Inventory of Site Resources

# Gold Creek Park

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## Introduction

Gold Creek Park is a 35 acre King County Park located in Woodinville within the Cedar-Sammamish Watershed Resource Inventory Area (WRIA 8) just 0.6 miles east of the Sammamish River (Fig. 1). Gold Creek Park is considered a *recreation park* according to the 2004 King County Open Space Plan, though its natural features and programmatic uses seem to fit the description of a designated *natural area* (also called an *ecological site*) fairly well. For example, 34 of the park's 35 acres are covered by diverse native western Washington forest, while just 1 acre near the park's entrance features gravel parking lot, grass-lawn, and the Gold Creek Lodge. The park is crisscrossed by approximately 2 miles of earthen trails and includes 0.2 miles of perennial stream and attendant wetland area.

Gold Creek Lodge is managed by the Boys & Girls Club of King County, which offers day and overnight programs to youth from King County as well as from neighboring counties. Boys & Girls Club programs make extensive use of the park features for environmental education activities conducted by a full-time Director that also acts as the site's steward. Other users of the park include local equestrian clubs and occasional day hikers. Gold Creek Park has high-quality natural habitat areas, a dedicated and invested local stewardship resource base, and is a valuable environmental education resource. However, like most parks within major metropolitan regions, it has some impacts which arise from its use by a growing regional population that will require some active management to protect its habitat features. Undertaking these management activities will protect the park from further degradation and ensure that it will continue to be a great learning environment for youth programs and visitors from the general public.

This report is intended to assist planning efforts for the on-going stewardship and maintenance of Gold Creek Park. It is intended to help facilitate the cooperative partnership between King County Parks and Recreation and the Boys & Girls Club as co-stewards of this area. This report was initiated and funded by the Boys & Girls Club to provide an initial inventory of the site's natural resources and to incorporate aspects of the ecological planning process itself into education programs for youth from the Boys & Girls Club during the summer of 2004.

This inventory is principally concerned with vegetation resources, but includes some additional information about soils and hydrology. Site management priorities have been identified and carefully mapped with GPS and GIS technologies. Education activities have been documented and initial monitoring plots have been established. Main user groups have been identified, though a formal participatory planning process to develop park-wide goals has not been conducted in the course of this inventory. This report contributes to a greater understanding of planning checklist items 3, 4, 5, and 6 of King County's planning process for natural areas published in its 2004 Best Management Practices Manual. These checklist items include the following:

(3) Inventory a site's natural resources and human-use patterns.
(4) Analyze where site resources are not achieving intended goals
(5) Develop recommended strategies for correcting deficiencies. Set priorities based on both natural resource and human-use issues.
(6) Present these recommendations to public and other agencies for comment. Modify and implement recommendations as priorities and available resources allow.

Fig. 1. Gold Creek drainage basin and vicinity

## Site Description

### Soils

Soils in Gold Creek Park belong to two common Puget Sound soil series, Alderwood and Indianola, occupying the east and west half of the park respectively (Appendix B, USDA 1973). The Alderwood series formed in conifer forests over glacial moraine features or till plains. It is typically composed of gravelly loam over a layer of compacted glacial till. The compacted till layer is practically impermeable resulting in moderate rooting depths (~40"), high storm water runoff potential and perched water tables during the winter months. In the summer months these soils tend to be droughty. The phase of Alderwood-gravelly-sandy-loam that occurs in portions of Gold Creek Park has slopes ranging from 14° to 27° (15-30%), which is the steepest slope-class for this soil phase(Appendix B). Erosion potential in these areas is consequently moderate to severe. The Indianola series formed in conifer forests over stratified sandy glacial deposits such as terraces, eskers or kames. Unlike the Alderwood series, this soil is considered excessively well drained in all seasons. Therefore it does not usually have a perched water table and water freely drains down to 5' or more. Run-off potential is consequently low and permeability is quite high. According to the King County Soil Survey, the map unit of this phase of Indianola-loamy–fine-sand in the western half of Gold Creek Park has slopes that range from 4° to 14° (4-15%). However, we have observed slopes within this soil series in Gold Creek Park that approach 90° (100%), perhaps due to erosion that has occurred since the 1973 soil survey. Both soil series typically support Douglas fir, western hemlock, western red cedar, big leaf maple and red alder, as seen in Gold Creek Park.

### Topography and Hydrology

The topography of Gold Creek Park consists of two prominent ridges oriented towards the northwest and descending from a terrace at the eastern edge of the park (Fig.2). The two ridges are separated by a prominent ravine bisecting the park from east to west. A second ravine marks the northern edge of the park along the base of the northern ridge. Elevation in the park ranges from 120' at the south west end to 345' at the eastern edge (Fig. 2).

The King County GIS information depicts Gold Creek as a creek that generally flows from north east to south west into the Sammamish River, fed by four tributaries (Fig. 1). The county's GIS information for this stream shows two tributaries of Gold Creek originating near 154$^{th}$ Ave NE between NE 155$^{th}$ St and NE 160$^{th}$ St. A third tributary is shown joining Gold Creek at the west edge of the park property and originating in the north-central portion of the park. The fourth tributary is shown joining Gold Creek approximately 600' east of the Sammamish River and originating approximately 1000' north of this confluence near 140$^{th}$ Pl NE (Fig. 1). However, our inventory found only one perennial stream channel that originated near the northwest corner of the park. All areas denoted as stream on county GIS that are located to the east of the Gold Creek Lodge did not have surface water present, nor did they have evidence of recent flows. Rather these areas appear to be wooded ravines with forest litter and rooted forest understory plant species present (perhaps where the historic stream channel was once located). No clear evidence of a stream channel was observed in the ravines located in the north-central portion of the park or the east side of the park.

Fig. 2. Gold Creek Park project area

Surface water issues forth and flows in a well defined channel from a source located approximately 400' north of the lodge near the toe of the slope of a prominent northwest facing ridge. The source appears from beneath a deep (30') sandy escarpment, probably where this highly permeable soil layer meets a deeper lying layer of impermeable hardpan. From here Gold Creek flows southwest and then south along the west edge of the park property. Downstream Gold Creek passes through a series of impoundments at a neighboring trout pond, crosses under 148th Av NE and then flows westward toward the Sammamish River. We did not investigate whether the fourth tributary closest to the Sammamish River was present because this area was outside the park boundary.

No other wetlands are shown in Gold Creek Park according to either the 1990 King County wetland inventory or the 1990 National Wetland Inventory. However, the west end of the central ravine in Gold Creek Park has characteristics of a palustrine scrub/shrub wetland with standing water present in late August 2004. Surface water in this area does not flow in a defined channel into Gold Creek, but it pools at the confluence of the ravine and Gold Creek and extends west approximately 200' east. Within this depression obligate and facultative wetland plant species dominate and both woody species and emergent species are present.

**Vegetation**

The lowland forests of Puget Sound fall within the broadly classified association often referred to as the Western Hemlock Zone which extends from sea level to over 1000m in western Washington. Left to the natural processes of succession and under ideal conditions of moisture, drainage, and topography, forests in this zone would potentially become dominated by evergreen trees with *Tsuga heterophylla* being the most prevalent. Following a disturbance, early successional species such as Douglas fir, big leaf maple, and red alder would initially dominate the site. Eventually, shade tolerant species such as western hemlock and western red cedar that have become established in the understory would eventually out compete and dominate the stand.

Most, if not all, of the forest remnants remaining in the Puget Sound area have undergone some sort of major human-caused disturbance during the past 150 years. Many of these areas have been heavily logged and left to their own accord. As a result of this disturbance, deciduous trees have often occupied areas previously dominated by evergreen forests. Lacking a seed source or the presence of decaying wood on the forest floor necessary for seed germination, conifer trees are often lacking or heavily underrepresented in the resulting forest composition. Historically limited to the niches of stream banks, floodplains, and wetter slopes and flats, red alders and big leaf maples have become dominant species in the present forest structure.

