Table of Contents
GREEN LAKE VEGETATION MANAGEMENT GUIDELINES

I. VEGETATION MANAGEMENT GOALS

II. EXISTING RESOURCE DOCUMENTATION & EVALUATION

HISTORIC EVOLUTION OF PARK PLANTINGS

TREE CHARACTERISTICS

IV. VEGETATION MANAGEMENT RECOMMENDATIONS

I. VEGETATION MANAGEMENT GOALS

GOALS DEFINITION PROCESS

The need to address future landscape management at Green Lake grew out of Departmental and citizen concern for the continued well-being of the plant community in this well-loved, much-used Seattle park. Developing relevant vegetation management guidelines requires first identifying and articulating clear objectives. The multi-faceted goal-setting process is described in this secton.
A variety of contributions were solicited to help define overall landscape management objectives. These included:

- A round-table meeting of diverse Parks personnel, whose common link was involvement with direct care or management of Green Lake Park. Broad and specific observations offered by this group brought into focus important issues, frustrations and hopes relating to Green Lake's vegetation. The comments tended to be specific, but pointed to more general themes echoed by many other contributors. Tabulated staff comments are found in Appendix A. A few followup questionnaires were received and combined with those from interested citizens.

- Citizen perspective was sought in two ways, from April through May of this year. Consultant and project manager together assembled a simple questionnaire with map for dissemination to both the general public and target citizen groups: Seattle Audubon Society, Friends of Seattle's Olmsted Parks, Green Lake Community Council and Green Lake Advisory Board. Appendix A contains both the survey and tabulated responses. Only nineteen surveys were returned, despite broad availability and a liberal return deadline. Besides valuable ideas shared by those who did respond, an important additional dividend was to inform the public about this initiative from its inception. Additional comment surely will flow during draft guideline review.

- Finally, consulting team members, all of whom have known the Green Lake environment over a long period of time, individually contributed draft goals for consideration. These ranged in specificity and emphasis, but suggested consistent themes.

Vegetation management goals then emerged as the synthesis of consultant, staff and citizen contributions. Significant commonalities exist, while divergent viewpoints do not point to truly contradictory objectives. Information about the current condition of the resource itself may help reconcile conflicting perspectives, as the landscape reveals its own needs.

VEGETATION MANAGEMENT GOALS

Too frequently...policies are formulated in response to a specific issue or a crisis situation. While a quick response will obviously be necessary in some unforeseen or unique occasion, the development of an over-all policy document that is reasonably capable of anticipating change and guiding decisions and that will ...provide a framework of consistency...is clearly desirable.

-Seattle Parks and Recreation Policy Plan (1987)

Proactive management is the essential motive in creating vegetation guidelines for use in Green Lake Park. Landscapes managed piecemeal or by crisis have little hope of achieving optimal resiliancy or beauty over time. Incremental maintenance and episodic planting and removals together define and redefine a landscape, for better or worse. The sum of such perennial activities determines the quality of a park's plant community. Management which reflects thoughtfully-delineated policy can be a powerful tool, whereas management lacking overall direction can endanger both the resource and its users. Vegetation management guidelines for Green Lake Park are intended to supply practical and specific policy direction, grounded in the following broad goals. The many specific objectives suggested are subsets to these goals. Measures to fulfill them will constitute the substance of the vegetation management guidelines.

- **Provide landscape continuity in the Park both spatially and over time.**
- **Insure the health and longevity of appropriate Park vegetation.**
- **Effectively maintain Park plants while conserving both labor and resources.**
- **Foster community appreciation and stewardship for Park vegetation.**
- **Create a balanced symbiosis among plants, wildlife and human users of the Park.**

II. EXISTING RESOURCE DOCUMENTATION & EVALUATION

HISTORIC EVOLUTION OF PARK PLANTINGS

CHRONOLOGY

Green Lake's vegetation history necessarily touches on subjects far broader than planting only, especially given the degree of site manipulation which preceded landscape establishment in the park. The Chronology found in Appendix B derives largely from primary sources, in an effort to maximize both its authenticity and immediacy. As many users know, Green Lake's past is utterly unique and thus important to understand in directing any aspect of its future.

EVALUATION

Green Lake's landscape originated as a narrow, artificially created band, stabilized and planted over several decades' time. This green ring mediates between a significant transportation corridor and an attractive but perennially problemmatic body of water. These concentric perimeter conditions have always powerfully affected the park's character, presenting unique challenges and opportunities for landscape care. Future vegetation management must acknowledge both Green Lake's intensely influential boundaries and its own inherent magnetism. Pressures on this park, including its plantings, are extreme. Although Green Lake's land margin is a fragile green screen, without design vision there would have been little green at all.

Historical examination of Green Lake interweaves topics evaluated individually elsewhere, revealing patterns of interaction important in understanding how to direct future plant management in the park. Most past dynamics remain inherent to the Green Lake Park environment today. The landscape history thus provides both categorical and broad implications for framing appropriate vegetation management guidelines.

Themes

Several broad themes emerge in reading the chronology of Green Lake's history:

- Nothing is easily accomplished in this park. Funding for landscape development and care and the lake's own fragile stasis present dominant, recurring issues which have had significant cost implications.
- Recreational opportunities have always drawn people to Green Lake in great numbers, driving many generations of infrastructure improvement, landscape alteration, and policy reevaluation. To balance human use pressures with the capacity and capabilities of the ecosystem has always represented a challenge at Green Lake.
- Shoreline, upland management and lake wellbeing are intimately linked. Treatments to control erosion and eutrophication have affected both wildlife habitat and landscape character through the years. Public sentiment has been intense and divided. Citizens and bureaucrats continue to search for balance and sustainability.
- The design vision which inspired Green Lake Park's development has proven both a blessing and a curse. The massive landscape alterations required were both daunting and unrealistic to implement fully. The Olmsted Brothers' concept, while legible, necessarily

became diluted. Exponential increases in park use and adjacent vehicular traffic also were historically unanticipated.

Issues

Specific vegetation management issues which flow from the above-noted themes include the following:

- How can we manage the Green Lake landscape to maximize plant health, longevity and beauty while concurrently minimizing expenditure of time and resources? Can we reduce or eliminate episodes of catastrophic, reactive intervention through consistent, thoughtful landscape maintenance and replenishment, fitting rather than fighting environmental constraints?
- How can the park landscape best survive and support intensive human use? Are there ways that recreational activity can be directed to improve plant survival, or must the vegetation itself bear the entire burden of heavy use? By what means can we foster both active and passive stewardship? As park users cumulatively threaten that which they love, this dynamic bears examination.
- How can we simultaneously satisfy aesthetic, wildlife, recreation, and lake survival needs in managing shoreline vegetation? The Olmsted vision was clearly naturalistic, but plant eradication and artificial bulkheading have occurred through the years to "save the lake". Where does necessity truly lie, and how wild should Green Lake's shore become? Maintenance prescriptions can only derive from answers to these questions.
- In what ways can the original Olmsted vision, never fulfilled, be reclaimed and reinforced through future planting and landscape care? What missing elements can we reinject, compatible with late twentieth century conditions? Are there inherent flaws of either design or implementation we need to acknowledge and mitigate through incremental management?
- What have we learned from and about Green Lake over eighty-plus years of park development and management? What basic, practical wisdom should we apply to the future care we give? As we ourselves mature with the landscape, in what ways can we improve upon the efforts and experiments of the past? Without doubt Green Lake's historic practices can be instructive.

Elements to Conserve

The Olmsted firm's design for Green Lake Park finds only partial embodiment in today's landscape, due to several related factors. First is the sheer magnitude of the park development project as conceived, from land reclamation forward. The Olmsteds themselves may not have recognized the full scope and expense implementation would entail. From the vantage point of today's civilized-looking, completed park, we forget how severely resources and patience were strained for forty years. Scaling back the project to more practical dimensions proved necessary along the way, evidenced by elimination of the somewhat duplicative boulevard within the park and simplification of the shoreline.

A second factor is the diluting influence of protracted implementation, making the end product a composite of many actors' contributions, rather than the realization of one clear vision. Green Lake Park in actuality evolved more than it executed a fixed plan. The paradigm of the Olmsted design remained, but details of layout and planting were modified, abandoned, or selectively

implemented. Few if any of the extensive proposed shrub beds were created, for example, and relatively few of the specified trees planted. Like all landscapes, Green Lake's continues to evolve as plants grow and times change. It is a tribute to the Olmsted vision that certain basic characteristics can still be read and appreciated in the park.

The third factor which compromised full embodiment of the Olmsted Brothers' scheme was feedback from the environment itself, little of which seems to have been predicted. Logging, filling, and lowering the lake all increased the relative volume of organic bottom sediment, exacerbating growth of algae in the already-eutrophying lake. Considerable resources have been diverted over the years to reclaiming and maintaining adequate water quality for a recreational lake. Aquatic parasites and weeds, rats, and elevated E.coli counts also have demanded intermittant attention. Upland, settlement of copious organic fill has necessitated periodic landscape renovation. The lowered shoreline has proven fragile to erosion, resulting in several expensive armoring projects. These environmental interventions have siphoned (and will continue to siphon) resources. Fulfillment of the Olmsted plan and even basic landscape maintenance have been constrained in competition for finite public funds.

Particular landscape characteristics attributable to the Olmsted design influence should be conserved and reinforced wherever possible. Park elements reflecting Olmsted Brothers' intentions for Green Lake Park include:

- Sweeps of lawn with informally spaced, predominantly shade trees. This naturalistic vocabulary derived from the English romantic landscape tradition and was much favored by the Olmsted firm; referred to as "greensward". Future tree locations should be carefully considered for landscape effect. More artful informality and less random placement would greatly enhance this essential character.
- Greenery screening street from lake and enhancing views outside as well as within the park. This element needs considerable reinforcing. The Olmsted-intended shrub buffers are almost entirely absent, and additional trees are sorely needed in some locations. Simultaneously, lake views from homes and vehicles must be considered. Since Green Lake Way and Aurora Avenue travel well above lake elevation in most places, screening and vistas need not be mutually incompatible.
- Formal perimeter street tree plantings originally proposed for Green Lake Way, found in two vestiges near the Bathhouse and Lower Woodland Park. Since Green Lake Way combines functions of street and pleasure drive segregated in the Olmsted plan, one needs to decide if a formal or informal street tree treatment is more appropriate for future plantings. In any case, continuity of street with park was a key aspect of the Olmsted design which needs to be respected.
- Natural-looking shoreline and offshore island. The Olmsted Brothers clearly intended that the massive reconstruction of Green Lake's shore result in an ultimately unstructured, informal character, offering respite to urban dwellers and refuge to wildlife. Duck Island and parts of the shore now possess such qualities; in the future perhaps this treatment can extend more uniformly around the lake. Decades after initial design, the first island was built; perhaps additional islands might yet be added, in keeping with the original plan.
- Continuity of forested character flowing from Woodland Park to southwest Green Lake. Tree canopy unites the parks where they meet, but Green Lake's palette is largely non-native. The Olmsteds treasured Phinney's coniferous forests and advocated for their

careful preservation. Adding native plants at southwest Green Lake could strengthen this important landscape link, in keeping with the greater Olmstedian principle of interconnected open space.

We need not bemoan the incomplete implementation of the Olmsted plan for Green Lake. Parts were probably better deleted (notably the land-consuming internal boulevard) and certain "bones" are irrevocably with us, above all preservation of the lake itself for public enjoyment. Neither is the story over yet. In developing guidelines for future management of Green Lake's vegetation, we have the opportunity not just to preserve historic landscape elements, but also to help realize the original Olmsted design more fully.

TREE CHARACTERISTICS

EXISTING TREE DEMOGRAPHICS

Quantity

Approximately 2,500 to 2,600 trees are at Green Lake. The figure is necessarily general for several reasons. Where does one draw the line between a shrub and a tree? Does one count every wild sapling by the edge of the lake? Does one include standing dead or dying trees which will be removed shortly? What about trees such as willow, which gardeners prune to the ground every few years? What about the trees on Duck Island? Common logic guided what to include as "trees" for the purpose of evaluation. Appended maps indicate landscape type and projected life expectancy for 2,550 trees within the Park.

Type

Green Lake's 189 tree species and varieties by landscape type break down as follows:

62	33.00%	shade trees
56	29.50%	flowering trees
54	28.50%	coniferous evergreens
10	5.25%	small accent trees
4	2.00%	deciduous conifers (*Larix, Metasequoia, Taxodium*)
3	1.75%	broadleaf evergreens (*Ilex, Magnolia grandiflora, Photinia*)

The actual field counts of trees by map subareas are:

type	SE	Aqua	Aurora	Bath	Pool	C Cen	TOTAL
shade	166	190	69	147	151	154	35.00%
flowering	35	27	28	116	174	124	20.00%
coniferous everg	43	271	157	185	134	170	36.50%
small accent	0	6	3	7	4	1	1.00%
deciduous conifer	7	5	8	37	98	20	7.00%
broadleaf everg	1	1	0	4	2	5	0.50%
TOTAL	252	500	265	496	563	474	100.00%

Taxa

A complete list of existing Green Lake trees is included in Appendix C. Names and quantities of all taxa are tabulated, along with landscape type and native or wild-growing status. Although in

no way a natural landscape, Green Lake does possess half (15) of Seattle's native tree species. Quantities noted below are approximate. "W" means at least some park specimens grow wild:

3		*Abies grandis*	FIR, Grand
2		*Acer circinatum*	MAPLE, Vine
17	W	*Acer macrophyllum*	MAPLE, Bigleaf
75	W	*Alnus rubra*	ALDER, Red
11		*Betula papyrifera*	BIRCH, Paper or Canoe
4	W	*Cornus Nuttallii*	DOGWOOD, Pacific
8		*Picea sitchensis*	SPRUCE, Sitka
14		*Pinus contorta*	PINE, Shore
35		*Populus tremuloides*	ASPEN, Quaking
64	W	*Populus trichocarpa*	COTTONWOOD, Black
1	W	*Prunus emarginata*	CHERRY, Bitter
110	W	*Pseudotsuga Menziesii*	FIR, Douglas
33	W	*Salix lasiandra*	WILLOW, Pacific Black
15	W	*Salix sitchensis*	WILLOW, Sitka Pussy
4		*Thuja plicata*	CEDAR, Western Red

The remaining Seattle native trees, which might be considered for planting at Green Lake are:

Acer glabrum	MAPLE, Dwarf
Alnus sinuata	ALDER, Sitka
Amelanchier alnifolia	SERVICEBERRY, Western
Arbutus Menziesii	MADRONA
Cratægus Douglasii	HAWTHORN, Black
Fraxinus latifolia	ASH, Oregon
Malus fusca	CRABAPPLE, Pacific
Pinus monticola	PINE, Western White
Quercus Garryana	OAK, Oregon White
Rhamnus Purshiana	CASCARA
Salix Hookeriana	WILLOW, Hooker Pussy
Salix Piperi	WILLOW, Piper Pussy
Salix Scouleriana	WILLOW, Scouler Pussy
Taxus brevifolia	YEW, Pacific
Tsuga heterophylla	HEMLOCK, Western

EXISTING TREE DEMOGRAPHICS

Evaluation

Diversity: The tree tapestry of Green Lake is exceptionally diverse, especially for a city park. For perspective, we may compare Green Lake's species count against other local tree collections:

1,550+	Washington Park Arboretum
475	U.W. Campus
300	Bloedel Reserve (Bainbridge Island)
200+	Carl S. English Gardens at the Ballard Locks
189	**Green Lake**
175	Volunteer Park
150	Woodland Park Zoo
125+	Interlaken/Boren Park
125+	Lincoln Park

The above figures reveal Green Lake has more kinds of trees than anyplace except an obvious botanic garden or institution associated with plant collecting. Curiously, Green Lake was never planned to be a veritable arboretum; the development came about by chance. A review of planting lists prepared for Green Lake by the Olmsted Brothers reveals no more than 70 tree species and varieties proposed. Two thirds of Green Lake's 189 tree taxa are represented by 10 or fewer specimens; 48 are represented by one individual only.

Keeping Green Lake's tree diversity high is advantageous for several reasons. With balanced diversity the threat of catastrophic disease or pest problems diminishes. A wider variety of wildlife find food and cover where much diversity exists. The more plants and wildlife in a landscape, the better the human stimulation and learning opportunities become.

Finally, a tradition has evolved which ought to be upheld unless there is sound reason to alter it. Since most new, large landscape projects use comparatively few species and rely heavily on clones, the genetic richness of Green Lake is something of an anachronism: an oasis of plenty in a world dominated by formal grids and low species-diversity. To maintain Green Lake's richness, some propagation by the park department (or arboretum) nursery staff will be necessary. Due to commercial unavailability, obtaining identical replacement trees or additional specimens may depend on using Green Lake trees themselves for propagation.

While varied trees are desirable, there is no sense in replanting tree species which have performed poorly at the park - better to replace them with new kinds likely to thrive. Past failures should not be repeated simply to uphold tradition. For example, five of Green Lake's seven crabapple varieties are disease-prone and no longer sold in nurseries. As old diseased specimens die in the Park, they should be replaced with disease-resistant varieties. Specific examples are called out below, by the six park subareas.

Native species: Native species are preferable for native wildlife, but not necessarily for human park users. Provision of wildlife habitat is a secondary function of Green Lake's vegetation. However, since there is a common desire to help urban wildlife where practical, the best of additional native species should be planted where their value will be maximized. Species most apt to be favored by wildlife may be those which make berries: *Amelanchier alnifolia*, *Arbutus Menziesii*, *Cratægus Douglasii*, *Malus fusca*, and *Rhamnus Purshiana.*

Every Seattle native tree species will grow if planted at Green Lake in a proper site, but some are far more likely to thrive than others. Some are so problem-plagued that they must be planted cautiously if at all: *Pinus monticola* (prone to blister-rust disease, easily blown down by wind) and *Taxus brevifolia* (very slow growing, usually thin and scrawny) come to mind. To the human aesthetic, the most lovely may be *Arbutus Menziesii*, and in great age, *Quercus Garryana*. Unfortunately, neither makes an easy or ideal ornamental, although their potential beauty may merit making planting attempts at Green Lake.

