# CHAPTER 4
# URBAN LAND EVIRONMENTS

## INTRODUCTION

This plan divides Portland's urban forest into five basic categories called Urban Land Environments (ULEs). Each ULE has particular physical characteristics and issues, provides various benefits and serves different needs. Each is managed by different bureaus, agencies or individuals to achieve different results. The health and quality of the urban forest in each ULE depends on the knowledge, skills and involvement of the owners and managers.

This chapter provides a description of each ULE as well as management goals, information about property owners, managers and principal partners, and an analysis of the strengths, weaknesses, opportunities, threats and issues for the ULE. This is followed by specific objectives and recommended actions. Where possible, specific performance measures are included.

The chart below shows the approximate number of acres in each ULE and its percent of the city land base. Portland encompasses 92,800 acres (145 square miles) of land including portions of the Willamette and Columbia Rivers within the city boundaries. Excluding the area of the rivers, the land base is 87,040 acres (136 square miles). The land environment percentages shown below are based on the land portion only, not including the rivers. Creeks and other waterways are included.

Areas shown do not add up to 100% because of overlap and duplications, particularly between the Natural Areas, Transportation Corridors and Residential ULEs. Much of the land in these ULEs is designated for particular uses like environmental conservation and protection or transportation, but is privately owned and, consequently, also shows up in the Residential ULE.

Since it is difficult, if not impossible, to determine the percent of each ULE that is paved, in rights-of-way or zoned for environmental protection, these numbers are *very rough estimates*. They are gleaned from a variety of sources, and are only *general indications* of the distribution of land in each ULE.

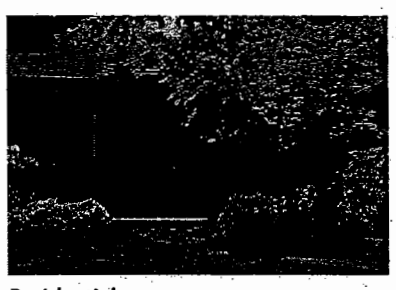
*Trees in a Portlland park*

# URBAN LAND EVIRONMENTS

| Urban Land Environments | Acres | % of city land |
|---|---|---|
| Residential | 50,000 | 57% |
| Commercial/Industrial/Institutional | 20,000 | 23% |
| Natural Areas and Stream Corridors[70] | 14,500 | 16% |
| Transportation Corridors & R-of-W | 8,700 (paved portion)[71] | 10%[72] |
| Developed Parks and Open Spaces[73] | 4,000 | 05% |

*Note: Because of overlap in the ULEs, the total exceeds 100%.*

## URBAN LAND ENVIRONMENTS SUMMARY



*Residential.*

### RESIDENTIAL

*All residential development, from traditional single family to multi-family dwellings.*

### DESCRIPTION

Over half of the city's land base is dedicated to residential use. Single family homes on 5,000 - 7,000 sq. ft. lots comprise most of this Urban Land Environment, although some single-family homes are on larger lots and multi-family dwellings are located throughout the city. By 2020, Portland is expected to include another 113,000 people, an increase of about 20%.[74] The density and design of future residential development to accommodate these new residents will impact the urban forest throughout this ULE.

The quantity and quality of the urban forest in this ULE varies greatly. Generally speaking, residential areas have more trees and vegetation than other privately owned property, but this varies by area. Affluent areas often have generous tree canopy cover and landscaping that is in good condition, while other areas lack canopy cover entirely and landscaping may be non-existent or in poor condition.

Most trees and vegetation on single-family residential property are unregulated, with the following exceptions:

[70] *Includes the islands in the Willamette River.*
[71] *ODOT and PDOT provided information on the amount of pavement in their respective systems from which the following estimates were made for areas within Portland: ODOT - 1,210 acres of roadway, PDOT - 6,480 acres of streets and 1,020 acres of sidewalk for a total of 8,710 acres of impervious surface. There is no information on the amounts of unpaved ROW.*
[72] *The city's Stormwater Advisory Committee estimates that city streets make up18% of city land.*
[73] *Developed Parks and Open Spaces includes areas that have structures or built facilities, or are designated and programmed for specific recreation activities; e.g., sports fields, as well as open and unprogrammed areas with no structures that are set aside for low intensity uses and passive recreation.*
[74] *Metro (1995).*

- Situations which represent a hazard to the general public.
- Trees afflicted with or susceptible to Dutch Elm disease.
- Situations involving power line clearance.
- Areas within environmental zones.
- Trees used for stormwater mitigation.
- Trees subject to the Tree Preservation Ordinance.
- Heritage trees.