The vegetation communities present at Gold Creek Park exhibit many characteristics of a forest following patterns of succession following a human-caused disturbance. The occurrence of large diameter red alder trees throughout all regions of the park suggests the possibility of past logging incidences where deciduous trees were left to thrive. This is further exemplified by the apparent even-aged distribution and the absence of any large diameter conifer trees throughout the park. The difference in the highly diverse evergreen canopy structure of the southern portion of the park (designated as Zone 4 in this inventory, Fig. 3) compared to the even-aged, even-spaced

Fig. 3. Vegetation zones and management issues

heavily Douglas fir dominated area to the north (Zone 8) with sparse understory regeneration also suggests past logging (and possible planting) practices. It should be noted, however, that no large stumps or other physical evidence of logging was noted during this inventory. Regardless, the presence of abundant cedar and hemlock seedlings in many areas of the park, including Zone 8, show promising potential for improved evergreen forest structure. In fact, only two small areas of the park (zone 1 and zone 7) were found to be dominated by deciduous trees with no sign of conifer regeneration.

Overall, Gold Creek Park clearly exhibits the characteristics of a dynamically functioning western Washington forest. Of a general list of native species common to Westside lowland forests (Scherrer, W. and Johannessen, T., 1996), 23 of 29 species were found within the park. 13 from a list of 23 species common to riparian communities were also found. A total of 78 unique species were found to occur within the park, with 54 (69%) being native to western Washington (Table 1). Native species richness per community type ranged from 10 to 35 species with Zone 5 having the greatest native richness (Table 2). Aside from the rich flora, a variety of mosses, fungi, and lichens were also seen in abundance within the park, as well as several native animals. Of particular note was the observed use of the park by a red-tailed hawk, a pair of pileated woodpeckers, and a barred owl.

Following is a descriptive characterization of each of the 15 community types delineated during this inventory (Fig. 3). These summaries include descriptions of the dominant native species and non-native invasive species that occur in each zone. Further study of this area should include quantitative measurements of tree density and regeneration, as well as cover measurements of all floristic diversity. This would yield a better understanding of the current vegetation structure and allow for future observations of the changing forest dynamics within the park.

**Table 1**. All plants found in Gold Creek Park are listed in alphabetical order and indicated native or non-native.

| Code | Scientific | Common | Native | Number of Zones Occupied | Percent of Zones Occupied |
|---|---|---|---|---|---|
| ACCI | Acer circinatum | vine maple | Yes | 4 | 29% |
| ACMA | Acer macrophyllum | bigleaf maple | Yes | 13 | 93% |
| ACTR | Achlys triphylla | vanilla leaf | Yes | 2 | 14% |
| ALRU | Alnus rubra | red alder | Yes | 13 | 93% |
| ASCA3 | Asarum caudatum | wild ginger | Yes | 1 | 7% |
| ATFI | Athyrium filix-femina | ladyfern | Yes | 9 | 64% |
| BENE | Berberis nervosa | low Oregon grape | Yes | 10 | 71% |
| Bromus sp. | Bromus sp. | brome | X | 1 | 7% |
| BRVU | Bromus vulgaris | Columbia brome | Yes | 10 | 71% |
| CAHI | Cardamine hirsuta | hairy bittercress | No | 5 | 36% |
| CADE | Carex deweyana | Dewey sedge | Yes | 5 | 36% |
| CIAL | Circaea alpina | enchanter's nightshade | Yes | 1 | 7% |
| Cirsium sp. | Cirsium sp. | thistle | No | 1 | 7% |
| COCO | Corylus cornuta | beaked hazelnut | Yes | 12 | 86% |
| Cotoneaster sp. | Cotoneaster sp. | cotoneaster | No | 1 | 7% |
| DIFO | Dicentra formosa | western bleedingheart | Yes | 7 | 50% |
| DIHO | Disporum hookeri | Hooker's fairybells | Yes | 7 | 50% |
| DREX | Dryopteris expansa | wood fern | Yes | 9 | 64% |
| EQTE | Equisetum telmateia | giant horsetail rush | Yes | 2 | 14% |
| Galium sp. | Galium sp. | bedstraw | Yes | 2 | 14% |
| GASH | Gaultheria shallon | salal | Yes | 11 | 79% |
| GERO | Geranium robertianum | herb Robert | No | 14 | 100% |
| GEMA | Geum macrophyllum | bigleaved avens | Yes | 5 | 36% |
| HEHE | Hedera helix | English ivy | No | 4 | 29% |
| HODI | Holodiscus discolor | oceanspray | Yes | 1 | 7% |
| ILAQ | Ilex aquifolium | English holly | No | 9 | 64% |
| LAMU | Lactuca muralis | wall-lettuce | No | 4 | 29% |
| LACO | Lapsana communis | nipplewort | No | 9 | 64% |
| LOCI | Lonicera ciliosa | orange honeysuckle | Yes | 2 | 14% |
| LUAN | Lunaria annua | annual honesty | No | 1 | 7% |
| LYAM | Lysichitum americanus | skunk cabbage | Yes | 1 | 7% |
| MOSI | Montia sibirica | Siberian miner's lettuce | Yes | 3 | 21% |
| OECE | Oemleria cerasiformis | Indian plum | Yes | 11 | 79% |
| OPHO | Oplopanax horridus | devil's club | Yes | 6 | 43% |
| PHAR | Phalaris arundinacea | reed canarygrass | No | 3 | 21% |
| PLMA | Plantago major | broad-leaved plantain | No | 1 | 7% |
| Polygonum sp. | Polygonum sp. | knotweed | No | 1 | 7% |
| POGL | Polypodium glycyrrhiza | licorice fern | Yes | 6 | 43% |
| POMU | Polystichum munitum | swordfern | Yes | 12 | 86% |
| POTR | Populus trichocarpa | black cottonwood | Yes | 3 | 21% |
| PRVU | Prunella vulgaris | common self heal | Yes | 1 | 7% |
| PREM | Prunus emarginata | bitter cherry | Yes | 1 | 7% |
| PRLA | Prunus laurocerasus | cherry laurel | No | 1 | 7% |

**Table 1. Continued**

| Code | Scientific | Common | Native | Number of Zones Occupied | Percent of Zones Occupied |
|---|---|---|---|---|---|
| PSME | Pseudotsuga menziesii | Douglas fir | Yes | 12 | 86% |
| PTAQ | Pteridium aquilinum | bracken fern | Yes | 7 | 50% |
| RARE | Ranunculus repens | creeping buttercup | No | 4 | 29% |
| RHPU | Rhamnus purshiana | cascara | Yes | 9 | 64% |
| RILA | Ribes lacustre | swamp gooseberry | Yes | 6 | 43% |
| RISA | Ribes sanguineum | red-flowering currant | Yes | 1 | 7% |
| RONA | Rorippa nasturtium-aquaticum | water cress | No | 1 | 7% |
| ROGY | Rosa gymnocarpa | baldhip rose | Yes | 6 | 43% |
| RUDI | Rubus discolor | Himalayan blackberry | No | 7 | 50% |
| RULA | Rubus laciniatus | evergreen blackberry | No | 6 | 43% |
| RULE | Rubus leucodermis | blackcap | Yes | 2 | 14% |
| RUPA | Rubus parviflorus | thimbleberry | Yes | 2 | 14% |
| RUSP | Rubus spectabilis | salmonberry | Yes | 9 | 64% |
| RUUR | Rubus ursinus | trailing blackberry | Yes | 14 | 100% |
| RUOB | Rumex obtusifolius | bitter dock | No | 1 | 7% |
| SASC | Salix scouleriana | Scouler's willow | Yes | 2 | 14% |
| Salix sp. | Salix sp. | willow | No | 1 | 7% |
| SARA | Sambucus racemosa | red elderberry | Yes | 13 | 93% |
| SMRA | Smilacina racemosa | false Solomon's seal | Yes | 1 | 7% |
| SODU | Solanum dulcamara | deadly nightshade | No | 3 | 21% |
| SOAU | Sorbus aucuparia | European mountain ash | No | 6 | 43% |
| STME | Stellaria media | chickweed | No | 2 | 14% |
| SYAL | Symphoricarpos albus | snowberry | Yes | 1 | 7% |
| SYMO | Symphoricarpos mollis | creeping snowberry | Yes | 1 | 7% |
| TABR | Taxus brevifolia | western yew | Yes | 3 | 21% |
| TEGR | Tellima grandiflora | fringecup | Yes | 3 | 21% |
| THPL | Thuja plicata | western red cedar | Yes | 13 | 93% |
| TITR | Tiarella trifoliata | foamflower | Yes | 1 | 7% |
| TOME | Tolmiea menziesii | piggy-back plant | Yes | 6 | 43% |
| TRLA2 | Trientalis latifolia | starflower | Yes | 3 | 21% |
| TROV | Trillium ovatum | trillium | Yes | 6 | 43% |
| TSHE | Tsuga heterophylla | western hemlock | Yes | 11 | 79% |
| URDI | Urtica dioica | stinging nettle | Yes | 11 | 79% |
| VAPA | Vaccinium parvifolium | red huckleberry | Yes | 12 | 86% |
| VEOF | Veronica officinalis | common gypsyweed | No | 1 | 7% |

