability of the clay is so low that the presence of a clay layer as thin as 10 inches may be sufficient to alter the hydrology significantly.

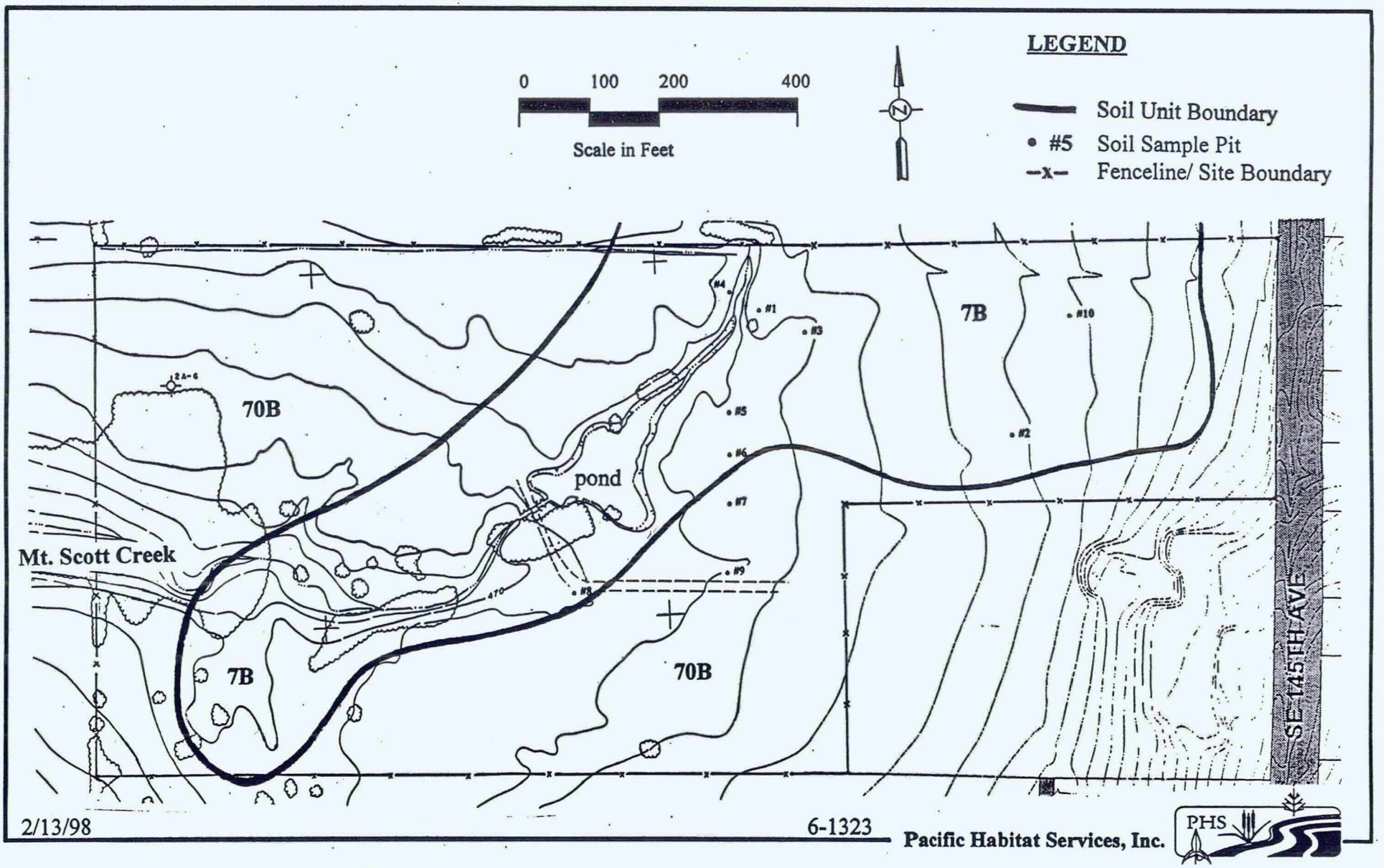


Figure 1. Soil units as mapped by SCS, and locations of soil sampling pits on the City of Happy Valley restoration site. Mapped soils include Powell silt loam (#70B) and Borges silty clay loam (#7B).

The principal variation in site soils is depth to the clay horizon, which is generally at greater depth towards the west. North to south variations in soil densities may be due to variation in the density of loess deposition. The south side of the site shows less variation in clay depth, relative to the steep gradient of the silt depth near the northern edge of the site. This may be due to some variation of the weathering regime during the interglacial period, or perhaps to a fluvial sedimentation regime during the same period.

The swale in the northeastern portion of the site (now dominated by cattails) appears to be a landscape expression of an outcrop of the Borges silty clay loam. The clay is not seen in corings to the west of the swale. The north -south expression of the clay horizon is at variable depth, possibly reflecting interglacial drainages from the volcanics to the east of the site. Correlation between the silty clay horizons in hole #3 and #5 suggest that this may represent the edge of an ancestral tributary drainage feature to the east. The silty clay horizon lies at greater depth toward the southern portion of the site, although the surface horizons have textures which suggest a history of upper soil disturbance in this area.

Density of the clay horizon is not so high that aeration does not occur within the horizons. Fine mottling (on a 1 millimeter scale) is seen within most of the clay layers. The development of mottling is limited, but apparently the clay is aerated at certain times. Soils at some southern locations have platy structures within the silt loam, especially near its interface with silty clay horizons at depth. These features suggest a history of wet loading of the soils, not inconsistent with the rumored history of the site as an airport. All corings made south of the pond suggest a recent history of soil compaction along the southern border of the site.

Soil acidity in these clays generally lies in the 5.0-6.0 range (buffered by soil bicarbonate- HCO_3^{-1}). Most of the clay mineral cationic surface sites will be protonated at this pH and the local soils will have a high cation exchange capacity (i.e. well suited to fertilizer use). Gross variations in soil chemistry across the site are probably limited, although there may be some local differences in the silty clay loams that have weathered out of the Boring volcanics. These soils are lower in phosphate and potassium than most of the surrounding soils. The windblown silt of glacial origin over most of the site is relatively homogeneous in bulk chemistry with only minor variation post-glacial weathering.

The northeastern corner of the site has a relatively steep silt-to-clay surface gradient, which strongly affects the local hydrology. Water flow through these soils appears to be bounded by the basal clay horizon (which is thinner here than near the lower wetland areas to the west). Silt deposition on top of the clay reaches a thickness of 4 to 5 feet along the eastern margin. The silt thickness decreases downslope; an outcropping of the clay horizon defines the edge of the Borges soil. More silt lies beneath the upper clay horizon, with a second clay horizon reached at the deepest point sampled (at 76 inches below the surface).

2.0 SITE HYDROLOGY

2.1 Site Hydrology Sampling Methodology

A total of 26 groundwater monitoring wells were installed by the City of Happy Valley during summer 1997 to monitor seasonal water table variations across the site (Figure 2). Each well installation consisted of a single slotted PVC pipe set a minimum of 3 feet deep in a sand-filled bore pit. This design does not allow for the distinction of groundwater movement above and below the Powell fragipan, but nevertheless will show regional groundwater recharge/discharge characteristics. Arrangements were made by the City to have students from the adjacent public school measure water table depths at each well, as part of class or special projects.

After initial settling of the monitoring wells, water level measurements as of December 1997 have documented the recharging of groundwater levels in conjunction with fall rains. The aquifer geometry is reflected in the filling rates of the water table at the different monitoring well locations; Figures 3 through 7 illustrate groundwater fluctuations along several well alignments. Since the data collected thus far can only indicate water table depths during a short recharge period, establishing the direction of groundwater flow at a particular location may be speculative at best. The following discussion describes the apparent hydrologic regime across the site based on the data collected to date.

2.2 Site Hydrology Description

Monitoring wells in the eastern part of the site show water movement through silt loam soils constrained by silty clay loam horizons. Wells located in areas having thicker silt loam horizons show lower rates of recharge than those located at the edge of the constraining clay-rich layers. Wells #12, #15, and #18 show steeper charging rates than wells #11 and #14, likely due the shallow clay horizon. Soils east of the pond having a silt layer over a clay-rich layer (such as near wells #10 and #11) show a relatively slow, yet nearly linear, charging rate.

The northwestern edge of the site lacks the near-surface silty clay horizon, showing a much lower charging rate than that occurring to the east (see wells #4, #5, #6, #23, and #25). The northeastern edge of the site, however, appears to have sufficient flow across the surface to maintain a relatively constant shallow water table through most of the year (see wells #17, #19, and #21). Water levels along the southeastern fence line do not seem to have changed greatly with time; this area of the site has a shallow clay horizon (see wells #13, #14, and #19).

The topographic gradient from the northeastern corner of the site defines a hydrologic gradient with respect to clay horizons within the soil profile. Water trapped between clay-rich layers may determine much of the water transport through the site. Groundwater flow in the northeast corner of the site appears to travel along the top of a clay-rich horizon which lies at depth beneath a layer of silty loess. Local changes in the thickness of the clay-rich horizon on

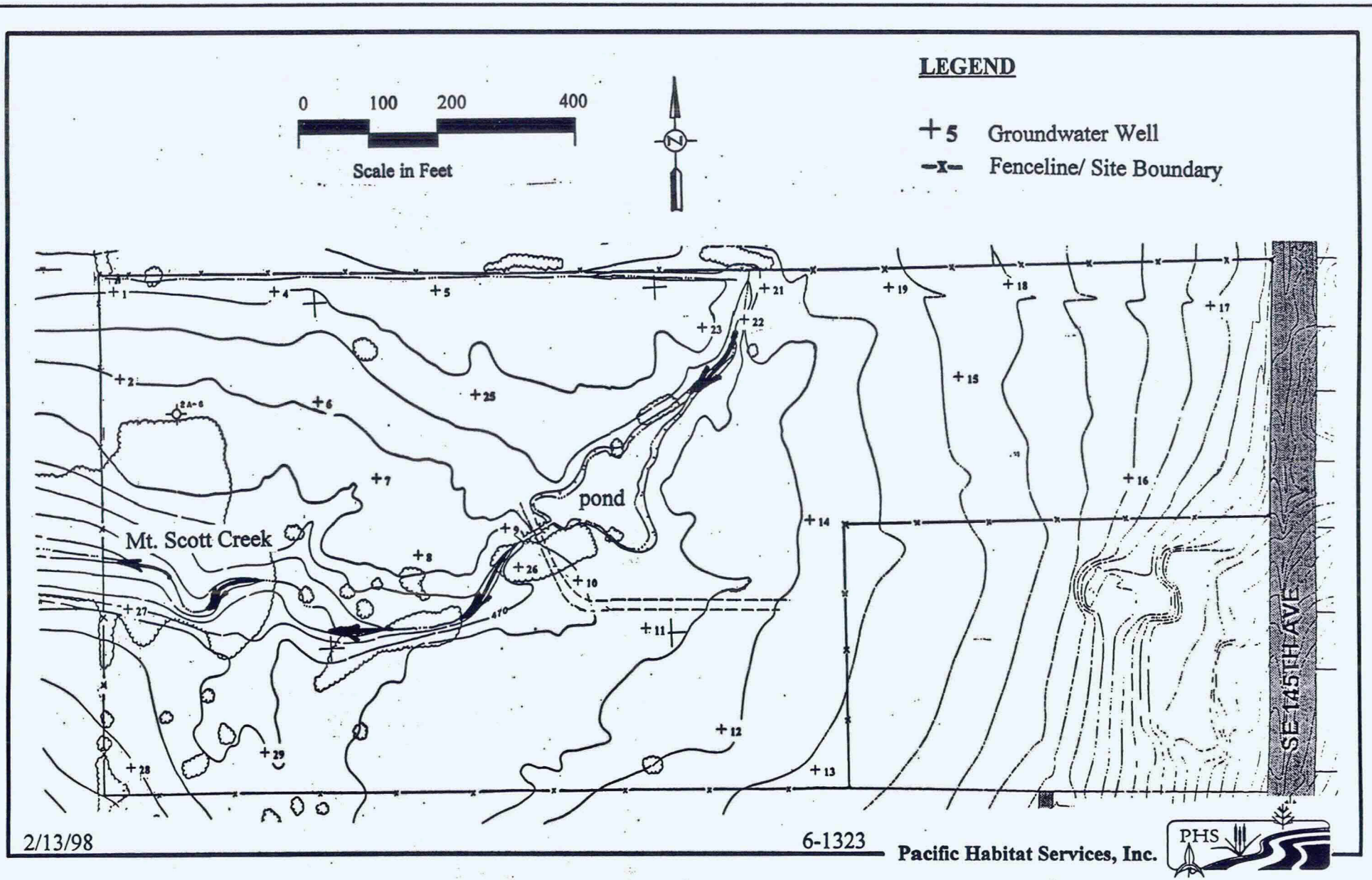


Figure 2. Surface water features, and locations of groundwater monitoring wells on the City of Happy Valley restoration site in Happy Valley, Oregon.

