Mercer Madison Woods

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abstract

The area currently known as 3001 Madison Street is a 1/3rd acre lot located southeast of the intersection of Madison and Lake Washington Boulevard. It is a triangular shaped, steeply graded hillside containing several mature trees and a variety of shrubs. Many of the typical Northwest invasive species have colonized the area as well and, due to the sites previous lack of management, become well established. The lot is made up of fill material, which was brought to the site around 1915 when Madison Street was graded to its current height. Since that time the lot has been unmaintained, collecting garbage and attracting some undesirable people and activities. Recently, the site was purchased by the City of Seattle to use as urban green space, and a P-patch was installed along the lower border of the property. As the neighborhood around it has become more affluent, so too has awareness of and interest in preserving local green spaces such as this. Our plan for this site is to clean out the accumulated refuse, remove undesirable nonnative species, do some erosion control, and replant the site with native species. These native species were chosen for their ability to survive with little or no maintenance, ability to provide for wildlife, and for overall appearance.

Madison Street cable car circa. 1922.

site + essentials

The 1/3 acre green space officially known as “3001 Madison St.” is located just east of Madison Street and just south of Lake Washington Boulevard near the Washington Park Arboretum in Madison Valley. This site is located on the side of a large earthen dam built to support Madison Street.

3001 Madison Street, (also called Mercer Madison Woods) is officially owned by the City of Seattle and regulated by the City of Seattle Parks and Recreation Department. Seattle Tilth has established a P-patch along Mercer Street on the lower portion of the hillside..

site + history

Before the arrival of European settlers, Madison Valley was the site of an ancient salmon stream and densely forested hillsides. It was considered sacred hunting and fishing grounds of the Duwamish people, who established seasonal camps on the shores of Lake Washington and called the area “Where One Chops” (Rochester, 2001).

In the 1860’s, Judge John J. McGilvra from Illinois bought 420 acres of land in Madison Park, an area just north of Madison Valley. In order to get to his “remote” claim, he built his road directly from downtown, over Capitol Hill, and out to Lake Washington, creating a diagonal route through what would soon be mostly north-south streets. McGilvra established 24-acre Madison Park at the terminus of Madison Street and soon the area became a popular recreation and vacation spot. Due to the increasing popularity of the area, McGilvra and others founded the Madison Street Cable Railway Company (Cableguy, 2003). During this construction the street was widened and a large trestle was built over the center of Madison Valley. This trestle allowed the trolley to pass over a salmon-bearing stream, and created a long level stretch of track for it to travel on.

The 1909 Alaska Yukon-Pacific Exposition, held on the current grounds of the University of Washington, started a new phase of development in the University and surrounding areas. In 1908, the decision was made to tear the trestle down and replace it with a large earthen dam, splitting the valley in half and blocking the underlying stream (Sherwood, 1980). “3001 E. Madison St.” sits on the northern end of the southeastern facing side of this dam.

Due to the steep slope required to grade Madison Street to that height, the embankments on either side of the street are unbuildable. The site location is triangular shaped, bordering Madison Street to the northwest, five adjacent residential lots to the northeast, and Mercer Place to the southeast. The earthen dam continues southwest another 120 feet from the site, property owned by the DOT and covered with a solid layer of Himalayan blackberry.

For nearly 100 years this site has been neglected, rendered value-

less because of its unbuildability, and therefore allowed to grow unmanaged. Because of this, many of the typical northwest second growth species have grown up here, including Big Leaf Maple, Red Alder and Indian Plum as well as many invasive species, such as English Ivy and English Laurel.

Recently, however, due to decreasing urban open space, and increasing affluence of the Madison Valley area, more attention is being paid to this sites such as this. The lot was purchase in 1995 by the City of Seattle Parks under the Conservation Futures Tax Bond and a few preliminary studies were made at that time. In March 2001, a P-patch was built at the Mercer Street level and some invasive species removal was done around the area. In 2001, the Parks Department applied to a University of Washington forestry/landscape architecture program that creates design plans for urban green spaces. This report and design proposal is from that program.

One of few images of the Madison Street cable car trestle.

site + current use

Because of the sites out of the way location, lack of visibility, multiple exit points, and its obvious lack of management, it has been an attractive place for drug sales/usage, and for garbage dumping. Recent efforts by the community to clean up the area and reduce the drug activity have been successful, although litter on this unmaintained site continues to be an issue.

Several social trails wind through the property, though there are no “official” entrances into the site. From above, there is a gap at the end of the railing along the Madison Street sidewalk that allows access, though the steepness of the grade at this location prevents most people from entering here. The lower access point is from inside the P patch, which is difficult to see from the road. Because of this, the current recreational use of this property is very limited.

The highest purposes of the site currently are: habitat for small birds and animals, contribution to the cities’ canopy layer and biomass total, and slope erosion control. Because of the sites proximity to the 200+ acre Washington Park Arboretum, and the presence of a large blackberry thicket on the adjacent DOT property, numerous bird and small animals live, eat, and commune here. Though it is a small area, the sites structural complexity, variety of canopy covers, and lack of people, make it a welcome area for a number of different wildlife species. Several mature Big Leaf Maples on the site add to the canopy cover percentage in the city, an important figure in the health of a cities forest component. The root structures of the Maples, as well as those of several of the existing trees like the Beaked Hazelnut, are helpful in stabilizing the hillside, reducing erosion.