Problematic species: Green Lake's single most problematic species is the native cottonwood, *Populus trichocarpa.* It grows larger than any other native species and sheds great branches. Its roots make bumpy lawns and paths, and female individuals spew forth messy, cottony seeds. If it were not such a landmark species, commanding the skyline and truly beautiful in its seasonal displays, people would clamor to have them all removed. Periodic removal of individual

cottonwoods as they become indisputable hazards should be matched by planting of cottonless cottonwoods (*Populus* 'Robusta' or other male clones).

A species to watch out for in the future is the Douglas fir, *Pseudotsuga Menziesii* . More than 100 are at Green Lake, mostly planted circa 1976). Douglas firs ultimately grow very large and live a long time, but shed limbs as well as blow over. No more should be planted. If native coniferous evergreens are desired, a much safer choice is red cedar (*Thuja plicata*). It lives still longer, does not blow down readily, and sheds few limbs.

Criteria for future tree plantings: Future tree plantings should emphasize species which are long lived, tough, and add ornament in a meaningful way. Green Lake as a whole is well stocked with shade trees, but far from optimal in its fall color display. Spring-flowering trees are abundant but need reinforcing in some stretches. Summer or autumn-blooming trees are greatly needed, as are broadleaved evergreens such as hollies, which can provide valuable winter cheer. A preliminary list of tree species and varieties believed suitable for the Green Lake environment is included in Appendix C. Only eight of the fifty taxa are currently present in the Park. The list is intended to indicate the variety of trees feasible to grow even on Green Lake's most marginal sites; a longer list could be developed for locations with better soil and less dry sun and wind. A final recommended tree palette, with particular subarea suggestions, will be developed as part of vegetation management guidelines.

Community Center subarea: Above all, high human use characterizes this area. As the park's major entry from much of the south and the east, it should be visually welcoming rather than undistinguished. The sandy, compacted bathing beach presents a special challenge to shade trees (and other plants); *Fraxinus Ornus*, *Maclura pomifera, Paulownia tomentosa*, *Populus* hybrids, *Robinia* x *ambigua* 'Idaho' and *Tilia tomentosa* might succeed in this difficult cultural environment. The play area presents an opportunity to plant trees especially suited to children's needs: perhaps climbable, bearing edible fruit or unusual in flower, form or leaf.

When the entire area is viewed, it becomes apparent that thoughtful tree removals would do as much good towards beautification as would tree planting. For example, the tennis court Douglas firs (*Pseudotsuga Menziesii*) might well be removed before they grow large enough to pose problems. Thinning crowded groves to allow better growth of remaining trees would help throughout the area.

Wading Pool subarea: The park's highest percentage of flowering trees (31%) occurs here, and by an easy margin, the highest percentage of deciduous conifers (17.5%). The most critical issue is certainly the immense cottonwoods (*Populus trichocarpa*), both the grove of 25 at Gaines Point plus about a dozen scattered individuals. The largest are more than 112 feet tall, with trunks four feet thick. To prune them as needed, year after year, would be costly, to leave them alone, reckless. To remove them all and replant with a "cottonless cottonwood" clone is ultimately the best solution, but would entail a major public relations hurdle.

Other tree issues pale in comparison with the cottonwoods. The projected widening of the path will likely affect more trees here than in any other area; such losses should be carefully weighed and treated as opportunities for appropriate new plantings. The many wild shoreline alders, willows and cottonwoods need to be greatly thinned if a giant shady thicket is to be averted

between the wading pool and Bathhouse Theater. A final worthy priority is that the street trees of Norway Maples (*Acer platanoides*) have their fallen comrades replanted, on both sides of the street. At this point, little continuity among them remains.

Bathhouse subarea: To tree lovers, the Bath House area is probably the finest section of landscape at Green Lake. It possesses 14 trees or groves identified as "outstanding", and a good representation of all different tree categories. This area boasts the park's most pronounced topography, rising 25 feet above the lake level. A particularly well-sited bench is located at this high spot, amidst a shady grove of eastern North American oaks. Along with the Community Center and Aqua Theater areas, this area is humanity's major hub at the park. Nonetheless, its abundant trees offer users welcome eddies for quiet retreat.

The point toward Duck Island already is becoming denuded of trees, and needs replanting. One of Green Lake's best sites for shoreline native species revegetation is here, and tree selections might reinforce this theme.

Aurora Strip subarea: This long narrow stretch is characterized by pollution, noise, and a dramatic contrast between its Aurora edge (well-drained, dry and sparsely vegetated) and shoreline (lush and thick with plant life). There are few outstanding trees, and what luster is theirs they owe to comparison with their scrubby neighbors. There are proportionally few flowering trees (10.5%) or shade trees (26%), but the highest park percentage of coniferous evergreens (59.25%). Unfortunately, air pollution appears to be seriously stunting the area's many pines. Along the shoreline, unmanaged willows (and to a lesser degree alders) could overrun the entire area. Periodic "mowing" of the majority should be considered, to the degree it is compatible with wildlife enhancement objectives.

Dense evergreen trees and shrubs are needed along the Aurora highway, to help soften its visual and acoustical intrustion. Some tree and shrub taxa to consider (subject to evaluation for pollution tolerance during guidelines development) include: *Arbutus* 'Marina', *Arbutus Unedo, Cotoneaster salicifolius, Elæagnus* x *Ebbingei, Elæaganus macrophylla, Eucalyptus pauciflora, Ilex crenata, Ligustrum lucidum, Myrica californica, Osmanthus heterophyllus, Photinia* x *Fraseri, Podocarpus macrophyllus, Pyracantha coccinea, Quercus Ilex, Rhamnus californica, Rhamnus Frangula, Rhododendron macrophyllum, Rhododendron ponticum, Stranvæsia Davidiana, Taxus* x *media, Umbellularia californica,* and *Viburnum Tinus.* Tough-natured flowering trees could be planted within the park, against this evergreen screen.

Aqua Center subarea: This area features 14 outstanding trees, and is remarkable on several accounts. Its proximity to Woodland Park and high percentage (54%) of coniferous evergreens points to an evolving shady future. This area has the smallest percentage (5.5%) of flowering trees in the Park. The Aqua Center is subject to heavy recreational use and vehicular access impacts. A dominating shoreline thicket, mostly of willows, demonstrates what can happen if no pruning is done to wild shoreline trees.

Overall, the area has adequate numbers of trees and needs few additions; the paucity of flowering specimens can be corrected by judicious planting of small, choice species. Future tree selection also should reflect this area's direct relationship with Woodland Park and its native forest.

Absent its removal, improved vegetation screening for the abandoned Aqua Theater should be a high priority: vines are probably a more appropriate choice for this purpose than trees.

Southeast Shore subarea: This area is very narrow and receives relatively less use than other parts of the lakeshore. The tree category breakdown reveals a remarkably high 65.75% shade trees, but only 14% flowering trees and 17% coniferous evergreens. The diversity of trees by species is quite low. Additional trees are much needed to enrich this area's monotonous landscape character, as well as to offset high anticipated losses. In siting trees, views into the park, wildlife habitat, and shore-related uses simultaneously must be considered.

OUTSTANDING TREES

Description

Outstanding trees have been identified throughout Green Lake Park, and include:

- Visually prominent trees or groups
- Historic and landmark trees
- Champion-sized specimens
- Examples of exceedingly rare varieties

Some trees listed below are not necessarily more worthy of being singled-out than others, given that selections were made by consensus and choices would vary with any group of judges. Choices also might vary from season to season. When in blossom, for instance, the cherry trees are outstanding; the rest of the year they are ordinary. As a result, only a special few were included. Outstanding trees are listed in Appendix D by location. On accompanying maps, they are circled and assigned numbers corresponding to the list.

Evaluation

Future treatment: All trees designated "outstanding" deserve to be given special consideration in planning and care, if not cherished. Not all are handsome or in good condition, but each possesses some quality which distinguishes it from the general tree population. Where outstanding trees are also hazardous, removals should be coupled with replanting (and repropogation if necessary). Replacements for specimens which have not performed historically should be sited more favorably, or if a truly flawed variety, eliminated. Not all species have adapted well to the rigors of the Green Lake environment, including some rare varieties. Outstanding status is not a sacred designation, but an alert to accord extra respect to these trees. Prescriptions for a handful of particularly vulnerable outstanding specimens and groups are given below, by subarea.

Community Center subarea:

- The Double-flowered Danube Crabapple (*Malus dasyphylla* 'Plena') is neither healthy nor attractive. It could be relocated to a less prominent site, or repropagated.
- The allee of 28 Planes or Sycamores (*Platanus* x *acerifolia*) has at least three anthracnose-prone specimens. Spraying them annually with fungicide is not practical, and replacing them with disease-resistant clones might cause an outcry not worth the ultimate good. Pruning could mitigate disease by giving them better air circulation and sunlight exposure.

• The Weeping Lawson Cypress (*Chamæcyparis Lawsoniana* 'Intertexta') should be repropagated (by cuttings) and planted in sites with well-drained soils.

Bath House subarea:

• The street-trees of Norway and Sycamore Maple (*Acer platanoides* and *Acer Pseudoplatanus*) are an Olmsted feature, and should be replanted where gaps exist. Only a small handful remain on the north side of Green Lake Way.

• The Tanko-shinju Cherry (*Prunus* 'Tanko-shinju') suffers from competition; pruning (or removal) of adjacent larches should be considered.

• Crabapple trees (*Malus baccata, M.* x *micromalus,* and *Malus Niedzwetskyana*) should be replaced with scab-resistant cultivars. Possibilities include: *Malus baccata* 'Jackii', *Malus* Brandywine®, *Malus floribunda, Malus hupehensis, Malus* 'Indian Summer', *Malus* 'Klehm's Improved Bechtel', *Malus* 'Liset', *Malus* 'Professor Sprenger', *Malus* Red Jewel™, *Malus* 'Sentinel', *Malus* 'Silver Moon', *Malus* 'Snowdrift', *Malus* Sugar Tyme®, *Malus* White Angel®, *Malus* x *Zumi* 'Calocarpa'.

• The so-called Mikuruma-gaeshi Cherry (*Prunus* 'Mikuruma-gaeshi') should be re-propagated grafted on mazzard rootstock). Although it is not especially choice, perhaps a regrafted specimen would prove to be attractive and worthwhile.

Aqua Center subarea:

• Missing Black Walnut trees (*Juglans nigra*) lining West Green Lake Way should be replanted, and the three young horse chestnuts moved elsewhere to make room for black walnuts. Where there is no room for walnuts, compromise is advised. Presently, 50 walnuts remain on the Green Lake side, and 19 on the Woodland Park side.

• The Hybrid White Willow (*Salix* x *rubens*) is hazardous and must be removed. It should be propagated and replanted, easily done by inserting twigs in the ground in an appropriate site.

LIFE EXPECTANCY

Description

The mapping of estimated tree longevity is necessarily impressionistic, having been done quickly, to indicate general age classes. Based on observation and records going back more than fifteen years, we marked in *orange* those species which tend to be relatively short-lived (less than 20 years left), in *dark green* the long-lived species (likely to live at least 50 more years), and the rest, with an "average" life expectancy (20–50 years), in *light green* . Overall estimates are conservative; species expectations were adjusted downward according to particular trees' circumstances (stress, disease, competition, old age, etc.). Maps are contained in Appendix D.

Freshly-planted trees (in the ground less than about two years) usually are not yet established; these were marked *yellow* and not rated for life expectancy. Statistically, survivors should average into the mid-range lifespan (20–50 years). Some will die young, others may live well over 50 years. Many new trees appear to be struggling, from deep planting, lack of irrigation and training, or other factors. Placing them into categories according to a theoretical life expectancy could have put an overly-optimistic skew to the overall longevity picture.

Wild shoreline trees mostly were relegated to the default category of mid-range lifespan. Many are periodically cut to the ground, and others probably will be removed altogether for safety,

maintenance or aesthetic reasons. Because of their species and site conditions, few are likely to live more than 50 years in any case.

Trees rated short-lived may be inherently so, or may be struggling for various reasons. Stresses which contribute to early death include: being planted when root-bound, being planted too deeply, compacted soil, too dry a site, too wet a site, too much shade or competition, harmful fungi. Example short life expectancy species at Green Lake include *Abies Veitchii, Alnus rubra, Larix decidua, Pinus densiflora, Populus* spp., *Prunus* spp., *Salix* spp., *Sorbus aucuparia*.
Examples of long life expectancy trees found include: *Calocedrus decurrens, Liquidambar Styraciflua, Metasequoia glyptostroboides, Pinus ponderosa, Platanus* x *acerifolia, Pseudotsuga Menziesii, Sequoiadendron giganteum, Taxus baccata*.

The actual field count of mapped trees according to longevity breaks down as follows:

Predicted	SE	Aqua	Aurora	Bath	Pool	C Cen	TOTAL	
0 – 20 years	39	49	31	108	138	138	19.7	%
20 – 50 years	181	204	211	343	253	219	55.3 %	
50+ years	22	224	19	37	154	106	22.0 %	
Recent	11	22	2	8	13	18	3.0 %	
TOTAL	253	499	263	496	558	481	100.00 %	

LIFE EXPECTANCY

Evaluation

The park's tree life expectancy prognosis is surprisingly heartening. No alarm is called for, although complacency is equally to be avoided. In certain areas, tree replacement is needed just to ensure maintenance of the status quo. In the Southeast Shore subarea, for example, a poor 8.75% of trees are expected to live more than 50 years. In the Wading Pool subarea, large numbers of flowering trees together with its many cottonwoods, causes the short-lived tree count to be high. One significant weakness in the Bathhouse zone, too, is the very low percentage of trees expected to live more than 50 years (only 7.5%).

The Community Center zone has the highest percentage of trees predicted to live less than 20 years (28.75%). Nonetheless, that figure is skewed by several factors. First, there are nearly 30 Lawson cypresses (*Chamæcyparis Lawsoniana*), which are short-lived only if they become infected with the fatal *Phytophtora* root rot. For purposes of our survey we conservatively assumed this would occur. Second, many trees were brought in when large and planted with a tree spade, which has resulted in a high degree of shock and potentially-abbreviated lifespans. Most such trees are zelkovas and flowering cherries. Third, there are 14 weeping poplars (*Populus Simonii* 'Pendula') nearing the end of their normal lifespans. Longevity is best in the Aqua Center subarea, with the lowest short-life (9.75%) and the highest long-life (45%) percentages among the subareas.

Most of the trees which are dying at Green Lake in storms are inherently short-lived, or are common and well represented. Our 1975 base maps show about 375 trees which are now gone. Most were weak, crowded, shortlived, or intentionally removed. Few were serious losses. In the Aurora Strip section for example, 22 large trees (mostly native alders) have died since 1975.

Many more than 375 trees have been planted since 1975. With a high degree of accuracy, we can predict which trees are most likely to topple in storms or die soon from other causes. Prolonging the existence of such doomed trees is far less useful than planning ahead and planting ideal replacement kinds.

TREE HAZARD POTENTIAL

Field Data Collection

In assessing Green Lake vegetation, evaluation of the existing tree population for hazard potential was clearly the most urgent priority; action on that information will be more important still. Because of budget constraints, field work could only provide a preliminary screening to identify trees requiring immediate attention. Although desirable, no attempt was made to document tree condition for all park trees. Condition and hazard are linked, but the focus was strictly on hazard identification. Some broad impressions of tree condition were gleaned, however, from both this field work and that evaluating life expectancy.

Field work was conducted from March through June, 1995. Followup field checks were made in some cases to verify live-crown ratios and annual shoot growth. Structural defects were most visible during the dormant season. All park trees were observed briefly, but only those with obvious problems were evaluated on field forms and marked on maps. A copy of the data collection form is included in Appendix E; it documents an abbreviated version of individual tree hazard and condition assessment.

Each evaluated tree was assigned a "Tree Hazard Condition and Abatement Recommendation" rating and color-coded on summary maps found in Appendix E. Field data summaries for the entire park as well as individual subareas are also found in the appendix. Field forms themselves (290 total) have been assembled in a separate binder for future reference by Department staff.

Tree Hazard Condition and Abatement Recommendations were based on the following ratings:

A. Condition Rating (based on overall tree health)
B. Potential Hazard Rating (based on tree & site factors)

The rationale for each of the four recommended Abatement categories follows. Summary sheets identify categories in the order of importance:

A. Removal / High Hazard Potential

Trees in this category have more than 60% decay within the crown, indicating the greatest potential for tree failure. These trees are located adjacent to footpaths, roadways, or desig-nated fishing and swimming areas. Concerns for public health, safety and welfare determine this rating to have the highest priority for action.

B. Prune Defective Parts

Trees in this category have 40-60% crown decay and/or dieback. This category also should receive high priority for action because of tree location adjacent to footpaths, parking lots and other high use areas. Pruning defective parts will: a) remove 'hangers' or deadwood broken from the canopy and suspended within the branches, b) increase vigor and promote longevity, and c) increase longterm aesthetic value of the tree.

C. Removal / Low Hazard Potential
Trees in this category have 50% or more crown decay and/or dieback. Their low hazard potential is based on size, species attributes, and location.

D. 'Watch Status' (Further inspection required)
Trees in this category have either 30-40% crown dieback and/or decay, significant structural defects, or excessive crown density. Some trees in this category function as habitat trees, providing food and nesting sites for birds and small animals. 'Watch Status' trees should be inspected twice a year for changes in their condition and hazard potential.

Field Inventory Results
From the more than 2500 trees evaluated within the park, 290 were identified with a Tree Hazard Condition. The recommended immediate removal count is not onorous. High priority hazard pruning, however, may place a heavy burden on available tree crew - especially since nonessential deadwooding, aesthetic pruning and tree training needs are excluded from these findings. The number of park trees found in each condition category are**:**

#	CATEGORY	% PARK TREES
24	Removal / High Hazard Potential	< 1 %
113	Prune Defective Parts	4.4 %
89	Removal / Low Hazard Potential	3.5 %
64	Watch Status (Further inspection required)	2.5 %
290	Total of All Categories	11.4 %

By subarea, the number of trees assigned a condition rating are:

#	ZONE	% ZONE TREES
63	Community Center	13 %
50	Wading Pool	9 %
66	Bathhouse	13 %
15	Aurora Strip	6 %
49	Aqua Center / Pitch 'n Putt	10 %
47	Southeast Shore	19 %

Zone by zone percentages reveal variable concentrations of hazard trees, the worst area having over
three times as many proportionally as the best.