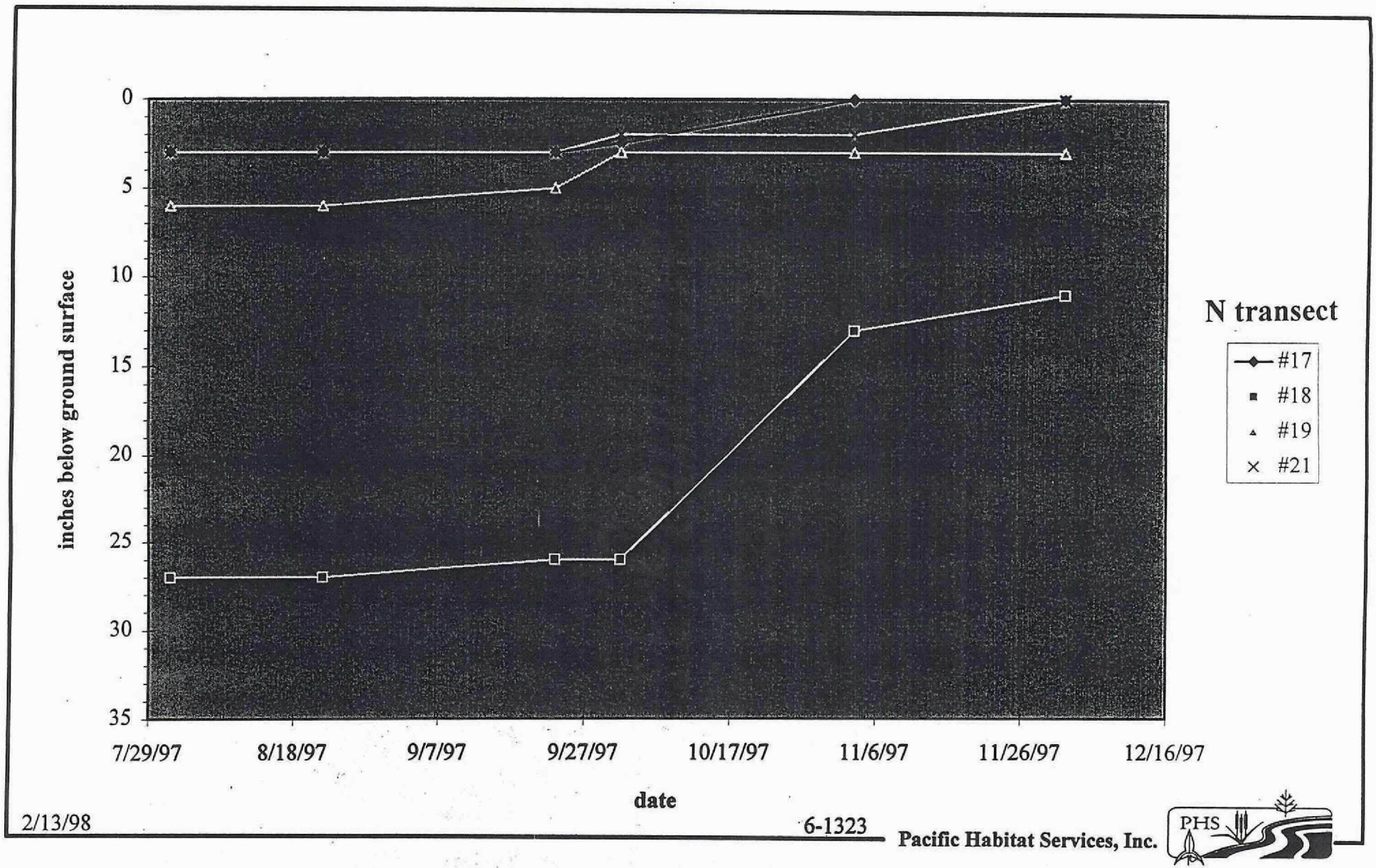


Figure 3. Groundwater fluctuations during Fall 1997 on the City of Happy Valley restoration site. Transect includes wells 17, 18, 19, and 21 along the site's northern edge.

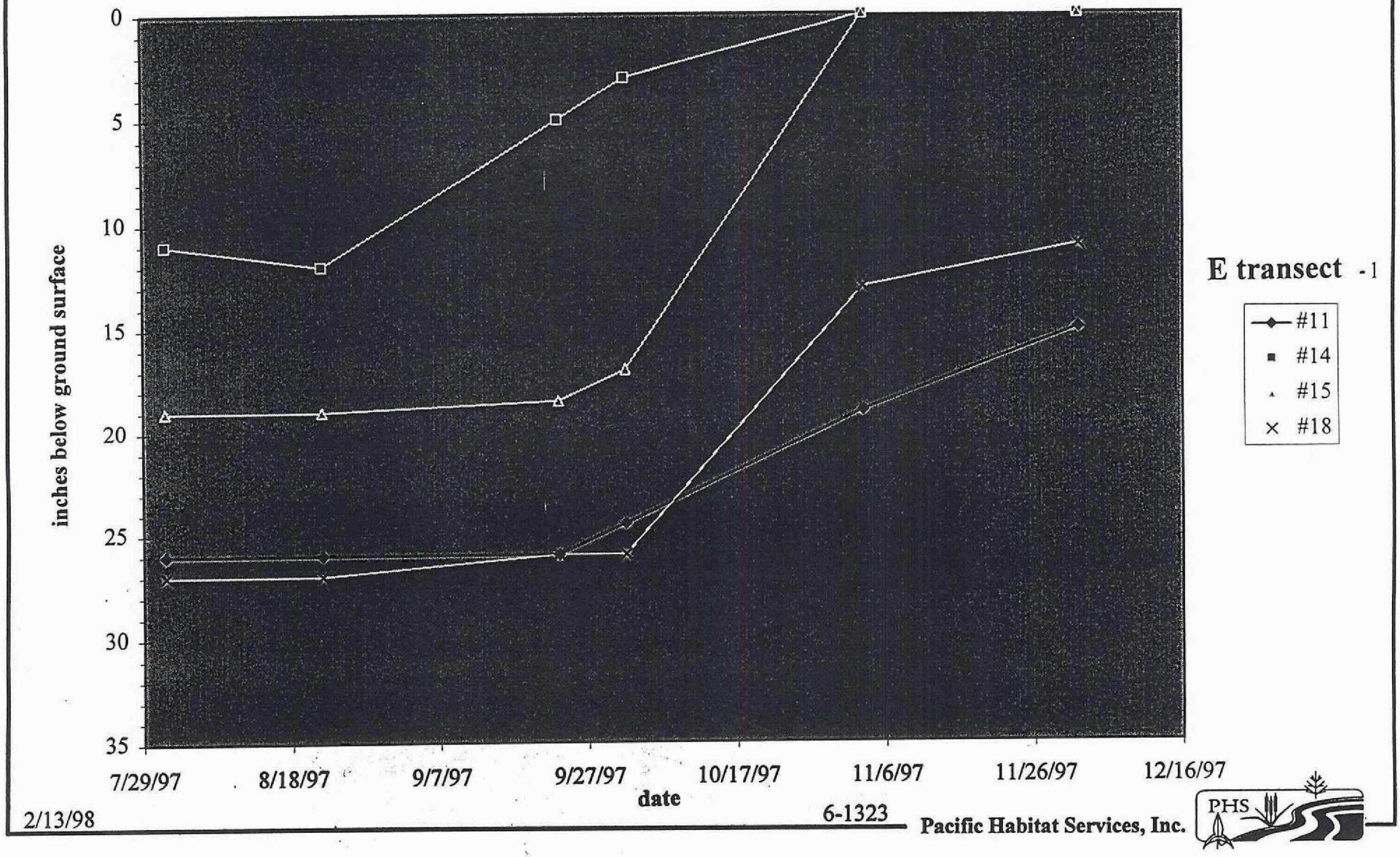


Figure 4. Groundwater fluctuations during Fall 1997 on the City of Happy Valley restoration site. Transect includes wells 11, 14, 15 and 18 in eastern portion of site.

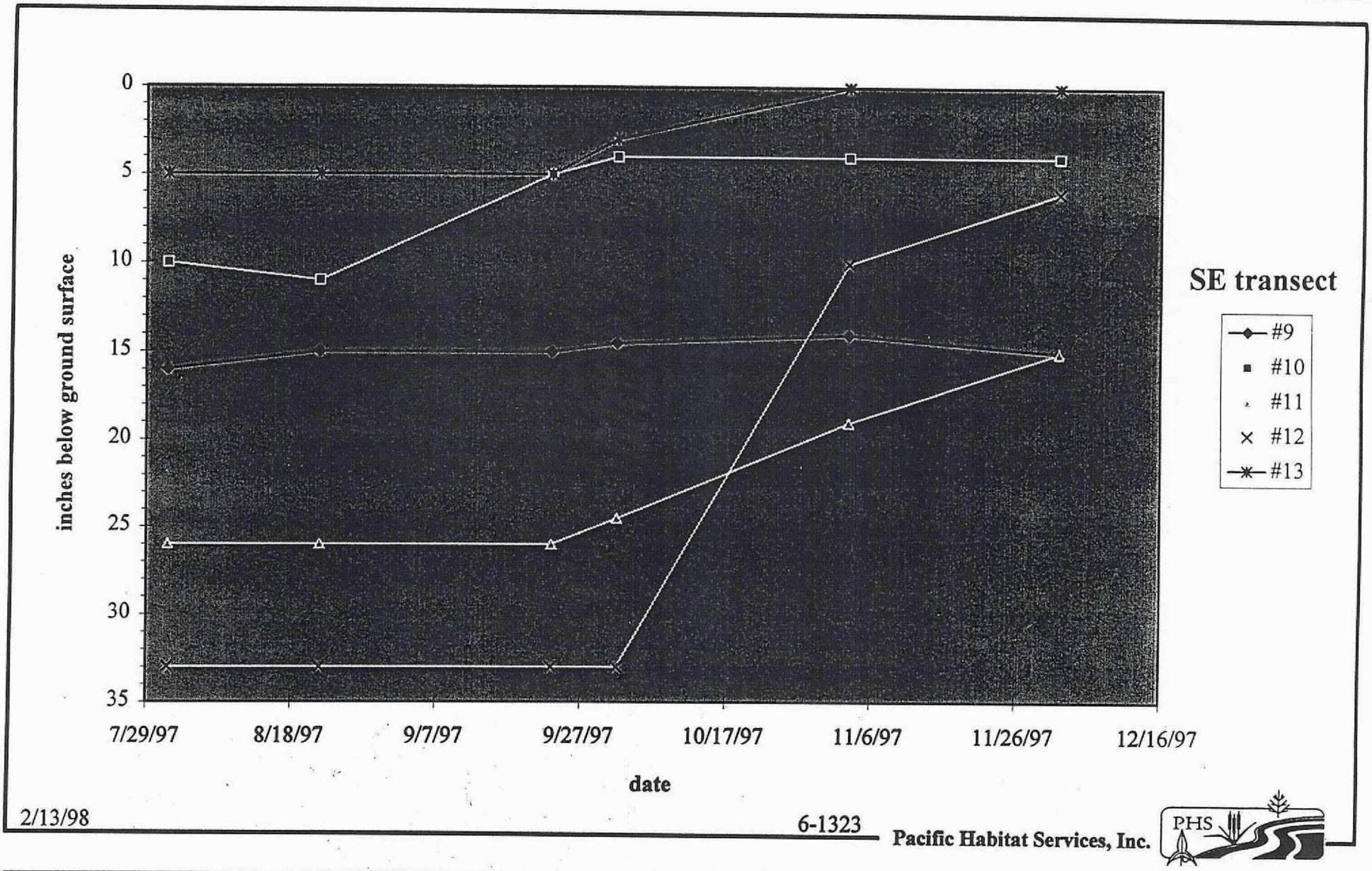


Figure 5. Groundwater fluctuations during Fall 1997 on the City of Happy Valley restoration site. Transect includes wells 9, 10, 11, 12, and 13 in the southeastern portion of the site.