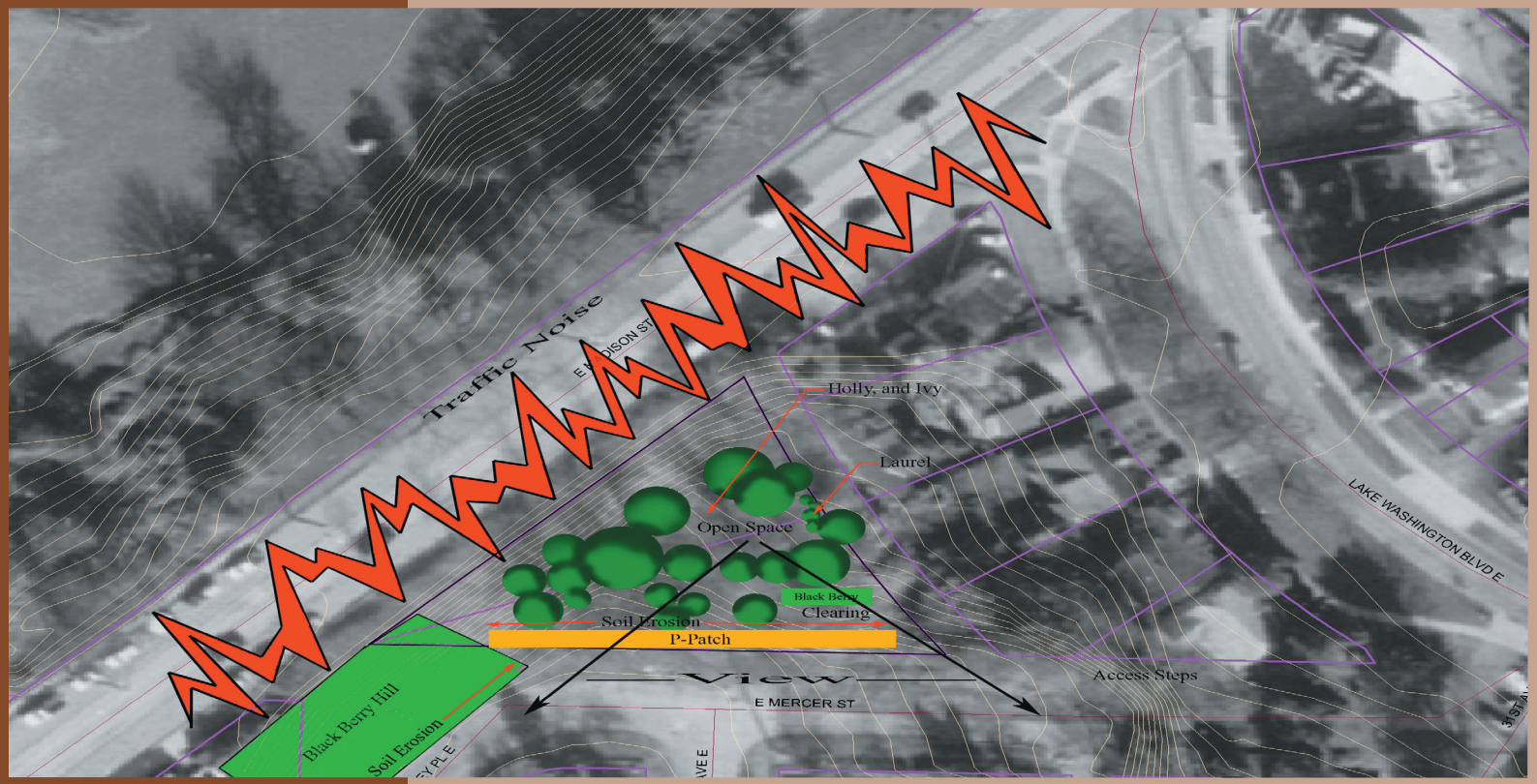
site + analysis

hazard tree assessment

Two existing mature Big Leaf Maples (*Acer macrophyllum*) must

site analysis

diagram



be examined for hazard tree conditions. Hazard ratings are based on the likelihood of failure of the tree, added to the proximity and frequency of potential “targets”, people or property (Harris, 2001) In the case of the more southern Maple, there is a large (20 ft. long, 8 in. diameter) “hanger” or a dead branch that has broken and is hanging up in the canopy by other branches. For the safety of the workers, this branch must be taken down before activity is begun on the site. Both trees are healthy, but have a good deal of dead-wood that should be pruned out by an arborist.

light

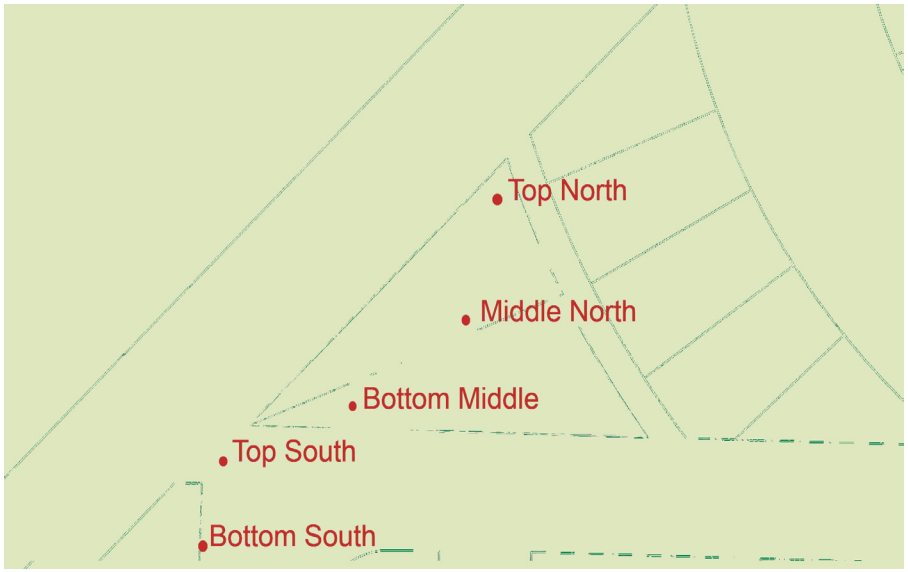
Though there are two large Big Leaf Maples and several medium sized trees, the site faces southeast and receives several hours of direct sunlight. During the early morning, trees to the northeast shade the site, but by late morning it becomes direct sun. This lasts until late afternoon/early evening when the sun dips behind Capitol Hill, an hour or so before sunset. This site averages about 6-8 hours of sunlight per day, depending on time of year and should be suitable for all but the most shade-loving plants.

soil analysis

Soils provide five crucial functions in any ecosystem (Brady,2002). Most obviously, soils provide a medium for plant growth. Soil also acts as a water purification element, provides habitat for soil dwelling organisms, as well as recycles nutrients and organic wastes. In an urban setting, like the Mercer Madison Woods Site, soil also acts as an engineering medium. The land constituting this hillside did not naturally exist as of 1908. At that point, the trestle road was replaced by mounds of soil used to elevate the road as it is today. It is unknown where this soil came from, but is likely that it came from the dredging of the Montlake cut between Lake Union and Lake Washington. (Sherwood, 1980).

Understanding how soil supports the growth of plants by providing nutrients and medium for plant roots is very important when designing an urban forest. Soil texture, density, and chemistry all play a role in plant performance on any given site. Soil testing can be done to assess and predict horticultural of environmental problems that may occur on the sampled area. Analysis of the soil also helps find contaminates in the soils that may affect plant growth.

To better understand soil properties and chemistry involved with plant growth, five soil samples were analyzed. Three sample (top north, middle north, and bottom middle) where taken from the City of Seattle property. Samples were also taken from the Department of Transportation property, which may be used to expand the Mercer Madison woods site. Samples were taken on January 15, 2004 using a sampling corer. Each sample was transported in a zip-lock bag and then dried on a plastic plate at the University. Once dried, a one cup measure of each sample was placed in a clean zip-lock bag and sent to the University of Massachusetts,



Map of sample sites

List of existing vegetation to be kept at 3001 Madison Street

Species	Common Name	Plant Type
Acer macrophyllum	Big Leaf Maple	Tree
Alnus rubra	Red Alder	Tree
Athyrium filix-femina	Lady Fern	Fern
Carex	Assorted Sedges	Herbaceous
Corylus cornuta	Beaked Hazelnut	Tree
Crataegus monogyna	English Hawthorn	Tree
Gaultheria shallon	Salal	Shrub
Galium	Bedstraw/Cleavers	Herbaceous
Holodiscus discolor	Oceanspray	Shrub
Lathyrus	Wild Pea	Vine
Mahonia nervosa	Oregon Grape	Shrub
Malus	Apple	Tree
Oemlaria cerasiformis	Indian Plum	Shrub/Tree
Polystichum munitum	Sword Fern	Fern
Prunus	Cherry	Tree
Pteridium aquilinum	Bracken Fern	Fern
Rubus spectabilis	Salmonberry	Shrub
Rubus ursinus	Trailing blackberry	Vine
Taxus brevifolia	Pacific Yew	Tree

Amherst, soil and plant tissue testing laboratory. Once dried, samples were sent to the University of Massachusetts, Auburn, soil and plant tissue testing laboratory.