There are additional regulations for multi-family residential lots that can be subdivided.

Note: All property owners are responsible for street trees in the ROW for their properties. This is covered in the Transportation Corridors and Rights-of-Way ULE.

**Property Owners, Managers and Principal Partners**

| **Owner/Manager** | **Acres*** | **Primary Activities** |
|---|---|---|
| Private Property Owners | 50,000 | Private yard and garden care (some more than others) |
| **Additional Partners** | **Role** | |
| BES | Water quality improvement, stormwater mitigation, naturescaping and erosion control | |
| BDS | Erosion control, regulations and enforcement | |
| BOP | Healthy Portland Streams and environmental zones | |
| PP&R - Urban Forestry | Oversight of trees in select circumstances and education | |
| Fire and Rescue | Maintaining safe zones around homes | |
| FOT | Education | |

*This is a *very rough estimate*, gleaned from a variety of sources, and only a *general indication* of the amount of land in this ULE.

## ANALYSIS

### Strengths

- There are many areas of mature trees and abundant vegetation in good condition.
- Portland has a great climate for growing vegetation.
- Many residents take great pride in their yards and gardens.

### Weaknesses

- The urban forest is unequally distributed in this ULE.
- Some people lack the resources needed to maintain trees and vegetation.

- Management of trees on private property, except for rights-of-way and trees that are specified for stormwater mitigation when development occurs, is unregulated.

**Opportunities**
- Property owners can be effective stewards for the vegetation in this ULE.
- Partnerships with volunteers can help to plant trees in low-income areas.
- Trees and vegetation can establish regional and neighborhood character and community identity.

**Threats**
- New development and increased density reduces existing canopy.
- Trees are cut or topped to create private views or to reduce maintenance costs.
- Disease or pests may quickly wipe out large segments of the urban forest.
- Some property owners provide poor or inappropriate maintenance of trees.

## ISSUES

Some low-income property owners find care and maintenance of trees to be an economic burden. Poorer areas of the city lack abundant amounts of the urban forest.

Developing the amount of "defensible space" needed around buildings to reduce the risk of wildfires in urban/wildland interface areas may conflict with the need to retain canopy cover, as well as the need to protect the vegetation in environmental zones.

## GOALS, OBJECTIVES AND PERFORMANCE MEASURES

Urban forest management in this ULE focuses on encouraging private property owners to maintain and enhance the urban forest on their property. Note: Not every objective has a specific performance measure.

**Goal - Provide the benefits of the urban forest to all residents.**
A healthy urban forest improves the quality of life for residents, increases property resale values and enhances comfort.

***Objective: Increase tree canopy.***
Tree canopies offers multiple benefits to residents. Recommendations for residential canopy cover range from 10-60%.[75]

[75]*See Appendix for information on recommendations.*
[76]*Calculated using information from Head, Fisher, and O'Brien (2001), p. 57.*

*Performance Measure - Canopy Cover*
35-40% canopy cover
Canopy cover of 35-40% requires 1-2 large trees or 2-3 medium trees or 5-6 small trees for a 6,200 square foot lot.[76] Trees should be selected based on specific site conditions and needs.

For development in single and multi-dwelling zones, City Code dictates "at least 2 inches of tree per 1,000 square feet of site area must be preserved [or planted]. On lots that are 3,000 square feet or smaller, at least 3 inches of tree must be preserved [or planted]." (Chapter 33.248.020) While this is a good standard, it is difficult to enforce, and does not necessarily translate into canopy cover.


*Mature street tree*

**Goal - Educate residents about the management and care of the urban forest.**
Knowledgeable residents provide better care and act as stewards for the urban forest.

***Objective*: *Provide information about best management practices for tree planting, preservation and care.***
Develop a variety of resources to educate homeowners about the urban forest.

- Expand partnerships with other bureaus and agencies to educate homeowners about the benefits of trees and vegetation including water quality management, erosion control and energy savings.
- Encourage the use of large canopy trees in appropriate areas.
- Encourage the use of native trees and vegetation in appropriate areas.
- Expand the Neighborhood Tree Liaison Program to provide two Neighborhood Tree Liaisons in every neighborhood.
- Develop a community assistance program to encourage low-income property owners to plant and care for trees and vegetation.

**Goal - Ensure public safety from potential wildfires.**
Wildfires are a threat in some areas of the city.

***Objective*: *Reduce fire hazards near homes and structures.***
Under certain conditions, some residential areas are at risk for wildfires.