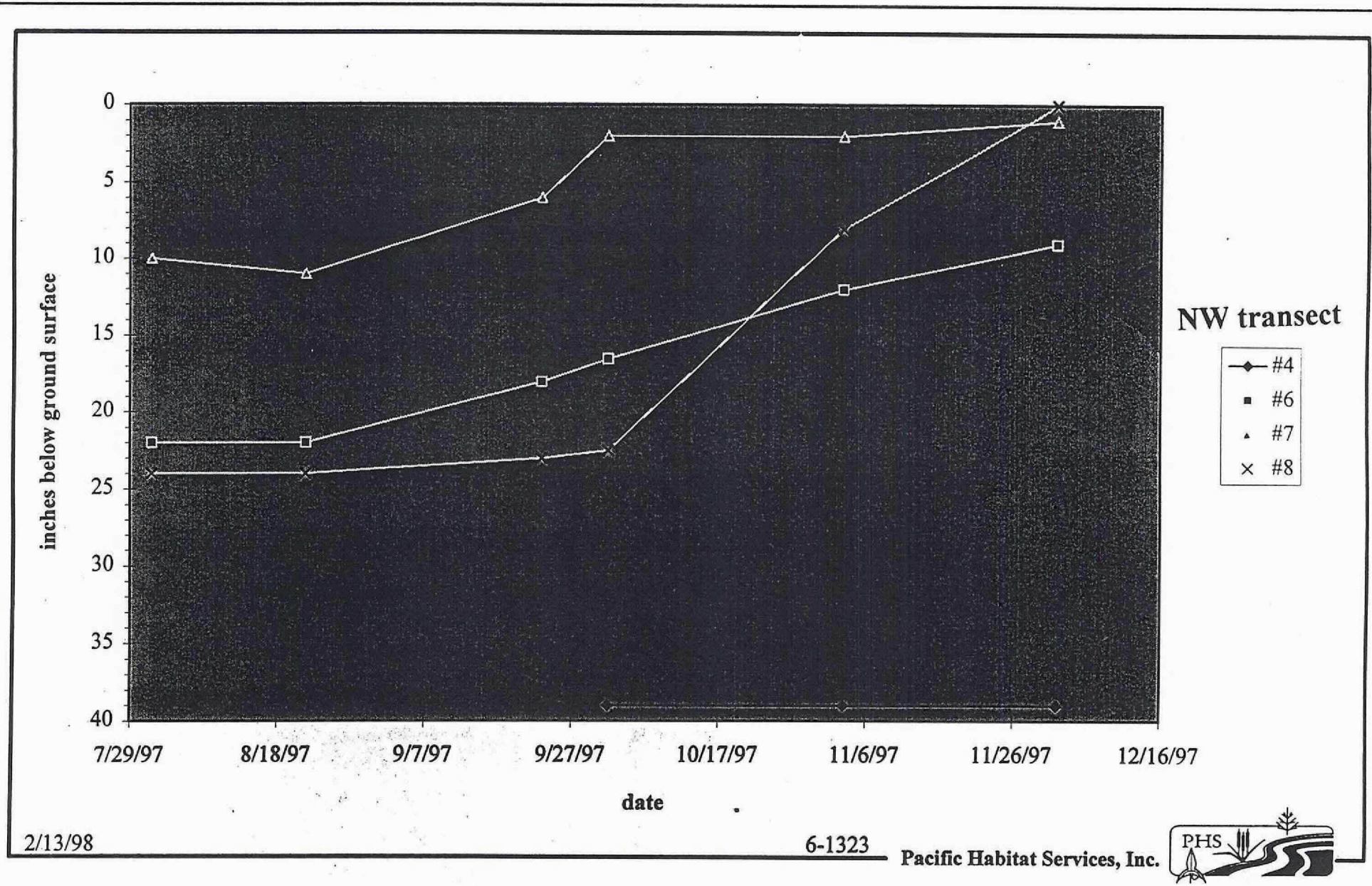


Figure 6. Groundwater fluctuations during Fall 1997 on the City of Happy Valley restoration site. Transect includes wells 4, 6, 7, and 8 in the northwestern portion of the site.

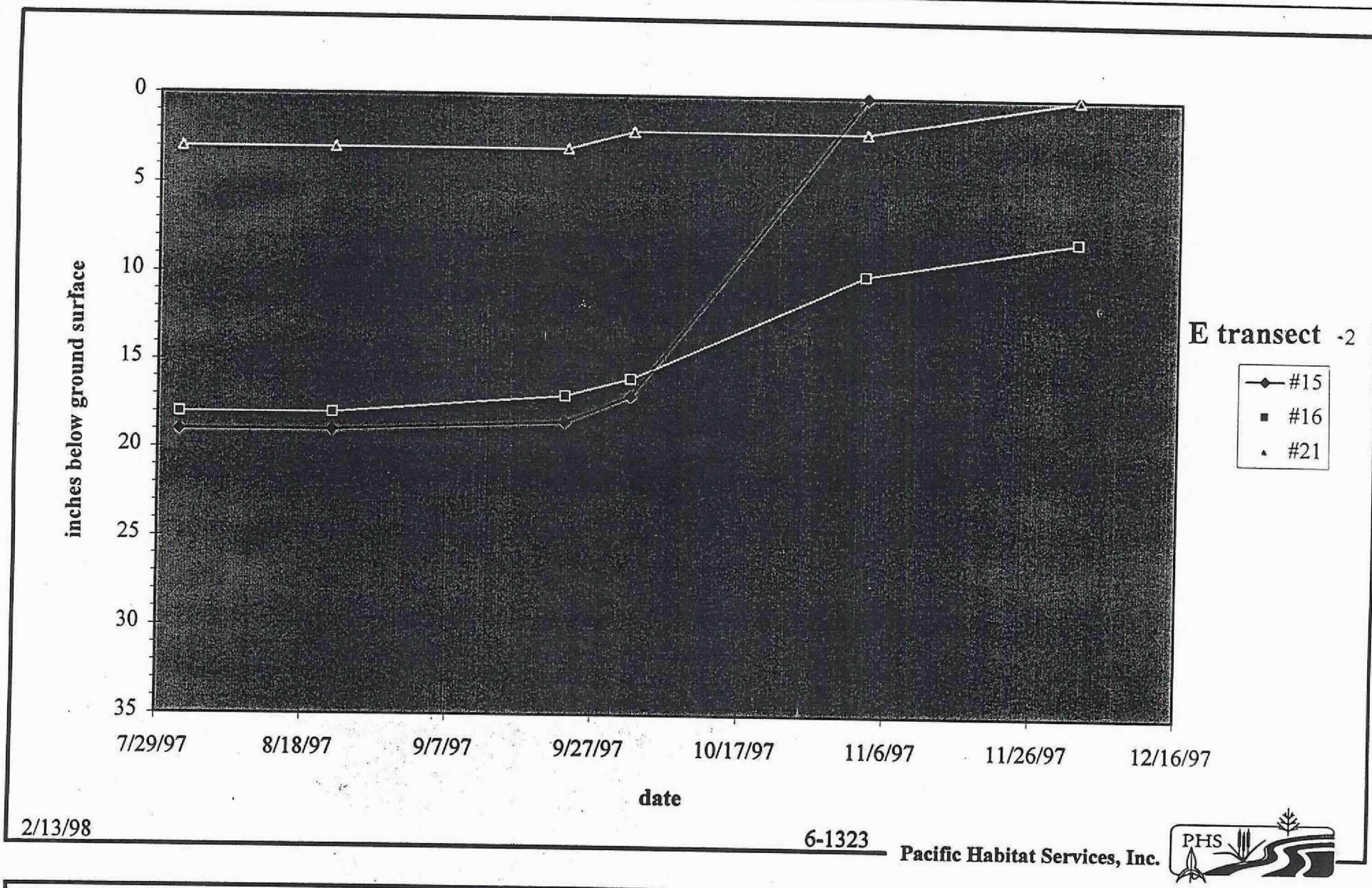


Figure 7. Groundwater fluctuations during Fall 1997 on the City of Happy Valley restoration site. Transect includes wells 15, 16, and 21 in the eastern portion of the site.

the northeast hillside may allow groundwater to rise from beneath the clay horizon at some locations. Occasional wet spots on the east slope may be due to these variations.

Both the topographic and hydrologic gradients are lower in the southeast corner of the property. In addition, the site has been tiled in the past as an agricultural drainage tool, with tile lines open to the surface at several locations. The tile is in the surficial silty horizons which have a relatively high conductivity. The long-term hydrology of this area depends more on the function of the drainage tiles than do the steeper portions of the site to the east. If the tile system were disrupted, the hydrology of this area would likely change toward a wetter condition.

The area immediately north of the school has a silty soil with a deeper water table through much of the growing season. Horizontal flow of groundwater through this area may be so small that the tile lines in this area may not greatly affect the surface hydrology through the summer.

Groundwater levels are typically subject to seasonal fluctuations, with variations greatest in areas where downward percolation through the soil is constrained by nearly impermeable clay-rich horizons. Water may be retained longer in these areas than where thick silty soils lack a significant fraction of expandable clay. Areas with discontinuous clay-rich layers, or which may be punctuated by drainage tiles, can also exhibit a sharp wetting threshold in late summer when the more permeable horizons go dry. Relatively permeable soils are less likely to exhibit sharp thresholds in drying.

The lower edge of the Borges soil may experience rapid seasonal changes in surface hydrology, with water welling up from beneath the clay layers. These variations will occur due to water potential changes in the confined permeable silt layer beneath the silty clay. The area immediately west of the Borges silty clay outcrop will tend to have more gradual seasonal changes in surface hydrology. Areas in the western reaches of the site seem to have a relatively stable seasonal hydrology, with only minor fluctuations in water table.

Summer winds will help dry soils at a slightly different rate in grassland than in shrub-sapling communities. Shrub communities are likely to favor drier soil conditions during the early summer than will grassland due to higher transpiration rates. Any discernible differences, however, will be even less noticeable at other times of the year. Changes in the early summer drying pattern would be most noticeable along the edge of the Borges clay-rich soils.

3.0 PLANT COMMUNITIES

The Happy Valley Nature Park site is comprised of a mosaic of riparian mixed conifer/deciduous forest, scrub/shrub thickets, and open meadow and pastureland. Hydrologic variations across the site have determined species composition to a large extent. In addition, historic land uses (primarily agricultural) have also fundamentally influenced

community composition. Agricultural activities have included periodic clearing and mowing, drain tile installations, pond excavation, weir construction, and grazing.

Large areas of the site are composed of palustrine wetlands which can be further distinguished as emergent, scrub-shrub, and forested (PEM, PSS, and PFO), following the Cowardin wetland classification system developed for the U.S. Fish and Wildlife Service (Cowardin, et al. 1979). Each of the above communities is described in the sections below. Each community is also depicted in Figure 8 as follows:

Map Unit	Habitat type
	Riparian mixed deciduous/conifer forest
A	upland
B	wetland **(PFO)**
	Scrub-shrub thicket
C	upland
D	wetland **(PSS)**
E	Emergent (herb-dominated) wetland **(PEM)**
F	Wet pasture **(PEM)f**
G	Upland pasture

A Riparian Mixed Forest--Upland

Upland mixed deciduous/conifer forest is located in relatively well-drained areas of the Mt. Scott Creek riparian corridor. Dominant overstory species include Douglas fir (*Pseudotsuga menziesii*) and Oregon white oak (*Quercus garryana*), with red alder (*Alnus rubra*) also present. Understory species in these areas typically lack diversity, since past disturbance has favored development of extensive thickets of Himalayan blackberry (*Rubus discolor*). The mature tree overstory along the creek typically lacks sufficient density or width to shade out the blackberries.

Where blackberry thickets have not completely crowded out the understory, shrub species such as Indian plum (*Oemleria cerasiformis*), salal (*Gaultheria shallon*), beaked hazelnut (*Corylus cornuta*), Oregon grape (*Berberis nervosa*), Saskatoon serviceberry *(Amelanchier alnifolia*), cascara *(Rhamnus purshiana*), baldhip rose (*Rosa gymnocarpa*), and California dewberry (*Rubus ursinus*) may be present. The herbaceous ground cover is typically represented by such species as sword fern (*Polystichum munitum*), bracken fern (*Pteridium aquilinum*), and a sparse selection of pasture grasses and forbs.