Lab results included bulk density, pH, and percentage of Nitrogen, Phosphorous, potassium, micronutrients and lead (Appendix ?). The soil analysis also includes reccomendations for planting and soil ammending.

Two soil pits, 12 inches deep, were dug on the City of Seattle property to analyze possible horizons, and soil drainage. Four liters of water were poured into each pit and then the drainage time was noted. A ribbon test on these soils was also performed to examine soil texture.

From the soil pits, it appears that the top organic layer is quite thick (10 inches) on the flat areas. On the slopes where the organic matter is more likely to be washed or blown down hill, the organic layer is only 4 inches.

The ribbon test results suggest that the horizon below the organic layer has about high clay content by volume. The slope B horizon

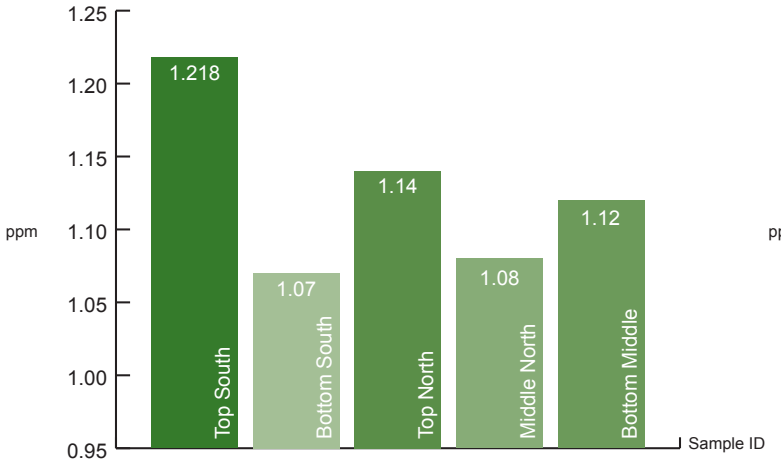


Figure 1 Bulk Density

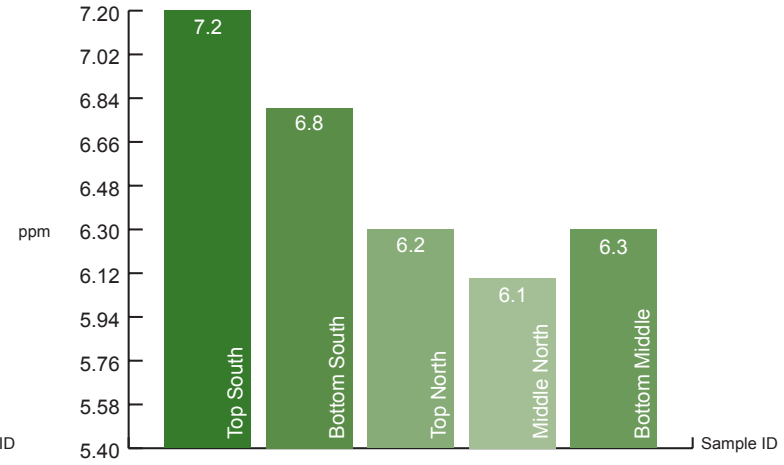


Figure 2 Soil pH

was a little greyer in color that the flat areas B horizon. Also, water drained much faster from the slope pit than the flat pit.

Bulk Density is defined as mass of a unit volume of dry soil. The lower the measurement of bulk density, the greater the amount of pore space available in the soil. To put this in perspective, concrete has a bulk density of 2.45 while an uncultivated forest grassland generally has a bulk density between .8 and 1.2 (Brady). A bulk density of 1.6 is enough to inhibit root penetration due to resistance to penetration, poor aeration, slow movement of nutrients and water and buildup of toxins. Fortunately the measurements from the MMW site are similar to uncultivated grassland (figure 1). Initial road construction may have been the greatest impact on this site. Due to its steep slope, and dense vegetation, the only compaction seems to be on the few social trails through the area.

Water permeability of the soils was sufficient to eliminate water-logging of the soil. Soil pit testing concurs with the bulk density measurements. Roots in this area should not be inhibited by poor water and gas movement in the soil.

Soil pH affects plant growth by changing the availability of nutrients as well as toxins in the soil. Generally plants grow best in soils with a pH between 5.5 - 7.5; 6.5 being the optimum pH (University of Massachusetts). All soils fall within this acceptable range (figure 2). The samples from the Department of transportation land however were noted by the soil results to have a relatively high pH (Appendix ii). Although amending soil with sulfur (6 cups per cubic yard) was recommended by the University of Massachusetts for new plantings, we feel choosing plants adapted to the high pH would work best. The Department of Transportation property will not be considered for this design.

Cation Exchange Capacity (CEC) is the amount of exchangeable cations that a soil can hold; measured as moles of positive charge absorbed per unit mass (milliequivvalents per 100 grams) (Brady 2002). Cations are positively charged ions that are attracted to the negatively charged soil particles (Harris 2004). A fine clay soil will have greater surface area, so it can hold more cations and will have a greater CEC (Harris). Greater amounts of organic matter

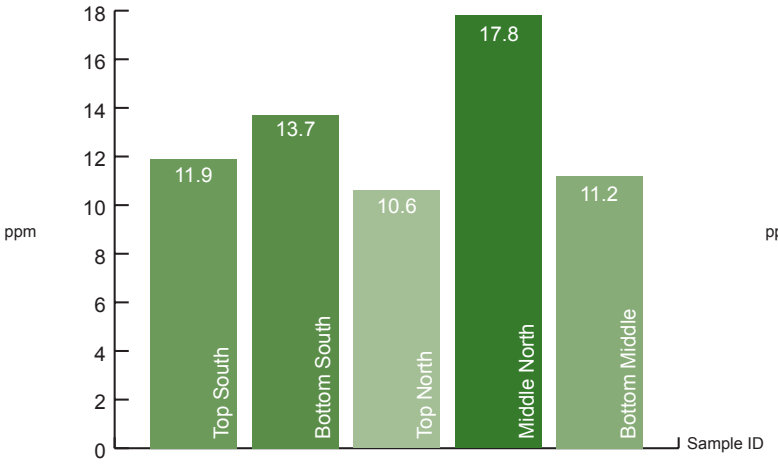


Figure 3 Cation Exchange Capacity

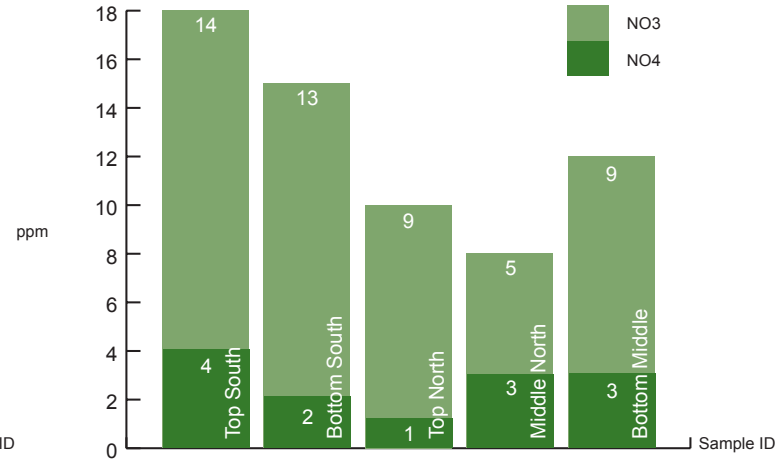


Figure 4 Nitrogen Levels

or greater pH will lead to increased CEC in the soil (Brady, 2002). Soil humus measures between 150- 250 meq/100g (Brady, 2002) The sandy loam soil of this site has relatively low CEC (figure 3).