TREE HAZARD POTENTIAL

Evaluation
Implications of Field Data: As compiled, each Abatement Recommendation category presents a slightly different pattern. Implications are highlighted below:

Removal / High Hazard Potential

The distribution of the 24 trees identified in this category is nearly even throughout the six zones. The Southeast Shore has several more 'high hazard potential' trees than the other five zones, the consequence of which will be near-term creation of significant voids needing replanting.

Prune Defective Parts

Of the 113 trees in need of immediate action to minimize their hazard potential and maintain their longevity, the majority are located within the following zones: Community Center, Aqua Center, and Wading Pool. Although outright removal is not indicated, safety pruning must be seen as equally urgent, given the degree of danger to users in these busy areas.

Removal / Low Hazard Potential

A total of 89 trees throughout the park need removal but do not pose an imminent hazard. The highest proportion are located within the Bathhouse zone, where sufficient space exists and wildlife activity may warrant a measured approach to non-critical removals.

Watch Status (Further inspection required)

The distribution of trees in need of further observation is dominated by trees growing along the Southeast Shore. With regular inspection and appropriate abatement measures, many of these trees could be retained safely for several more years. Watch status does NOT imply no action: it indicates a need for active management.

Opportunities: Several opportunities present themselves in relation to tree hazard mitigation at Green Lake:

- The Southeast Shore offers many opportunities for future planting because of its current amount of open space, its poor tree longevity prognosis and its high number of recommended hazard removals.
- Trees in the process of aging and decay often serve as important habitat trees for birds and small mammals. Where such trees do not pose high hazard potential for humans, they can function as habitat trees, especially those adjacent to the lake.
- Some trees identified for removal which do not pose a risk, are located in the Bathhouse zone. Of these, several have important historical significance and could be replaced with fresh specimens of the same taxa, or with similar species that are better adapted to the site conditions.
- The Bathhouse zone is rich in tree groupings of the same genus and often the same species. An opportunity exists to continue this trend along the depauperate Aurora Strip, as well as elsewhere in the park.
- As plans are made for widening the primary foot path around the lake, many mature, potentially hazardous trees adjacent to the path may need to be removed. Opportunities will arise to choose more appropriate replacement trees which can withstand the site conditions while providing shade and aesthetic value along the path.

Issues and Constraints: Tree hazard evaluation for Green Lake also suggests several concerns which need to be addressed.

- The health, safety and welfare of the public is an important consideration in evaluating

trees in heavily-used public locations. The majority of trees in need of restorative pruning at Green Lake are located in high use areas of the park: Community Center, Aqua Center and Wading Pool. Without such restorative pruning, further decay and degeneration will occur, resulting in an increase in tree failure and hazard potential in these high use areas. Corrective pruning must play a key role in managing existing vegetation in the park.

- Deferred restorative pruning will result in additional tree loss and possible user injury, leaving many areas within Green Lake's highest use zones without the shade canopy and the aesthetic value current mature trees offer.
- From an aesthetic perspective, many of the 89 trees in the removal/low hazard category display poor form, weak canopies and excessive deadwood that minimizes their aesthetic quality. Removal of such trees would improve landscape appearance and create sites for vigorous, attractive replacements.
- Many of the trees throughout the park are of similar ages (planted in the 1930's). Because of the high impact conditions, their longevity may be compromised compared to their genetic species potential. Frequent pruning of those trees 'at-risk' could increase their life span substantially, especially in conjunction with anti-compaction measures.

- Parking lots at the north and south ends of the lake are adjacent to large mature trees with dense canopies. Excessive weight on the limbs and the substantial 'sail' caused by dense canopies increases the potential of limb and tree failure. Parking lots need to be given high priority for maintenance and management practices.

- Many of the trees planted within the last 10-15 years would benefit from selective pruning to eliminate co-dominant branches, inherent weak unions and provide form and direction for future growth and longevity. Minimal investment in appropriate training nearterm could yield significant longterm improvements to tree quality.

- Field data indicate that some of the trees identified as Outstanding urgently need pruning or fall into the 'watch' category, displaying initial signs of dieback and decline. Management recommendations particularly should address these issues for Green Lake's special trees.

- A plan is needed to protect the Gaines Point Cottonwood Grove, addressing the need for its regeneration and to minimize its hazard potential. Removing trees with 30% or more deadwood, or those which reach a diameter of 30 inches may provide criteria for removal. A strategy of replacing trees with a species of cottonwood more suitable for an urban park should be integrated in grove regeneration.

UNDERSTORY

UPLAND SHRUB BEDS

Field Assessment

Green Lake Park's upland understory is almost entirely dominated by mowed turf rather than shrubbery, whether for reasons of initial cost, upkeep requirement, or in recognition of user pressure on limited ground area, Green Lake's few shrub plantings also represent low species diversity compared with the abundant and richly-varied tree population. A brief inventory of shrubs throughout the park recorded the following information for each area encountered:

- assigned name to each bed
- types of plants
  - *botanical names (when possible)*
  - *leaf-type segregation*
- relative age
- relative health
- presence of weeds
- definition of bed edges

Photographs of conditions was also made. A summary map documenting bed locations, contents and condition is included in Appendix F.

Findings

Parkwide patterns became clear during field documentation of Green Lake's upland understory. Findings consistent among all areas were:

- weeds prevalent in most all beds
- signs of too little plant care
  - *opportunistic growth*
  - *malnourishment*
- signs of too little bed maintenance
  - *undefined edges*
  - *competition from 'volunteer' plants*
- some plant material has outgrown its context
- little variety in shrub material

Evaluation

Shrubs at Green Lake deserve a good deal more attention than they receive. In their current condition, most would not be missed. However, a shrub layer in the landscape assuredly would be sorely missed. What little understory Green Lake Park possesses should be reclaimed, and serious consideration should be made to expanding shrub plantings within the park. Issues relating to understory are discussed elsewhere in this report, and must be weighed carefully.

Regarding existing shrub areas, four objectives should be pursued in developing vegetation management guidelines. Specific actions to carry out these objectives are suggested:

- FORTIFY EXISTING SHRUB BEDS
  - more individual plant attention over the short-term
  - begin a shrub donation program

- ENHANCE PLANT HEALTH
  - diversify plantings and assemblages
  - amend soils
  - establish beneficial insect populations for pest control
  - remove unwanted competing plants
- REDUCE LONG-TERM MAINTENANCE BURDEN
  - install compatible plant palettes
  - fill voids
  - establish an adopt-a-bed program
  - plant weed-suppressing groundcovers and shrubs
  - replace lawn areas with self-maintaining shrub beds
- PRESERVE AND RETAIN HISTORIC INTEGRITY
  - study historic planting plans
  - study reasons for deviation from those plans
  - incorporate these historic patterns in future managment guidelines

SHORELINE VEGETATION

Description

Green Lake's wild plants growing between the path and water's edge were surveyed, as well as some of the floating species near shore. Mushrooms, mosses and most grasses were excluded. Plants that only grow submerged in the water, such as the notorious Eurasian Water-Milfoil, were also ignored. Duck Island's vegetation was undocumented, but is by no means unimportant. A few species no doubt were missed during the inventory because of their ephemeral nature or rarity. The species list is found in Appendix F, and includes 62 taxa:

PLANT TYPE	# SPECIES	# NATIVE
Vines and vinelike	5	0
Shrubs	5	2
Grasses, rushes, sedges	10	5
Ferns and horsetails	3	3
Floating and aquatic	6	3
Wildflowers, weeds, herbs	33	4
TOTAL	62	17

Evaluation

Although the inventory list may appear impressively long, in reality a few species dominate Green Lake's shoreline vegetation: rushes, Canary reed grass, yellow iris, cattails, and shrubby willow, alder and cottonwood. Little practical diversity exists. Half of the plants inventoried are limited to one or a few specimens or locations, and most are weedy rather than ornamental in character. Green Lake's wild woody plants are mostly native species; wild herbaceous plants are mostly non-native species. This is not surprising or unusual in a disturbed environment. Whether plants are native or non-native is not inherently good or bad. Far more important are the characteristics individual taxa possess: ecologic role, beauty, maintenance implications, etc.

Three aggressively invasive, non-native species should be singled out for total elimination at Green Lake, or for periodic control in the areas of greatest infestation:

Purple Loosestrife (*Lythrum Salicaria*) - a tall, lovely waterside perennial which won't stop once it has a stronghold, luckily not the case at Green Lake so far.

Japanese Knotweed (*Polygonum cuspidatum*) - a tall, large-leaved plant which spreads like bamboo, but with a deciduous habit and showy, saucer-sized leaves. Some is starting to colonize the Southeast Shore.

Himalaya Blackberry (*Rubus discolor*) - a well known,thorny and robust cane grower, abundant throughout Seattle on untended land. Largest patch is near Aurora.

Other than these noxious weeds, shoreline herbacious plants and shrubs are perhaps best left alone, having formed a community of sorts which is fairly attractive and highly competitive, mostly firmly established and not easily altered. Where vegetation thwarts legitimate access to the water, physical reduction of colonies may be indicated. Introduction of more ornamental shoreline species might be considered.

For years, debate has raged and policy shifted concerning appropriate management of the Green Lake shoreline. No attempt to resolve the debate is attempted here, only another perspective added. Although marginal plants may contribute to the lake's phosphorus levels through detritus decomposition, the amount must be tiny compared with centuries of accumulated organic sediment fueling algal growth. A basically naturalistic (if non-native) shore treatment can provide significant aesthetic and wildlife benefits, and through bioengineering, help check erosion.

Even in areas with bulkheads plants grow, beneath and sometime within actual walls. The imperative is extremely strong. Such growth must be curtailed where danger exists that overlarge, poorly-anchored plants may topple. A corkscrew willow recently fell on a calm summer's day, presumably for this reason. From a vegetation management standpoint, Green Lake's 200+ wild shoreline trees, not its understory species, are a primary concern. Many trees currently appear as shrubbery, but ultimately their genetic potential is to create an impenetrable, forested ring around the lake. Sustained management of wild willow, birch, cottonwood and alder species is mandatory.

In only very limited places is there sufficient room to add plantings of native shoreline species not already present at Green Lake. Such an effort would increase biological diversity and especially benefit animal wildlife. Seattle native plants suitable for introduction to Green Lake shoreline areas might include:

Birch, Swamp	*Betula glandulosa*	large shrub
Avens, Bigleaf	*Geum macrophyllum*	perennial herb
Bur-reed,	*Sparganium eurycarpum*	water plant
Brooklime	*Veronica americana*	perennial herb
Cinquefoil, Marsh	*Potentilla palustris*	perennial herb
Elder, Red,	*Sambucus racemosa*	large shrub
Fern, Lady	*Athyrium felix-fœmina*	decidous fern
Forget-me-not, Water	*Myosotis scorpioides*	perennial herb
Gooseberry, Swamp	*Ribes lacustre*	large shrub
Hedge-nettle, Giant	*Stachys Cooleyæ*	perennial herb
Horehound, Water	*Lycopus americanus*	perennial herb

Honeysuckle, Black Twinberry	*Lonicera involucrata*	large shrub
Rush	*Juncus* spp.	grasslike clump
Sedge	*Carex* spp.	grasslike clump
Salmonberry	*Rubus spectabilis*	shrub
Skunk Cabbage,	*Lysichitum americanum*	perennial herb
Viburnum	*Viburnum ellipticum*	shrub
Water Plantain	*Alisma plantago-aquatica*	water plant

A footnote concerning Duck Island: large loads of cormorant droppings there are hurting the plants, and could eventually lead to tree and shrub death. Also, a wider band of aquatic plants could help protect the island from human entry.

RELATED RESOURCES

WILDLIFE HABITAT

Species of Fauna

Information on wildlife in Green Lake Park is based mainly on frequent visits to the lake over the past eleven years, including a weekly bird census of the park for the past five years documenting the species and their abundance at the lake. Some added information was supplied by Seattle Audubon Society members, who have seen additional bird species at the lake. One is cautioned against too literal a reading of the assembled information on species occurrence in certain locations and at certain times. Birds are highly mobile and may show up in unexpected places or "the wrong place at the wrong time." Just because a species has been seen in one place doesn't mean it won't be found elsewhere at different times.

Several species abound during winter but are almost totally absent during the nesting season, or vice versa. Yet other species show up during migration: absent for many months, for a few weeks suddenly the "trees are crawling with them." Such seasonal changes should be kept in mind when discussing wildlife usage of the park. Also, one cannot accurately predict what will happen in any given season, based on previous years' seasons.

Close to 160 species of birds have been documented at Green Lake (see list, Appendix G), including 5 out of 7 "special status" species (native species that have been accorded special legal or management protection because of concern for their continued existence). These are: green heron, hooded merganser, bald eagle, peregrine falcon and great blue heron.

A few mammals (Raccoon; *Procyon lotor* and Opossum; *Didelphis marsupialis)* visit the lake sporadically and their stays are of short duration. Rats (*Rattus spp.*) of wild and domesticated origin and feral cats (*Felis spp.*) are present but not included in consideration. Eastern Gray Squirrels (*Sciurus caroliniensis hypophaeus*) are abundant throughout the park. This introduced species is common in both backyards and parks; several nests can be found in the crown of tall, mostly deciduous trees at Green Lake each year. Provision of mammal habitat in the park is a tangential consideration compared to bird and human use.

Habitat

Wildlife, mainly birds, use almost every part of the park. However, certain areas of Green Lake appear to be used more heavily and consistently than others. The Wildlife Habitat Map in

Appendix G delineates two types of wildlife habitat in the park, based on field observation. These can be differentiated as follows:

- Primary Wildlife Habitat: Areas with vegetation which allows relatively undisturbed usage by birds.
- Secondary Wildlife Habitat:Areas which are used by birds, and although people can enter these areas wildlife is relatively undisturbed by their presence. (For example, birds use the canopy of tall trees, or graze when people are not present).

Primary Wildlife Habitat areas identified include:

- Waldo J. Dahl Water Fowl Refuge, otherwise referred to as Duck Island.
- The shoreline area paralleling Aurora Avenue, including the patches of water lilies.
- The shoreline area with willows and reeds northeast of the Aqua Theater.
- Gaines Point and other areas with large cottonwoods closer to the Wading Pool.

Secondary Wildlife Habitat areas include:

- All of the lake's shoreline area.
- Grassy areas along the southeast shore, near the Community Center (including play field) and east of the Wading Pool.
- Fruit-bearing trees like those found along the southeast shore (upland) and those in the Wading Pool subarea (hawthorns).
- The areas around the Bathhouse Theater, including the grassy areas at the west beach steps, both hills between the theater and the parking lot, the shoreline vegetation including the dead trees between the theater and the dock towards the island.

Subarea Wildlife & Habitat

Community Center: Near the Community Center the ball field is of importance to foraging ducks but also attracts killdeer and large numbers of gulls. Mew gulls especially appear to roost on the open field in late winter and early spring. Bird species that are found in vegetation along the perimeter of the park do not appear to differ from those found closer to the water, but knowledge of the perimeter is not as extensive as that for the immediate vicinity of the inside path. No species have been identified that use the perimeter exclusively. It seems reasonable to expect the same species as elsewhere in the park in equivalent habitat. The evergreens around the tennis court are used during the winter months by one or more Great Blue Herons to spend the day when large numbers of people along the shoreline disrupt foraging in the shallows.

Wading Pool: The grassy areas between Sunnyside and North 77th are frequented by wintering water fowl. Downy woodpeckers, northern flickers, red-breasted nuthatches, chickadees, bushtits, American robins, mew gulls, ring-billed gulls use the vegetation in this area. Some of the older trees have holes in them excavated by woodpeckers in the past but now used by mainly European starlings. Woodpeckers do still nest in this area some years. American crows' nests can be found in treetops. Hawthorns attract berry eating birds in winter.

The black cottonwoods on Gaines Point, and to a lesser extent those near the Wading Pool, are attractive to Bald Eagles. Peregrine Falcons have been seen using the same trees to perch in and hunt from. Double-crested cormorants are known to use these trees for perches during the daytime as well. The cottonwoods are used by downy woodpeckers and northern flickers to forage in and excavate for nesting holes. Old nest cavities are used by European starlings as sites to raise their young.

Bathhouse Theater: This area's more diverse canopies, with different layers of vegetation, provide better habitat than elsewhere in the park. A good example are the two small hills west of the Bathhouse Theater. One is planted with oaks and the other with elms and maples. The "valley"between them has an assortment of shrubs and trees. This area is especially attractive to species of warblers migrating through the area. While small numbers of birds use the area all year long, for a few weeks during spring migration the trees abound with small birds gleaning much-needed food during brief stopovers while migrating.

Aurora Strip: Along Aurora Avenue, cattails, iris, sedges, willows and water lilies provide nesting habitat for species like pied-billed grebe, mallard, gadwall, American coot, downy woodpecker, red-breasted nuthatch, American crow, black-capped and chestnut-backed chickadees, bushtits, northern orioles and red-winged blackbird. Swallows use portions of the reeds to roost after their young have fledged. Additionally, during the winter months the same area of shoreline is important for foraging herons. While strictly speaking species like double-crested cormorants, hooded and common merganser, buffleheads and goldeneyes don't use the shoreline vegetation, the dense stands of blackberry and willow provide them shelter from humans, and

Aurora Strip, cont:

facilitate these species' feeding near shore. This interaction illustrates the importance of shoreline vegetation for water birds.

Aqua Center: The willows east of the Aqua Theater provide shelter during winter for as many as a dozen different species of ducks. In some years pied-billed grebes wintering on the lake congregate underneath the willows extending furthest over the water; dispersing across the lake during the day. Usually one pair of pied-billed grebes nests in the reeds outside the willows. Herons roost in or underneath the trees, and forage in the area during winter months. Belted kingfishers forage from branches over the water. Songbirds wintering in the area can be found here and species like black-capped chickadees and downy woodpeckers nest in cavities in dead standing timber. Swallows bring their newly fledged to the area and feed the young perched on overhanging branches, after hunting over the lake. Accipiters like sharp-shinned hawk and Cooper's hawk hunt among the trees and use the densest trees to perch and devour their freshly caught prey (songbirds etc.).

Tall trees on the Pitch-n-Putt Golf Course are used by the usual variety of insect-eating songbirds. Poor drainage in part of the grassy area is very attractive to grazing water fowl, including geese and ducks. In late winter large numbers of gulls rest and roost on these fields, presumably because the fence surrounding the golf course keeps dogs and humans from disturbing the birds there. Along one section of the fence (at the northeast end of the golf course) dead wood and other organic debris is stockpiled along the fence, underneath trees. This practice makes a section of dense cover attractive to species like winter wren, rufous-sided towhee, dark-

eyed juncos - and particularly during cold spells in winter, varied thrush. As in almost every place with tall trees, one or more pairs of American crows nest in the crown of trees here.