B Riparian Mixed Forest--Wetland (PFO)

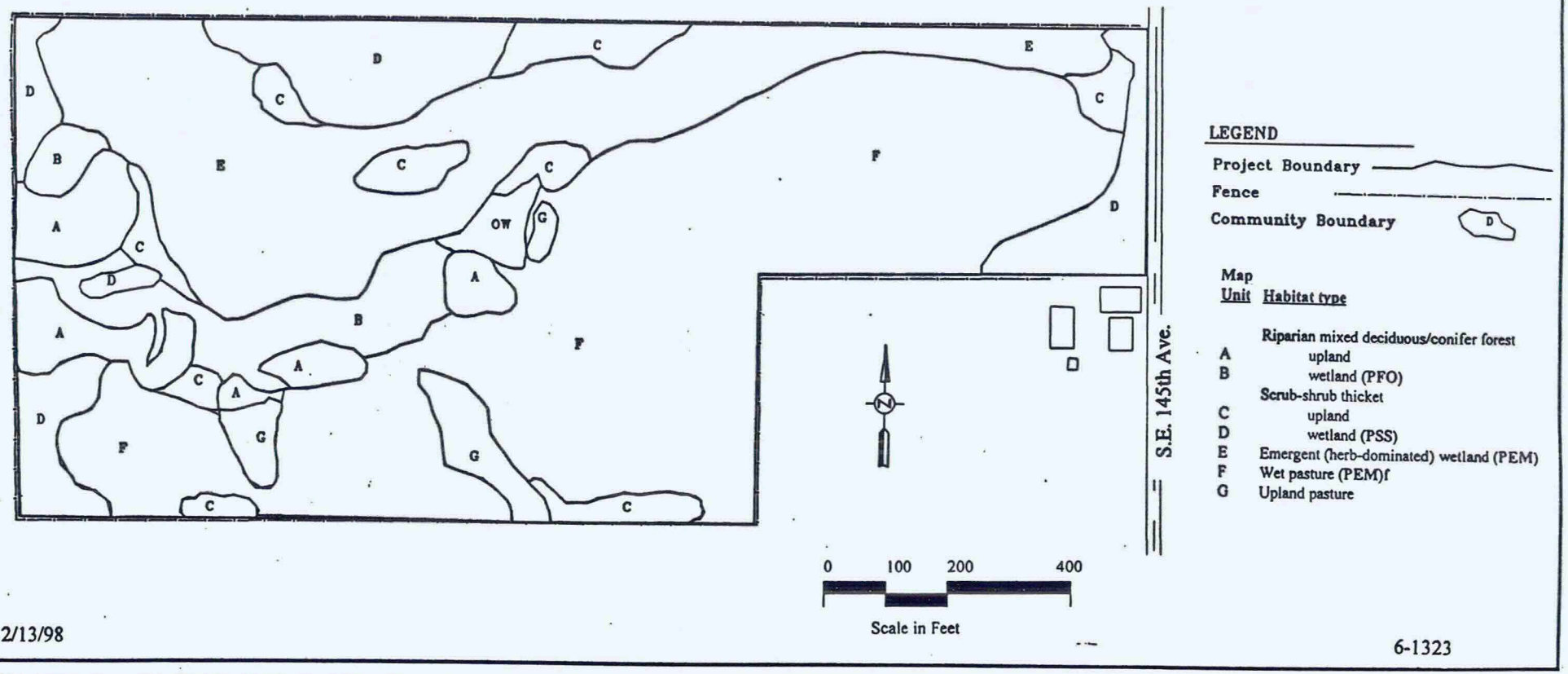


Figure 8. Existing vegetation community types on the City of Happy Valley restoration site in Happy Valley, Oregon.

Pacific Habitat Services, Inc.

The mixed forest in wetter portions of the riparian area is typically composed of red alder, Oregon ash *(Fraxinus latifolia)*, and Pacific willow (*Salix lasiandra*). The shrub layer may consist of such species as Pacific ninebark (*Physocarpus capitatus*) and willows; however, Himalayan blackberry is still the dominant species in these areas and has crowded out nearly all natives in some areas. Understory plants often include species from the following scrub-scrub and emergent wetland communities. The transition from riparian upland to wetland communities are often subtle, with some species present in both habitats.

C Scrub-shrub thicket--upland

Upland shrub thickets are located as widely scattered, relatively well drained 'islands' across the site. Dominant species include Himalayan blackberry, one-seed hawthorn *(Crataegus monogyna)*, and clustered and Nootka rose (*Rosa pisocarpa, R. nutkana*).

D Scrub-shrub thicket--wetland (PSS)

Palustrine scrub-shrub wetlands often include saplings of Oregon ash and Pacific willow, along with such shrubs as Sitka willow *(Salix sitchensis)*, clustered or Nootka rose, Douglas hawthorn (*Crataegus douglasii*), Douglas' spiraea *(Spiraea douglasii)*, and red-osier dogwood (*Cornus stolonifera*).

E Wet Meadow---Emergent wetland (PEM)

Palustrine emergent wet meadow areas are present primarily within and to the north of the riparian corridor and along the northeast property line. These areas have not been subjected to clearing and grazing activities as recently or as intensively as most areas south of the creek. Dominant graminoid species include small-fruited bulrush (*Scirpus microcarpus*) and slough sedge (*Carex obnupta*), which are dense in places; also common are soft rush (*Juncus effusus*) and cattail (*Typha latifolia*). Common forbs include smartweed (*Polygonum* spp.), American speedwell (*Veronica americana*), and creeping buttercup (*Ranunculus repens*).

F Wet Pasture (PEM)f

Most of the study area has been disturbed by historic agricultural activities, including clearing of vegetation, drain tile installation, grazing, and pond construction. Scattered shrub thickets have developed along fencelines and along the riparian area; however, most of the land in the eastern half of the site remains dominated by a mixture of pasture grasses and forbs.

Dominant pasture grasses in the wetter areas include meadow foxtail (*Alopecurus pratensis*), common velvetgrass (*Holcus lanatus*), and colonial bentgrass (*Agrostis tenuis*). Other common species include slender rush (*Juncus tenuis*), creeping buttercup *(Ranunculus repens)*, and dock (*Rumex* sp.).

G Upland pasture

Scattered small 'islands' of upland pasture are located primarily in the southern part of the site. These areas are dominated by such common pasture grasses as sweet vernalgrass (*Anthoxanthum odoratum*), colonial bentgrass (*Agrostis tenuis*), orchardgrass (*Dactylus glomerata*), timothy (*Phleum pratense*), and tall fescue (*Festuca arundinacea*).

Common herbaceous species include Queen Anne's lace (*Daucus carota*), vetch (Vicia spp.), English plantain (*Plantago lanceolata*), catchweed bedstraw (*Galium aparine*), and oxeye daisy (*Chrysanthemum leucanthemum*).

4.0 FISH AND WILDLIFE HABITAT ASSESSMENT

The Happy Valley restoration site currently provides a diverse habitat for a variety of species, despite its past agricultural history. Reliable water sources, relatively infrequent human disturbances, and a variety of plant communities offer year-round water and food sources, resting cover, and escape cover from predators. However, the proximity of human habitation, encirclement by roads, and presence of introduced predators (i.e. cats and dogs) has also likely limited the site's ability to support certain species.

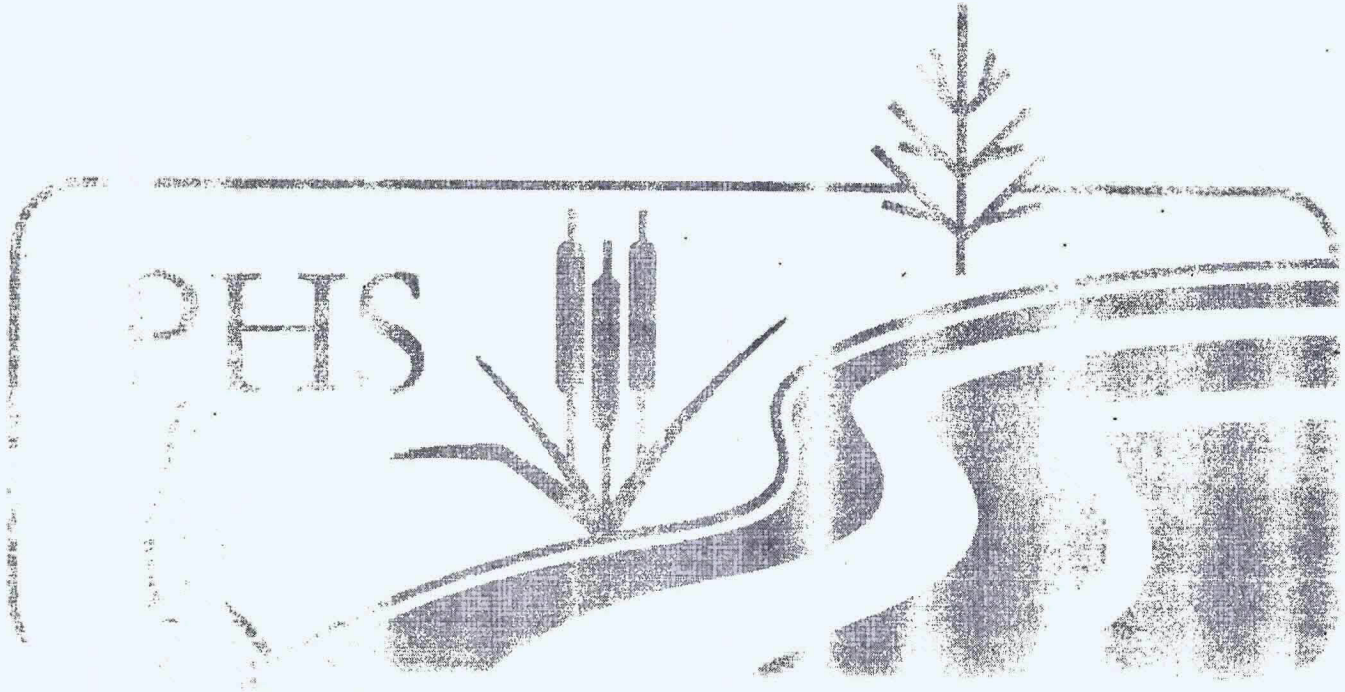
A methodical survey for the presence of specific fish and wildlife species on the site was not within the scope of this manual. However, given the site's mosaic of plant communities, certain species could be expected to make use of the site on at least an occasional basis. Vertebrates likely to be observed on the site include:

mammals: shrew, mole, bat, brush rabbit, deer mouse, Townsend chipmunk, gray squirrel, beaver, nutria, red fox, coyote, raccoon, weasel, black-tailed deer

herptiles: California newt, bullfrog, Pacific tree frog, red-legged frog, western pond turtle, northwestern garter snake

birds: song sparrow, house finch, black-capped chickadee, Oregon junco, winter wren, American crow, European starling, cedar waxwing, spotted towhee, tree and barn swallows, northern flicker, scrub jay, American robin, red-tailed hawk, killdeer, mallard, Canada goose

Appendix B
Plant List for Happy Valley Park



Suggested native trees and shrubs of high habitat value on the Happy Valley Park site. Note that some species may be appropriate in only a narrow range of habitats (i.e. well drained and shady vs. poorly drained and sunny)

TREES				
Scientific Name	**Common Name**	**Soil/Water**	**Sun/Shade**	**R9-Ind.**
Acer macrophyllum	Bigleaf maple	M/ SS to NW	full/partial	FACU
Alnus rubra	Red alder	M/ SF,PS,SS	full/partial	FAC
Cornus nuttallii	Pacific dogwood	M/ NW	partial/shade	UPL
Fraxinus latifolia	Oregon ash	M/ SF,PS,SS	full/partial	FACW
Populus trichocarpa	Black cottonwood	M/ SF,SS	full	FAC
Pseudotsuga menziesii	Douglas fir	M/ SS to NW	full	FACU
Quercus garryana	Oregon white oak	M/ NW	full	UPL
Thuja plicata	Western red cedar	M-O/ SF,PS,SS	partial/shade	FAC
Tsuga heterophylla	Western hemlock	M/ PS,SS	partial/shade	FACU-

SHRUBS				
Scientific Name	**Common Name**	**Soil/Water**	**Sun/Shade**	**R9-Ind.**
Acer circinatum	Vine maple	M/ NW	partial/shade	FAC-
Amelanchier alnifolia	Saskatoon service-berry	M/ NW	sun/partial	FACU
Berberis nervosa	Cascade Oregon-grape	M/ NW	partial/shade	UPL
Cornus stolonifera	Red-osier dogwood	M/ SF, PS, SS	sun/partial	FACW
Corylus cornuta	Beaked hazelnut	M/ NW	sun/partial	FACU
Crataegus douglasii	Douglas' hawthorn	M/ SS	sun/partial	FAC
Euonymus occidentalis	Western wahoo	M/ NW	shade	UPL
Gaultheria shallon	Salal	M/ NW	partial/shade	FACU
Holodiscus discolor	Ocean spray	M/ NW	sun/partial	UPL
Oemleria cerasiformis	Indian plum	M/ NW	partial/shade	FACU
Physocarpus capitatus	Pacific ninebark	M/ SS to NW	sun/shade	FAC
Prunus virginiana	Chokecherry	M/ NW		FACU
Rhamnus purshiana	Cascara	M/ NW	sun/partial	FAC-
Ribes divaricatum	Spreading gooseberry	M/ NW		FAC
Rosa nutkana	Nootka rose	M/ SS to NW	sun	FAC
Rosa pisocarpa	Clustered rose	M/ SS to NW	sun	FAC
Rubus parviflorus	Thimbleberry	M/ NW	sun	FACU
Rubus spectabilis	Salmonberry	M/ SS to NW	partial/shade	FAC
Salix lasiandra	Pacific willow	M/ SF, PS, SS	sun	FACW+
Salix scouleriana	Scouler's willow	M/ SS to NW	sun	FAC
Salix sitchensis	Sitka willow	M/ SF, PS, SS	sun	FACW
Sambucus racemosa	Red elderberry	M/ NW	sun/partial	FACU
Spiraea douglasii	Douglas's spiraea	M-O/ SF, PS, SS	sun/partial	FACW
Symphoricarpos albus	Common snowberry	M/ NW	partial/shade	FACU

LEGEND

Scientific Name: Follows Hitchcock and Cronquist (1976); synonyms may be encountered in the nursery trade.