Soil testing results suggests that the nutrients in the soil are all adequate for plant growth. Some recommendations were made for adding fertilizer or incorporating compost in with the back fill of new plantings (appendix ii).

Nitrogen is one of the most important nutrients, yet is also generally the most limiting nutrient. Chlorophyll, amino acids, and nucleic acids all use nitrogen. A proper supply of nitrogen will promote root growth as well as increase the uptake of other nutrients (Brady 2002). Nitrogen is easily leached from the soil so result levels may fluctuate over time. Levels in nitrate (NO3-) and ammonium (NH4+) were measured (figure 4).

Potassium may be a necessary nutrient for plants to utilize water and nitrogen efficiently (University of Massachusetts). Potassium, calcium, and Magnesium were all in the high to very high range. Potassium was so high in the Top North and Bottom South samples that it was recommended not to add ANY Potassium to these areas (figure 5). Excessive amount of potassium may inhibit magnesium uptake in sandy soils, like the ones at this site (Harris). Phosphorous, which is used in metabolism, was found in medium levels in these samples. One source of phosphorous is decomposing organic matter. Mulching or adding compost was recommended by for all sampled areas. It should be noted however that there is little scientific evidence proving that adding compost or prganic material to the soil is beneficial (Harris, 2001).

Lead was found at low levels through out the site. Lead should not be a problem on the Mercer Madison Woods site as it is to remain an urban forest. The gardeners of the P-Patch area, which is farthest from Madison Street, should use good gardening techniques, including maintaining a pH of 6.5(University of Massachusetts, Soil Lead Levels).

slope + stabilization techniques

There are many different available techniques for reducing erosion on hillsides, from complex, labor-intensive excavations, to simple

live staking of plant material. (WSDOT, 1997) Because of the large amount of woody material to be created by the pruning of hazardous branches from the existing Big Leaf Maples (see Hazardous Tree Assessment), and the likelihood of limited resources available for this project, a varied form of contour wattling was chosen as the preferred method of erosion control. In contour wattling, a bundle of sticks are tied tightly together, partially buried in a small trench, and staked into place.

What we are recommending is staking some of the larger pruned branches (3-5 in. diameter, 1 ½-2 feet long) into the sides of the steeper slopes using J-shaped pieces of rebar. This method is simple enough for any skill level to perform, uses on-site resources, and only requires several long pieces of pre-bent rebar. Though there is little documentation supporting this technique, it has proven successful in some residential landscapes, such as in the above photo.

In the Mercer Madison Woods, the only slopes steep enough to require erosion control are along the upper edge near Madison Street. The branches should be staked in 5-foot intervals up the slope, and spaced about 5 feet apart across the slope. The branches should also be staggered to increase erosion control effectiveness and to give it a more natural, random appearance. The key to this technique is to choose branches that fit snugly into the crook of the "J" of the rebar. If it is not tight, the branch could come loose, reducing its effectiveness and creating a possible safety hazard. The pieces of rebar will also have to be checked periodically and removed after the branch pieces have decayed.

objectives

Despite the neglect it has recieved in the past, Mercer Madison Woods has many parties concerned about its future. In addition to the City of Seattle Parks and Recreation Department, the Madison Valley Community Council and adjacent neighbors all have vested interests in the site and how it is used. All parties involved wish to improve native plant vegetation and reduce undesirable activity on site. The goals of the parks department include: increasing canopy, removing invasives, maintaining slope stability, and maintaining a safe area for the people on site as well as the neighbors.

With everyone's goals in mind, our objectives are as follows: (1) remove of invasive species, (2) maintain safety through hazard tree pruning, (3) maintain slope stability, (4) establish native plants that offer food and habitat for birds, (5) reduce human impact on site, and (6) providing a sustainable woodland environmental able to survive with little to no maintenance.