Southeast Shore: Along the southeast shore, from beyond the Aqua Center willows to the Community Center, the shoreline vegetation is rather thin. However, tall trees are occasionally used by bald eagles. Seed-bearing trees are used by finches and sparrows, while warblers and woodpeckers use almost all mature trees at some time. There are several berry-bearing trees on the upland side of the path between Kenwood Place and Kirkwood Place, which during the winter frequently attract such berry-eating species as American robin and both Bohemian and cedar waxwing. Flocks of bushtits with chickadees and nuthatches intermixed also frequent these trees during the colder months.

The cattails and willows offer habitat for red-winged blackbirds and song sparrows. In two locations pied-billed grebes nest almost every year, not always successfully. Since there are few blackberry bushes on this side of the lake, often fishermen enter the reeds, possibly disturbing nesting and foraging birds. This intrusion may contribute to less usage of these areas by wildlife than areas with blackberry bush buffers.

The grassy areas on the slope from the road down to the water (both sides of the paved path) are frequently used by wintering birds to forage. Mew and ring-billed gulls, Canada geese, mallard, gadwall, American and Eurasian widgeon and American coot are among the most frequent users during the winter months. The number of individuals of these species during the nesting season are quite low compared to the wintering population. For instance, while American coots number in the hundreds to more than 1800 during some winters, only two or three pair attempt to nest on the lake. Of the three hundred or so widgeons, none summer here (unless they are injured and can't migrate out). The winter number of 300-400 mallards is reduced to about fifty individuals during the nesting season.

Although some female ducks manage to nest within the park, in hollow trees or underneath shrubs, most successful nests are incubated in residential yards in the immediate vicinity of the park. The **Southeast Shore, cont**:
female ducks then lead their newly hatched broods to the lake to rear them. Canada geese numbers peak during the post-nesting season when the adult birds go through a molt of their flight feathers. For about a month the birds cannot fly very well and they choose locations with ample food and an easy escape route to safety. Lawns near open water without intervening barriers provide this type of habitat, hence their presence in parks and waterside yards throughout the area.

Waldo J. Dahl Water Fowl Refuge
The island in Green Lake, commonly known as "Duck Island" is an official State Water Fowl Refuge, off-limits to people. The trees on the island are used by various birds of prey. Bald eagle, peregrine falcon, osprey, Cooper's hawk and sharp-shinned hawk. The birds perch there during hunting. Bald eagles have been seen using some of the fallen logs that extend into the water to walk into the water and bathe extensively. Belted kingfishers also use branches over the water for hunting.

Species that nest on the island include Canada goose, domesticated goose, mallard and perhaps gadwall. Many swallows use the trees to perch in or to "park" their newly fledged, still dependent young, while their parents forage over the lake. American crows use the trees to congregate in, especially in the afternoon on winter days, when they are on their way to the communal roost near Foster Island where 8,000-10,000 crows roost.

Many water birds like wood ducks, common and hooded mergansers, mallards, gadwalls, green-winged, blue-winged and cinnamon teal like to rest on the fallen logs along the shores of the island. Great blue herons often perch on logs or in the trees on the island during the daytime and one may roost there during the winter. During winter months, double-crested cormorants use the trees on the island as roosts. From December through April as many as 200 of them fly in from surrounding bodies of water (Puget Sound, Lake Washington) to spend the night in these trees. While some also spend the day on the lake, the majority leave to forage elsewhere.

Management Practices

No formal wildlife management practices are currently in place at Green Lake. Decision making is left largely to grounds maintenance personnel. Increasingly over the past few years DOPAR personnel have consulted informally when planning specific activities which might disturb park wildlife. The Department's 1994 *Urban Wildlife and Habitat Management Plan* may lead to more conscious and institutionalized protection of Green Lake for its well-recognized wildlife value.

WILDLIFE HABITAT

Evaluation

Green Lake is the most popular park in the city of Seattle, possibly the state of Washington. Despite the large numbers of people who visit Green Lake yearly, an amazing amount of wildlife can be found on and in the lake. This old, naturally nutrient-rich lake, supports plant and algae growth which in turn supports higher levels of organisms. In evaluating wildlife habitat at Green Lake, the focus is upon the rich diversity of birds and their requirements, other fauna being few and commonplace.

Birds are attracted to the lake primarily because of the abundance of food available, but the infrastructure of vegetation surrounding the lake and on the island is also of major importance. For example, eagles and peregrine falcons hunt from and perch in the tall trees. Both heron species use densely vegetated shoreline to find undisturbed perching and foraging areas. During the winter, between one and six great blue herons each year use the lake as a source for food. They hunt in shallow waters when not too many people are present, finding shelter on the island or in dense evergreen trees along the shore later in the day. Trees hanging over water and fallen logs extending over or into the water provide herons and hooded mergansers with appropriate perches.

In general, wildlife need undisturbed vegetated areas for foraging, perching, roosting, and nesting. Trees like willows which hang over the water, especially over patches of water lilies, provide nesting habitat for species ranging from bushtits and northern orioles to pied-billed grebes. Denser stands of trees that include older, dying and decaying trees, and that are relatively inaccessible to people, provide foraging habitat for thrushes, chickadees, bushtits, kinglets, creepers and nuthatches, perches for herons, kingfishers, raptors, swallows and roosting areas for several of these species. Tall trees, like the stand of black cottonwoods on Gaines Point along the

northeast shore, provide excellent perches for bald eagles and peregrine falcons as well as nesting and foraging areas for other species, including three species of woodpeckers.

Vegetation which functions best for wildlife may not possess the aesthetic attributes people expect in a maintained park landscape. The Urban Wildlife and Habitat Management Plan describes desirable habitat characteristics:

> *In general, more complex plant communities with more vegetation layers and more plant species provide higher-value wildlife habitat than less complex vegetation communities....*
> *Bird species diversity...increases with increasing structural habitat diversity. Habitats with more canopy layers, greater foliage volume, and greater total percent vegetative cover support greater bird diversity than habitats with fewer layers, less foliage volume, and less vegetative cover.* (p. 10)

At Green Lake, a simple, two-layered vegetation structure (trees and lawn) has long dominated the park's landscape character. Adding richer vegetation layers in the future may be desirable not just for benefits to wildlife, but also for tree protection, peripheral screening, and fidelity to the Olmstedian design. In making any modifications to Green Lake's vegetation, a balance will need to be struck, deviating not too far from past precedent and respecting the park's essentially neat landscape aesthetic. Within these constraints, much can still be accomplished for wildlife.

In developing vegetation management guidelines for Green Lake Park, key existing wildlife habitat should be protected and where possible, enhanced. Because of limited park area and competing demands by human users, opportunities to create additional primary habitat will be limiited. Perhaps most important is to recognize where and in what ways birds utilize the park landscape along with humans. If certain areas must be altered or important plants removed, other provision should be made to offset such losses. Wherever possible, management should favor those maintenance practices and plant additions which satisfy multiple agendas rather than serving human users only. Green Lake's rich population of birds is one of its greatest assets; enhancing bird habitat enhances an important aspect of the park experience.

SOILS

Description

There are two primary soil conditions surrounding the lake. The first is areas adjacent to the lake built up by refuse fill through the late 1930's. Filling occurred in four primary locations following the lowering of the lake by seven feet to provide park land. The largest of these areas are the golf course vicinity and the playing field south of the Community Center, where the original lake outlet was located. The third and fourth locations are both along Aurora, one at the base of Woodland Park, the other west of the Bathhouse Theater. (Map in Appendix H shows exact locations).

The remainder of the soil around the perimeter of the lake was formerly lake bottom sediments. Two soil samples were obtained to determine the soil texture: its composition of sand, silt and clay. One sample was taken west of the Wading Pool, the other sample from an incline on the Southeast side of the lake. Both samples indicate the soil texture to be approximately 60% sand, 30% silt, 5% clay and 5% organic matter, resulting in a sandy loam soil. Both samples had a pH of 5.5, indicating slightly acidic conditions for most plants. Fertility was not analyzed.

SOILS

Evaluation

Opportunities: Soil texture and pH factors indicate favorable conditions for growing a wide variety of trees and shrubs in the Green Lake environment. Some areas along the shore are saturated most of the year, and while problemmatic for recreational use, provide ideal conditions for trees adapted to or tolerant of wet soil conditions. Representative species include: *Fraxinus latifolia* - Oregon Ash, *Nyssa sylvatica* - Tupelo, *Rhamnus purshiana* - Cascara, *Metasequoia glyptostroboides* - Dawn Redwood, *Taxodium distichum* - Bald Cypress. Not all are currently represented in the park.

Issues and Constraints: Compaction due to the recreational demands on the lake and surrounding area causes the greatest impact on the establishment of trees. The restriction of root expansion due to lack of pore space prohibits optimal growth and development. Compaction seriously impedes drainage and oxygen supply to the root zone. Wet soils with poor drainage throughout the year exist in several locations along the north and northeast perimeter of the lake. (See map for exact locations). Compacted conditions reinforce saturation, by prohibiting adequate soil porosity for drainage.

Compacted soil conditions at Green Lake suggest a strong need for special site preparation prior to planting, to support long-term tree survival. Good soil texture cannot be exploited without adequate soil structure. Mulching planting beds and bases of individual trees will always be an especially important maintenance practice in Green Lake Park, to protect trees from mechanical injury, preserve soil structure and improve fertility, and retain water during dry summer months. A tangential benefit is direct disposal of shredded leaves and chipped woody debris on-site as mulch.

Green Lake's altered landform has yet to attain full stability, manifest in continuing settling and erosion problems. Signs of erosion are evident along the northwest shore just south of Oak Knoll, where boaters, fishermen and waterfowl enter and exit the lake. Two additional locations experiencing shoreline erosion are in the Bathhouse zone near Duck Island, and in the Wading Pool zone at Gaines Point. In both areas fishing is prevalent. Shoreline planting to control access and stabilize unarmored banks should be considered.

The long-term effects of fill operations is most evident south of the Community Center, where the ball fields become saturated early in the fall and drain slowly in the spring and summer. Fill repeatedly has been added to this area, even quite recently, to remediate ongoing settlement. More may need to be added in the future. Much organic material was originally used for fill in this area, the decomposition and subsidence of which is a natural, inevitable process. Continued aggressive turf aeration might be combined with restricted use during extremely wet weather. A permanent "fix" seems unlikely but symptomatic relief is feasible.

VEGETATION - RELATED PARK USES

BASIC PARK USES

Description

Green Lake hosts a wide variety of uses, including structured and unstructured, active and passive, individual and group activities. All relate to park vegetation in either direct or indirect ways. Plants define activity settings, and foster or deter particular recreational uses. For the most part, the existing Green Lake landscape is "permissive": it allows diverse activities to occur and prohibits few.

Park uses fall into three general categories:

- Formal & informal, active recreation tied to specific facilities:
  - Tennis courts
  - Wading pool
  - Ball fields
  - Playground
  - Golf course
  - Small craft center
  - Boat rental area
  - Fishing piers
  - Swimming beaches
- Informal recreation (active & passive) focused in particular areas:
  - Sunbathing
  - Fishing
  - Kite flying
  - Swimming
  - Ball & frisbee
  - Windsurfer launching
- Informal recreation (active and passive) occurring throughout the Park:
  - Jogging
  - Skating
  - Walking
  - Picnicking
  - Reading
  - Sitting
  - Birdwatching
  - Peoplewatching
  - Dogwalking

The above list is not exhaustive, but suggests the range of activity occurring in this people-filled park. The accompanying field map (see Appendix I) indicates where certain informal uses of the second category gravitate at Green Lake today. As a practical matter, neither fixed facilities nor parkwide uses are shown.

Evaluation

Orientation, topography, presence of shading or obstructing trees, shelter, shoreline planting, and aesthetic qualities are key landscape components which affect patterns of park use. Future plant additions, removals, and maintenance should recognize and respect these activity patterns. Fixed usage settings need plantings that enhance rather than frustrate intended recreational activities. For instance, Douglas firs adjacent to the Community Center tennis courts increasingly shade and litter the surface. Different plants could provide longterm screening without creating major litter and shading problems. Non-fixed uses, of course, are capable of relocating as the landscape itself evolves; as trees grow or die, for example, open areas will shift and sun-dependent activities with them.

Vegetation management can enhance appropriate park uses and to a limited extent, discourage those which impinge on broad public enjoyment or damage the landscape itself. Future vegetation management at Green Lake should foreclose no current legitimate uses, neither should it be bound to provide those opportunities exactly where they now occur. Park users themselves may need to adjust their activities to better favor plant survival. Wear and tear

affects the landscape throughout the park, especially where use is heaviest. Compaction, trampling, and plant injury are common. Strategies which accomodate a wide array of human use yet nurture and protect park vegetation must be devised.

ADJACENT USES

Description

Single family and limited multifamily residences are dominant land uses surrounding Green Lake. An abutting commercial zone and a few institutions also neighbor the park, as does another large park and a major highway. Interstate 5 freeway and additional parks lie close by. Green Lake serves as an oasis amidst a highly developed district of the city, accomodating streams of users every day of the year as both neighborhood and destination park.

The most potent adjacent impact on Green Lake without doubt is the vehicular traffic which rings the park. Traffic creates a barrier which ranges from absolute along Aurora to moderate adjoining Woodland Park and the Bathhouse Theater. On the majority of the perimeter, busy streets tend to functionally isolate the park. Simultaneously however, streets provide vistas for motorists in keeping with the original Olmsted design, which was titled "Green Lake Boulevard" not "Park". Automobile entry into Green Lake Park is limited to three parking areas serving major recreational hubs: the Community Center, Bathhouse, and Aqua Theater/Small Craft Center.

A second external influence important to address is the presence of views into the park from most directions. Because topographically Green Lake lies in a bowl, the park is easily seen; the drama and range of views varies. Green Lake constitutes a significant visual resource which refreshes and inspires both its neighbors and passersby, regardless of physical presence in the park.

A third category of external influence to which Green Lake vegetation should respond is user entry into the park, by car, foot, wheelchair and bicycle. People come to Green Lake from virtually all directions, with designated pedestrian access at approximately fifteen points around the lake. Some, like the island where Winona and Green Lake Way merge, are invitingly landscaped. Others, along the southeast shore for example, offer neither entry planting nor even a path once one crosses into the park.

An adjacent uses field analysis map is included in Appendix I.

Evaluation

Activities and land uses surrounding Green Lake at once complement and detract from the park landscape. Green Lake's plantings need to respond as positively as possible to the full range of external influences, which affect not just users but plants themselves. Park vegetation exists as nature under pressure, simultaneously appreciated and assaulted, if unintentionally. This broad reality is perhaps the most important and most intractible external influence on Green Lake's plant community. To the extent possible, vegetation management guidelines must address constant user pressure on the landscape.

Particular external influences call for targeted attention. Where traffic volume and speed are greatest on adjacent streets, buffer plantings must be fortified. These can help protect the park's interior and give its users refuge, although only minimal pollution and noise reduction will be achieved. Vehicular access points bear special consideration in future plant selection and placement, both to orient visitors and to mitigate the effects these concentrations of vehicles have on the park itself. Key pedestrian entries also merit focal landscape treatment.

Opportunities exist to heighten, through planting, user welcome and orientation at major park "gateways".
Particularly important from a landscape perspective are the intersections where Ravenna Boulevard and Stone Way meet the park. Both locations deserve heightened landscape emphasis, given their key placement in the citywide boulevard system. Vistas into the park landscape and to the lake itself must be maintained, but perhaps not exactly as configured today in all locations. Trees provide foreground, and seen across the water, a softening background; sensitively chosen and sited, trees can greatly enrich water views. Overall, vegetation wrapping Green Lake should provide a significant but pervious screen. Its current effectiveness is variable; more consistent, sustained realization all around the park is indicated.

TREE : USER CONFLICTS

Description

Problems arising between trees and park users take two forms: first, inappropriate plantings which cause particular difficulties for users, and second, human activity which compromises tree health or survival. Trees identified as creating functional problems for park users (See map, Appendix I) include:

- Cockspur hawthorns at the south edge of the ball fields (dangerous thorns)
- London plane trees lining the double walk from the street into Evans Pool and Community Center buildings (limited root heave, tripping hazard)
- Douglas fir row immediately south of the east tennis courts (litter poses tripping & traction hazards, shaded pavement dries slowly for play)
- Cottonwoods at Gaines Point (limb drop & limited root heave in path & bench vicinity endanger users)
- Dense mixed canopy at wading pool (reduces sunlight for user comfort)
- Conifers surrounding west tennis courts (litter and shading on pavement)
- London planes along path at south end of Aurora strip (limited root heave)

Human uses impairing tree survival are less location-specific. The chief culprit is compaction, which varies in severity but occurs throughout the Park. By the east beach and west beach, as well as the small beach facing Duck Island, activity levels are so high that turf cannot survive. Without doubt, compaction in these locations is severe enough to impair tree health and stability. Human entry on Duck Island occurs with certain regularity, and disturbs both its resident wildlife and plants. Young trees adjacent to high-traffic areas are inherently vulnerable to malicious and inadvertent damage, often with fatal consequences.

Ironically, a final category of human activity which negatively affects park trees is landscape maintenance itself. Tractor mowing in close proximity to trees is difficult for both operator and trees. A young stripe bark maple tree was recently severed in a new bed north of the lake, perhaps unnoticed. Limbing for clearance is not well tolerated by all species, nor is herbicide application to root zones. Neglect, particularly deferred pruning and absent irrigation, also impairs tree survival.

Evaluation

As many trees and users as coexist at Green Lake, specific conflicts between them are remarkably few. All can be mitigated, but some may arouse alarm unless the public is fully informed and included in strategy development. Intentional removals are always a sensitive topic, as people develop strong attachments to mature trees. Removals must be fully justified, used only as a last-choice abatement method, and accompanied by appropriate replanting.

Initiatives to offset broad deleterious impacts on Park vegetation likewise will require a strong public communication and education effort. Adjustments to landscape maintenance practices, while not easily accomplished, certainly are feasible once guiding policies have been clarified. Finally, an important criterion for future tree selection and placement should be to avoid creating new potential conflicts requiring mitigation years hence. Prevention is the best cure.