**Table 2.** Native versus non-native species richness is indicated by zone.

| Zone Number | Number of Native Species Present | Number of Non-Native Species Present |
|---|---|---|
| 1 | 13 | 4 |
| 2 | 34 | 6 |
| 3 | 17 | 2 |
| 4 | 28 | 11 |
| 5 | 35 | 12 |
| 6 | 25 | 10 |
| 7 | 22 | 5 |
| 8 | 21 | 7 |
| 9 | 23 | 3 |
| 10 | 23 | 3 |
| 11 | 27 | 7 |
| 12 | 22 | 6 |
| 13 | 25 | 8 |
| 14 | 10 | 2 |

**Zone 1:**

The canopy of zone 1 is dominated by a dense stand of fairly small diameter *Alnus rubra* with considerable *Acer macrophyllum* regenerating in the under story. The shrub layer is dominated by *Polystichum munitum* and *Rubus spectabilis* with a moderate *Rubus ursinus* component. The herbaceous layer is dominated in places by *Geranium robertianum*, especially on the slope directly facing the lodge, and *Urtica dioica,* which is heaviest on the eastern facing slope above trail one. Zone 1 exhibited the second lowest native species richness in the park with only 13 native species present (Table 2).

Aside from the moderate to high *Geranium robertianum* cover in this zone, there is a fairly large area dominated by *Rubus discolor* on the edge of zone 3 (off the SW corner of the lodge) that is beginning to spread into the interior of both zones 1 and 3. *Ranunculus repens* is also present along the northern edge of zone 1 directly behind the lodge, but is not present in the interior of the zone.

**Zone 2:**

Zone 2 consists of mixed hardwood/conifer forest representing a transition between the conifer-dominated zone 4, and the deciduous-dominated zone 3. The canopy is dominated by *Pseudotsuga menziesii*, *Tsuga heterophylla*, *Alnus rubra,* and *Acer macrophyllum*. Centered along the western edge of this zone is a small, nearly pure stand of *Tsuga heterophylla* and *Alnus rubra* (also of note, one *Taxus brevifolia* individual was seen in this area), while the northern ridge is dominated by *Pseudotsuga menziesii* and regenerating *Thuja plicata*. The shrub layer consists primarily of *Rubus spectabilis* and *Berberis nervosa* transitioning to *Urtica dioica* and *Rubus ursinus* along the western boundary. Zone 2 had the second highest native species richness in the park with 34 species (Table 2).

There are scattered infestations (five were noted, Fig. 3) of *Rubus laciniatus* located throughout zone 2, with the greatest density in a partial gap in the southern portion of the zone. There are also a few *Ilex aquifolium* individuals, at least one of which was quite large, along the northern ridge.

**Zone 3:**

Zone 3 is characterized by an *Acer macrophyllum* dominated canopy along the east side of Gold Creek before it is diverted into the fish ponds. The deciduous dominated canopy transitions into the mixed deciduous/conifer canopy of zone 2 towards the top of the ridge that forms the eastern boundary of zone 3. There is a sparse scattering of regenerating *Thuja plicata* and *Tsuga heterophylla* trees throughout. The shrub layer is dominated by patches of *Rubus spectabilis*, especially in the flatter western part of the zone and *Rubus ursinus* and *Urtica dioica* up onto the ridge.

There is a small contained area of *Hedera helix* near the top of the slope of the eastern ridge and moderate *Geranium robertianum* cover along the slope in the same vicinity.

**Zone 4:**

The south-eastern portion of the park consists of a moderately open canopy conifer forest with *Pseudotsuga menziesii* as the most prevalent species along with a strong *Thuja plicata* and *Tsuga heterophylla* component among the mature canopy and regenerating understory. As a result, this zone has perhaps the most developed vertical canopy structure in the park. The understory also has light but consistent cover of small *Rhamnus purshiana* throughout zone 4 and moderate *Corylus cornuta* cover, especially in openings. The shrub layer is dominated by *Gaultheria shallon* with moderate cover of *Polystichum munitum* and *Berberis nervosa* in some areas. A few *Taxus brevifolia* individuals were also noted in this zone. With 29 native species present, zone 4 represents the third highest native species rich polygon in the park (Table 2).

There are substantial infestations of *Ilex aquifolium* (with some individuals becoming quite large) throughout zone 4 with the heaviest concentrations towards the south-east corner of the park. Also of note are several large, isolated C*otoneaster sp.* individuals in the south-east and one small *Prunus laurocerasus* individual near the south park boundary. There is moderate *Rubus discolor* and *Rubus laciniatus* cover along the southern part of trail 3. *Geranium robertianum, Lapsana communis* and *Lactuca muralis* are present trailside.

**Zone 5:**

Zone 5 is defined by the Gold Creek ravine that runs west from the eastern boundary of the park and veers north to the area north-east of the lodge. The zone consists of a riparian influenced forested ravine showing no clear evidence of surface water flow during this time of year (late August). The ravine widens and flattens into Zone 12 where water issues from subsurface sources. The canopy is quite open and dominated by *Thuja plicata* and *Alnus rubra* with minor *Acer macrophyllum* and *Tsuga heterophylla* components. The well developed shrub layer

consists primarily of *Rubus spectabilis* with scattered *Sambucus racemosa* cover throughout except for one area of heavy *Oplopanax horridus* cover. The herbaceous layer is also well developed and dominated by *Tolmiea menziesii* often forming thick mats, and large areas of heavy *Athyrium filix-femina* cover in the valley bottom. There is light to moderate cover of *Disporum hookeri*, especially along the southern walls of the valley. Zone 5 was found to be the most native species rich zone in the park with 35 native species present. This zone also had the highest non-native or invasive species richness with 12 species present (Table 2).

There is a small patch of *Phalaris arundinacea* along trail 1 just south-east of the lodge near zone 12. Several other non-native species are present in generally small numbers throughout the zone with the majority being found directly trailside.

**Zone 6:**

The north-eastern portion of the park is generally typified by a moderately open canopy consisting of *Pseudotsuga menziesii*, *Tsuga heterophylla*, and *Alnus rubra*. The understory consisted of regenerating *Thuja plicata* and *Tsuga heterophylla* and moderate *Corylus cornuta* cover throughout. The shrub layer is well developed and consists of a mix of *Gaultheria shallon*, *Rubus spectabilis*, and *Polystichum munitum* with *Vaccinium parvifolium* scattered throughout. The herbaceous layer is not well developed in this zone and consists of light cover of *Dryopteris expsansa* and *Bromus vulgaris* with an area of *Lonicera ciliosa* to the west of trail 3. The portion of the zone to the west of trail 5 has several standing snags and recent windblown dead trees which appear to be primarily medium-to-young aged *Tsuga heterophylla* which is not typical of other areas of the park and should be investigated.

Zone 6 has scattered patches of *Rubus laciniatus* throughout, especially along trail 5. Also, there is a relatively large patch of *Rubus discolor* in a canopy gap just to the east along trail 5 in the north-east corner of the park.

**Zone 7:**

Zone 7 consists of an open canopy stand of mid-diameter Alnus rubra and a well developed shrub layer dominated by *Polystichum munitum* and *Rubus ursinus* with scattered *Vaccinium parvifolium*. There is sparse cover of *Corylus cornuta*, *Holodiscus discolor*, and *Rhamnus purshiana*. The herbaceous layer consists of moderate cover of *Urtica dioica* and *Bromus vulgaris*, particularly in the area to the south of trail 4.

The southern half of Zone 7 hosts a large bramble of *Rubus laciniatus* which appears to be out-competing the *Gaultheria shallon* and *Rubus ursinus* which is still present. There is a patch of *Phalaris arundinacea* along trail 4 which seems to be encroaching from the north. Light cover of *Solanum dulcamara* is also present near trail 4.

**Zone 8:**

The north-central area of the park is typified by a moderately open canopy, medium to large diameter *Pseudotsuga menziesii* forest with a minor *Alnus rubra* component and continues into a

small ravine bordering the northern boundary of the park. The understory is not well developed and consists of sparse regenerating *Thuja plicata* and moderate cover of *Rhamnus purshiana*. Medium to large diameter *Thuja plicata* trees are notably absent. The well developed shrub layer is dominated by *Gaultheria shallon* and *Polystichum munitum* with scattered *Vaccinium parvifolium*. Moderate cover of *Urtica dioica* dominates the herbaceous layer with light cover of *Bromus vulgaris*.

