The habitat of the ravine area in the northeast corner of Pioneer Park is mature, floristically diverse second-growth forest surrounding a steep-sided ravine through which flows a small creek. The riparian habitat along the creek and ravine is unique within the park, which is primarily upland forest. The riparian area is a mosaic of diverse microhabitats characterized by hillside slope wetlands, dense forested canopy cover, and open canopy areas. The forest is a mixture of coniferous and deciduous trees dominated by bigleaf maple, Douglas fir, and western hemlock. Black cottonwood dominates where the ground is moist. Habitat succession is in evidence, with large early successional species such as bigleaf maple and Douglas fir making way for western red cedar and western hemlock saplings.

The steep slopes of the ravine, intensity of stormwater flows, and geology of the ravine allow for frequent tree blow-down. Downed trees have opened the forest canopy, allowing dense undergrowth to flourish. Downed trees function as nurse logs for young tree and shrub saplings, and woodpecker holes can be seen at very close range. Gaps left by upturned rootwads provide opportunities for pioneer species to become established. Understory plants are very diverse, and include native species such as devil’s club, salmonberry, Indian plum, salal, western hazel, large-leaf avens, trailing blackberry, long-leaved Oregon grape, horsetail, and stinging nettles, among others. Long-lived plant species such as red huckleberry, trillium, at least six fern species (sword, deer, lady, bracken, maidenhair and licorice), and giant conifer stumps are indications of the mature forest which once was present at the site. Non-native plant species are relatively uncommon, present primarily in isolated areas of recent disturbance. Non-native species include Himalayan blackberry, English ivy, English holly, English laurel, mountain ash, and a horticultural variety of St. John’s wort.

The diversity of the microhabitats and the presence of water associated with the stream and hillside wetlands attracts a wide variety of wildlife species, including invertebrates, amphibians, reptiles, mammals, and birds. Riparian systems are generally extremely productive in terms of invertebrates and plants. They attract wildlife for feeding and nesting, and often function as migration corridors. Invertebrates in the stream may include mayflies, caddisflies, midges, true flies, worms, and snails, among others. These are a food source for numerous terrestrial predator species. The moist riparian woodlands are likely inhabited by terrestrial salamanders such as Ensatina and western red-backed salamanders, which prefer hiding under abundant downed logs and leaf litter. If shallow ponds are present nearby, the riparian area may also attract Pacific tree frogs, long-toed salamanders, and red-legged frogs. Pacific giant salamanders may breed in the stream and burrow underground in the moist forest. Garter snakes are likely to prefer basking in large brush or rock piles or along sunny slopes in the riparian area, where food is abundant. Raccoon, Virginia opossum, bats, and small mammals such as the creeping vole, dusky shrew, Trowbridge shrew, vagrant shrew, and deer mouse are also likely to inhabit the riparian area. Douglas squirrel, a relatively uncommon native squirrel, was observed at the site (April 24, 2002).
The area provides excellent opportunity for passive recreational use by hikers, educational groups, and nature lovers, birdwatchers in particular. Migratory birds are attracted to large trees such as those present along the ravine, and warblers are particularly attracted to black cottonwood trees. Pileated woodpeckers are found in the area, and abundant snags provide myriad habitat opportunities for cavity-dwelling birds such as chickadees, swallows, downy woodpeckers, and nuthatches, among others. Birds of prey such as red-tailed hawks, Cooper’s hawks and sharp-shinned hawks tend to be attracted to such areas where they can be seen to hunt for small birds and mammals.

17. Appendix G: Summary of Forest Management Projects to date

17.1. Revegetation projects
In 1997, a slope revegetation project was completed at the twin cedars overlook in the NE Quadrant.

In 1998, a crew of 2-5 removed 11 tons of invasive plants during a 2 month period.

Beginning in 1999, the City Council funded forest management CIP projects for Pioneer Park. This funding initiated the first large-scale approach to forest management in the park. That year, the Southeast Quadrant was replanted in areas of root rot as identified in the report by Edmonds on tree diseases.

Year 2000 was the first major project. This project built on the experience gained from previous projects in 1997, 1998 and 1999. Brian Gilles was hired as a consulting arborist to plan and direct the project in cooperation with Bob Stagman from the Open Space Conservancy Trust Board. A crew of 10 from Green Life Landscaping was hired and spent three weeks clearing 36 tons of invasives from the park and planting 1600 plants. Volunteers helped to plant a portion of the plants.