UNDERSTORY ISSUES

Description

Green Lake's landscape includes only minimal understory plantings, most faring poorly as a combined consequence of neglect and intensive human use. Like any urban park, Green Lake experiences user problems relating to its understory vegetation. Homeless encampments exist and assaults have occurred in shrub beds; illicit drug and sexual activity may also occur but are undocumented. High general park use and small shrub bed area limit the extent of such activities.

An entirely different issue stemming from user : understory interaction is planting and removal pressure from neighbors and donors. Absent guiding protocols, part of a north perimeter bed recently was substantially altered and replanted with material unrelated to the existing palette or aesthetic intent. Certain memorial benches also have been accompanied by spot shrub plantings disconnected from the overall park landscape. Such changes are isolated and incremental, not integrated with comprehensive management goals.

Evaluation

Perhaps more than any other single landscape component, Green Lake's understory needs policy attention. As discussed in other sections, compelling reasons exist for adding understory at Green Lake, despite the risk of additional antisocial activity. The Department and community together must decide the appropriate relative balance once needs are clearly described. For example, users strongly desire more screening against Aurora Avenue; however, more screening creates more potentially-dangerous cover. Intensive human use may be the enemy of shrub survival, but it serves a very positive role in discouraging personal crime. Arguably, Green Lake thus can accomodate shrub plantings with fewer negative consequences to offset benefits than in Seattle's quieter parks.

Uncoordinated understory placement and alteration indicate the need for clear policy direction regarding both donations and incremental alterations. Green Lake possesses both a strong landscape character and a significant design legacy, which should be respected and reinforced by individual planting changes whenever and wherever they occur. The intent in framing vegetation management guidelines is to help fill this void.

LANDSCAPE MANAGEMENT PRACTICES

TREE SELECTION & PLACEMENT

Description

Tree selection and placement at Green Lake follows no strict guidelines. For the most part, these activities are driven by availability of special funding. Coordinattion has been on a project-by-project basis, without apparent continuity over time. Tree selection has been driven mostly by funding source-linked criteria and personal preference of staff involved at any particular point in time. Implementation has tended to be ad hoc, since tree procurement and planting are not a continuing program under a particular individual's direction. Teams are assembled as needed, often under pressure, with variable results. Extensive substitutions and acceptance of poor quality stock have been resulting problems. Most recent tree additions have come to the park in one of three ways:

- As part of larger capital projects (Examples: Path & play area improvements)
- Federal Emergency Management Act - funded replacements for trees lost in major storms
- As memorial donations from private citizens and organizations

Evaluation

The tree population at Green Lake clearly reflects a heritage of funding- and donation-driven planting, dating from before 1920 when dozens of black walnuts were planted as a war memorial on the southwest edge of the park. The preponderance of similar age-class trees at Green Lake directly results from W.P.A.- funded landscaping in the 1930's, followed by long gaps in investment in grounds improvements. Apparently, little reference was made then or since to the available Olmsted planting plans or palette. This information still could be tapped, or at very least evaluated for contemporary appropriateness. Green Lake's rich diversity of taxa no doubt relates to the ad hoc way trees have been added over the years, a silver lining in a somewhat chaotic situation.

Absent a stable, ongoing tree removal and replacement program, methods must be devised to oversee the many separate planting initiatives at Green Lake. Without overall and ongoing direction, many culturally, functionally and/or aesthetically-inappropriate trees may accrue in the park. Likely consequences include high mortality and compromised vigor, tree : user conflicts, and loss of landscape legibility in one of Seattle's most precious public landscapes. Green Lake deserves better. Vegetation management guidelines should provide both criteria and direction for coordinated, ongoing tree planting in the park. Trees are the backbone of the landscape: their attentive selection and placement can do much to enhance both landscape durability and quality.

TREE PLANTING, CARE & REMOVAL

Description

Trees used at Green Lake are procured mostly from wholesale nurseries and growers in the Puget Sound region. Parks' own nursery stock is rarely used, due to small size and limited selection. Current planting practice is to augur or hand-dig holes no deeper than root ball height, and to backfill with unamended soil. Pairs of wood stakes are used to stabilize and protect new plantings; these are tied to the trunk with plastic Chain-Lok. There is no organized schedule for stake removal; park users often take stakes, leaving few in place for any period of time. All new

trees are mulched with a layer of woodchips from the tree crew's supply at lower Woodland Park. Water is supplied to new trees for two seasons following planting, by hand or truck where automatic irrigation is unavailable or inadequate.

Established trees receive no fertilizer and no supplemental watering except turf overspray. Pesticide treatment for disease and insects is not provided, due in part to staffing limitations. The herbicide glyphosate ("Roundup") currently is sprayed around the base of trees in high-visibility turf areas, particularly at the Community Center. This is a recently-inaugurated practice to reduce crew use of string trimmers which hurt both tree bark and users' wrists. Trees throughout the park are mulched with chips as necessary and feasible, generally during winter. Fallen leaves currently are raked or blown, and hauled away - a major disposal effort. Staff hopes to start running leaves through a mulching mower instead, allowing on-site dispersal and disintegration into the ground.

Pruning occurs on a targeted basis only, in response to specific needs: hazard abatement (of either high limbs that may fall or low limbs that can injure passers-by), sucker removal, and transcient encampment discouragement within the low canopy of large trees. "Skirting" of trees for mower clearance was reinstated last year; previous crews had tried to implement alternative strategies. During the early 1990's, the park was on a three year cycle for maintenance pruning of all trees; budget cuts have since eliminated this program.

Removals are limited to emergency hazard abatement, often of trees which have fallen or broken spontaneously. Patterns of tree loss reflect aging populations of relatively short-lived native species (alder, willow, cottonwoods), particularly in compacted areas of exposed shoreline. Major limb loss regularly occurs from large blue Atlas cedars and cottonwood trees. Older ornamental cherries also have been heavily represented in recent losses. Proactive removals have not been possible, and are not an easy "sell" to tree-loving park users.

Evaluation

Evidence suggests that park trees receive inconsistent care, depending on the personnel involved both in the field and at the management level. Some practices clearly favor tree health and longevity more than others. Described planting protocols are basically sound, but execution has often been hasty or inadequate. Damaged young trees planted deep and stressed for water are a common sight. Mulching varies from excessive near the crown to completely absent. Some maintenance practices also may compromise tree wellbeing in favor of human convenience. Herbicide damage to larches is apparent, although generally string-trimmer damage is an epidemic gladly reversed. Limbing-up of trees should be judiciously done for safety, but not to provide mower access. Under low branches and in groves, groundcovers or mulch should replace turf, thus eliminating the problem.

Pruning and removal practices fall far short of the ideal. Tree longevity and quality are certainly compromised by budget-driven neglect, although malpruning at least has been averted. Liability issues demand attention - and perhaps a funding response. Aesthetics aside, Green Lake simply has too many trees and too many users to prudently eliminate all regular pruning.

A positive maintenance innovation is the mulching and disposal of leaves on-site. Means should be explored to expand upon this practice to include chipping for mulch of all woody debris in the

park. Limiting inputs of water, fertilizer and pesticides are sound (and pragmatic) horticultural practice, but only if appropriate types of trees are selected, then carefully planted and tended through establishment. Consistency and quality of tree management at Green Lake need to be reinforced.

UPLAND SHRUB BED MANAGEMENT

Description

Limited grounds budget prevents adequate attention to even the limited shrub areas within Green Lake Park. At best these beds receive sporadic weeding, policing and mulching. No regular pruning is performed. Considerable thinning has been done in beds near the Sunnyside crosswalk, Bathhouse Theater and west tennis courts in recent years, to reduce cover. Occasionally individual beds are replanted, some with more successful results than others.

Evaluation

Grounds maintenance is stretched too thin at Green Lake to adequately care for all park plantings. Nowhere is this fact more apparent than in shrub bed areas. It seems unfair to comment on current management, given that staff are able to provide so little care. One might argue that shrub areas should be eliminated if they cannot be maintained, but to relegate Green Lake Park to a landscape without understory would be a great loss. Admittedly, most of the beds in their current condition are little better than no beds at all. Policy clarification and initiative are particularly needed to remedy this visibly discouraging situation. Better funding and carefully-cultivated volunteer involvement could help appreciably.

TURF MANAGEMENT

Description

Presently, most park turf is irrigated regularly but never fertilized, aerated or thatched. Herbicides are not used, except to maintain grass-free zones under some trees (as discussed above). Annual whole-park aeration is scheduled to begin within the coming year. Reseeding occurs when and where the need and opportunity arises, not according to a set schedule. Special maintenance for the athletic fields and golf course include core aeration twice a year and sand-dressing. The ball fields and limited high-visibility lawn areas receive fertilization once a season, in May. The Pitch 'n' Putt concessionaire performs all greens maintenance, fertilization and fungicide application as needed. Park crews mow only the fairways.

Evaluation

Turf is both an extensive and key part of the Green Lake landscape. Considerable resources must be devoted to its upkeep in such a heavily-used environment. Subtracting from the current bare-bones maintenance program would be difficult. Reseeded with appropriate species, certain peripheral park areas might go unirrigated and less frequently mown. However, an accompanying aesthetic shift would occur, not appropriate for all park areas . New lawn substitutes like yarrow or chamomile might be given a limited trial as well. If successful, these could reduce irrigation and maintenance while conserving the appearance and function of lawn.

In certain areas like the west beach, it appears impossible for lawn to survive constant human assault. Serious consideration should be given to using hard surfaces instead, softened by trees

or elevated planting beds. Initial capital cost to restructure the landscape might be offset longterm by reduced maintenance requirements.

SHORELINE VEGETATION MANAGEMENT

Description

Recent shoreline vegetation management has gravitated away from plant eradication of earlier decades toward limited, judicious intervention. Both staff and citizens increasingly are seeking ways to enhance wildlife habitat in this and other parks. At Green Lake, many standing and fallen snags intentionally have been retained by the water's edge. Also, because they provide protection to birds shoreline blackberries have been kept in bounds but not eradicated.

To intercept runoff, no regular turf mowing is done between the jogging path and the water. Willows are coppiced periodically with volunteer assistance, to prevent extensive thickets from developing. Stretches of shoreline near the east and west beaches are kept clear for periodic milfoil harvester landing, to offload the aquatic weeds for disposal. Gradually-expanding areas of water lilies are beyond the authority of landscape staff to manage.

Evaluation

Management of plants growing adjacent to the lake seems largely attuned to contemporary, environmental values. However, issues of wild tree management, invasive plant removal and erosion control are probably not being addressed adequately with current laissez-faire practices. These challenging concerns are discussed more fully in Wildlife Habitat, Shoreline Vegetation and Historic Evolution of Park Plantings sections. Finally, shore vegetation management must not impede lake-based recreation. Crew races, for example, depend on maintaining visible monuments along shore. Interestingly, landmark trees partially fulfill this function.

III. SUMMARY: SUGGESTED APPROACH TO VEGETATION MANAGEMENT

PARKWIDE CHARACTERISTICS TO CONSERVE & ENHANCE

After eighty-five years of evolution, Green Lake Park has attained an established landscape character. The intent in developing vegetation management guidelines is to reinforce and sustain that character for the next eighty years, without experiencing major discontinuities or loss of landscape quality. Changes will, do, and must occur in any system of living things, but such change can be predicted and directed, rather than just being allowed to "happen" to the park landscape.

What essential landscape characteristics should we conserve at Green Lake? First and foremost, this park is a recreational environment, in which vegetation plays a strong supporting role but not the lead. Plantings above all must support and enhance human park use. They should complement the facilities where people congregate and add pleasure to travel through and past the park. The lake without its green surroundings would - and no doubt once did - look naked and unappealing. Wildlife needs, even aesthetic considerations, at Green Lake must take second billing to functional demands placed on the park's vegetation.

In parks with such high human use, open ground is especially important to conserve. The turf carpet with tree canopy structure at Green Lake accomodates large crowds throughout much of the year, and should never be reduced appreciably. Nonetheless, in places shrubs are sorely needed: for screening, for wildlife cover, for tree and shore protection, for visual enrichment. The "trees and lawn" character which predominates in Green Lake Park is both appealing and functional, but by no means naturally-sustainable. Turf unmaintained would rapidly evolve into weeds and shrubbery, and ultimately perhaps, forest. Green Lake cannot retain its essential, time-honored character while simultaneously becoming a truly low-maintenance landscape. Management guidelines need to explore innovative ways to sustain the existing vegetation structure with fewer, safer inputs.

Variety within the overall "greensward' matrix is another characteristic of the existing landscape bearing retention. Anomalies like the unkempt willow thicket on the south shore serve to enrich user experience, and support much wildlife. The formal plane tree allee leading from street to Community Center provides strong definition to this important facility, by contrast with the prevailing landscape structure. If anything, such differentiation among places within Green Lake Park should be reinforced.

Finally, certain existing characteristics are probably better eliminated: threadbare turf, standing scrawny or dangerous trees, inconsistent shoreline treatment (ranging from hard and bare to wild and choked), half-empty shrub beds randomly placed, few new trees and these motley, untrained and often in distress. Renewed attention can do much to alleviate these deficiencies and refurbish Green Lake's inherent landscape charm.

DEFINING SUBAREAS FOR LANDSCAPE MANAGEMENT

Because it encircles an entire body of water, Green Lake Park naturally and necessarily divides into subareas for evaluation and landscape management purposes. By virtue of the lake, the park also possesses a fundamental unity of character which must be acknowledged and consistently reinforced through maintenance and planting. Management subareas have been identified largely for practical convenience, present and future.
In dividing Green Lake into subareas, facilities within the park directed some choices, adjacent external uses the remainder. The park functions around activity centers linked by lakeside path and encircling perimeter streets. The Community Center, Bathhouse, Wading Pool, and Aqua Center (Aqua Theater + Small Craft Center) are activity-based zones, while the linear Southeast Shore (defined by East Green Lake Way) and Aurora Strip subareas take their definition from adjoining streets.

Green Lake's landscape thus logically contains about six clearly-distinguishable zones. A larger number would be unwieldy to visualize or manage, fewer would negate important differences among areas around the lake. Field work was done using both parkwide and detailed zone maps, as appropriate by topic. Vegetation management guidelines will include both comprehensive and subarea-based recommendations, to support both landscape unity and variety found within the park.

A final factor in creating subareas is that they reflect user affinities. In the future, citizens wishing to help care for the Park landscape will be able to select or create projects in areas with which they especially identify. Although Green Lake definitely functions as one big place, it also consists of numerous smaller places well-known and loved by residents and visitors. Subarea-based management is intended to reflect and reinforce user and staff "ownership" of the park landscape.

A map showing the six park subareas is found in Appendix J.

IV. VEGETATION MANAGEMENT RECOMMENDATIONS

VEGETATION MANAGEMENT OBJECTIVES

Five broad goals have been identified for vegetation management at Green Lake:

- Provide landscape continuity in the Park both spatially and over time.
- Insure the health and longevity of appropriate Park vegetation.
- Effectively maintain Park plants while conserving both labor and resources.
- Foster community appreciation and stewardship for Park vegetation.
- Create a balanced symbiosis among plants, wildlife and human users of the Park.

The Phase IV. Vegetation Management Guidelines provide practical, specific direction to help fulfill these goals. Objectives emerging from the overall goals are described below; specific practices to fulfill these objectives are contained in following sections. The role of objectives is to provide standards and a context for all recommended management actions. If in the future particular practices need modification, such changes should continue to respond to these objectives.

OBJECTIVES

Plants:

- Conserve and properly maintain valuable existing vegetation.
- Provide continuous replenishment of park vegetation through time.
- Select future plants for durability and health, as well as character.
- Provide plant palette consistency through time and throughout the park.

Landscape Character:

- Retain the essential landscape pattern balancing open areas and canopy enclosure.
- Retain and reinforce historic landscape elements wherever possible.
- Retain and improve quality of public views into and within the park.
- Protect the park environment from detracting external influences.
- Accommodate variations in landscape character, as particular conditions dictate.
- Encourage wildlife habitat throughout the park and in focal areas.

.Maintenance:

- Cultivate management practices which make the most efficient use possible of both resources and labor, in service of plants themselves.
- Insure maintenance which fosters and does not reduce plant health and longevity.

Community:

- Encourage and fully integrate citizen participation in the provision, planting and ongoing care of park vegetation.
- Cultivate public understanding of the park landscape ecosystem, its management and protection.

PARKWIDE VEGETATION MANAGEMENT PRIORITIES

References detailing recommended approaches and standard landscape management practices are being assembled by the Department for distribution to personnel actively engaged in landscape care and direction at Green Lake Park. These rererences function as an important adjunct to the guidelines themselves, and encompass the following topics:

Landscape Management Approach

Tree Planting & Early Care

Mature Tree Care

Additional Vegetation Management Techniques

These materials are intended to bring consistency to vegetation planting and care within the park over time. All staff and volunteers directly involved with the Green Lake landscape should acquaint themselves with relevant content, since the degree of knowledge individuals possess varies widely. An important adjunct will be to provide leadership and oversight, to insure that recommended practices are both understood and used. Funding and organizational impediments to implementation also must be identified and addressed.

Below are highlighted those approaches and practices particularly important to include in a comprehensive landscape management program at Green Lake. They have emerged from evaluation of the existing park landscape and maintenance program. Some suggestions con-ect past practices, others represent new approaches to help achieve optimal vegetation quality and longevity in the park.

Historic Legacy

- Preserve historic landscape elements and plants.

Because Green Lake Park evolved incrementally, restoration to a particular design or period is untenable. Nonetheless, retention and perpetuation of historic landscape elements adds great richness to the park. Such plantings should be accorded recognition and attentive management - as described in the subarea character objectives, planting recommendations and vegetation management sections. Specific recommendations throughout these guidelines were developed to protect and reinforce Green Lake's historic landscape fabric. Briefly these include:

Maintain & replant historic street tree plantings - on both sides of streets, with same or similar tree species.

Maintain & replant internal allees.

Replant or repropogate unusual trees of known historic association.

Incorporate appropriate Olmsted plant list taxa into new plantings parkwide.

- Conserve and reinforce the Olmsted design legacy at Green Lake.