Examples of stabalization technique using branches and rebar

site design

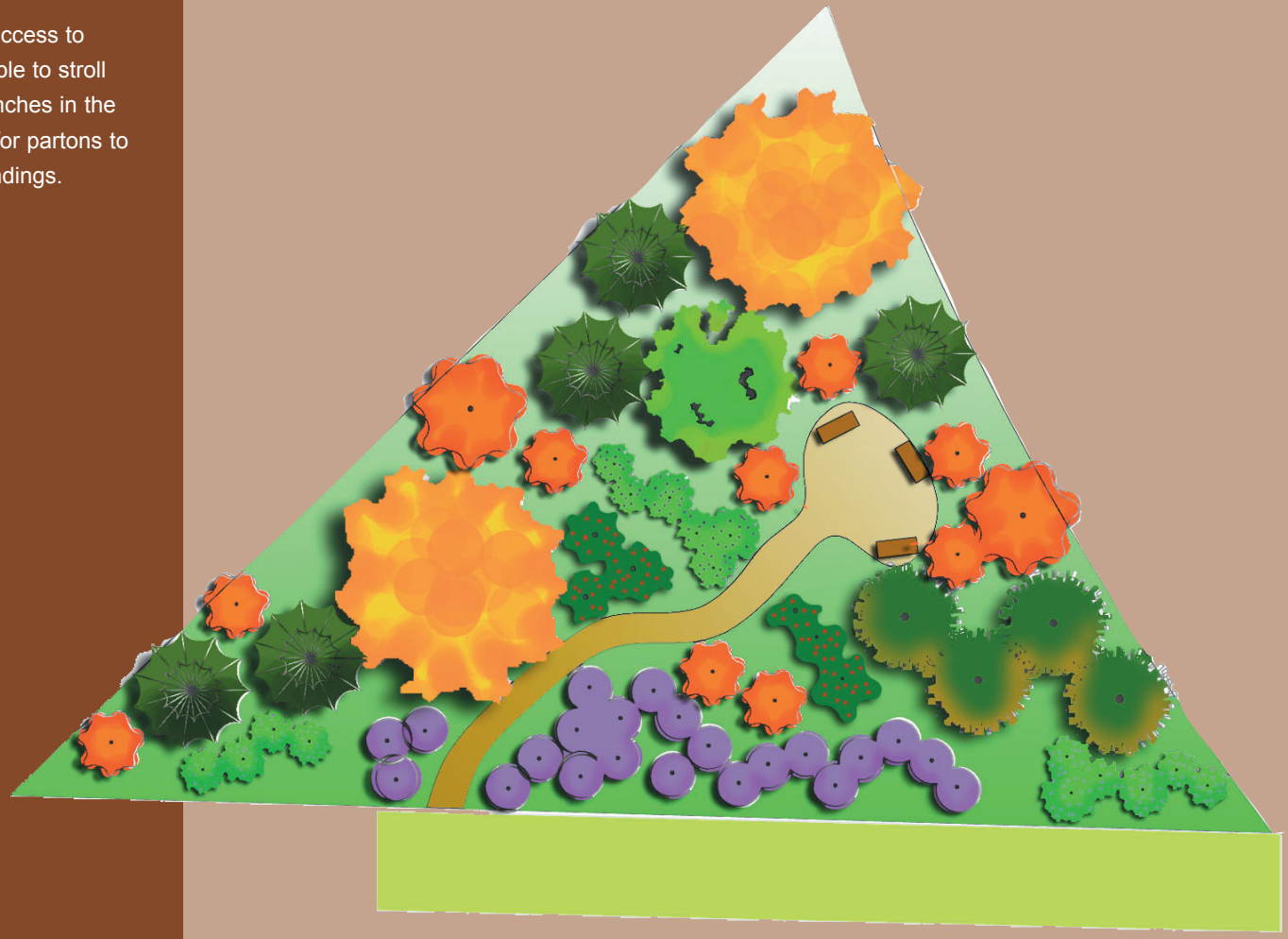
design narrative

When we began our study of the Madison Woods Area we were presented with many different ideas about what could be done to improve this site. From our clients and from community members came ideas ranging from just leaving this space alone, to building a full park here, including a possible tunnel underneath Madison Street to the Arboretum. Because of the wide variety of concepts, we decided on two different design concepts to present. Both designs call for restoration of the land, including cleaning up the garbage and restoring the native plant life (a request from our client). One plan would encourage more human access, the other would not. What we wanted to happen on this site is a rejuvenation of this area as an attractive island of green within the city. It would be a satellite extension of the Arboretum intended to increase urban habitat, visual beauty, and provide for a cleaner, greener Seattle.

site design

alternative design

The second design offers access to visitors. A path invites people to stroll through the woodland. Benches in the seating area are available for partons to relax and enjoy the surroundings.



Common tree names	Latin name	Plant form	Sun requirements	Wildlife considerations
Bleeding Heart	Dicentra formosa	perennial ground cover 6-8 in. tall Pink and white flowers Apr.-June	Partial shade	
Deer Fern	Blechnum spicant	Elegant fern 12-14 in. tall	Shade	
Douglas Fir	Psuedotsuga Menzeisii	Conifer tree, 80-200 ft.	Full sun	Birds eat seeds, important nesting and shelter habitat for birds
False lily-of-the-valley	Maianthemum dilatatum	Perennial ground cover up to 1 ft. tall	Partial/full shade	
Lady Fern	Athyrium filix-femina	Deciduous fern 2-6 ft. tall	Partial/full shade	
Pacific Madrone	Arbutus Menzeisii	Broad-leaved evergreen tree 20-65 ft. Bark reddish brown.	Sun to part shade	
Red Flowering Currant	Ribes sanguineum	Deciduous multistemmed shrub, 8-10 ft tall. Flowers in clusters early spring	Partial shade	Berries eaten by robins, thrushes, waxwings, jays, sparrows, woodpeckers
Red Huckleberry	Vaccinium parvifolium	Deciduous shrub 4-10 ft. tall Small pinkish flower w/ red berry	Sun to part shade	Berries eaten by doves, jays, orioles, sparrows. Hummingbirds and bees extract nectar
Red Ozier Dogwood	Cornus sericea var. stolonifera	Deciduous shrub 4-10 ft. tall. Can be up to 18 ft.	Full sun/sull shade	Offers good protective habitat, berries eaten by warblers, robins, fly catchers, flickers, quail
Shore Pine	Pinus contorta	Conifer tree 40-50 ft. tall	Full sun	Seeds eaten by pigeons, quail, doves, finches.
Sword fern	Polystichum munitum	Evergreen fern 2-3 ft. tall	Partial/full shade	
Vine Maple	Acer circinatum	Deciduous tree, 10-20 ft. tall multistemmed,	Sun or deep shade	Birds eat seeds, good nectar source for bees
Western Red Cedar	Thuja plicata	Evergreen tree 50-100 ft.	Sun to part shade	
Western Trillium	Trillium ovatum	Shrub 5-10 in. tall	Shade to part shade	
Wood sorrel	Oxalis oregana	Perennial ground cover 2-6 in. tall, coverlike	Full shade	

site prep

Initial site prep for this area will primarily consist of removal of hazardous branches on existing trees, trash, including brush piles, and non native plants. No soil amendments are recommended for this site (see soil analysis). Mulching of bare ground after invasive plant removal may be appropriate if there will be a long delay before planting the site.

hazardous tree branch removal

For the safety of the workers, it is recommended that an arborist remove the "hanger" branch and other dead branches as described in the Hazard Tree Assessment. Some of these branches should be saved for use in slope stabilization. These branches should be cut into 4 to 5 foot sections.

trash and brush removal

It will be necessary to remove trash and brush piles before planting the site. Most of the trash can easily be picked up and bagged. Gloves should be worn as there is much broken glass on site. There are also several tires that have been dumped on the property. These will have to be removed and disposed of properly. There may be some fee involved in the disposal of these tires.

Brush piles have been deposited on the hillside behind the adjacent residential properties. These brush piles are unstable to walk on and have English ivy growing over them. To facilitate in the removal of invasive and planting, these piles should be hauled off site.

Garbage dumping along Mercer Street.

Removal of existing trash and brush piles will hopefully discourage further dumping.

invasive plant removal

Although the site is made up of fill material and has been neglected for many years, the soil itself is of good quality. (see soil survey results) This is because the area is too steep to be compacted by cars or people, and the vegetation has had many years to replenish the top organic layer of the soil through natural mulching processes. During the first phase of work, invasive and undesirable species will be removed and hauled away from the area. It should take a small team of volunteers (7-10) approximately 1 to 1 1/2 days to complete this job. Due to the steepness of the area, care should be taken by workers during the removal phase. Below is a reference list of

Existing vegetation to be removed from 3001 Madison Street

Species	Common Name
Calystegia sepium	Hedge Bindweed
Geranium robertianum	Herb Robert/Stinky Bob
Hedera helix	English Ivy
Ilex aquifolium	English Holly
Lapsana communis	Nipple Wart
Prunus Laurocerasus	English Laurel
Ranunculus repens	Creeping buttercup
Rubus discolor	Himalayan Blackberry

how to remove each undesirable species.

Morning Glory This invasive weed species is one of the most difficult to eradicate. It grows out of the ground as a single vine and will run along the ground until it finds something to wind around. It winds its way counterclockwise around anything stationary (or slow) and eventually will get up into the canopy where it puts out large white flowers. As opposed to most plant species, the part coming out of the ground is tender and thin, whereas the vine high in the canopy is thick and almost woody. There is a tendency when pulling this weed to start ripping it out of the affected tree or shrub canopy. This helps for the short term but any remnant not removed will soon grow back. What needs to be done is to pull the vine where it comes out of the ground. Unfortunately, this is often in the least accessible area, like deep under a thick shrub. Also, trying to trace the root back to its origin should be attempted, although if the area is infested with the weed, there may already be a huge network of these succulent white roots throughout.