Common Name: Follows Hitchcock and Cronquist (1976).

Soil: Mineral (M) or Organic (O)

Water: Typical water regimes:

PF-- Permanently flooded; surface water present year-round

SF-- Seasonally flooded; surface water present at beginning of growing season only

PS-- Permanently saturated; surface water is seldom present; saturation is always at the surface

SS-- Seasonally saturated; surface water is seldom present; saturation is present at beginning of growing season only

NW-- Non-wetland; typically well drained site, may be flooded for short periods (i.e. streambanks)

Light: Sun (full sun), Partial (mixed sun/shade), Shade (full shade)

Sources: *Hortus West*

Restoring Wetlands in Washington. A Guidebook for Wetland Restoration, Planning, and Implementation
Washington State Department of Ecology Publication #93-17

Appendix C
Bioengineering and Planting Suggestions

1.0 BIOENGINEERING

Bioengineering involves the use of organic, preferably living, materials such as willow cuttings in ways that promote long term slope and channel stability. Such time honored materials as riprap, concrete, and rock-filled gabions may provide the desired stability but lack habitat value and aesthetic appeal. In contrast, establishing a live cover of willows or other appropriate species along a channel can provide increasingly affective soil-binding root systems while also favoring habitat values such as stream shading, food, and cover.

Perhaps the simplest approach to providing additional stability along stream corridors is to install live cuttings, or stakes of willow or other fast-rooting species (Figure 9). Cuttings are typically available locally, and can be collected in quantity for a minimal cost.

In-stream structures can also be valuable in directing stream flows away from an eroding bank, or for dissipating stream energy. A live gully structure can be erected across a shallow channel to slow runoff velocities and act as a high-flow dam (Figure 10). The spacing of stakes will minimize silt buildup during the early stages of growth; however, woody debris will ultimately provide some detention. A simple log structure (Figure 11) will also slow runoff velocities and provide a shallow pool behind the log. Notching the log will allow lower streamflows to pass without silt buildup, and also direct the flow away from the banks.

2.0 PLANTING TECHNIQUES

Establishing native trees and shrubs on a site requires attention to soil water conditions, shade, and competing vegetation and herbivory, among other factors. Provided the site conditions are appropriate for a particular plant, its installation can be a major factor in early survival. Figure 12 illustrates typical practices used when installing nursery-grown trees and shrubs in a landscape setting. Such specifications as the use of fertilizer may or may not be appropriate, depending on site soils and the plant's optimal growth requirements. Each species should be evaluated on the basis of its needs and the site conditions to determine whether each recommendation is appropriate.

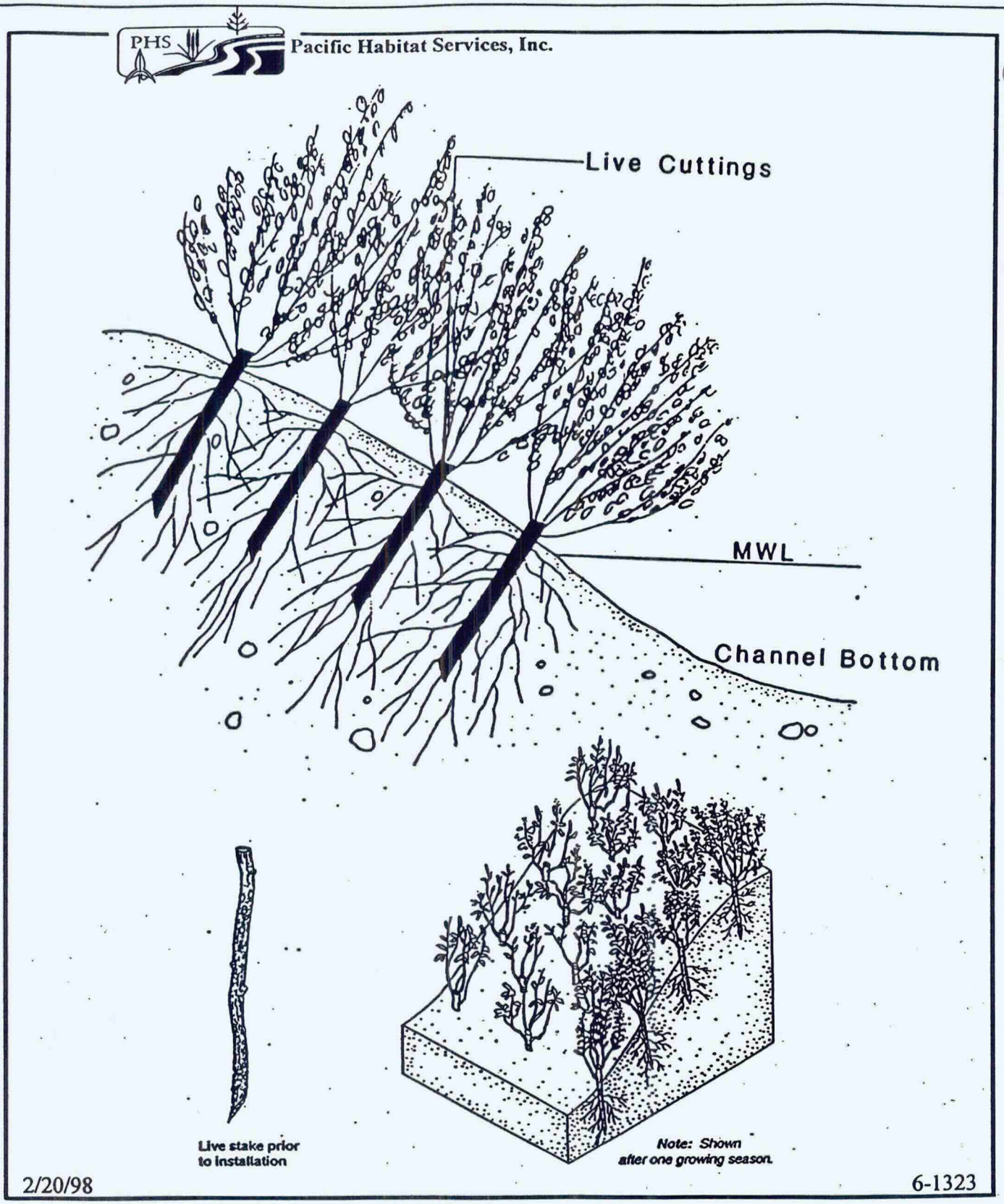
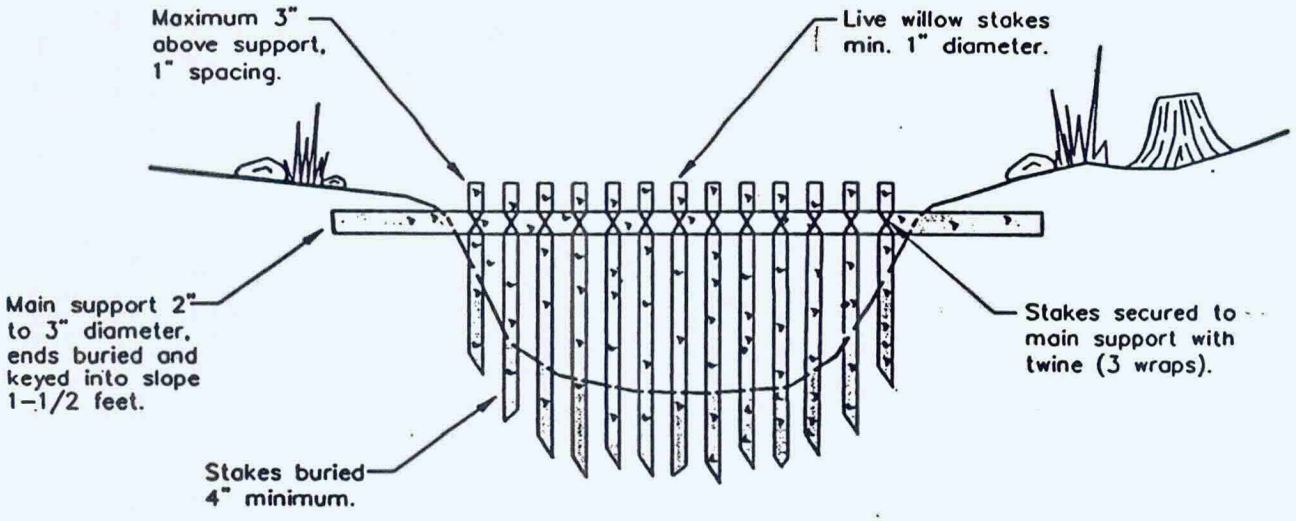


Figure 9. Installation of live cuttings or stakes (typically of *Salix* sp.) in riparian areas on the City of Happy Valley restoration site (after Mt.Baker-Snoqualmie 1994).



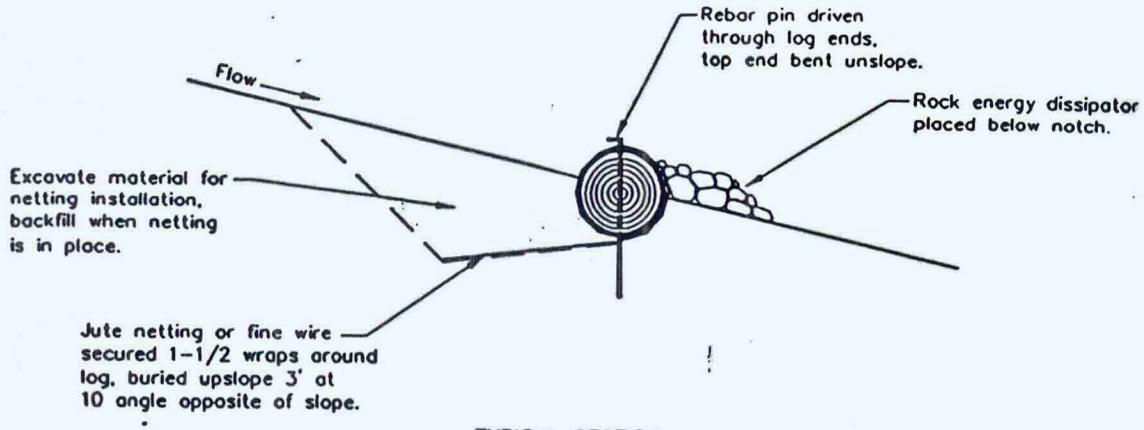
NOTES

1. Willow stakes must not exceed 14" in length.
2. Maximum willow stake exposed above ground 8".
3. Place stakes, nodes sprouting notch up.