The Olmsted Brothers' mark on Green Lake is essentially secure, in the park's basic landscape character and physical configuration. Unexecuted designs developed by the firm cannot realistically be resurrected. Likewise, future use exclusively of Olmsted-recommended plants would not encompass contemporary needs. Several important principles manifest in their design are reinforced by these guidelines:

Protect greensward character.

Naturalize more of shoreline.

Protect vistas into park from boulevard.

Increase landscape connection between south Green Lake and Woodland Park through plant palette and style.

Tree

- **Integrate management of all tree-related functions.**

Trees are the most valuable component of the Green Lake Park landscape, and the longest-term investment in terms of management and care. For this reason, a "cradle-to-grave" approach is strongly recommended. The one crucial action Seattle Parks must take to optimize its investment in trees is to integrate management of all the following tree-related activities:

Exact species selection & site identification

Tree selection, purchase & acceptance

Planting & early establishment care

Mature tree care & periodic inspection

Hazard management & removals

Capital project development & monitoring Volunteer involvement & public outreach

Recordkeeping, scheduling & maintenance budgeting

Currently, the above responsibilities are dispersed among several employees in different divisions, resulting in serious coordination and continuity problems - to the frequent detriment of the trees. The essential interconnection among these activities must be recognized and reinforced by the organization.

- **Make tree selections deliberately, with the long view in mind.**

Given its cost and longevity, a tree is better left unplanted than hastily chosen and sited – even if money remains on the table. Appendix maps and lists are designed to facilitate this key step.

- **Inspect trees carefully before planting.**

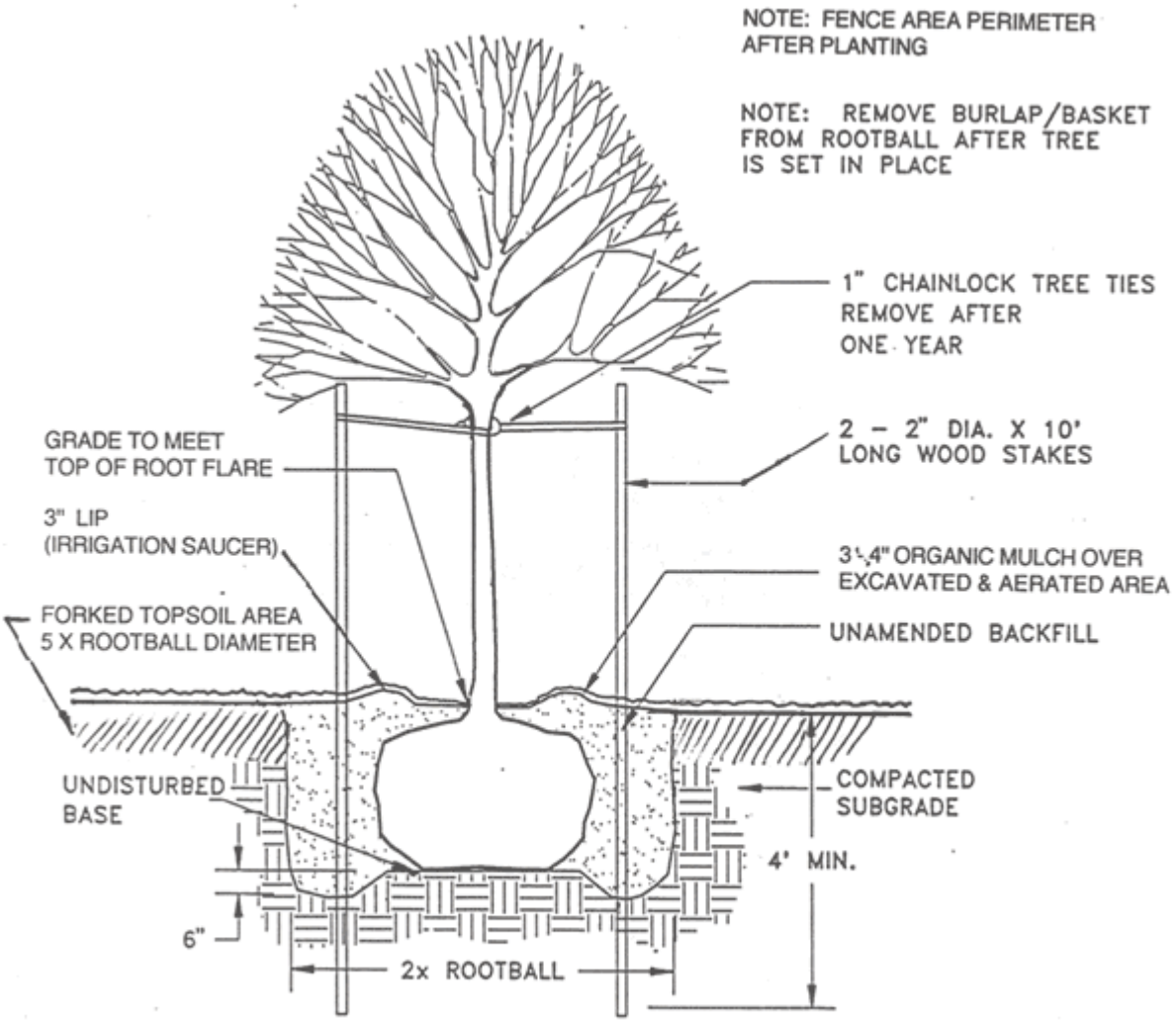
Trees should be individually chosen for good branch structure, undamaged trunk, and healthy, noncircling roots. Even if staff personally selects trees at the nursery, inspect again before acceptance for on-site planting. Digging and transporting can result in significant damage, and no imperfect tree is worth planting at Green Lake. Where site demands are high, quality must also be high.

- **Prepare planting site and provide followup protection.**

In advance of planting, all grass within an area five times the diameter of the anticipated rootball (8-10' diameter) should be killed with herbicide and the surface forked or tilled to aerate. After planting, temporary protective fencing should be installed at the area's perimeter and maintained for three years, or until the tree is established. Such measures will give new trees the competitive advantage they need entering Green Lake's inherently stressful environment.

- **Plant trees at proper height.**

Field observation at Green Lake suggests that many young trees were set too deep during planting, impairing establishment due to root smothering. The freshly-planted tree should be backfilled only to its original growing level - or set on a very slight mound to allow for soil settling, particularly where drainage is poor. Backfill to top of actual root flare: note that burlap ties may beset much higher. Overexcavation of the planting hole can be avoided by measuring and matching root ball depth while digging. Earth directly under the tree must be firm, and preferably undisturbed.



Tree Staking & Planting Detail

Section

- **Stake properly for individual site and tree, and remove stakes & ties after initial season.**

Stakes should penetrate soil outside the root ball, as shown on the typical planting diagram. On the north shore, orient stakes in line with prevailing southwest winds, NOT perpendicular. Many existing trees have grown up with a pronounced lean which thus could have been prevented. Install ties loosely, and at the lowest possible height to stabilize the crown. First year maintenance and removal of stakes and ties should be a scheduled activity: permanent lean, blowover and stem girdling all can result from neglecting such attention. .

- **Maintain a grass-free zone around tree bases & mulch carefully.**

Research has shown that grass over tree root zones markedly inhibits tree establishment and growth. Mower and trimmer damage to trunks also can permanently hamper tree vigor and health. Place 3-4" of coarse woody mulch over the sod-free area surrounding new trees, and remove invading grass and weeds promptly. Mulch should be laid down carefully, none against the trunk itself. In tight locations, mulch an area at least 2' in diameter, and to the drip line where feasible.

- **Irrigate adequately during the first three seasons.**

Many existing young trees at Green Lake appear drought-stressed and weakened - not off to a good start in life. Even drought-tolerant trees need inigation to establish. Where lawn irrigation exists, overspray is rarely adequate to meet young trees' needs. New trees need faithful hand watering during any dry spell, plus weekly from June through September the first year, biweekly the second summer, and monthly the third. This schedule may be adjusted according to actual field conditions, but constitutes a reasonable guide. Fall planted trees benefit from natural precipitation.

- **Provide early pruning for proper structural development.**

A few proper cuts during a tree's youth can do wonders for its strength, health and beauty in the long run. In the dormant season tree structure is most visible. Allow a season's establishment before removing any branches, unless dead, damaged or diseased. Skilled pruners should do this work, since the consequences and benefits are lifelong. Only a small investment of time is needed per tree.

- **Introduce a mulching program for all park trees & reduce herbicide use.**

Trees of all ages profit from root zone mulching, a far safer way of discouraging grass than current practice of herbicide application to tree bases. Many larch trees appear to have sustained damage from glyphosfate; avoid its use on *Larix* and *Cedrus* species in the future, and near any young trunk bark or basal suckers. Mulching should greatly reduce - if not eliminate - the need for herbicide. Whenever possible, spray the perimeter for control against reinvasion, rather than the mulch itself where surface roots may extend.

Mulch should be applied 3-4" deep, and never against tree trunks themselves. Replenish as decomposition diminishes depth, roughly yearly. Chipped woody debris and shredded or composted leaves make excellent, available materials. Significant side benefits are recycling plant debris onsite and replenishing soil organic matter.

- **Inspect trees for hazard condition & damage on a regular basis & promptly provide corrective pruning or removal.**

Ignoring trees once established is a prescription for shortened life and potential liability. Deferring pruning for damage, serious crown structure defects, and disease results in dangerous, even dying trees. Trees designated as Hazard Watch status (see Phase II. Tree Condition & Hazard Abatement maps) must be checked at least annually for negative change; the entire park tree population needs

screening on no more than a three year basis. Green Lake is an exposed, high use environment where tree safety must be taken particularly seriously. All pruning should follow International Society of Arboriculture Standards to insure tree health and longevity.

- **Incorporate compaction mitigation measures for park trees.**

Soil compaction is a fact of life for most of Green Lake's trees. By depriving roots of oxygen and proper drainage, tree vigor is reduced. For trees growing in open lawn areas, turf aeration should be done at least annually for the simultaneous benefit of tree root zones. Mulching understory areas where grass no longer thrives should be made standard practice, particularly if foot traffic is heavy as occurs near parking lots. Mulch helps reduce further trampling, and soil structure regenerates slowly as organic matter becomes incorporated. Underplanting is a third, very attractive way to reduce or prevent root zone compaction, worth selective introduction in the park. Thorny plants are particularly recommended. Possible understory sites are shown on the Plant Recommendations & Locations maps in the appendix.

- **Regularly coppice and thin wild shore trees.**

Wild willows, alders and cottonwoods grow abundantly along the shore, some even in the seawall itself. The latter should be removed because of their inherent instability. Other tree-sized individuals should be thinned to irregular intervals, allowing light penetration and vistas from shore. Male willows should be favored for their superior attributes. A variety of ages and sizes should be selected. Shrubby growths should be coppiced hard yearly, except in the landmark grove at the south end of the lake, or where a replacement tree is needed. Unless thinning is done, much 'of the lakeshore will eventually be a thicket of trees.

Understory

- **Eliminate extraneous and moribund shrubs.**

Although the park has very little understory, certain shrubs should be removed to reduce maintenance and improve landscape clarity. Targeted removals are noted in the Vegetation Management Matrix. In addition, any severely neglected, sparse plantings should be removed now and the empty beds mulched to reduce weeds until they can be replanted.

- **Reinstate basic bed maintenance: mulching, weeding & pruning.**

Presently, park understory plantings receive almost no care. The visible consequences are demoralizing to staff and public alike. Regular pruning on even a three year basis would make a difference to plant health and beauty. Mulching should be practiced religiously and carefully, not to bury plant crowns. Invasive weeds like morning glory must be controlled through frequent hand removal; eradication is probably unrealistic but clearly desirable.

- **Aggressively remove noxious shore weeds as they appear.**

Currently Green Lake's shoreline harbors small colonies of Japanese knotweed and purple loosestrife, both of which can wreak havoc if allowed to spread. These and any subsequent infestations must be eradicated swiftly, by hand removal, perhaps supplemented by herbicide if necessary. Blackberry and morning glory vines also have taken hold along the lake, and should be eradicated or severely confined through persistent cutting and pulling. Reed canary grass has spread along much of the shore as well. Its clumps should be reduced periodically to leave openings for other plants, for water access and for view. Target limits need to be clarified in conjunction with wild tree management and native understory introductions.

- **Foster appropriate citizen involvement in provision and maintenance of park understory.**

Understory vegetation is well suited to volunteer planting and maintenance, and to donation. Using these guidelines, specific projects should be identified to appropriately renovate and expand park understory. Projects could accomodate many interests, from provision of seasonal color to wildlife habitat creation to exotic plant eradication. Projects to plant only are not appropriate.

Turf

- **Provide regular aeration for all park turf.**

Aeration is key to maintaining good quality turf, especially in environments subject to heavy wear. The current aeration program must expand to include all park turf at least once a year, preferably twice, in spring and fall. Bare-bones turf maintenance Green Lake Park needs to include aeration, irrigation and mowing at minimum. Areas converted to rough grass ultimately could be excluded from this requirement. Periodic dethatching would improve turf quality and irrigation efficiency, but is probably an unrealistic addition.

- **Utilize mulching mowers to dispose of clippings and leaves in place.**

Grass mowings should be returned directly to the sod, to recycle nutrients. Fallen leaves shredded into small fragments also should be left to decompose in place, on lawns or under trees. The labor savings in avoided removals and disposal should quickly offset equipment cost. If volume of leaves exceeds that which can be mulched into turf, shred and place excess under groves or large trees within the park. Hauling should be eliminated, as both an ineffiecient practice and one which squanders valuable nutrients and organic matter much needed on-site.

- **Test different grass types and lawn substitutes in limited areas.**

Turfgrass research currently is focusing considerable attention on creating both more rugged and lower water-demand lawns (not necessarily simultaneously). In consultation with Cooperative Extension experts, staff should develop test areas for promising new grasses and lawn substitutes. Level of use, degree of maintenance, availability (and effectiveness) of irrigation, and desired appearance all need to be considered. Deep soil preparation is essential The payoff for such effort could be considerable savings in watering and/or mowing if widespread conversion from more traditional turf proves feasible.

- **Abandon or remove totally unsuccessful turf.**

Trampling and deep shade render turf impossible to maintain in several park locations. Management resources in these areas should be redirected, to mulching, establishing understory, installing crushed rock or pavers, or planting and circulation redesign. The appropriate alternative depends on the particular site, many of which are addressed in the Vegetation Management Matrix.

- **Renovate park irrigation to insure adequate water to maintain plants in good health.**

The Aurora portion of the park has no automatic irrigation system, although piping and operable quick-coupler connections are available to the area. These guidelines do not presume extension to Aurora of the automatic system, but instead suggest planting and maintenance strategies requiring little supplemental water after establishment. Automatic irrigation could save labor and enhance plant survival along Aurora, but cannot be considered a necessity. In most of the park, where mowed turf is a primary landscape ingredient, dependable automatic irrigation is essential. The twenty year old system soon will need renovation.

Weeds

- **Eradicate invasive plants which can seriously disrupt shoreline ecology.**

Wherever Japanese knotweed and purple loosestrife are found, aggressive removal should be undertaken until colonies are eliminated. Himalayan blackberry, reed canary grass, English ivy and bindweed also should be removed, although total eradication is neither mandatory nor realistic for these species. Refer to Understory recommendations above.

- **Eliminate weeds and grass from areas surrounding newly-planted trees.**

Turf and weeds thwart new tree establishment. Refer to Trees recommendations above.

- **Control invasives in planting beds and mulch to discourage other weeds.**

The majority of park shrub beds look unkempt and function poorly, due in part to weeds. Apply corrective measures described in Understory recommendations.

Soil

- **Mitigate compaction and drainage problems wherever possible.**

Serious soil problems were mapped as part of Phase II (see Appendix H). Vegetation management alone cannot provide remedies, but some practices recommended above will help: mulching, turf aeration, forking new tree planting sites, etc. Specific plants also were selected to accommodate these difficult conditions, and if used will improve landscape quality in wet or compacted areas.

SUBAREA VEGETATION MANAGEMENT RECOMMENDATIONS

LANDSCAPE CHARACTER OBJECTIVES AND PLANT PALETTE EMPHASIS

COMMUNITY CENTER

The Community Center zone absorbs the greatest concentration 6f park users, as both Green Lake's primary entry point and location of its major recreational facilities. The land extends back deeply from the lake, and is relatively flat. Ball fields occupy the southern half of the zone, providing an extensive open area which contrasts with dense tree groves at the periphery and to the north. A long allee of Sycamore trees, still relative juveniles at age sixty-five, imparts formal grandeur to the pedestrian approach from Ravenna Boulevard's terminus. Currently, competing trees and extraneous understory partly obscure the allee's impact. Other formally-spaced trees exist in the zone but their effect is far less dramatic.

A thin band of mixed trees parallels Green Lake Way around most of the subarea perimeter, rather open to the south and denser to the north. It provides a continuous sweep of canopy along the park edge, screening interior from street, and offering views through the greenery to passersby. This perimeter tree band extends continuously from the Community Center northwest to the Bathhouse, a continuity which should be maintained across zones.

Significant landscape deficiencies exist due to subsiding fill, heavy use and deferred maintenance. Vegetation management strategies can ameliorate but not eliminate these problems. The community center-pool complex badly needs replenished screening; important vehicular and pedestrian entries also merit enhanced planting. Perimeter trees require thinning and restocking, and the bathing beach grove and understory need rejuvenation. The tennis court Douglas fir screen needs replanting with lower, less litter-producing trees. All these measures, taken together, are intended to strengthen the civic image of one of Seattle's key public landscapes, while simultaneously addressing numerous functional problems.

Landscape character objectives:

- Enhance the civic image of the centerpiece of a key Seattle public landscape.
- Retain and reinforce the continuous perimeter band of vegetation.
- Soften the exposed mass of the community center-pool on the south side.
- Adjust vegetation to support rather than thwart active recreation.
- Conserve and perpetuate historic landscape elements.

Plant palette emphasis:

- Variety of shade, flowering, coniferous and broadleaf evergreen trees to supplement and replace aging, weak and hazardous trees.
- Enhanced component of fall color and flowering trees.
- Tough shade trees adapted to wet and to dry, compacted conditions.
- Evergreens, mostly broadleaf, for massing.
- Ornamental shrubs, groundcovers and limited seasonal color for high-visibility locations, including but not limited to evergreens and natives.