Herb Robert/Stinky Bob Grows in rounded form to 1 foot or more in diameter. Consists of a large number of pink stems growing out of a central node. These nodes should be grabbed between your fingers (if small) or grasped like a baseball (if larger). By pulling straight up, the weak root and the entire plant should come right out.

English Ivy By now, most everyone is familiar with the threat posed by this species to the urban forest. Since they climb up trees beyond reach, the only option for removing the ivy from the upper canopy (besides climbing the tree) is to cut it at the trunk and allow the rest of the vine to die. Although this leaves an unsightly mess and leaves a pathway for the next generation of ivy to follow up the tree, this is by far the most cost effective way to remove this species from a site. Grasping an end of the vine and carefully pulling upward usually works to remove the runners along the ground. The small white roots are fairly shallow and come out easily.

English Holly This tree species is made of an extremely hard wood and cannot be pulled out by hand except for the youngest saplings. These trees must either be pulled out with a weed wrench, or cut off at the base. A small chain saw may be required for the thicker trees.

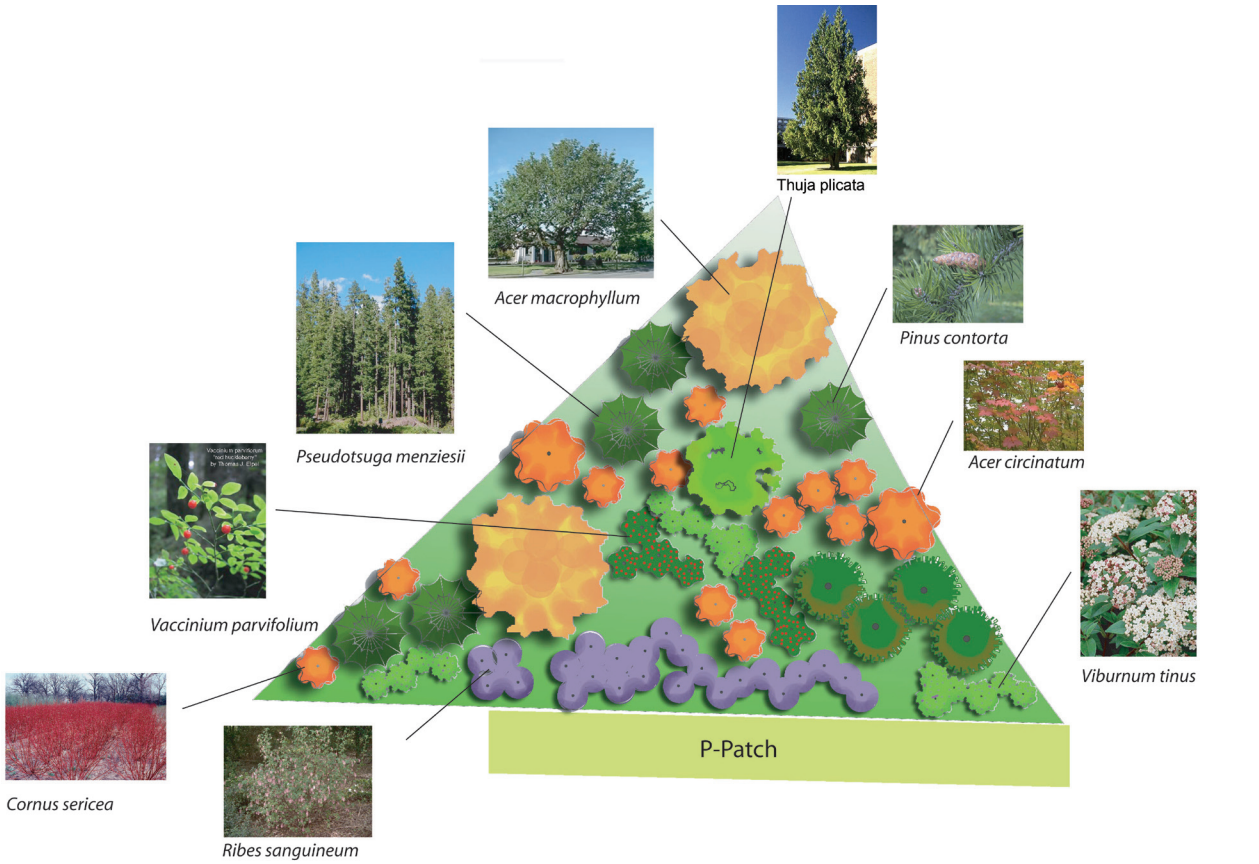
Nipple Wart These long stemmed invasives spread quickly and grow in any patch of light. The flowers appear like dandelions but have longer, much thinner stems that can grow up to 3 feet tall, though most are usually 1-2 feet. Although they die off in the winter, the brown stalk remains until the spring. Nipple Wart can easily be pulled out by grasping the stem in your hand like a hammer and pulling straight up. The key is to use the vertical strength of the stem to pull the root out.

English Laurel Though a popular hedge, this invasive can quickly spread throughout an unmanaged landscape. These trees grow fast and often are multi-stemmed, making them removal challenges. They often send out a large number of saplings which themselves are difficult to remove. This work can be done most efficiently with a chain saw. Large, unwieldy branches should be removed first and drug away. Working back to the base of the tree, the question of removal needs to be assessed. Will it be possible to chain out the stump? If so, then leave enough of the trunk for leverage. If not, then cut to the ground and consider treating the stump with poison or grinding it up.

Creeping buttercup Of all the weeds present on this site, this one is probably the most difficult to eradicate. It is low growing, and spreads by sending runners in all directions along the ground. The buttercup roots are extremely strong and have a very large number of small roots per root clump. What often happens during removal is the root gets pulled at ground level ripping off the root node and leaving the entire root mass in the ground, ready to create another

buttercup plant. The best way to remove is when the soil is moist with a gardening fork, digging deeply under the roots and lifting up. It is very difficult and time consuming to remove all traces of an established buttercup patch. A very thick layer of mulch can be applied (6-8 inches) over the top, but buttercup has the ability to extend its leaf stem upward several inches in order to reach sunlight.

Himalayan Blackberry This thorny cane can cause serious lacerations if not handled properly. Ensure that the person doing the removal has heavy gloves, preferably leather, and very little exposed skin, especially on the forearms and lower legs. First, trace the cane back to where it enters the ground. Then, either pull the root out, or if too large to pull, then clip with pruners close to the base. If a blackberry tip grows into the ground, it will root itself. These root masses make the job more difficult, but come out of the ground relatively easily. The canes can then be carefully folded or cut up for transport.



Ground Covers

Dicentra formosa *Blechnum spicant* *Trillium ovatum* *Maianthemum dilatatum* *Oxalis oregona* *Athyrium filix-femina*

installation

Once the area has been cleared of all hazards, trash, and invasive species, installation of slope stabilizers and native plants should begin. The pruned limbs from existing trees will be placed and anchored in with hooked rebar as explained in the slope stabilization section of this report.