In June of 2001, Parks and Recreation rehired Green Life Landscaping to weed the plantings which were being overgrown. Mortality on coast redwood and ponderosa pine was noticed in several areas. New seedlings of native elderberry were observed volunteering in many planting areas. This native regeneration was an unexpected benefit of this project.

In the Fall of 2001, the previous year’s plantings were weeded again, and new trees were planted in existing planted areas. New areas in the northeast and southeast quadrants were planted as well. A total of 875 trees and 1900 shrubs were planted. Shrubs were concentrated in forested areas along the east side of Island Crest Way. In response to public comment from the previous year’s plantings, only native plants were used in the 2001 plantings. In some areas of the SE quadrant, debris piles were made to avoid hauling off organic waste.
In Spring of 2002, the previous two years of plantings were weeded. In Fall, 2002, a fourth round of weeding was completed. At the time, one-fourth of the 2001 trees were dead or dying. In contrast, year 2000 plants were surviving well. The cause was attributed to an exceptionally dry summer and early fall, combined with the sandy, well-drained conditions. One hundred trees were replanted where the previous year’s trees had died.

These projects have provided us with a wealth of experience that has been analyzed and used to formulate management prescriptions for Pioneer Park. See Section ??? below.

17.2. Transmission Line Project
In late fall of 1997, Puget Sound Energy sponsored a project along the south side of SE 68th Street to protect the transmission lines that provide electricity to Mercer Island. This stretch of roadway had a history of outages from tree failures. The project removed Douglas fir, bigleaf maple, red alder and madrona that were underneath the clearance zone of the lines. Replacement plantings included hazel, vine maple, elderberry, ocean spray, salal, sword fern and huckleberry. Resprouting maples were recut in the fall of 2002.

18. Appendix H: Summary of Stand and LIDAR Analyses
Overstory of the park was surveyed using a combination of digital aerial imagery, Light Distancing and Ranging (LIDAR) data and ground observation. Staff delineated stands using ArcView GIS software and 1999 color orthophotos. Stand delineation was based on canopy composition, except where topography or hydrology was observed to be a strong environmental influence. Therefore, ravine areas containing steep slopes (>40%) or wetlands were considered separate stands. The two most dominant tree species found in each stand was recorded. Based on this analysis, the park contains 32 acres of conifer forest, 45 acres of broadleaf forest, and 40 acres of mixed broadleaf-conifer forest.

Marshall and Associates conducted an analysis of LIDAR data captured in late 2000 and early 2001. This data was collected by flying over the area with laser equipment to measure ground level and intermediate heights of objects that the light beam intercepted in a 6’ spacing. For the purposes of this analysis, the difference between the height of the “first return” and the ground level was considered to be the canopy height in each 6’ x 6’ “pixel”. Canopy heights were grouped into classes as follows:

- 0-4 feet: bare earth, prone vegetation
- 5-15 feet: shrub vegetation
- 16-30 feet: small trees
- 31-50 feet: medium trees
- >50 feet: tall trees
Areas of six pixels (216 square feet) or greater in prone or shrub vegetation were considered canopy gaps. Each non-gap pixel was also rated for actual height variability in comparison to its neighbors. A window of seven by seven pixels around each pixel was analyzed for height variability. That is, within the seven by seven pixel frame, the standard deviation of the height in each pixel was calculated relative to all the pixels within the frame. Areas of low variability were considered “closed” canopy using a standard deviation breakpoint of 875. Areas of high (standard deviation above 875) variability were considered “fragmented” canopy. The center pixel of the frame was then labeled with a code for either “closed” or “fragmented”. The entire frame was then moved over one pixel and the calculation redone.

Results from this analysis are as follows:

Percentage of the total area of each quadrant containing each canopy condition

<table>
<thead>
<tr>
<th></th>
<th>Northwest</th>
<th>Northeast</th>
<th>Southeast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canopy Gap</td>
<td>19.9%</td>
<td>15.5%</td>
<td>13%</td>
</tr>
<tr>
<td>Fragmented Canopy</td>
<td>14.5%</td>
<td>17.8%</td>
<td>16%</td>
</tr>
<tr>
<td>Closed Canopy</td>
<td>65.5%</td>
<td>66%</td>
<td>71%</td>
</tr>
</tbody>
</table>

Ground surveys with the resulting data in May of 2003 verified the accuracy of both the extent and the location of these canopy conditions.