One rather large *Ilex aquifolium* individual is present to the east of trail 4 in the north-east part of the zone with few others scattered throughout. A few scattered individual *Rubus laciniatus* plants were noted in the central portion of the zone as well as isolated *Rubus discolor* individuals along the ridge to the west.

**Zone 9:**

Zone 9 is defined by a mixed conifer/deciduous open canopy section of forest following a shallow ravine between the denser conifer forest of zone 8 and mixed forest of zone 11. Like the larger central ravine, there is no distinct stream channel and no evidence of surface water flows were noted at this time of year (late August), even up to where the ravine opens into the basin of zone 13. A slightly smaller, drier ravine runs along the northern extent of zone 8, also with no evidence of a stream channel. The northern portion of zone 9 is primarily covered by *Thuja plicata* while the southern portion of the zone is dominated by *Tsuga heterophylla* and *Alnus rubra*. The understory consists of sparse to moderate shrub cover dominated by *Rubus spectabilis* and *Sambucus racemosa* with patches of Op*lopanax horridus*. The herbaceous layer is poorly developed in this zone with scattered *Athyrium filix-femina* and *Dropteris expansa*.

Some scattered small *Ilex aquifolium* and *Geranium robertianum* individuals were noted.

**Zone 10:**

The ravine in zone 9 opens into a slight depression towards the center of the park. This area consists of a moderately closed canopy *Tsuga heterophylla* stand with a substantial *Alnus rubra* component. Some smaller diameter *Tsuga heterophylla* regeneration was present in the understory. The shrub layer is dominated by heavy cover of *Berberis nervosa* with scattered *Vaccinium parvifolium* and *Rubus spectabilis*. The herbaceous layer is dominated by light cover of *Dropteris expansa* and *Trientalis latifolia*.

A few small *Ilex aquifolium* individuals were noted and light *Geranium robertianum* cover persists along trail 4.

**Zone 11:**

The canopy of zone 11 is dominated by *Acer macrophyllum* and *Alnus rubra* with moderate cover of *Thuja plicata* and light cover of *Acer circinatum* in the understory. The shrub layer contains a mix of *Rubus* spectabilis, Vaccinium *parvifolium*, and *Polystichum munitum*, with light cover of scattered *Oemleria cerasiformis*. The herbaceous layer is dominated by light cover of *Urtica dioica* and *Bromus vulgaris*.

There is an area west of trail 4 as it bends to the north with moderate cover of *Lunaria annua*. While the area is small and contained, this zone appears to be the only location in the park with this species present.

**Zone 12:**

Zone 12 consists of a generally moderately open canopy mixed hardwood/conifer forest dominated by *Pseudotsuga menziesii* and *Acer macrophyllum* along the western facing slope with moderate cover of *Thuja plicata*, *Alnus rubra*, and *Tsuga heterophylla* throughout. Zone 12 has a well developed shrub layer dominated by *Rubus spectabilis* and *Polystichum munitum* with moderate C*orylus cornuta* cover and scattered *Oemleria cerasiformis*. The herbaceous layer is dominated by *Urtica dioica* and *Bromus vulgaris*.

There are several large stemmed clusters of *Ilex aquifolium* along the upper ridge of zone 12 to the south and west of trail 4. Two discrete patches of *Hedera helix* were noted within this zone. The largest can be found along the south side of trail 4 as it turns east from the main ridge. The second is down slope from this area north-west from the same turn.

**Zone 13:**

Zone 13 consists of a riparian influenced mixed conifer/deciduous forest with varied vertical canopy structure dominated by *Thuja plicata* and *Alnus rubra*. The source of Gold creek flows from zone 14 southward through zone 13. North-west of the stream there is a well developed shrub layer dominated by *Rubus spectabils.* The south-east portion of the zone consists of moderate *Acer circinatum* cover near the mouth of the central valley (zone 5). The herbaceous layer is dominated by thick carpets of *Tolmiea menziesii* and *Equisetum telmateia* to the east of the stream towards the parking lot.

There is moderate to heavy cover of *Phalaris arundinacea* along the south-west side of the stream and in the wetland areas located to the north and east of the lodge. The *Phalaris* along trail 1 referenced in the description of zone 5 is an extension of this population and should be watched for further spreading. Also present along the south-west bank of the wetland area is heavy *Solanum dulcamara* cover and heavy *Rubus discolor* cover. A discrete patch of fairly heavy *Hedera helix* cover exists to the west of the short trail leading to the fire pit and has occupied the trunks of several trees in the vicinity.

**Zone 14:**

Zone 14 is defined by the extent of more or less two erosion washes from which Gold Creek issues. It appears that Gold Creek emerges mostly from subsurface water runoff, at least during this time of year (late August), which issues from the sandy soil in the north-west corner of the park. The larger northern wash consists of steep sandy cliffs bare of vegetation along the east side with heavy cover of *Rubus discolor* along the hill slopes to the north and west. The majority of Gold Creek's water flow arises from underground springs at the center of this wash. A smaller wash just to the south also has water issuing from the ground and is separated from the

larger by an eroding bank with some vegetation providing minimal soil stabilization. The slopes and walls of both basins show signs of substantial, active erosion.

**Zone 15:**

The Gold Creek Lodge and paved parking area are delineated as zone 15.

## Pilot Scale Monitoring

INTRODUCTION:

In order to provide a base level of ecological information from which future observations could be compared, two types of monitoring programs were established at Gold Creek Park. The first was photo monitoring points located along Gold Creek in front of the Gold Creek Lodge. This area will be the site of continued restoration efforts planned by the Gold Creek Boys and Girls Club Program Director, Tara Irvin. The second program was part of the educational exercise concerning nested plot frequency sampling of invasive species discussed below. In order to investigate the extent of invasive species infestation within the park, two pilot-scale plots were established where invasive species frequency was sampled. The methods of sampling done on these two plots could be repeated in other areas of the park in order to obtain a more comprehensive understanding of invasive species distribution throughout the extent of the park.

**Photo Monitoring Points:**

The stream bank vegetation structure of a segment of Gold Creek was photographically documented. This set of photographs will be an important tool in tracking any changes that may result from future restoration efforts.

METHODS:

Photos were taken using a Canon PowerShot S10 digital camera with a 6.3 – 12.6mm lens (35mm film equivalent: 35 - 70mm). Each image was captured with the lens set to its widest angle. Photographs were taken of the stream from various angles to include the greatest coverage. A meter stick appears in each photo for scale and was usually placed three meters from the photo point (Table 3). A total of 12 plots were established: six looking west at the exposed portion of the flowing channel, two looking up and down stream of the flowing channel, and four looking east along the weaker channel towards the mouth of the valley. The location of each photo point was recorded using GPS and is displayed graphically in Fig. 4.

Fig. 4. Photo point locations along Gold Creek

**Table 3.** Photo plots are shown with bearings and locations.

| Date | Plot Number | Bearing | Distance from meter board | Comments |
|---|---|---|---|---|
| 9/7/2004 | 1 | 260° | 3 meters | east of main channel |
| 9/7/2004 | 2 | 270° | 3 meters | east of main channel |
| 9/7/2004 | 3 | 270° | 3 meters | east of main channel |
| 9/7/2004 | 4 | 260° | 3 meters | east of main channel |
| 9/7/2004 | 5 | 260° | 3 meters | east of main channel |
| 9/7/2004 | 6 | 270° | 3 meters | east of main channel |
| 9/7/2004 | 7 | 218° | 3.5 meters | main channel / downstream |
| 9/7/2004 | 8 | 34° | 6 meters | main channel / upstream |
| 9/7/2004 | 9 | 50° | 3 meters | south of side channel |
| 9/7/2004 | 10 | 70° | 3 meters | south of side channel |
| 9/7/2004 | 11 | 70° | 5 meters | south of side channel |
| 9/7/2004 | 12 | 70° | 3 meters | south of side channel |

**Invasive Species Sampling:**

The invasive species monitoring program employed at Gold Creek Park was designed to capture baseline invasive species frequency information on a pilot-scale. Because no previous data was available, assumptions of plot size and spacing were made and then evaluated for accuracy based on the returned results. Two nested plot frequency samples were conducted using similar methods but differing in structure. The first was a continuation of the education activity using a rectangular macroplot comprised of five 50m transects. The second method used the same sampling procedure but used a 270m portion of one trail as a single linear transect.