Ideally plant installation should take place in the fall. Soil conditions in fall including warm soil temperature, good water and air availability allow plants to start off with fewer stresses and grow better than plants planted in winter or spring (Harris 184-5). Because plant material will likely be donated, it may be impossible to control when the timing of availability. Maintaining container and ball and burlap plants until fall may not be feasible and may create more stresses

on the plants. Due to the fact that there is little space to store plants and the regular watering that would be necessary it is recommended that plants be installed as soon as they are available.

Short term storage should be done in the shade with plants placed close together help keep the plants from drying out as well as to reduce damage caused by excessive movement and plants falling over (Harris 185). Bare root plant material should be placed in moist sawdust or peat and then placed in the shade.

The recommended technique for planting all forms of plant materials involves removing all soil medium (and containers, burlap, and wire) from container and ball and burlap plants. This practice eliminates the possible interfaces between the different soil types that can prevent water movement between soil types (Harris 186). This practice also exposes the root structure of the plants, which can greatly affect performance of the plants. Pruning of dead, diseased, circling, or matted roots should take place at this time.

Holes should be dug large enough for the roots to easily spread out. Plants should then be place in the hole with the root flare just above the soil surface. Backfill with the same soil that was dug for the hole. Care should be taken not to damage roots while backfilling. It is best to use water to settle the soil rather than tamping down the soil. Tamping pressure may cause roots to break. Also, watering the plant after planting is an essential part of the installation process no matter what the season or the weather that day.

Mulch is very beneficial for retention of moisture in the soil, inhibiting weeds, and providing some nutrients as it breaks down. Mulch is also effective at lessening soil temperature changes and reducing erosion caused by wind and rain. Wood chips would be the mulch of choice for this sight due to its availability and inexpensiveness. Mulch should be spread 3 to 4 inches on all the bare soil, taking care to leave 4 inches around each trunk mulch-free. Mulching directly around a trunk will hold water in that area, increasing the likelihood of disease. If mulch is used in the site preparation, it should be moved to the side when the hole is dug and then replaced around the plant after planting.

maintenance + monitoring

This site is not likely to receive much care after the initial planting. Installation of plants must therefore account for low maintenance.

If planting is done in the fall, sufficient water should be available for plant establishment. Plants should be monitored during dry spells as well as the following summer for moisture needs. If planted in the spring or summer, plants should be moisture needs should be monitored for the first growing season. It may be possible to have the children maintaining the P-Patch over the summer also water the new plantings.

Ideally this site should also be monitored annually for hazardous tree branches.

Removal of invasives should occur on an annual basis until sufficient tree canopy has established to shade out non native plants. Even after this time, the area should be monitored for encroaching invasives.

Mulch should be maintained on paths to prevent further compaction. Mulch should also be maintained around plants to reduce weeds and moderate soil moisture and temperature.

conclusion

From the time of the first settlers to the area, this area has been the site of neglect and abuse. Initially the site of one of the largest dumps in the city, a great deal of fill material was imported here to cover the refuse and to regrade for development. Then, to replace the trolley trestle, several thousand cubic yards of dirt

were brought in which was deposited unceremoniously on top of a salmon bearing stream. Some of this soil would become today's Mercer Madison Woods. During World War I, the area was home to a large number of hastily constructed worker houses. From the 1960's through the 1990's, Madison Valley, and specifically the Mercer Madison Woods, was the home to a large concentration of drug activity.

Today, however, the area is showing a revitalization. Largely because of the housing boom in Seattle that started in the late 1980's, and the fact that Madison Valley is surrounded by relatively high-end neighborhoods, the housing prices (and average income levels) have skyrocketed. This increased attention and money have resulted in the acquisition of green spaces in the area (3001 Madison St., Harrison Greenbelt) and an increased desire by the neighbors to have a cleaner, safer environment.

With the implementation of this design plan for the Mercer Madison Woods, along with the many other improvements being made, the Madison Valley is breaking from its past and establishing a new legacy. This time, it is centered on the safety and quality of life of its citizens, and on the preservation and appreciation of its natural spaces.

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appendix i

Budget

This site has totally relied on the kind hearts of the many people who have voluunteered in the past. There is no future budget to improve the woodland, but it is likely that neighbors and current volunteers will be excited about futher improvements. It is therefore assumed that most labor on site will be done by volunteers. It should be noted that a skilled arborist (certified arborist) will be necessary for hazard tree branch removal. It is possible that the city parks department will be able to performthis task. Materials such as mulch may also be availble free throught the city parks department or donated by tree maintenance companies. It is hoped that much of the plant material could be donated either by persons salvaging plants or through a nursery. Donations or grants may also be available to purchase plant material.

One possible source for the material is Storm Lake Growers, located at 21809 89th St SE, Snohomish, WA 98290, from which these prices were taken.

Common tree names	Latin name	Plant Type	Price Per Plant
Bleeding Heart	Dicentra formosa	4” container	$4.00
Deer Fern	Blechnum spicant	1 gal. container	$2.75
Douglas Fir	Psuedotsuga Menzeisii	1 gal. container	$2.75
		ball and burlap 5’	$25.00
False lily-of-the-valley	Maianthemum dilatatum	4” container	$1.00
Lady Fern	Athyrium filix-femina	not available	
Red Flowering Currant	Ribes sanguineum	1 gal. container	$3.00
Red Huckleberry	Vaccinium parvifolium	1 gal. container	$3.00
Red Ozier Dogwood	Cornus sericea var. stolonifera	1 gal. container	$2.75
Shore Pine	Pinus contorta	2 gal. container	$6.00
Sword fern	Polystichum munitum	1 gal container	$6.00
Vine Maple	Acer circinatum	1 gal. container	$2.75
		ball and burlap 4’	$25.00
Western Red Cedar	Thuja plicata	not available	
Western Trillium	Trillium ovatum	not available	
Wood sorrel	Oxalis oregana	4” container	$1.25

appendix ii

Soil test results

SAMPLE ID: M.H. BOTTOM MIDDLE

RECOMMENDATIONS FOR DECIDUOUS TREES, SHRUBS AND VINES:

SOIL PH ADJUSTMENT:

Soil pH is in the desired range. No adjustment required.

FERTILIZER:

The organic matter in this soil is adequate for many woody ornamentals. Maintaining a mulch will, however, conserve moisture and protect the soil surface.

PREPLANT PREPARATION: In the early fall preceeding planting incorporate 1 part finished compost or composted manure into 10 parts soil along with 3 cups bone meal per cubic yard of backfill; OR in early spring incorporate 1 part finished compost or composted manure into 10 parts soil along with 2 cups dried blood and 3 cups bone meal per cubic yard of backfill.

ESTABLISHED PLANTINGS: In the early fall topdress with 1/2 inch finished compost along with 2 cups bone meal per 100 square feet and gently scratch into the soil surface; OR in early spring topdress 1.5 cups 10-6-4 fertilizer per 100 square feet. For plantings in a lawn setting use fertilizer recommendations for established turfgrass.