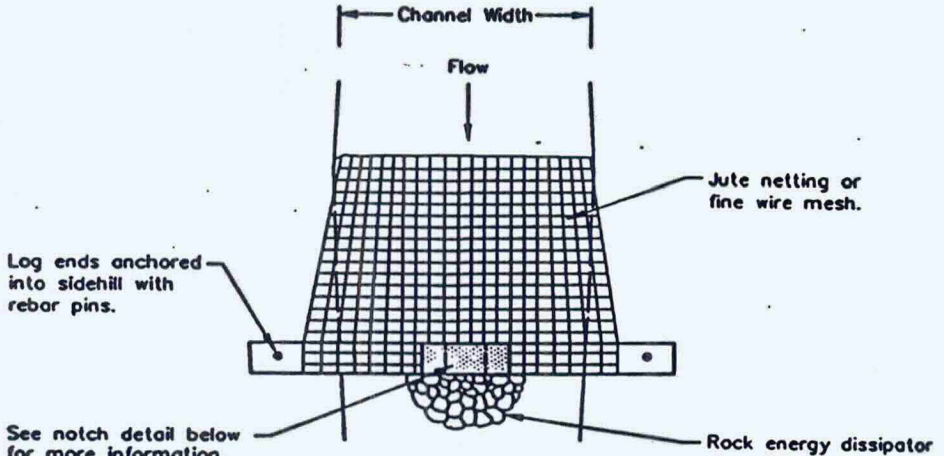
(NOT TO SCALE)

2/20/98 6-1323

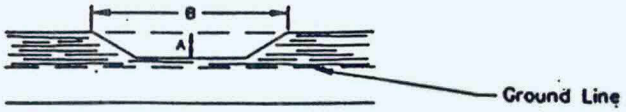
Figure 10. Construction of live gully structure using cuttings (typically of *Salix* sp.) in riparian areas on the City of Happy Valley restoration site (after Mt.Baker-Snoqualmie 1994).



TYPICAL SECTION



TOP VIEW



A = Max. cut 1/3 diameter of log.
Min. cut 1/4 diameter of log.
B = Width of cut.

NOTCH DETAIL

(NOT TO SCALE)

2/20/98

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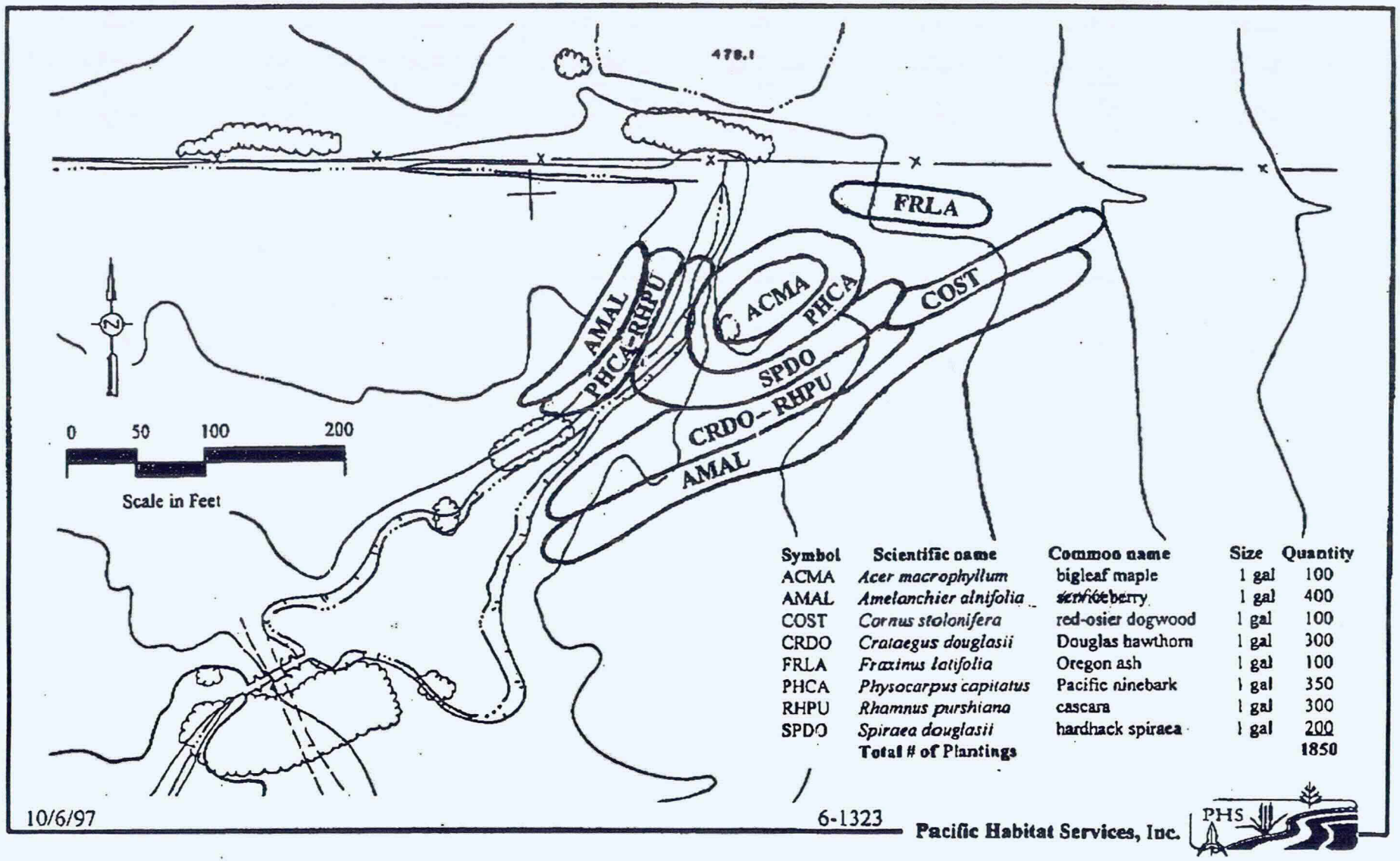
Figure 11. Construction of log check dam in stream channels on the City of Happy Valley restoration site (after Mt.Baker-Snoqualmie 1994).

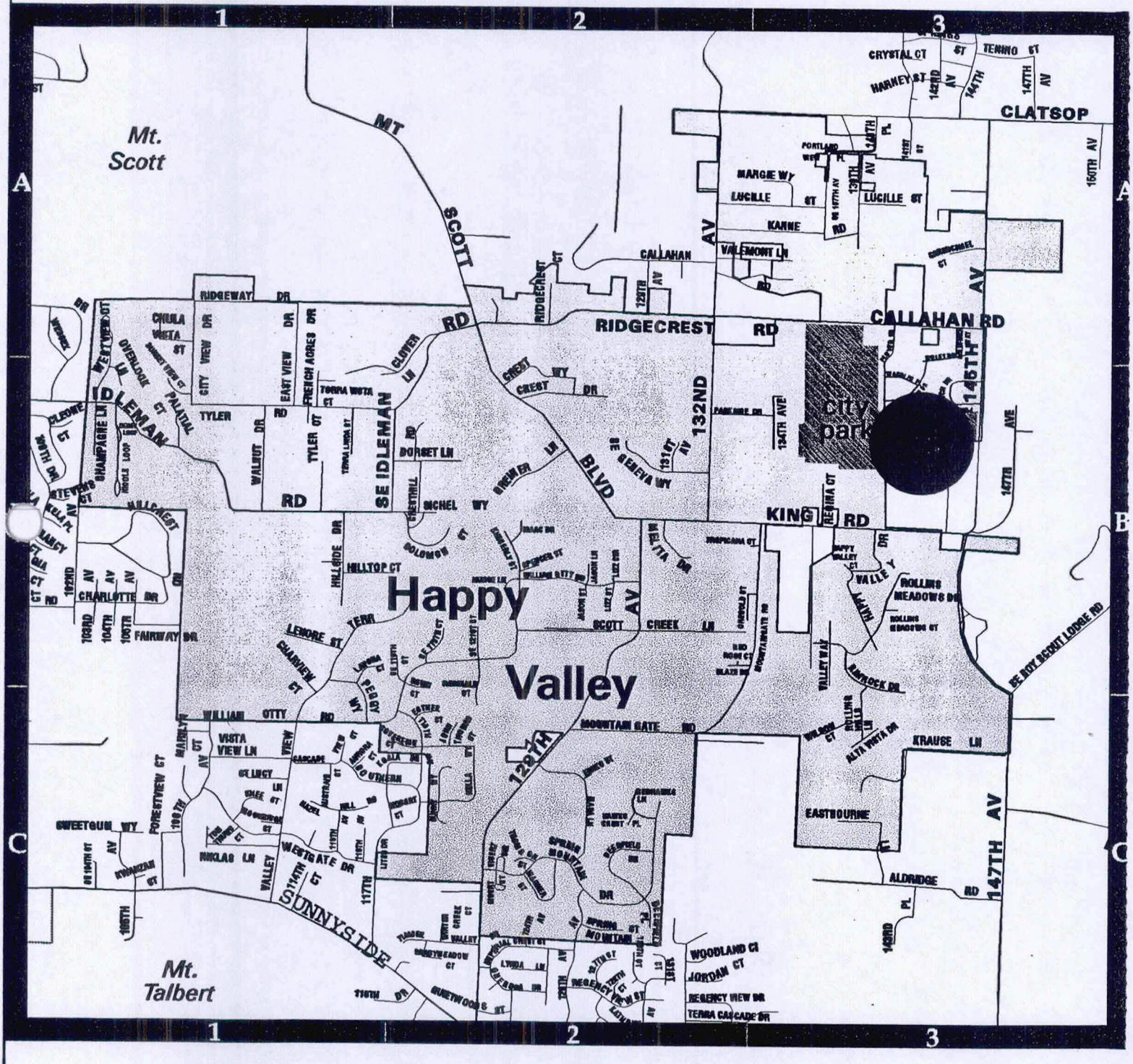


Symbol	Scientific name	Common name	Size	Quantity
ACMA	*Acer macrophyllum*	bigleaf maple	1 gal	100
AMAL	*Amelanchier alnifolia*	~~serviceberry~~	1 gal	400
COST	*Cornus stolonifera*	red-osier dogwood	1 gal	100
CRDO	*Crataegus douglasii*	Douglas hawthorn	1 gal	300
FRLA	*Fraxinus latifolia*	Oregon ash	1 gal	100
PHCA	*Physocarpus capitatus*	Pacific ninebark	1 gal	350
RHPU	*Rhamnus purshiana*	cascara	1 gal	300
SPDO	*Spiraea douglasii*	hardhack spiraea	1 gal	200
	Total # of Plantings			**1850**

Figure . Planting plan for City of Happy Valley habitat restoration site in upper drainage of Mt. Scott Creek, near SE 145th Avenue in Clackamas County, Oregon (Base map supplied by Clackamas County and City of Happy Valley, 1997).

Attachment 5

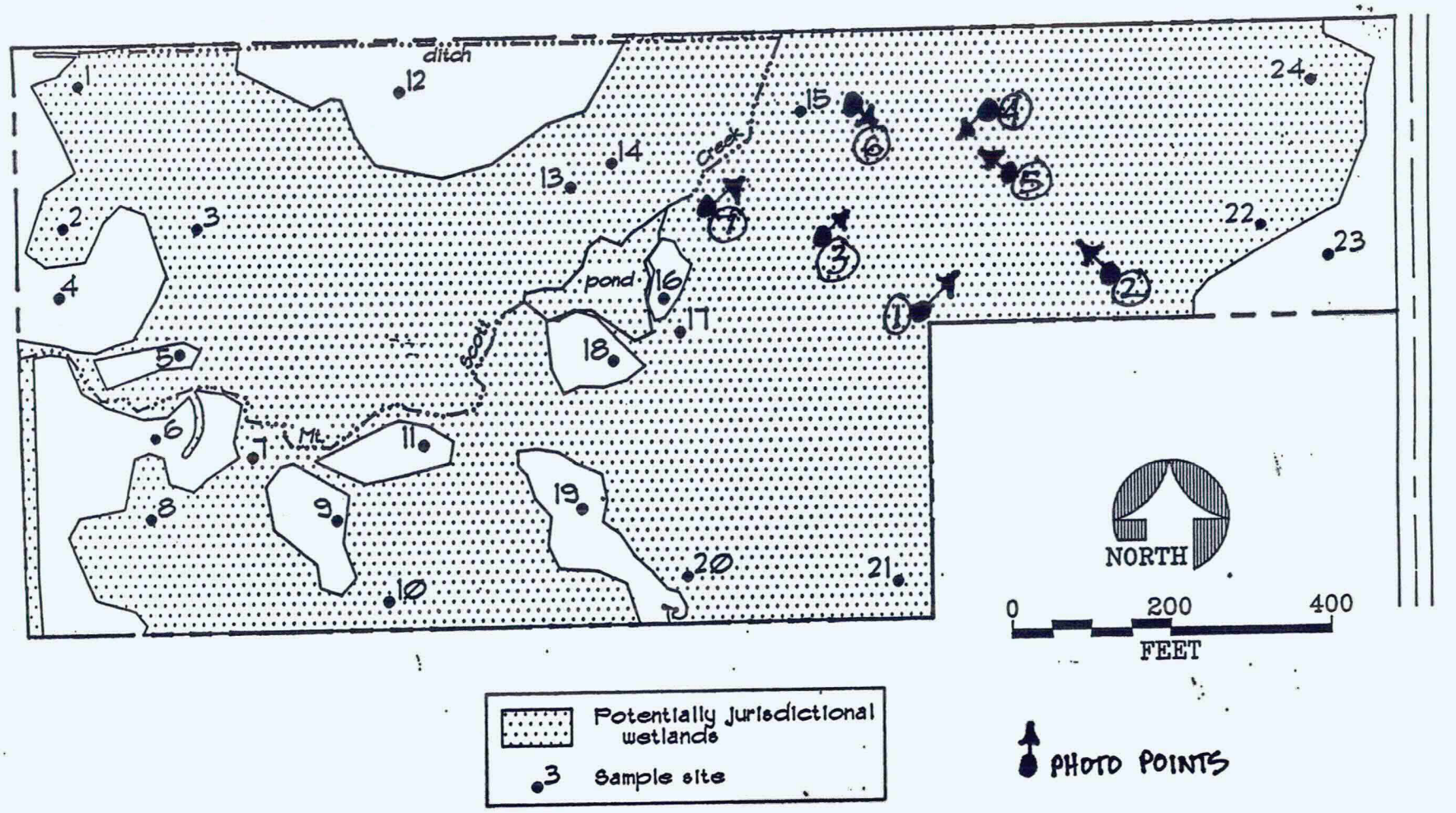
HAPPY VALLEY STREET MAP



Map Date: October 17, 1997

MILGIS /usr2/happyval/smile/treemap.aml CVH

PHOTO SET ONE



Base map from Compass Corporation, 1997

7961111 5/4/97

FIGURE 4

Potentially jurisdictional wetlands and sample sites for the Happy Valley Nature Park in Happy Valley, Oregon.