WADING POOL

The Wading Pool subarea incorporates both the landscape surrounding the wading pool and curving bands of greensward of varying width from the Community Center to the Bathhouse. Informal tree groupings parallel the street the full length of the zone, breaking here and there for vistas of the water from outside. Near the water lie several handsome groves of bald cypress, plus the landmark cottonwood grove on Gaines Point. Wild trees and undergrowth obscure the water in non-seawall locations. Striking giant sequoias grace lawn areas in western half of the zone; handsome but ailing Lawson cypresses grow somewhat further east.

Around the wading pool, towering cottonwoods provide strong character but pose a serious hazard to park users, as do those at Gaines Point and along paths. Necessary removals in these locations will yield opportunities to plant safer trees to offset the undeniably significant losses. Lawson cypress deaths also will diminish landscape quality if not replaced by other conifers. Extensive perimeter trees will need thinning and replenishment over time, to sustain and improve their effectiveness.

Area understory currently is limited to amenity screening at restroom and tool shed, sparse waterfall grove underplanting, and a few small beds little noticed or tended. These utilitarian-looking structures need improved screening to soften their presence; other, isolated shrubbery should be removed to strengthen the primary effect of trees and lawn. Wild shore vegetation needs "editing" to reopen and maintain views, and to create opportunities for specimen trees and native understory enhancements.

Landscape character objectives:

- Retain prevailing character of trees and open lawn.
- Conserve cottonwood grove effect at Gaines Point with a safer poplar species, and enhance quality of shoreline vegetation.
- Maintain opportunities to see into park from street, while providing green buffer of rich diversity.
- Create and perpetuate focal groves and specimen tree sites.
- Minimize understory, concentrating on few, key enhancements.
- Develop unifying canopy of medium scale, ornamental trees for south margin of wading pool area.

Plant palette emphasis:

- Variety of shade, flowering, coniferous and broadleaf evergreen trees to supplement and replace aging, weak and hazardous trees.
- Enhanced component offall color and flowering trees, specimens and in groves.
- Strong poplar hybrid to gradually replace Gaines Point cottonwoods.
- Phytophthora rot-resistant conifer to replace Lawson cypresses.
- Evergreen massing and understory plants to soften buildings.
- Tough, suckering, perhaps thorny low plants for waterfall understory.
- Native shoreline understory species with wildlife & aesthetic value.

BATHHOUSE

The Bathhouse landscape is probably Green Lake's most rich and complex. The zone provides a major entry point for the park, and a nucleus for recreation and culture. Informal and passive recreation seems to gravitate here more than to the Community Center or Aqua Center hubs. Although many users pass through along major paths, significant numbers come to this zone as a destination.

The parking lot, while large, is confined to the edge of the area, and the landscape band broadens here to form a small peninsula. Rises in topography screen the parking from the south, and provide settings for remarkable stands of oaks and elms. Pure stands of conifers and birches also enhance the area. Bathhouse plantings vary from completely wild vegetation along portions of the shore, to informal groves, to formal, symmetrical tree allees. The essential landscape character is spacious more than linear, informal with civic overtones.

The area's pure species groves are an appealing feature to retain and replenish through time, to be replaced wholesale only if culturally necessary. Opportunities to increase upland as well as shore wildlife habitat should be embraced, with selective additions of attractive understory emphasizing natives. The hallmark crabapple allees must be replanted, due to tree loss, old age and disease susceptibility. These allee plantings could extend to the northeast, forming a full arc through the area with a break for the Bathhouse Theater. Softening amenity plantings need considerable attention immediately surrounding the building.

Enhancements to existing tree groups for seasonal color, wildlife use and screening are warranted. The zone also needs additional single specimens in prime landscape locations like the point nearest Duck Island. Trees on the island may decline in the future without adequate regeneration, and should be monitored and replanted before all are gone. Obviously, the island is a key landscape feature at Green Lake.

One tangible vestige of the park's Olmsted design is the severely-eroded maple street tree planting along Green Lake Drive. Fortification on both sides of the street, or complete reinstatement, will be necessary. Species more colorful in fall than Norway and Sycamore maples but otherwise similar should be considered.

Landscape character objectives:

- Retain mixed vegetation types ranging from natural to formal.
- Replenish and clarify groves, reducing extraneous adjacent trees by attrition.
- Reinstate and extend historic allee plantings using similar but superior trees.
- Add attractive, wildlife-attracting understory to both shore and upland areas.
- Enhance fullness and beauty of bed plantings around the bathhouse.
- Convert conifer screen around tennis court to lower, less litter-producing evergreens.
- Conserve large areas of open lawn.

Plant palette emphasis:

- Attractive, healthy replacements for crabapples, maples, pines, oaks, elms & birches.
- Enhanced component of fall color and flowering trees, specimens and in groves.
- Broadleaf and coniferous evergreen trees for massing.
- Upland understory plants emphasizing natives with wildlife value.

BATH HOUSE
Plant palette emphasis, cont.:

- Ornamental shrubs and groundcovers for beds around and approaching bathhouse building.
- In composite, rich variety of types and scale of vegetation.

AURORA STRIP

The Aurora Strip is narrow and linear, without parking or built facilities around which recreational activities focus. Adjacent Aurora Avenue North influences this area's present character in strongly negative ways: acoustically, visually, by generating pollution, by blocking access to the park from the west. The path through this zone closely parallels the water, providing both near-range views of wildlife and cross-lake vistas. Currently, exposed, monotonous conditions prevail along Aurora for users, and upland vegetation appears stressed and depauperate. Wild vegetation blocks important views along the shore. Irrigation is lacking in much of the area.

Given both its problems and its underexploited assets of view and wildlife, the Aurora Strip merits the most substantial long term transformation of any landscape area at Green Lake. A carefully-crafted balance between vista reclamation and habitat protection will be imperative. Key to overall success will be responding to constraints in creative ways, working with rather than fighting the less-than-perfect environment.

Landscape character objectives:

- Buffer negative impacts of Aurora Avenue North (visual, acoustic, pollution).
- Enrich experience of movement through & past area.
- Heighten & protect vistas from and across lake to west shore.
- Enhance and extend key wildlife habitat along shore.
- Develop attractive upland plantings adapted to exposed, dry conditions.
- Cultivate wilder character than prevails elsewhere at Green Lake.

Plant palette emphasis:

- Pollution- and drought-tolerant broadleaf and coniferous evergreen trees.
- Specimen shade trees with outstanding seasonal interest.
- Drought- and exposure-tolerant upland understory plants.
- Native shoreline understory species with wildlife & aesthetic value.

AQUA CENTER

The Aqua Center subarea is large and diverse, unified somewhat by its adjacency to Woodland Park. In close proximity, this zone combines dramatically different types of landscapes, from formal and barren to lush and unkempt. Significant amounts of parking and boat-related recreation create a very busy park hub. The looming presence of the half-demolished Aqua Theater dominates the midst of this zone, together with additional facilities little softened by plants. To the north, the character gives way from deciduous formality to an informal coniferous grove paralleling the water and forested Woodland Park.

To the east the lake edge becomes a wild willow thicket teeming with birds, behind which lies a near-tunnel of coniferous and shade trees. The southern portion of the Aqua Center area, although fenced for use as a golf course, relates to the rest with its many, varied trees informally planted. T!':' East Green Lake Way periphery is mostly exposed and without large trees. West Green Lake \\' ay provides a strong contrast, with its historic, shading black walnut street trees and other mature trees nearby.

The primary challenges for future vegetation management at south Green Lake will be to impart continuity among its several contrasting elements, and to resolve the demands plants, wildlife and users place on the environment in ways favorable to all. The park's vegetative fabric is seriously disrupted at the Aqua Center's heart, yet remarkably rich and interesting at its extremities. The opportunity should be seized to improve the function and beauty of this core through thoughtful redesign and planting. A capital project is probably needed, since vegetation management alone can mitigate but not resolve this landscape's deficiencies.

Landscape character objectives:

- Unify area with emphasis on native species extending Woodland Park character.
- Soften barren Aqua Theater SUITOundingS and reconnect with adjacent vegetation.
- Restock and extend formal tree rows on street and shore.
- Conserve willow thicket as prime wildlife habitat and enhance its periphery.
- Shift long coniferous grove at north end toward native-enhanced forest, relating to Woodland Park.
- Mitigate functional and visual separation between park and golf course.
- Enhance seasonal color.

Plant palette emphasis:

- To soften structures, broadleaf evergreen trees and vigorous vines.
- For north conifer grove, native understory trees, sl1fubs and groundcovers.
- Shade tree varieties to match existing in formal row gaps.
- Semi-shade tolerant small flowering trees for interplanting existing groves.
- Native shore and upland shade understory species.
- Special accent, massing and mixed grove trees for good cultural environment within golf course area (deciduous, coniferous, broadleaf evergreen, flowering).
- For buffer east of golf course, sun-loving, low-water demand trees and understory species, mostly evergreen.

SOUTHEAST SHORE

The Southeast Shore forms a curving band of greensward along the lake, its scattered trees and continuous lawn sloping from Green Lake Way down to the water. Ornamental and wild trees, and colonies of weedy vegetation, grow on portions of the shore. Upland understory is almost completely absent, reinforcing the open feel and uniformity of the zone. This area contains no parking, major park entries or recreational facilities. The Southeast Shore links the park's most formal, highly-used landscape at the north with its least developed at the south. A gradient of treatment therefore needs to be integrated with overall planting continuity.

Linear movement around the take is the predominant activity the landscape needs to support, by both path users and vehicles on the adjacent street Views from, into and of this long stretch of shoreline are much noticed, and merit enhancement Currently, the Southeast Shore contains an eroding population of flowering and shade trees, and few offering special summer, fall or winter interest The essential character of turf and deciduous trees should be safeguarded in the future, but the palette enriched as vegetation is replenished.

Landscape character objectives:

- Perpetuate open greensward character and rhythm.
- Conserve areas of open view from street to water.
- Bolster seasonal variety and beauty of trees, as groves and specimens.
- Expand wild1ife-enhancing understory toward south end of shoreline.
- Limit upland understory to a very few, functional additions.
- Maintain well-defined, tree-free areas of lawn.

Plant palette emphasis:

- A mixture of tree types: flowering/accent, shade, broadleaf evergreen, conifer.
- A backbone of deciduous shade trees with stronger seasonal interest than current varieties provide.
- Shore accent trees with strong seasonal interest, like existing birches.
- Attractive native understory species for shoreline habitat enhancement
- Dry-shade tolerant species, especially evergreen natives, for upland understory.

HAZARD TREE MANAGEMENT

Preliminary screening of park trees for hazardous condition occurred in spring of 1995, and revealed 290 trees of clear concern. This group was sorted and mapped according to recommended hazard abatement action:

- Removal/High Hazard Potential
- Prone Defective Parts
- Removal/Low Hazard Potential
- Watch Status (Further inspection required)

Tree Condition & Hazard Abatement maps were included as part of Phases II of these guidelines (see Appendix E), and provide the essential information needed to initiate appropriate management steps.

The large quantity of urgently-needed tree work identified lies far beyond in- house capacity to accomplish promptly. A perennial work order backlog for the department's sole tree crew has contributed to the number and severity of tree problems at Green Lake - and throughout the park system. Means must be found to undertake the most-needed pruning and removals quickly.

Remediation of accumulated hazards must be coupled with proactive tree monitoring and management in the future. Emergency tree work can be reduced dramatically through consistent, coordinated tree care, to include:

- Frequent monitoring of all current "Watch Status" trees for possible further actionat least annually, preferably twice a year.
- Regular evaluation of entire park tree population for damage and emerging hazardous conditions - at intervals of no more than three years.
- Selection and use of tree species without proclivities for poor structure, weak wood, early breakup, or disease.
- Careful inspection of trees for good structure prior to acceptance and planting.
- Proper planting and staking methods to foster good root and trunk development to support tree canopy.
- Early training pruning of young trees to build a strong mature framework.
- Prompt remedial pruning of damaged wood and unstable or over-dense crowns, before rot or increased size makes such trees truly dangerous.
- Protection of tree bases and root zones from damage and compaction through mulching, understory planting, aeration and physical exclusion of traffic where possible, to reduce wind throw potential.
- Coordinated implementation of all of the above activities.

The above list makes obvious the need for comprehensive, "cradle to grave" tree management at Green Lake, in contrast with the fragmented approach prevailing today. Such a valuable park resource requires consistent investment to insure its optimal quality, longevity and safety.

MANAGEMENT OF OUTSTANDING PARK TREES

Several groups and individual trees at Green Lake have been identified as outstanding due to their size, rarity, aesthetic importance, or historic associations. Longterm management should incorporate attention to these trees, although the majority will require no special action or care. Both the Vegetation Management Matrix and subarea maps which detail proposed tree and shrub plantings (see Appendix) offer additional information concerning many of these trees. All of Green Lake's outstanding trees are listed below as a reminder to maintenance staff, but specific recommendations are limited to those needing individualized attention.

Community Center subarea

1 Two European Beeches *(Fagus sylvatica)* east of the ballfields.

2 Allee of 28 Planes or Sycamores *(PlaJanus* x *acerifolia)* near the Evans Pool.

> The allee has at least three anthracnose-prone specimens. Spraying them annually with fungicide is not practical due to their size, and replacing them with disease-resistant clones would disrupt the uniformity of the rows. Pruning would give these trees better air circulation and sunlight exposure, and should be undertaken. Before adjacent crowns become overcrowded, every other tree should be removed, since these trees can grow extraordinarily wide--one in England is 210 feet *wide;* at least one in Washington is more than 100 feet wide. Sycamores can live for centuries, thus management measures must favor the very long view.

3 Weeping Lawson Cypresses *(Cha11llEcyparis Lawsoniana* 'Intertexta').

> The Weeping Lawson Cypress *(CharntEcyparis Lawsoniana* 'Intertexta') should be repropagated (by cuttings) and planted in sites with well-drained soils, to reduce likelihood of infection by the deadly *Phytopthora* root-rot.

4 Sierra Redwood *(Sequoiadendron giganteum)* by the play area.

5 Double-flowered Danube Crabapple *(Malus dasyphylla* 'Plena').

> Although an extremely rare cultivar, this specimen is neither healthy nor attractive. It may be relocated to a less prominent site, or repropagated. Accorded regular spring fungicide spraying for disease, its appearance and vigor could be significantly improved. At Green Lake, such care is probably unrealistic but another home might be sought.

6 Five Schwedler Norway Maples *(Acer platanoides* 'Schwed1eri') by the parking lot.

7 Bald Cypress *(Taxodium distichum).*

8 Three Atlas Cedars *(Cedrns atlantica* f. *gl£luca)* northwest of the tennis courts.

> Monitor for structural problems as trees age; prune dangerous limbs and stonn breakage as needed. Eventually replace.

NOTE: Numbers reference those on Phase II maps - Outstanding Trees & Predicted Life Expectancy

Wading Pool subarea

1 Bald Cypress groves *(Taxodium distichum)* by the path (approximately opposite Sunnyside, Corliss, and Meridian).

2 Three Yoshino Cherry trees *(Prunus* x *yedoensis)* approximately opposite Corliss, Bagley, and 77th).

3 Red Hawthorn *(Crattegus ltevigata* 'Punicea').

4 The 25 Black Cottonwoods *(Populus trichocarpa)* at Gaines Point.

Replant grove in stages with strong, long-lived "cottonless cottonwoods"; large existing trees of this species are dangerous, especially given the amount of activity occurring in their immediate understory..

5 Ringleaf Willow *(Salix babylonica* 'Crispa').

6 Red Pine *(Pinus resinosa).*

7 Ten Sierra Redwoods or Giant Sequoias *(Sequoiadendron giganteum)* near the wading pool.

8 Street-trees of Norway Maples *(Acer platanoides).*

Replant to fill the gaps. Use *Acer* x *Freemanii* Autumn Blaze@, *Acer rubrum* Red Sunset®, or *Acer saccharum* 'Legacy', or reuse original species although ornamentally inferior.

9 Higan Cherry *(Prunus* x *subhirtella)*

Bath House subarea

1 Tanko-shinju Cherry *(Prunus* 'Tanko-shinju'-also known as 'Pink Pearl').

Prune (or remove) the adjacent European Larch trees, to give the cherry more light.

2 Three Witch Hazels *(Hamamelis virginiana).*

3 The Oshima Cherries *(Prunus speciosa).*

4 Ojochin Cherry *(Prunus* 'Ojochin').

5 The so-called Mikuruma-gaeshi Cherry *(Prunus* 'Mikuruma-gaeshi').

This tree should be propagated (grafted on mazzard cherry rootstock), although it is not especially choice. Perhaps a regrafted specimen would be attractive and prove well worthwhile, given its rarity.

6 Five elms *(Ulmus* spp.) on the hilI southwest of the Bathhouse Theatre.

Replant with elms resistant to Dutch Elm Disease as these trees fail and are removed.

7 Golden Rain tree *(Koelreuteriapaniculata).*

Bath House subarea, cont.

8 Thirteen oaks *(Quercus* spp.) on the large hill opposite the parking lot.

Eventually replant these trees as they fail and are removed. Use White Oak *(Quercus alba),* Scarlet Oak *(Qu£rcus coccin£a),* and Pin Oak *(Quercus palustris).*

9 Seventeen birches *(Betula* spp.) by the south end of the parking lot.

As individuals die or decay, replant gaps in kind.

10 Crabapple trees *(Malus baccata, Malus* x *micromalus,* and *Malus Niedzwetskyana)* southwest of the Bathhouse Theatre.

Replace allees with up to five scab-resistant cultivars (see matrix). To insure uniformity, remove and replant entire rows simultaneously in single variety; do not fill gaps incrementally.

11 The mostly-pine conifer grove *(Abies, Pinus* spp.) near the water southeast of the tennis courts.

Replant as these trees fail and are removed. Use Limber Pine *(Pinus flexilis),* Bosnian Pine *(Pinus leucodermis),* Cluster Pine *(Pinus Pina.ster),* Ponderosa Pine *(Pinus ponderosa),* and Scots Pine *(Pinus sylvestris).* Encourage pine litter mulch understory.

12 Six Cedars of Lebanon *(Cedrus libani)* by the tennis ,courts.

13 The 19 street -trees of Norway and Sycamore Maples *(Acer p1at{UlOides* and *Acer Pseudoplatanus).,* .

Replant to fill the gaps and extend the row where missing. Use all the same kind, either the original species or aesthetically superior *Acer* x *Freemanii* Autumn Blaze@, *Acer rubrum* Red Sunset@, or *Acer saccharum* 'Legacy'. Coordinate selection with replacement street trees in Wading Pool subarea.