**Invasive Species in the Forest:**

METHODS:

A 1250 m² rectangular area was designated in order to measure the extent of invasive species frequency in the forested area to the south of Gold Creek Lodge. The location of the north-east corner of the macroplot was recorded using GPS and is displayed in Fig. 4. A meter tape was laid out along the north side of the macro plot and flagging was used to indicate the beginning of five transects. The plot consisted of five transects each 50 meters long and oriented along the North/South axis (Fig. 5). It was randomly chosen whether to place the first transect on either the 0 or 5 meter mark. Each transect was sampled by laying a 50 meter tape south from the flagging using a compass as a guide. A total of 50 plots were sampled along five parallel 50m transects, each with 10 plots per transect. The presence or absence of six invasive species was recorded for each nested plot

One meter plot frames constructed of ¾ inch PVC pipe were used. Each one included nested ½ meter and ¼ meter plots constructed from ½ inch PVC pipe within the one meter frame (Fig. 6). Poles or strings appropriately marked could be substituted for the frames. Plot frames were placed on the ground at five meter intervals along each transect. It was randomly decided which side of the transect to place the plots and where among the first 5 meters to begin. Presence or absence of 6 pre-selected non-native plant species was recorded based on which nested plot it

was seen to occur. If a species was present in the ¼ meter nested plot area it received a mark of one. If present in the ½ meter nested plot it received a mark of two. If a species was present within the boundary of the meter plot but outside of either nested plot, it received a mark of three. A zero mark was recorded for each species not present in each sample plot area. It should be noted that when summing occurrences for each nested plot of the entire transect, presence of a species found only in the ¼ meter or ½ meter plot areas must also be noted as present in the respective larger plots. For example, if a single GERO species is present only in the upper left corner of plot area 2, then GERO is present in both the 50cm (2) and the 1m (3) plot areas but not in the 25cm (1) plot area. If present only in the 25cm (1) plot area, then it is present in all three plot areas.

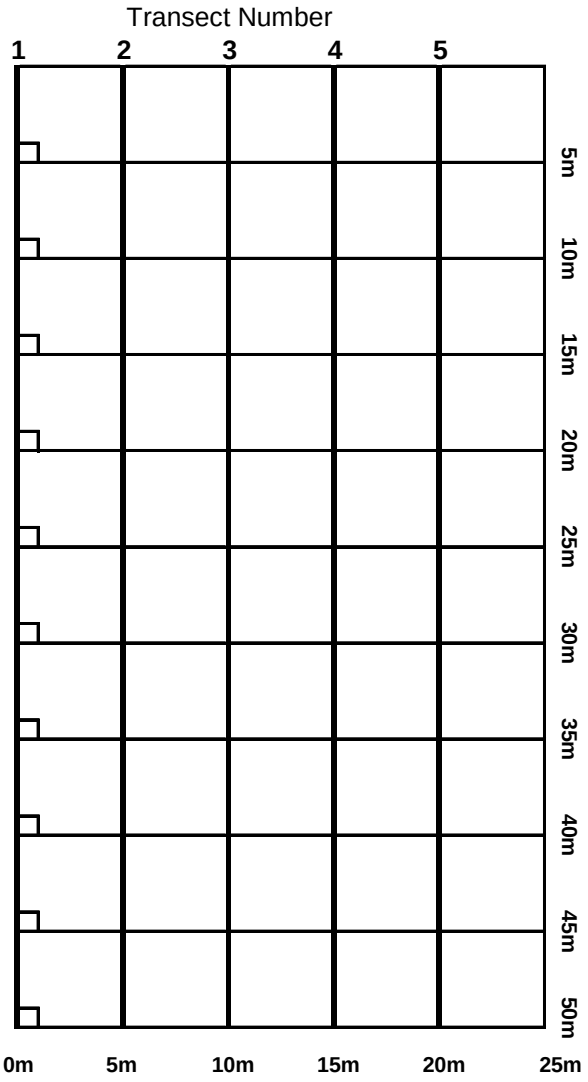


**Figure 5.** Macroplot dimensions are shown. Small boxes represent nested plot locations along each transect.

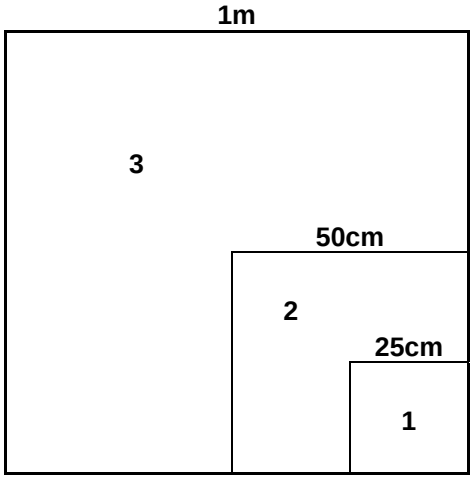


**Figure 6.** Dimensions of the nested plot are shown.

RESULTS:

Only two invasive species were recorded in the forested macroplot; *Geranium robertianum* and *Rubus discolor*. *Geranium robertianum* occurred in 24% of the ¼ m plots, 28% of the ½ m plots, and 36% of the 1m plots. *Rubus discolor* only occurred in 2% of each of the three plot sizes (Fig. 7). The low frequency of *Rubus discolor* suggests that larger plots would be necessary in order to accurately track any changes regarding this species.

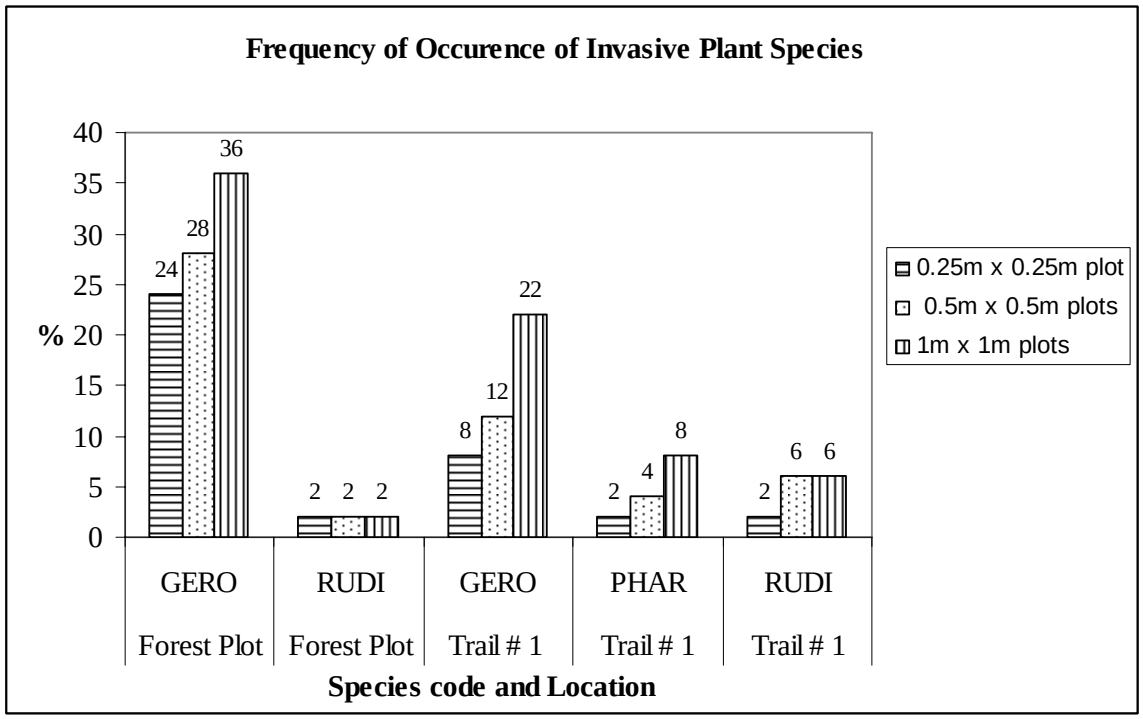


**Figure 7.** Frequency of occurrence of non-native invasive plant species within nested plots at two locations (forest plot and along trail # 1). Nested-plot frame size is indicated by the fill-pattern. Species codes are available in Table 1.