SRI/SHAPIRO/AGCO INCORPORATED

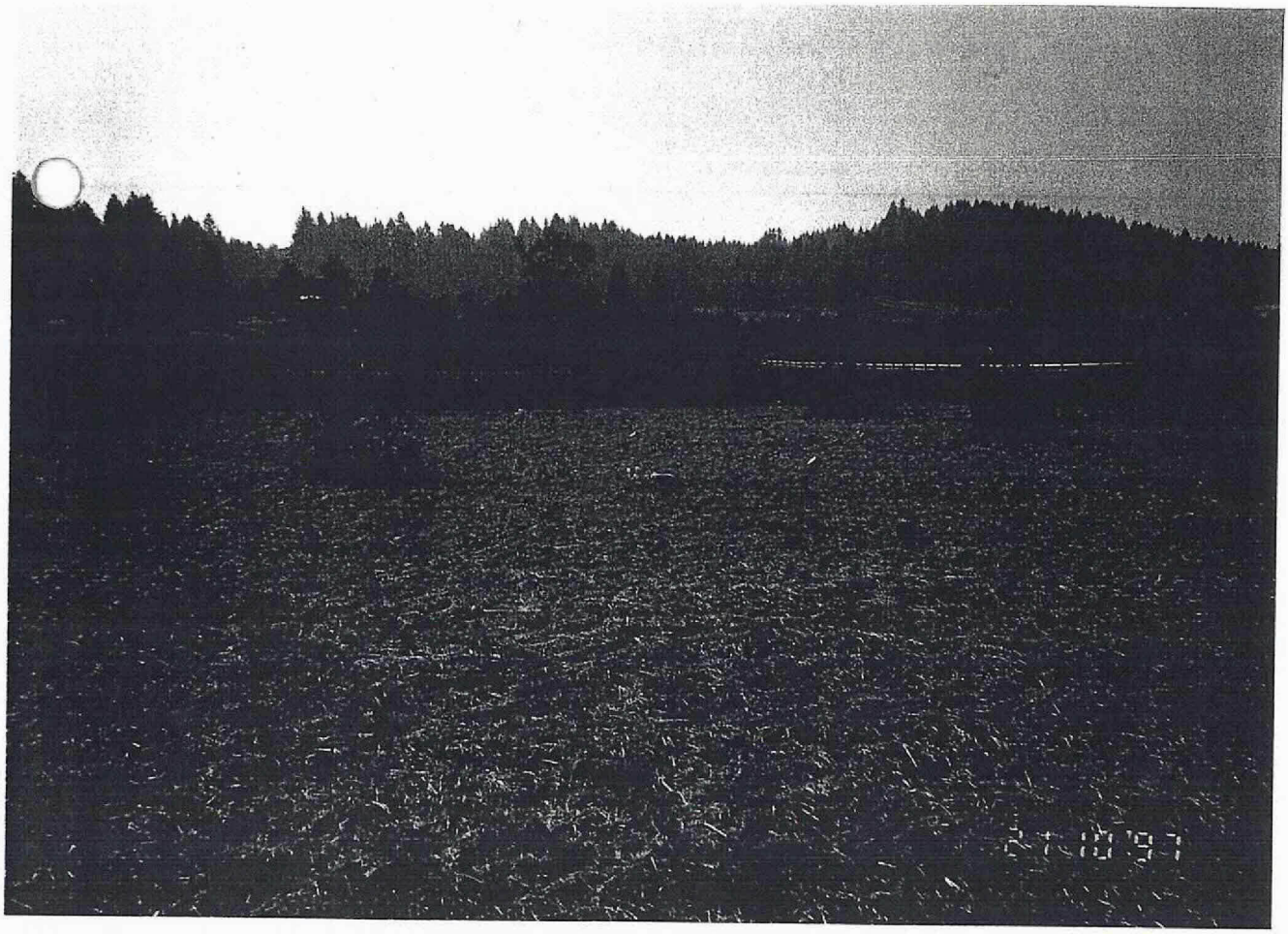
(1)

(2)

(3)