Aurora Strip subarea

1 Two Atlas Cedars *(Cedrus atlanticaf. glauca).*

Monitor for structural problems as trees age; prune dangerous limbs and storm breakage as needed. Eventually replace.

2 The grove of Bald Cypresses *(Taxodium distichum).*

3 Sitka Pussy Willow *(Salix sitchensis)* near the aforementioned cypress grove.

Aqua Center subarea

1 Seven Red Oaks *(Quercus rubra).*

Fill gap in row with same, seeking closest possible match for leaf and color.

2 Twelve Incense Cedars *(Calocedrus decurrens).*

Seek diagnosis for possible phytophthora root rot. If trees die, replant with *Chamaecyparis nootkatensis* or other resistant tall-growing conifer.

Aqua Center subarea, cont.

3 Twelve Sweetgums *(liquidambar Styracijlua).*

Consider extending row north along shore, seeking best possible match with original trees.

4 The 50 Black Walnut trees *(Juglans nigra)* lining West Green Lake Way.

Wherever sufficient room exists, fill gaps in this memorial row. Move three intruding young horse chestnuts (planted ca. 1980) elsewhere. The Woodland Park side of West Green Lake Way, where 19 black walnuts remain, should be replenished simultaneously.

5 Twelve Norway Maples *(Acer platanoides)* next to the parking lot.

Remove two trees immediately south of missing tree, to restore symmetry. Thin overlydense crowns of remaining trees to improve structure. Consider planting three nonmaples (perhaps oak or ash) with outstanding ornamental and shade value as a new centerpiece to this prominent row.

6 One of the three Dawn Redwoods *(Metasequoia glyptostroboides).*

7 Daimyo Oak *(Quercus dentata).*

8 Swamp White Oak *(Quercus bicolor)* .

9 The shoreline Willow thicket *(Salix* spp.).

10 Tulip Trees *(Liriodendron Tulipifera)* in the golf course.

Monitor double leader tree for hazard; if removed, replace.

11 Mugo Pine *(Pinus Mugo)* in the golf course.

12 Hybrid White Willow *(Salix* x *rubens)* in the golf course.

In serious decline, propagate and replant here or elsewhere. Simply inserting twigs into the ground in an appropriate site will do the job.

13 Six Coast Redwoods *(Sequoia sempervirens)* in the golf course.

14 European Larch *(Larix decidua)* in the golf course.

Southeast Shore subarea

1 Seven Zebra Cedars *(1hujaplicata* 'Zebrina').

Replant with a golden cultivar of Alaska Yellow Cedar *(Charno!cyparis nootkatensis* 'Lutea') as these trees fail and are removed. Perhaps also add the Goldtwig Weeping Willow *(Salix* x *sepulcralis* 'Chrysocoma') and understory echoing the yellow.

2 A Sepulchral Weeping Willow *(Salix* x *sepulcralis)* by the restrooms.

3 The 10 BigleafMaples *(Acer macrophyllum)* by the restrooms.

Replant with the same as these old trees fail and are removed. Also add Vine Maples *(Acer circinatum)* and Pacific Serviceberries *(Amelanchier alnifolia)* as edge- or underplanting.

Southeast Shore subarea, cont.

4 The Sierra Redwood *(Sequoiadendron giganteum)* by itself beside the path.

5 The 21 European White Birches *(Betula pendula)* between the path and the lake.

Existing gaps should be filled with infonnally-spaced trees, some of clump fonn. As these trees fail and are removed, replant with same species or the more robust yet similar-looking Japanese White Birch *(Betula platyphylla var.japonica).* Maximum landscape impact entails using a single species throughout the group, but long-tenn conversion is recommended if *Betula pendula* develops significant cultural problems.

VEGETATION MANAGEMENT MATRIX

Detailed vegetation management recommendations have been assembled into the matrix found on the following pages. Suggested actions are grouped according to primary landscape component affected, sorted by subarea:

- Trees - Individual removals, group thinning
- Understory - Additions, removals, care
- Turf - Removals, alterations, care
- Weeds - Eradication, control, prevention
- Soil - Drainage improvement, compaction reduction

Actively using this matrix, staff can assign priorities, generate work assignments, and monitor progress. Periodically the matrix content should be reassessed and updated, as landscape conditions change. The matrix also should prove useful in setting and justifying realistic budgets for grounds care at Green Lake.

RECOMMENDED TREE AND UNDERSTORY ADDITIONS

Tools to Guide Future Planting

The attached Appendix - Recommended Plants for Green Lake Park contains major documents developed to guide selection and placement of new vegetation at Green Lake in coming years:

- Subarea maps - Plant Recommendations and Locations
- Matrix - Recommended Trees for Green Lake
- List - Existing Trees Not to Plant in Future
- Matrix - Recommended Plants for Understory

The maps and matrices when used together provide a range of options appropriate for implementation in the park over time. Such direction is the synthesis of extensive existing resource analysis, identifying strengths, deficiencies, longevity, traditions and opportunities for the park landscape. Detailed choices within the parameters provided on the maps should yield culturally and aesthetically successful landscape additions. This information is *not* intended to exactly define future plantings as traditional planting plans and lists do.

Green Lake's landscape today includes a diverse palette of trees, but in some places a lack of thoughtful placement or selection is evident Resulting clutter compromises both the beauty and health of trees. Appendix documents are tools designed to reduce such clutter through time, while safeguarding strong landscape elements already in place and fostering the creation of new ones.

Trees - Use & Purpose of Maps

Tree locations are loosely drawn on the Plant Recommendations and Locations maps. Intended type of tree planting is noted for each addition, using the following code:

Sp	Specimen	1-3 trees of same kind, focal point
G	Grove	1-3 species, irregularly spaced
MG	Mixed Group	4 or more species intetplanted
M	Mass/ Screen	Densely planted trees / large shrubs
R	Row	Evenly spaced allees, street trees, etc.
P	Priority	Most important planting additions

For each recommended site, appropriate palette emphasis and implementation method are indicated briefly, with a list of suggested tree taxa. Highest priority plantings are staITed on the maps, based on patterns of anticipated or actual tree loss, on problem tree and area locations, and on perceived deficiencies in landscape character. This ranking results from pooled professional judgement, but is essentially subjective. Community and departmental priorities also will influence ultimate project selection.

The maps do not include all intended planting for coming decades - the optional replacement of non-critical trees, for example. The main emphasis is on key tree additions and replenishment required over the next several decades. The numerous planting suggestions are to be undertaken over many years, not at a single point in time. Users should refer to the Vegetation Management Matrix for related information about tree replacement and non-hazard removals.

Trees - Recommended Trees Matrix & Trees Not to Plant List

The Recommended Trees for Green Lake matrix provides detailed information regarding individual tree attributes and cultural preferences. It is designed for use by Parks staff, future project designers, and citizens interested in donating trees to the park. The matrix can be used. to learn more about trees listed on the map - or in reverse to identify taxa meeting particular criteria, should alternative selections be needed or additional locations identified in the future. The recommended plant palette includes trees which particularly merit introduction or greater use at Green Lake. The matrix is built around trees possessing certain key attributes suiting them to the rigors of life at Green Lake. Each must be:

Attractive

Dependable *I* adaptable

Structurally sound

Not easily physically damaged

Without noxious characteristics: root heave, suckering, large thoms, messy fruits, etc. Pest & disease resistant

Without major pruning need

Additional criteria some but not all taxa were chosen to fulfill include:

Low irrigation demand

Water tolerance

Pollution tolerance

Compaction tolerance

Reinforces existing successful taxa

Fills existing palette gap (seasonal interest, broadleaf evergreen, native)

Historic precedent (Olmsted list, prior significant use)

Wildlife value

With the exception of Existing Trees Not to Plant in Future list taxa, all existing trees may continue to be used in the park, especially for in-kind replacements. Reasons for eliminating certain trees from future use at Green Lake are listed with each species: all relate to plant performance or safety. The Recommended Trees for Green Lake matrix includes the most valued of existing species, many of which currently are underrepresented. Matrix taxa on the whole offer superior landscape value compared to the existing park palette, and if used, will increase landscape beauty and continuity. The matrix is comprehensive enough that a great deal of variety will still characterize park trees in the future.

Understory Selection - Map & Matrix Use

On the maps, recommended areas for understory improvements and additions are shaded; some are generalized, some quite specific. For each area, a brief indication of intended planting type is given. These in turn permit focused design and plant selection, utilizing the Recommended Plants for Understory matrix. The entire extent of areas marked cannot realistically be planted to understory, nor should it be. Instead shading defines a range of appropriate sites for planting. Primary uses for which sites were identified include: screening, wildlife cover, tree and shore protection, and visual enrichment for major facilities or points of entry to the park. Understory issues and opportunities were evaluated extensively as part of Phase II documentation.

STAFFING & TRAINING PRIORITIES

By all indicators, vegetation management at Green Lake Park is seriously understaffed. Only a modest improvement in landscape condition can be realized by "working smarter" in the future; creative efforts in this direction already are underway. Without doubt, fresh capital investment would benefit the park, but better maintenance funding is the real, persistent need. Planting represents only the first step in years of ongoing responsibility, thus vegetation does not lend itself to one-time capital improvement solutions. More adequate levels of routine maintenance could reduce or eliminate the periodic demand for expensive capital infusions. It is not sound fiscal policy to permit resource degradation which eventually results in expensive remediation.

Ideally, Green Lake Park should have its own, horticulturally proficient staff of gardeners who can assume considerable responsibility for hands-on care of park vegetation. In addition, sense of ownership and personal commitment to "their" landscape would be fostered, with attendant benefits for the resource itself. Engaged, talented staff given authority commensurate with their skills and working within the parameters of these guidelines could tremendously bolster landscape quality. Continuity of care probably also would improve compared with recent staff fluctuations in the park. This approach has met with considerable success in public gardens where it has been tried.

Although many limited-skill jobs will always exist in caring for Green Lake's grounds, staff trained in horticulture and arboriculture are urgently needed. The current system of institutionally segregating those skills makes integrated plant care difficult to achieve. Certainly, excellent professionals exist within the department, but their availability for consistent involvement at Green Lake is limited. The park needs far more attention, and on a regular basis, than they can provide.

Existing field staff should be offered regular in-house training and outside continuing education opportunities, to improve their baseline competency in horticultural techniques applied at the park. The department should aggressively seek and hire well-trained resource management personnel whenever job openings occur; educated, capable candidates abound in our gardening-oriented region.

Finally, serious study should be made regarding use of volunteers for supplemental planting and maintenance activities in the park. The existing Adopt-a-Park program is a good foundation, but coordination should be improved in both conceptualizing and implementing projects. Appropriate volunteer opportunities should be identified and tasks clearly defined in collaboration with resource management personnel, using these guidelines. Donations also need to honor the mapped and listed recommendations of this report, to avert fragmentation of the landscape and inadvertent creation of future problems or liabilities.

TOPICS FOR FURTHER ATTENTION

Several topics relating to vegetation management in Green Lake Park deserve more intensive investigation or exploration than this document could address. These include the following:

- **Green Lake path improvements**

Project coordination concerning vegetation impacts is needed, particularly but not only regarding trees. Use of the entire park and especially the shoreline would be affected by such improvements, as well as Green Lake's greensward landscape character. Consideration should be broadened beyond discussion of possible tree removals and offsetting additions, but these at minimum should be resolved.

- **Picnic tables & memorial benches**

The projected number and siting of these furnishings need careful review in reference to landscape character objectives and mapped planting recommendations contained in this document. Are both the locations and the recommended numbers appropriate? At what point is the value of the landscape itself diluted by the clutter of furnishings?

- **Aesthetic tree removals**

These guidelines have focused on removal of hazardous trees only. The vegetation management matrix suggests thinning and a few individual removals of weak or sickly trees which do not constitute actual hazards. The park landscape would look and function better if obviously unattractive trees were removed. Such decisions, and those regarding thinning of crowded group_, must be made with arborist and landscape architect involvement, as well as public notice or review.

- **Turf improvement strategies**

Detailed maintenance, site preparation and seeding recommendations for park turf are not included in these guidelines, but should be addressed more fully by turf management experts. Problem areas and those without ready irrigation particularly need attention. Since lawn care consumes a high proportion of available resources for maintenance, innovations and incremental improvements should be explored. Research and trials at Green Lake could benefit park turf systemwide.

- **Drainage improvements**

Serious drainage problems exist at several locations in the park, the worst of which were mapped. Specifying water- and compaction-tolerant plants for such locations provides only a partial solution. Surface and subsurface drainage, bioengineering and altered use patterns all need exploration to reverse degradation of the park environment.

- **Understory enhancements siting & design**

Only general recommendations for understory additions and improvements are included in these guidelines. Actual projects need to be defined and planting plans generate9 using the maps and understory matrix. One particular idea bearing consideration is making some portion of the park an Olmsted emphasis zone, using a palette and planting style drawn from available historic documents. Wildlife enhancements and amenity plantings definitely should be developed, possible donors identified, and volunteers enlisted for installation and maintenance, if appropriate. Public review may also be important to insure broad acceptance of such additions.

- **Pitch 'n' Putt golf course management**

At the golf course considerable clutter exists around the site, including maintenance equipment stored beneath focal trees, brush piles accumulating along the north fenceline, and miscellaneous items scattered outside the clubhouse. Landscape quality is compromised and more seriously, longterm tree health. . Parks needs to work with the concessionaire to resolve storage and debris disposal problems, perhaps developing new screening and plant waste management methods. Landscape quality within the fence should at least equal that for the rest of Green Lake Park.

- **Duck Island management & restoration**

Duck Island constitutes one of Green Lake's prime assets, contributing aesthetic and wildlife value and fulfilling the spirit of the Olmsted design for the park. Unfortunately, the island suffers from pressures which seriously threaten the future of its plant community: human trespass and trampling, heavy waterfowl usage and droppings accumulation, shore erosion, invasion of weedy exotic plants, and poor regeneration of trees. Because the island is a state-designated wildlife sanctuary, Seattle Parks needs to encourage Washington Department of Wildlife to address these problems before complete degradation occurs. Effective solutions will depend on collaborative effort between city and state.

- **Green Lake Park Conservancy concept**

An organization patterned after New York's Central Park Conservancy and Brooklyn's Prospect Park Alliance may be ripe for creation in Seattle. Alternatively, the feasibility of a citywide nonprofit foundation to support restoration, care, appreciation and use of historic parks might be explored. Departmental staff and citizens together should evaluate this possibility. In other major parks such organizations have brought new vitality, through advocacy and stable financial support. for both infrastructure and interpretive programs.

LANDSCAPE MANAGEMENT REFERENCES

I. Landscape Management Approach

"Sustainability in Landscaping" by Robert C. Perry, in Urban Forest Landscapes: Integrating Multidisciplinary Perspectives , Gordon A. Bradley editor; 1995, University of Washington Press, Seattle, WA.

"Landscape Composition Preservation Treatment: Defining an Ethic for Designed Landscapes" by Charles A. Birnbaum (excerpt) - National Association for Olmsted Parks Workbook Series, Vol. 3 Technical Notes; 1992, NAOP, Bethesda, MD.

"Trees for Wildlife", James R. Fazio editor - Tree City USA Bulletin No.13; 1993, The National Arbor Day Foundation, Nebraska City, NE.

"How to Work with Volunteers - Effectively", James R. Fazio editor - Tree City USA Bulletin No. 36; 1994, The National Arbor Day Foundation, Nebraska City, NE.

II. Tree Planting & Early Care

New Tree Planting - Consumer Information Program brochure; 1994, International Society of Arboriculture, Savoy, IL.

"Planting and Early Care" - excerpt from A Technical Guide to Community and Urban Forestry in Washington, Oregon and California by James Asher et al, Bruce Sullivan editor; 1989, World Forestry Center, Portland, OR.

"How to Prune Young Shade Trees", James R. Fazio editor - Tree City USA Bulletin No. 1; 1991, The National Arbor Day Foundation, Nebraska City, NE.

Dunn Gardens Plant Accessions Record (sample) and Checklist; 1994, The Portico Group, Seattle, WA.

III. Mature Tree Care

"Maintenance of Established Trees" - excerpt from A Technical Guide to Community and Urban Forestry in Washington, Oregon and California by James Asher et al, Bruce Sullivan editor; 1989, World Forestry Center, Portland, OR.

American National Standard for Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices, ANSI A300 (anonymous); 1995, American National Standards Institute, ?Washington, D.C.

Tree Pruning Guidelines (anonymous); 1995, International Society of Arboriculture, Savoy, IL.

"Living with Urban Soils", James R. Fazio editor - Tree City USA Bulletin No. 5; 1992, The National Arbor Day Foundation, Nebraska City, NE.

"Maintaining Tree / Turf Associations: A Plant Health Care Approach" by Donald I. Ham & James R. Clark, in Arborist News vol.2, no.3; June 1993, International Society of Arboriculture, Savoy, IL

III. Mature Tree Care, continued

Recognizing Tree Hazards by HortScience, Inc. (brochure); 1993, International Society of Arboriculture, Savoy, IL.

IV. Additional Vegetation Management Techniques

"How to Landscape to Save Water", James R. Fazio editor - Tree City USA Bulletin No. 17; 1993, The National Arbor Day Foundation, Nebraska City, NE.

Turfgrass Seeding Recommendations for the Pacific N.W. - PNW 299 by R.L. Goss et al; 1987, Washington, Oregon & Idaho Cooperative Extension and U.S. Department of Agriculture.

Principles of Turfgrass Management: Water Use and the Healthy Lawn (anonymous); no date, Water Conservation Coalition of Puget Sound (Water departments of Everett, Seattle & Tacoma, WA).

"Low Maintenance Turf?" by Tom Cook (article); August 1992, Oregon State University Horticulture Department (?), Corvallis, OR.

PlantAmnesty's Guide to Pruning (pamphlet); no date, PlantAmnesty, Seattle, WA.

"PHC: An Introduction" (anonymous) in Arborist News vol. 1, no. 3; June 1992, International Society of Arboriculture, Savoy, IL.

Noxious Weeds: A Guide to Invasivce Non-native Plants (anonymous); no date, King County Department of Public Works - Surface Water Management Division, Seattle, WA.