**Invasive Species along Trails:**

METHODS:

In order to measure the extent of invasive species along trails, a pilot project was run using similar methods as described for the macroplot vegetation sampling plan. The major difference was that instead of using a macroplot with 5 transects, this plan used a trail segment and positioned 5 transects end to end along either side of the trail. It was randomly decided whether to start at the 0m or 5m mark and weather the left or right side of the trail would be sampled for each transect. 10 plots were placed along side the trail tread at 5 meter intervals for each transect. Each transect was separated by approximately 5 meters. The presence or absence of six invasive species was recorded for each nested plot.

RESULTS:

Three species were found in the trailside sampling effort; *Geranium robertianum*, *Rubus discolor*, and *Phalaris arundinacea*. *Geranium robertianum* occurred in 8% of the ¼ m plots, 12% of the ½ m plots, and 22% of the 1m plots. *Rubus discolor* occurred in 2% of the ¼ m plots, 4% of the ½ m plots, and 8% of the 1m plots. *Phalaris arundinacea* occurred in 2% of the ¼ m plots, 6% of the ½ m plots, and 6% of the 1m plots (Fig. 7).

## Education Activities

Two educational programs were developed to provide hands-on learning experiences for Boys and Girls Club youth. One program focused on general concepts of GIS mapping and was geared towards younger participants. The other introduced concepts and methods of plant ecology and vegetation sampling and was developed for older teens.

**Mapping of Ecological Conditions Program:**

The goal for this project was to introduce basic mapping techniques and to demonstrate how varied information could be integrated and displayed on a single, functional map. Ecological concepts of erosion, invasive species, and tree canopy composition were introduced.

MATERIALS AND METHODS:

1. Aerial photographs of the park showing trail systems.
2. Sheets of mylar cut to map size.
3. Different colored markers suitable for writing on the Mylar.
4. Clipboards.

After a portion of the trail system was selected to be the study area, participants were divided into three groups. Each group received a base map with a sheet of mylar secured with paperclips. The groups then proceeded to walk the trail locating and marking on the map one of three ecological conditions. One group marked all occurrences of trail erosion and noted aspects such as length and depth of each location. The second group marked each occurrence of three invasive species common to the park. Each species was denoted by a separate color of marker. The third group located and marked the general boundary between deciduous dominated forest canopy and conifer dominated forest canopy.

Back at the lodge, each group presented their experiences and displayed their maps to the other groups. This provided an opportunity to review the concepts that had been introduced in the field with the group as a whole. Discussion included the causes and concerns of erosion and how it can be managed; why invasive species are a concern and what can be done to discourage their proliferation; and what are some of the reasons for existing variations in vegetation types and why this is ecologically important (habitat use by wildlife, rainwater surface flow reduction, etc).

Finally, the three mylar sheets were collected and combined to display all data on one map. The correlation between hand-drawn maps and computer generated GIS (Geographic Information

Systems) was made. The mylar sheets can be added and removed similar to turning layers on and off in a computer GIS application. Discussion included ideas of resource monitoring and management with an emphasis on how maps play an important role in directing efforts and illustrating results.

RESULTS:

The program ran smoothly and was considered a success. The children were adequately involved and participated throughout the exercise. More emphasis could be directed towards participant discussion of ecological concepts during the field exercise and presentations. There is the chance that the overall goal of correlating our exercise with current mapping techniques may have been under emphasized. The program could benefit from a more structured strategy to deliver this concept. Having a previously generated paper map or demonstration with a GIS application displaying information similar to what was collected could help with this process. Other improvements could include handouts highlighting key concepts that the participants could retain.

**Vegetation Sampling Program:**

The main goal of this program was to introduce concepts of plant ecology and methods of vegetation sampling. Key concepts include understanding how baseline ecological information forms the background of resource management and monitoring, and how vegetation sampling is a part of this process. By conducting a sample of the relative abundance of six potentially invasive species, the project introduced how this information is collected in the field. Other concepts such as invasive species concerns, plant identification, and project design were also emphasized.

MATERIALS AND METHODS:

1. Tape measures or marked string appropriately sized for the study area.
2. Survey flagging.
3. Compass.
4. Survey plot frames, poles or marked string.
5. Data sheets for recording plot information.

Two 25m by 50m macroplot areas were established as the study site and the participants were divided into two groups. One group used the plot location described in the section regarding frequency of invasive species in the forest. The other group established a plot approximately 150 meters to the south. Sampling procedures were carried out as described in the methods section under Sampling Invasive Species in the Forest. One transect was completed on the southern plot which was established solely for educational purposes.

RESULTS:

The program went well with good participation and involvement. The participants were engaged and asked pertinent questions throughout the exercise. Only 3 out of the 10 proposed transects

were completed by the two groups within the timeframe allotted to this activity (approximately 2 hours). An improvement would have been to have both groups working on the same macroplot. This would have reduced set-up time, allowed for more interaction of participants, and potentially enabled us to complete one set of five transects. Furthermore, due to the timing of the program (prior to lunch time) we were unable to adequately bring the group together following the plot exercises. This would have been an opportunity to discuss how the collected data are summarized and what this information can tell us about the state of invasive species in the park. Further discussion could include different types of management actions that could be proposed based on the results of the colleted data.

## Management Issues

Gold Creek Park is principally used by three groups, day-hikers, King County Boys & Girls Club, and local equestrians. Day hiker use is relatively low at Gold Creek Park because (for some reason) it seems that people do not know that the park exists.

King County Boys & Girls Club uses Gold Creek Lodge as a base for summertime day and overnight programs. These programs usually include an environmental education component. The forest, stream and hiking trails, along with the availability of the lodge itself make this park uniquely well suited for delivering environmental education programs. Within King, Pierce, and Snohomish Counties this is the only Boys & Girls Club facility with access to 34 acres of natural habitat and a suitable overnight facility. Local equestrians are encountered frequently along the trails and trail signs indicate that the Hollywood Hills Saddle Club has historically been active in the adopt-a-park program. Mountain bikers are seen occasionally using the park, but not very often.

### Erosion and Trail Conditions

The soil series, slopes, and current use at Gold Creek Park have contributed to areas of erosion. This erosion is a management concern because it can potentially undermine trail stability and decrease water quality of downstream surface waters. Water pools in the Alderwood soil on flat or low lying trail sections once the soils' surface horizons become sufficiently saturated. This produces wet ponded trail conditions, which causes trail users to walk or ride around the puddles, creating ever widening trail tread widths. When the site is sloped, water runs off the surface carrying soil particles with it. The trails themselves sometimes concentrate the path of the flowing water and accelerate the formation of gully erosion. The majority of Gold Creek Park is considered an erosion and landslide-prone area according to maps of King County's sensitive areas.

During the course of this inventory ten trail segments were identified where significant erosion had occurred (Fig. 3). Segments were mapped if the depth of erosion exceeded 20cm for at least 3m of trail length. The total length, average width, and average depth of each eroded segment was recorded and used to calculate the estimated volume of soil lost from each area. The estimated volume was used to rank the severity of soil lost for each segment in order to assist planning and prioritization of future trail maintenance projects. Segments varied from as little as

2 $m^3$ to as much as 29 $m^3$ of soil lost (Fig. 8). The average estimated amount of soil lost per segment was 9.6 $m^3$ and trail # 3 had the greatest number of eroded segments (5).