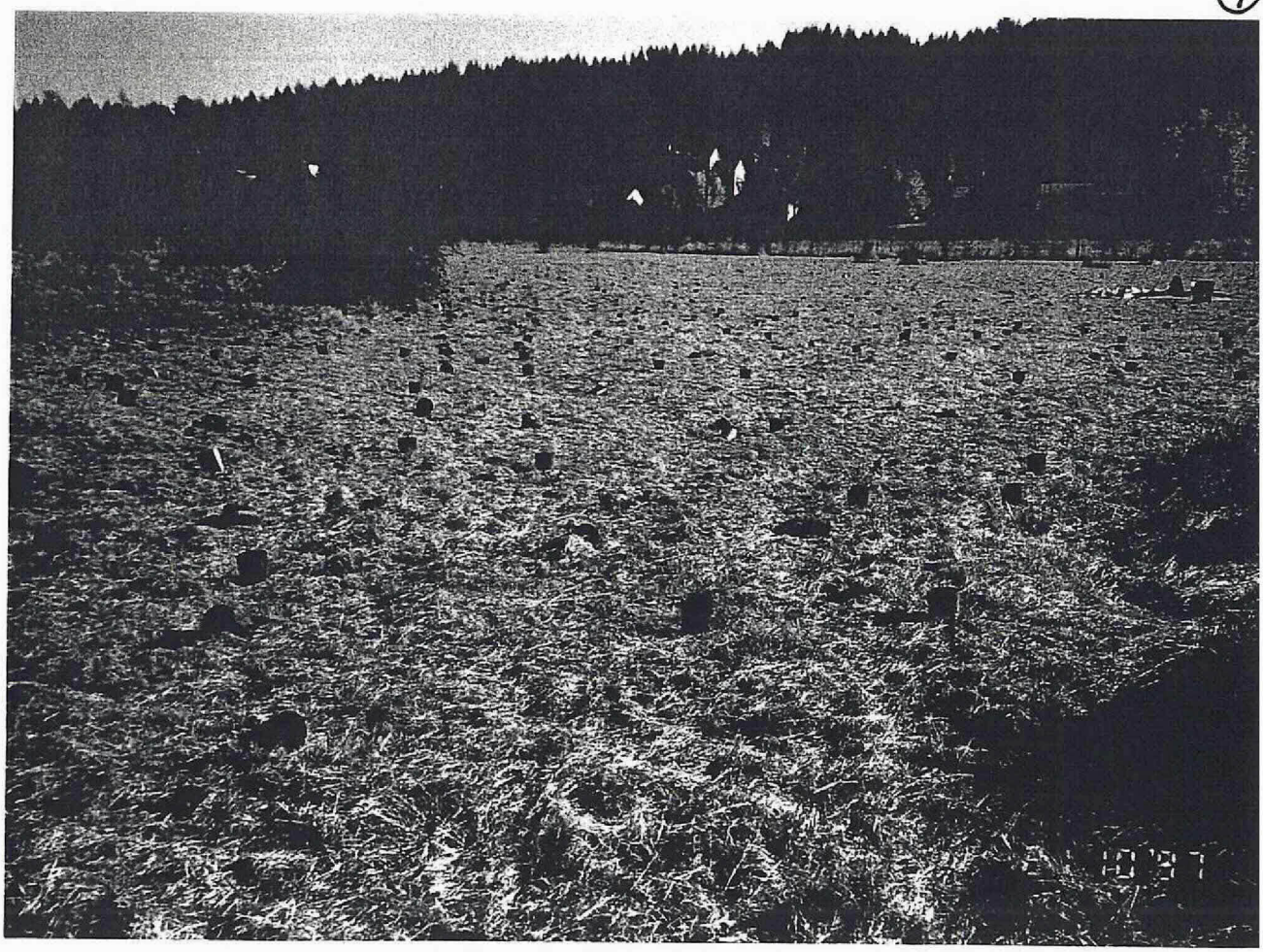
PHOTO SET TWO

④

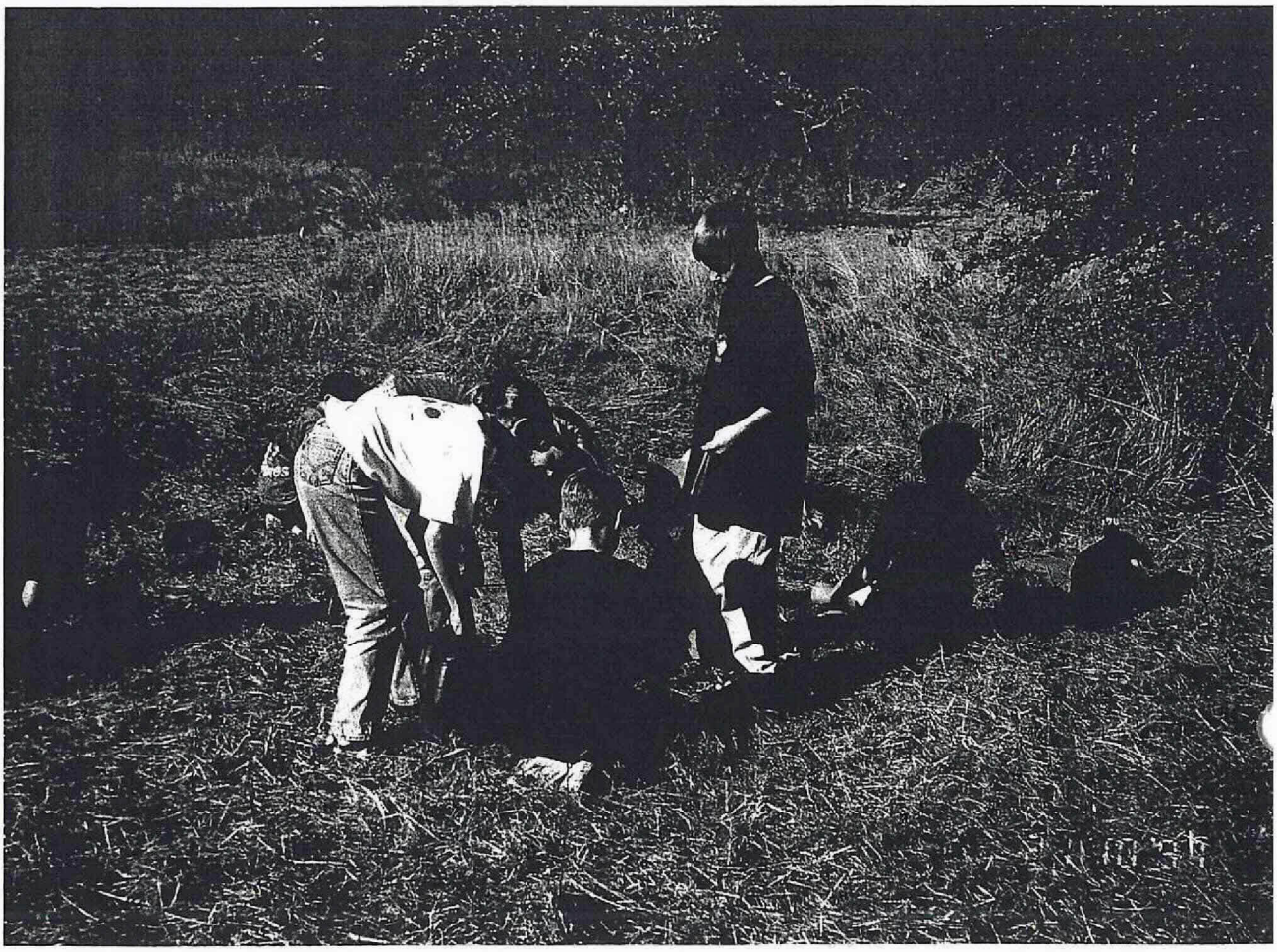


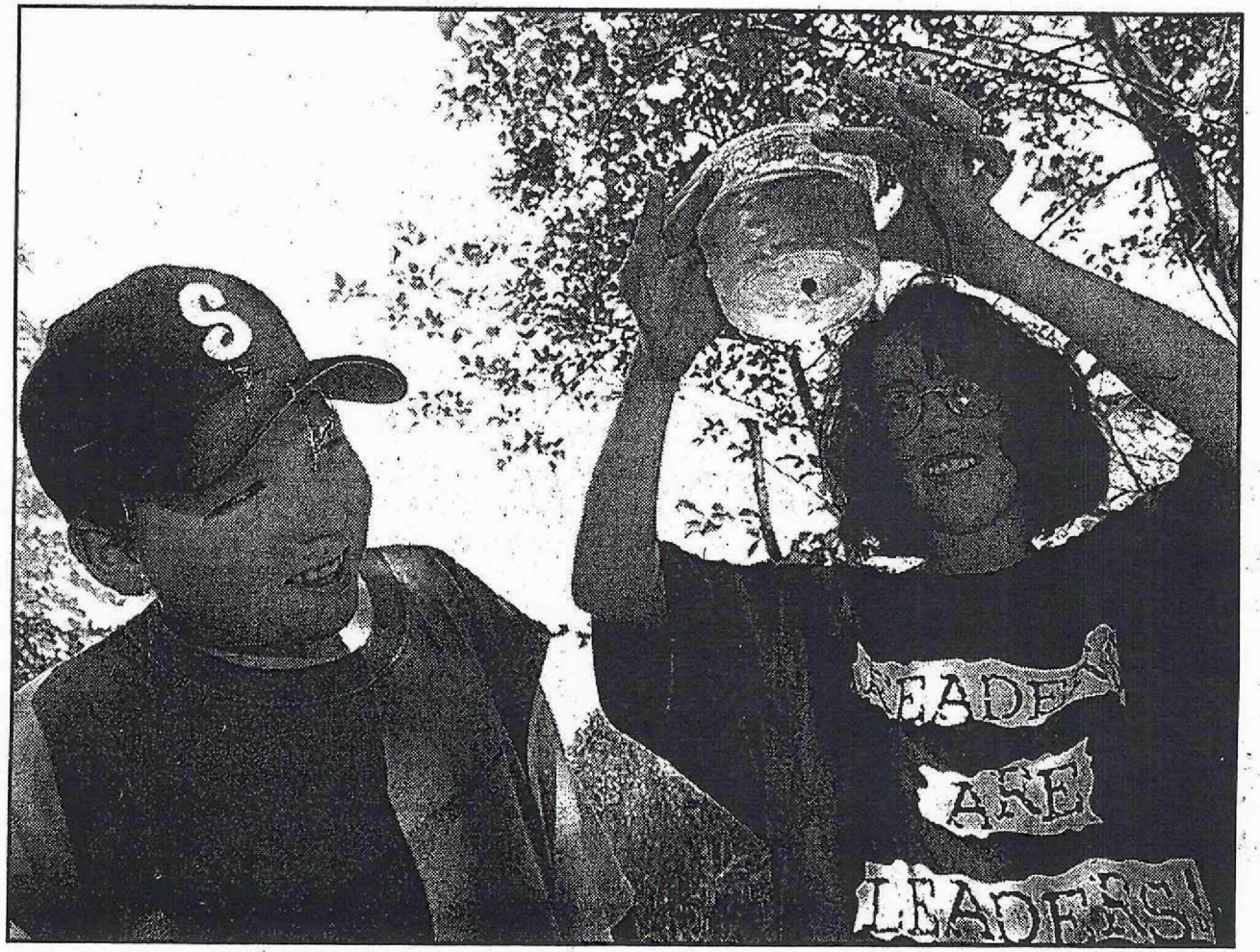
(6)

(7)



PROJECT PHOTOS





Wetland discovery: Eric Hunt and Devon Brownell, sixth-graders at Happy Valley Elementary School, examine a freshwater snail they found Tuesday on a field trip to a 25-acre wetland park next to the school. The children were among more than two dozen students in Jim Shumaker's class who sampled water temperatures, acidity and oxygen levels and captured and recorded the several kinds of fish, leeches, beetles and other animals in the ponds and streams in the park, which the city of Happy Valley bought in 1995 for $400,000. The students are taking part in a $20,000 wetland-restoration project to repair damage from cattle-grazing and from the use of part of the property for an airstrip.

DOUG BEGHTEL/The Oregonian

METRO REGIONAL PARKS & GREENSPACES

REQUEST FOR REIMBURSEMENT
GREENSPACES RESTORATION GRANT
BILLING FORM

CITY OF HAPPY VALLEY

Organization:
12915 SE KING RD.

Address:
PORTLAND, OREGON 97236

City/State/Zip Code:
CITY OF HAPPY VALLEY WETLAND PARK RESTORATION

Project Title:
905413

Metro Contract Number:
JUSTIN PATTERSON

Local Project Manager:

Signature of Project Manager:
4-16-98

Date Submitted Billing:
4-24-98

OVER→

Return Billing Form To:

Lynn Wilson
Metro Regional Parks & Greenspaces
600 NE Grand Ave.
Portland, Oregon 97232-2736

Have a Question? Call:

(503) 797-1781

METRO HABITAT RESOTRATION GRANT
ACTUAL BUDGET EXPENDITURES FOR PROJECT YEAR 97-98

CATEGORY	REQUEST OF METRO	CASH MATCHING	IN-KIND MATCH	TOTAL
PERSONNEL	$0.00	$5,350.23	$0.00	$5,350.23
MATERIALS	$5,500.00	$1,026.17	$0.00	$6,526.17
RENTAL FEES	$0.00	$45.50	$0.00	$45.50
PURCHASE OF EQUIPMENT	$0.00	$0.00	$0.00	$0.00
PURCHASE OF WATER	$0.00	$0.00	$0.00	$0.00
MAINT. COST	$500.00	$0.00	$0.00	$500.00
PROFESSIONAL SERVICES	$2,000.00	$5,304.01	$0.00	$7,304.01
VOLUNTEER LABOR	$0.00	$0.00	$3,891.25	$3,891.25
OVERHEAD COSTS	$0.00	$0.00	$0.00	$0.00
CONTINGENCY	$0.00	$0.00	$0.00	$0.00
TOTAL REQUESTED FROM METRO	$8,000.00 (30%)		$0.00	$8,000.00
CITY OF HAPPY VALLEY MATCH		$15,617.16 (70%)	<--- $3,891.25 (add to total)	
TOTAL EXPENDITURES	$8,000.00	$15,617.16	$3,891.25	$23,617.16

PROJECT NUMBER	DESCRIPTION			REGULAR HOURS	OVERTIME HOURS	TOTAL HOURS	LABOR COST	MATERIAL COST	TOTAL EXPENSE	TOTAL REVENUE	
910 001	METRO-WETLAND RESTOR										
	PROJECT ESTIMATES			.00	.00	.00	.00	.00	.00	.00	
	08/19/97	AP MAT	PACIFIC HABITAT SERVICES INC.					720.00	720.00		WETLAND RESTORE-ANALY/VEG MAI
	09/15/97	AP MAT	UNITED PIPE & SUPPLY CO					7.64	7.64		OVC PIPE - WETLAND GRANT PRO
	09/15/97	AP MAT	UNITED PIPE & SUPPLY CO					38.52	38.52		PVC FOR WETLAND
	09/29/97	AP MAT	QUAIL RIDGE NURSERY					455.00	455.00		25% DOWNPAYMENT PLANTS
	09/29/97	AP MAT	BOSKY DELL NATIVES					3000.00	3000.00		25% DOWN ON OCT/NOV PLANTINGS
	09/29/97	AP MAT	BOSKY DELL NATIVES					-3000.00	-3000.00		25% DOWN ON OCT/NOV PLANTINGS
	09/29/97	AP MAT	BOSKY DELL NATIVES					750.00	750.00		25% DOWN ON OCT/NOV PLANTINGS
	10/06/97	AP MAT	PACIFIC HABITAT SERVICES INC.					598.00	598.00		MAPPING FOR RESTORATION GRANT
	10/06/97	AP MAT	UNITED PIPE & SUPPLY CO					5.46	5.46		PVC CAPS
	10/06/97	AP MAT	CLACKAMAS BLUE PRINT					14.60	14.60		COPIES
	10/15/97	AP MAT	QUAIL RIDGE NURSERY					450.00	450.00		DUE FOR 10/21/97 PLANTING
	10/15/97	AP MAT	BOSKY DELL NATIVES					1950.00	1950.00		DUE FOR 10/21/97 PLANTING
	10/27/97	AP MAT	FRAY REPP					350.00	350.00		SPECIAL MOW FOR GRANT WORK
	11/03/97	AP MAT	PACIFIC HABITAT SERVICES INC.					526.00	526.00		RETORATION GRANT WORK
	11/03/97	AP MAT	ACF WEST, INC.					270.00	270.00		FABRIC/STAPLES-WETLANDS
	11/03/97	AP MAT	ACF WEST, INC.					60.00	60.00		STAPLES-WETLANDS PROJECT
	11/03/97	AP MAT	ACF WEST, INC.					180.00	180.00		STAPLES-WETLANDS PROJECT
	11/03/97	AP MAT	LUMBERMEN'S					4.98	4.98		UTILITY KNIFE
	11/17/97	AP MAT	QUAIL RIDGE NURSERY					908.00	908.00		BALANCE DUE FOR 11/21 PLANTIN
	11/17/97	AP MAT	BOSKY DELL NATIVES					400.00	400.00		BALANCE FOR 11/21 PLANTINGS
	12/01/97	AP MAT	MT. SCOTT FUEL CO.					312.00	312.00		SOIL MIX-PARK PLANTING-GRANT
	12/15/97	AP MAT	PACIFIC HABITAT SERVICES INC.					464.00	464.00		PREPARE RESTORATION PLAN-GRAN
	12/15/97	AP MAT	CASCADE EDUCATION CORPS					600.00	600.00		PLANTING PROJECT IN WETLANDS
	01/20/98	AP MAT	SRI/SHAPIRO					813.69	813.69		DEC RESTORATION GRANT WORK
	03/16/98	AP MAT	PACIFIC HABITAT SERVICES INC.					586.00	586.00		RESTORATION METRO GRANT
	04/20/98	AP MAT	LAZER-QUICK					21.36	21.36		COLOR COPIES
	05/19/97	PM MAT						1106.00	1106.00		PACIFIC HABITAT-GRANT WORK
	05/19/97	PM MAT						1069.99	1069.99		SRI/SHAPIRO-WETLAND DELINEATIC
	06/16/97	PM MAT						1071.32	1071.32		SRI/SHAPIRO-WETLAND DELINEATIC
	06/19/97	PM MAT						300.00	300.00		MULT EDUC SERVICE GROUP
	10/21/97	PM MAT						600.00	600.00		CASCADE EDUCATION CORP
	07/07/97	PM MAT						45.50	45.50		POWER RENTS-RENT AUGER
	06/16/97	PM MAT						128.63	128.63		UNITED PIPE-PIEZOMETER SUPP
	06/16/97	PM MAT						4.31	4.31		UNITED PIPE=PIEZOMETER SUPP
	09/15/97	PM MAT						14.20	14.20		UNITED PIPE-PVC FOR PIEZOMETER
	09/15/97	PM MAT						52.10	52.10		UNITED PIPE = PVC
	PROJECT ACTUAL COST			.00	.00	.00	.00	14877.30	14877.30	.00	
	ESTIMATE VS ACTUAL			.00	.00	.00	.00	-14877.30	-14877.30	.00	

**** REPORT TOTALS ****

ACTUAL COST	.00	.00	.00	.00	14877.30	14877.30	.00	
ESTIMATE VS ACTUAL	.00	.00	.00	.00	-14877.30	-14877.30	.00	