SOIL pH 6.3 NITROGEN: NO3-N = 9 ppm NH4-N = 3 ppm
BUFFER pH 6.8

NUTRIENT LEVELS:	PPM	Low	Medium	High	Very High
Phosphorus (P)	7	XXXXXXXXXX			
Potassium (K)	211		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		
Calcium (Ca)	1454		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		
Magnesium (Mg)	352		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		

CATION EXCH CAP	PERCENT BASE SATURATION	MICRONUTRIENT LEVELS
11.2 Meq/100g	K= 4.3 Mg=23.1 Ca=58.1	ALL NORMAL

EXTRACTABLE ALUMINUM: 27 ppm (Soil range: 10-250 ppm)

The lead level in this soil is low.

SAMPLE ID: M.H. BOTTOM SOUTH

RECOMMENDATIONS FOR DECIDUOUS TREES, SHRUBS AND VINES:

SOIL PH ADJUSTMENT:

Soil pH is too high. For new plantings you may incorporate sulfur at 6 cups per cubic yard of soil; OR consult insert for plants better adapted to this soil pH.
For established plantings you may carefully topdress soil with sulfur at 3 to 4 cups/100 sq ft and maintain an acidic organic mulch. such as pine needles.

FERTILIZER:

The organic matter level of this soil appears to be quite high. When properly fertilized and provided proper drainage it should provide a good growing medium for woody ornamentals which prefer a humus rich soil.

* Potassium level is extremely high in this soil. DO NOT add additional K at this time.

Contact the soil lab to discuss these results.

SOIL pH 6.8 NITROGEN: NO3-N = 13 ppm NH4-N = 2 ppm
BUFFER pH 7.0

NUTRIENT LEVELS:	PPM	Low Medium High Very High
Phosphorus (P)	8	XXXXXXXXXXX
Potassium (K)	277	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Calcium (Ca)	2166	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Magnesium (Mg)	381	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

CATION EXCH CAP 13.7 Meq/100g
PERCENT BASE SATURATION K= 4.9 Mg=21.3 Ca=73.9
MICRONUTRIENT LEVELS ALL NORMAL

EXTRACTABLE ALUMINUM: 24 ppm (Soil range: 10-250 ppm)

The lead level in this soil is low.

SAMPLE ID: M.H. MIDDLE NORTH

RECOMMENDATIONS FOR DECIDUOUS TREES, SHRUBS AND VINES:

SOIL PH ADJUSTMENT:

Soil pH is in the desired range. No adjustment required.

FERTILIZER:

The organic matter level of this soil appears to be quite high. When properly fertilized and provided proper drainage it should provide a good growing medium for woody ornamentals which prefer a humus rich soil.

PREPLANT PREPARATION: In the early fall preceeding planting incorporate 1 part finished compost or composted manure into 10 parts soil along with 3 cups bone meal and 2 cups wood ash per cubic yard of backfill; OR in early spring incorporate 1 part finished compost or composted manure into 10 parts soil along with 2 cups 9-5-4 plus 2 cups bone meal per cubic yard of backfill.

ESTABLISHED PLANTINGS: In the early fall topdress with 1/2 inch finished compost per 100 square feet and gently scratch into the soil surface; OR in early spring topdress 2.5 cups dried blood or 3 cups 9-2-4 fertilizer per 100 square feet. For plantings in a lawn setting use fertilizer recommendations for established turfgrass.

SOIL pH 6.1 NITROGEN: NO3-N = 5 ppm NH4-N = 3 ppm
BUFFER pH 6.7

NUTRIENT LEVELS:	PPM	Low Medium High Very High
Phosphorus (P)	9	XXXXXXXXXXXXX
Potassium (K)	148	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Calcium (Ca)	1927	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Magnesium (Mg)	746	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

CATION EXCH CAP 17.8 Meq/100g

PERCENT BASE SATURATION K= 2.0 Mg=32.0 Ca=50.4

MICRONUTRIENT LEVELS ALL NORMAL

EXTRACTABLE ALUMINUM: 35 ppm (Soil range: 10-250 ppm)

The lead level in this soil is low.

SAMPLE ID: M.H. TOP NORTH

RECOMMENDATIONS FOR DECIDUOUS TREES, SHRUBS AND VINES:

SOIL PH ADJUSTMENT:

Soil pH is in the desired range. No adjustment required.

FERTILIZER:

The organic matter in this soil is adequate for many woody ornamentals. Maintaining a mulch will, however, conserve moisture and protect the soil surface.

* Potassium level is extremely high in this soil. DO NOT add additional K at this time.

Contact the soil lab to discuss these results.

SOIL pH 6.3 NITROGEN: NO3-N = 9 ppm NH4-N = 1 ppm
BUFFER pH 6.8

NUTRIENT_LEVELS:	PPM	Low	Medium	High	Very High
Phosphorus (P)	11	XXXXXXXXXXXXXXXXX			
Potassium (K)	289	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			
Calcium (Ca)	1489	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			
Magnesium (Mg)	248	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			

CATION EXCH CAP	PERCENT BASE SATURATION	MICRONUTRIENT LEVELS
10.6 Meq/100g	K= 6.2 Mg=16.9 Ca=61.8	ALL NORMAL

EXTRACTABLE ALUMINUM: 36 ppm (Soil range: 10-250 ppm)

The lead level in this soil is low.

SAMPLE ID: M.H. TOP SOUTH

RECOMMENDATIONS FOR DECIDUOUS TREES, SHRUBS AND VINES:

SOIL PH ADJUSTMENT:

Soil pH is too high. For new plantings you may incorporate sulfur at 6 cups per cubic yard of soil; OR consult insert for plants better adapted to this soil pH.
For established plantings you may carefully topdress soil with sulfur at 3 to 4 cups/100 sq ft and maintain an acidic organic mulch. such as pine needles.

FERTILIZER:

PREPLANT PREPARATION: In the early fall preceeding planting incorporate 1 part finished compost or composted manure into 10 parts soil along with 3 cups bone meal and 2 cups wood ash per cubic yard of backfill; OR in early spring incorporate 1 part finished compost or composted manure into 10 parts soil along with 2 cups 9-5-4 plus 2 cups bone meal per cubic yard of backfill.

ESTABLISHED PLANTINGS: In the early fall topdress with 1/2 inch finished compost per 100 square feet and gently scratch into the soil surface; OR in early spring topdress 2.5 cups dried blood or 3 cups 9-2-4 fertilizer per 100 square feet. For plantings in a lawn setting use fertilizer recommendations for established turfgrass.

SOIL pH 7.2 NITROGEN: NO3-N = 14 ppm NH4-N = 4 ppm
BUFFER pH 7.1

NUTRIENT LEVELS:	PPM	Low Medium High	Very High
Phosphorus (P)	11	XXXXXXXXXXXXXXXXX	
Potassium (K)	118	XXXXXXXXXXXXXXXXXXXXXXXXXXX	
Calcium (Ca)	2545	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
Magnesium (Mg)	166	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	

CATION EXCH CAP 11.9 Meq/100g
PERCENT BASE SATURATION K= 2.1 Mg= 9.5 Ca=88.5
MICRONUTRIENT LEVELS ALL NORMAL

EXTRACTABLE ALUMINUM: 23 ppm (Soil range: 10-250 ppm)

The lead level in this soil is low.