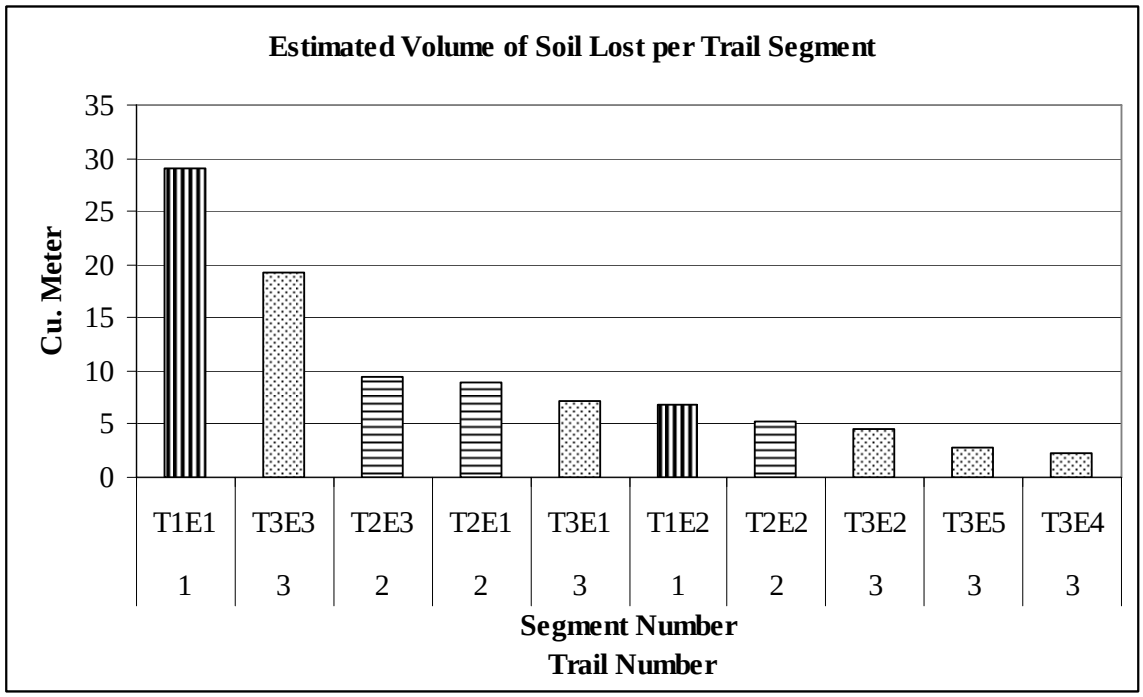


**Figure 8.** The estimated volume ($m^3$) of soil lost within each trail segment is displayed. Each trail is indicated by a unique fill-pattern.

## Invasive Plant Species

Non-native invasive plant species are a management concern in Gold Creek Park because they can have negative effects on native habitat structure and function. Non-native invasive plant species threaten native plant species diversity by occupying habitat niches that were formerly occupied by the native species. Other taxa (e.g. insects, vertebrates, or soil organisms) have co-evolved with native plant species and often depend on native plant species for essential habitat functions (shelter, cover, food, etc). Because of this interdependent relationship, threats to native plant species diversity also represent a threat to the biodiversity of the park as a whole.

22 non-native species were found in Gold Creek Park; 13 of these were invasive non-native species (Table 4). Three invasive plant species were found in only one vegetation zone, but most species were more widespread. Four invasive plant species were present in 50% or more of the vegetation zones (Table 4). The most widespread invasive plant species was herb Robert, *Geranium robertianum*, which was present in 100% of the vegetation zones surveyed. Both English Holly, *Ilex aquifolium*, and nipplewort, *Lapsana communis*, were present in 64% of the vegetation zones and Himalayan Blackberry, *Rubus discolor*, was present in 50% of the vegetation zones.

**Table 4**. Non-native invasive plant species found in Gold Creek Park are listed in descending order according to how many vegetation zones each species occupied.

| Code | Species | Common name | Number of Zones Occupied | Percent of Zones Occupied |
|---|---|---|---|---|
| GERO | Geranium robertianum | herb Robert | 14 | 100% |
| ILAQ | Ilex aquifolium | English holly | 9 | 64% |
| LACO | Lapsana communis | nipplewort | 9 | 64% |
| RUDI | Rubus discolor | Himalayan blackberry | 7 | 50% |
| RULA | Rubus laciniatus | evergreen blackberry | 6 | 43% |
| HEHE | Hedera helix | English ivy | 4 | 29% |
| RARE | Ranunculus repens | creeping buttercup | 4 | 29% |
| PHAR | Phalaris arundinacea | reed canary grass | 3 | 21% |
| SODU | Solanum dulcamara | deadly nightshade | 3 | 21% |
| Cirsium sp. | Cirsium sp. | thistle | 1 | 7% |
| LUAN | Lunaria annua | annual honesty | 1 | 7% |
| Polygonum sp. | Polygonum sp. | smartweed | 1 | 7% |
| PRLA | Prunus laurocerasus | cherry laurel | 1 | 7% |

Systematic monitoring of invasive species was conducted on a pilot scale for management areas near Gold Creek Lodge and along trail # 1 in order to determine monitoring indicators and methods that could be (1) sensitive to change due to stewardship activities, (2) efficient to collect with volunteers or youth from Boys & Girls Club and (3) feasibly scaled-up to monitor invasive plant species extents throughout the park's 35 acres. This information can also be used to a limited extent to establish a baseline level of invasive species within the two study zones. Frequency of occurrence was chosen as the attribute to measure because it is easy for students and volunteers to do. Simply recording the presence/absence of each species in a plot is easier, faster, and more accurate than measuring or estimating the cover of each species.

When monitoring the trend of the extent of invasive species that could either increase (frequency of occurrence increases) or decrease (frequency of occurrence decreases), the first year frame size should yield a frequency between 30% and 70%. This range of values in the first year allows for better measures in both directions in future years; if first year frequency is too low, it may not be possible to capture subsequent reductions in the extent of species. Since most species in most locations were below 30%, this pilot suggests that a larger nested-plot frame-size would be required for monitoring trends in all species and locations (except herb Robert in the forest plot area).

Trailside monitoring suggests that a greater number of invasive species occur along the trail as compared to the forest interior. Himalayan blackberry occurred more often along the trailside within the $0.5m^2$ and $1m^2$ frame sizes than in the forest plot (Fig.7). Herb Robert occurred more often within all frame sizes in the forest plot than along the trail (Fig. 7). English ivy and holly were absent from all plots. This could be due to one of two reasons: (1) sampling design error (e.g. frame size too small, sampling intensity too low, chance locations of macroplot, etc.) or (2) one or both of these species actually occur in relative low abundance in the park. Holly appears to be quite widespread (appears in 9 out of 14 zones) and English ivy appears to be more

localized (occurring in only 4 zones) (Table 3.). This suggests that for holly, its absence in frequency sampling is probably due to sampling design, but for English ivy, its absence is probably due to relatively low abundance in the park. More widespread sampling for the frequency of invasive plant species through the park is required in order to be more conclusive.

## Management Recommendations

- **Increase Stakeholder Involvement in Park Planning**

This inventory has been undertaken as a first step in the planning process for future stewardship and management of Gold Creek Park. Principally it has focused on the site inventory step as well as initial gathering of relevant background information. Next steps should include an expanded planning process with participation by all the relevant stakeholders. Initial leadership in this process has been displayed by the Boys & Girls Club, suggesting that they are involved and committed stewards of this park. The development of mutual goals and objectives for management of the park should be developed among at least the following list of stakeholders:

- King County Department of Natural Resources, Parks and Recreation
- Boys & Girls Club of King County
- Hollywood Hills Saddle Club
- Adjacent Neighbors
- Next owners of property located south of the park with Trout pond
- Frequent Park Visitors

Besides helping to set appropriate management goals and objectives for Gold Creek Park these parties form a broad base of support for on-going stewardship of the park. Perhaps some of these groups will become active volunteers on parks improvement projects.

- **Continue Education and Outreach Activities**

Education and outreach about Gold Creek Park should continue. Environmental education activities are a great use of this park's resources. Involving youth in exercises such as monitoring riparian restoration, monitoring invasive species extents or mapping ecological management issues achieves multiple outcomes related to (1) managing park resources efficiently, (2) raising awareness about ecological issues in county natural areas and (3) exposing urban youth from underserved communities to high-quality environmental learning opportunities.

- **Repair Eroded Sites**

The extent of erosion that was detected requires some timely management intervention to abate further soil loss. Concerns for impacts to downstream water-quality and trail-users' safety suggest making this issue a priority work-order in the next year. Estimates of soil loss can be used to prioritize work areas or to estimate materials and/or labor for trail repairs. It appears that where water bars had been installed and are still working areas with high potential for erosion were spared. Water bars were absent or non-functioning near areas with greater erosion. A professional trail design and maintenance crew should evaluate the trail standards used in Gold

Creek Park. These design standards should consider the park's soils, slopes, and current trail uses to arrive at appropriate re-routes, if deemed necessary. Design should plan for (1) increased traffic (2) trail longevity (3) correct handling of water on or around trails and (4) minimal soil loss.

- **Remove Invasive Non-native Plant Species**

Invasive species along trails and in the forest should be removed and monitoring should continue in order to document successful reduction of invasive species and to provide early warning of new invasions. Volunteer groups and/or contract labor can be employed to conduct invasive species removal. Environmental education programs can include monitoring for invasive species integrated in to their curriculum. Herb Robert, holly, nipplewort, both species of invasive blackberry, and English Ivy are the most extensive invasive species. Other invasive species are present in more localized areas or are less extensive. Removal efforts should focus on defensible areas, (areas with minimal invasive species will be maintained weed-free with moderate to low effort), and species with limited extents first, (invasive species with limited extents could be eliminated locally with the least amount of effort). More widespread or pernicious weed species will require greater commitment of time and labor resources. Most removal will be feasible with hand-removal and judicious use of non-persistent herbicide. The extensive cover of Himalayan blackberry located in the northwest corner of the park is probably the largest single patch of invasive species in the park. Soil in this area is moist and it is located near the eroding sandy escarpment. Removal here should be done in the driest time of year and the areas will need immediate replanting and perhaps soil bioengineering to re-establish cover as soon as possible after removal of the blackberry. This area may require mechanical, chemical or a combination of control methods in order to adequately control the blackberry.

- **Restore Riparian Structure and Function along Gold Creek**

The centrally located section of Gold Creek west of the lodge has a riparian area that consists almost exclusively as grass lawn cover. On September 17th, 2004 initial restoration activities are planned to remove invasive species in the riparian corridor and to plant native plant species with the intent of restoring the structure and function of the riparian zone. This restoration project can continue to be monitored by comparing post-installation conditions to the photo points established on September 7th, 2004. These can be repeated at 2-5 year intervals in order to track the development of this project towards its goal. If riparian structure is restored during the next 5-10 years it is assumed that many riparian functions will also be restored. More detailed information about the progress of this riparian restoration effort could be obtained by substituting qualitative monitoring techniques for more quantitative monitoring of selected attributes in future years.

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## Appendix A: Data Collection Sheets

Date_____ Page_____

# Gold Creek Park Boys and Girls Club

### Field Data Sheet: Vegetation Zones

### Seattle Urban Nature Project

| **Vegetation Zone:** |
|---|
| |

| **Dominant Species by Layer:** | | | |
|---|---|---|---|
| Canopy | Mid-Story | Shrub-Layer | Herbaceous-Layer |
| | | | |
| **Comments:** | | | |

| **Species Present:** | | | |
|---|---|---|---|
| Species | Prevalence | Species | Prevalence |
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## Appendix A: Data Collection Sheets

Date_____ Page_____

### Gold Creek Park Boys and Girls Club
**Field Data Sheet: Trail Erosion**
**Seattle Urban Nature Project**

| **Trail:** |
|---|
| **Comments:** |

| Date | Segment | GPS (Y/N) | Length (m) | Width (cm) | Depth (cm) | Slope (°) | Comments |
|---|---|---|---|---|---|---|---|
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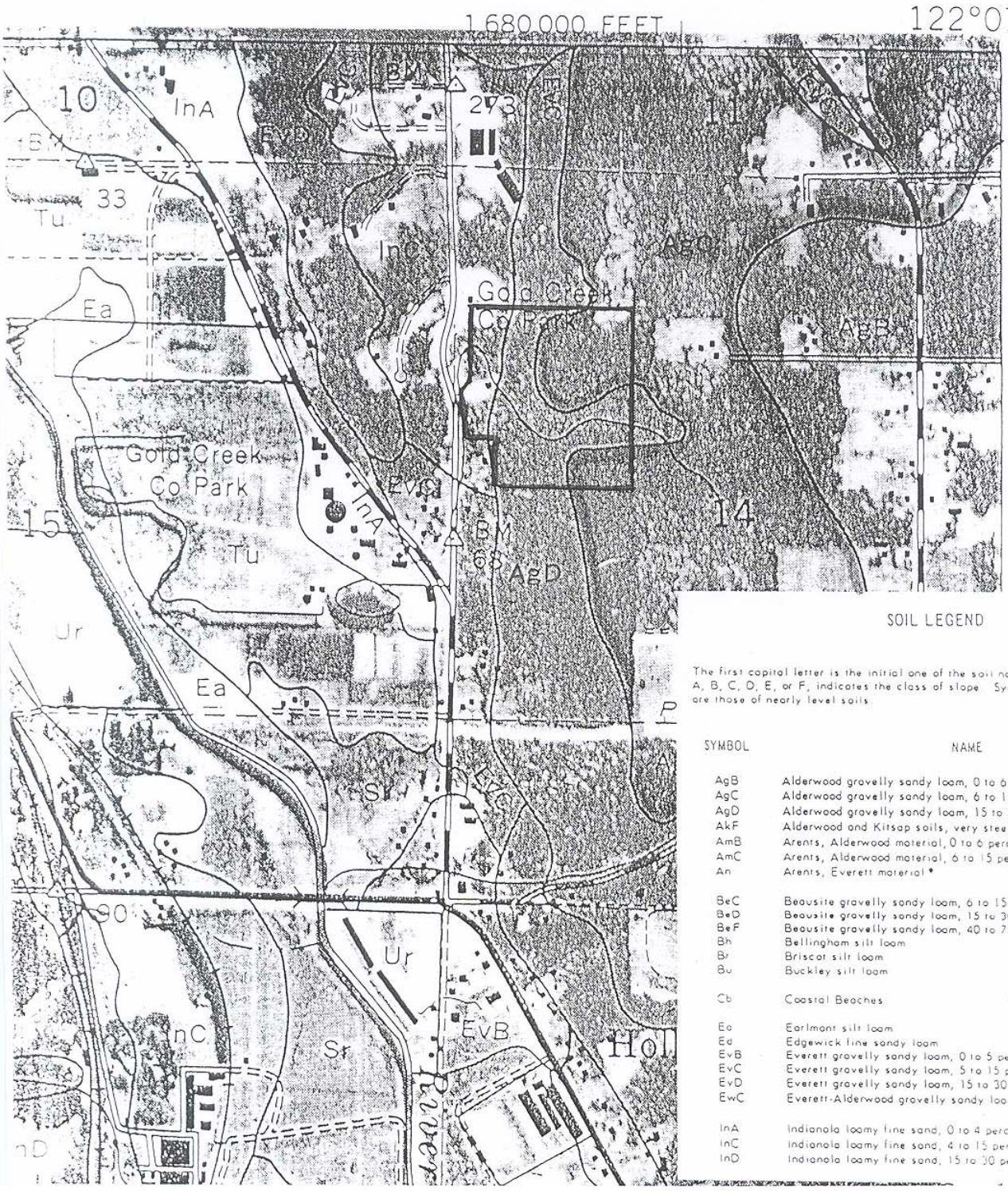
## Appendix B: King County Soil Survey, 1973

# SHEET NO.1

# KING COUNTY AREA, WASHINGTON

## (KIRKLAND QUADRANGLE AND PART OF SEATTLE NORTH QUADRANGLE)




SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, indicates the class of slope. Symbols without a slope letter are those of nearly level soils.

| SYMBOL | NAME |
|---|---|
| AgB | Alderwood gravelly sandy loam, 0 to 6 percent slopes |
| AgC | Alderwood gravelly sandy loam, 6 to 15 percent slopes |
| AgD | Alderwood gravelly sandy loam, 15 to 30 percent slopes |
| AkF | Alderwood and Kitsap soils, very steep |
| AmB | Arents, Alderwood material, 0 to 6 percent slopes * |
| AmC | Arents, Alderwood material, 6 to 15 percent slopes * |
| An | Arents, Everett material * |
| BeC | Beausite gravelly sandy loam, 6 to 15 percent slopes |
| BeD | Beausite gravelly sandy loam, 15 to 30 percent slopes |
| BeF | Beausite gravelly sandy loam, 40 to 75 percent slopes |
| Bh | Bellingham silt loam |
| Br | Briscot silt loam |
| Bu | Buckley silt loam |
| Cb | Coastal Beaches |
| Ea | Earlmont silt loam |
| Ed | Edgewick fine sandy loam |
| EvB | Everett gravelly sandy loam, 0 to 5 percent slopes |
| EvC | Everett gravelly sandy loam, 5 to 15 percent slopes |
| EvD | Everett gravelly sandy loam, 15 to 30 percent slopes |
| EwC | Everett-Alderwood gravelly sandy looms, 6 to 15 percent slopes |
| InA | Indianola loamy fine sand, 0 to 4 percent slopes |
| InC | Indianola loamy fine sand, 4 to 15 percent slopes |
| InD | Indianola loamy fine sand, 15 to 30 percent slopes |