- Adopt an Urban Wildfire Hazard Plan.
- Encourage the use of fire-resistant native plants in areas near structures and habitation.

**Goal - Protect the urban forest from pests and diseases.** (This goal and its objectives apply to all ULEs, except Natural Areas.)
Lower the risk of catastrophic loss from pests and diseases.

***Objective: Provide a diversity of tree species.***
A diversity of species is a risk-prevention measurement since an area with many species of trees is less likely to suffer catastrophic loss from diseases such as Dutch elm disease that can wipe out an entire species of trees in a geographic area. A diversity of species provides greater variety of habitat and food for fish and wildlife.

Note that this objective does not encourage the cutting of any existing trees, but rather encourages planting a diversity of new trees.

*Performance Measures - Species Diversity*
This should be measured on a large area basis, not by individual sites.

- No more than 10% of a single species. (Recommendations range from 5-15% for a single species. 10% is the general "rule of thumb.")
- No more than 30% of a single genus (e.g., maple).
- No more than 30% of any genus should be a single species (e.g., red maple).

***Objective: Ensure diversity of ages among trees in the urban forest.***
Since Portland's urban forest is already fairly diverse in overall age composition, this is not a goal that needs to be actively managed for. As long as trees are continually planted, the general age diversity of the urban forest will be perpetuated. Information on ages should be collected when trees are inventoried.

Like species diversity, this is also a risk-prevention measurement. Having a variety of ages among the trees of the urban forest reduces the likelihood that all of the trees will begin to die at the same time. A healthy mixture of young, medium and old trees provides a constant turnover of generations that ensures that the urban forest will remain in a fairly steady state as new trees replace those that die. A forest with a diverse age composition has more complexity that offers greater habitat for fish and wildlife.


*Commercial/Industrial/Institutional*

## COMMERCIAL/INDUSTRIAL/INSTITUTIONAL

*Urban and neighborhood commercial areas, malls, manufacturing and warehousing areas, industrial and wholesale sales, industrial parks, quasi public areas such as schools, religious institutions, cemeteries, and government facilities.*

## DESCRIPTION

Areas in this ULE are generally highly developed but have a wide variety of urban forest conditions. While many have a low percentage of vegetative cover, some areas such as campuses are well-vegetated.

When these properties are developed, they are often cleared and graded, which reduces the potential to protect existing vegetation. Any urban forest on these properties is usually a result of the City's landscaping requirements. New developments are required to have 15% landscaping, but some older developments have few trees, especially older parking lots, and little landscaping. Code requirements include street trees, parking lot and landscaping, buffer plantings and landscape coverage. City Code also regulates the cutting of trees in this ULE.

Note: All property owners are responsible for street trees in the ROW for their properties. This is covered in the Transportation Corridors and Rights-of-Way ULE.

**Property Owners, Managers and Principal Partners**

| **Owner/Manager** | **Acres*** | **Primary Activities** |
|---|---|---|
| Private and Public Property Owners | 20,000 | Vegetation management |
| **Additional Partners** | **Role** | |
| BDS | Erosion control, regulations and enforcement | |
| BOP | Healthy Portland Streams — environmental zones | |
| BES | Water quality improvement and stormwater mitigation | |
| FOT | Tree plantings on school and church properties | |
| PP&R - Urban Forestry | Administer tree cutting ordinance | |

*This is a *very rough estimate*, gleaned from a variety of sources, and only *general indications* of the distribution of land in this ULE.

## ANALYSIS

### Strengths

- Ample vegetation and green spaces exists on some industrial parks and institutional campuses.
- Existing parking lots that lack trees and vegetation are gradually being upgraded and planted.
- The Stormwater Management Manual (SWMM) requires trees and vegetation for development projects.
- Trees provide significant amenities in retail districts.[77] On average, consumers are willing to pay 12% more for products of all kinds in districts with trees.

### Weaknesses

- Growing conditions are often harsh due to compacted soils, extensive paving and heavy use of many sites.

[77]*Wolf, Kathleen (1999).*

- There are some overlapping and confusing regulations for developers and property owners. At present BDS, Urban Forestry, BES and sometimes PDOT administer three different codes with different requirements and procedures. There are multiple plant lists and multiple fees are required.
- Overlapping regulations address the same vegetation, e.g., mitigation for impervious surfaces, parking lots, landscape requirements
- Code enforcement is lax in some areas.

**Opportunities**

- Trees and vegetation can be added to improve water quality, improve the comfort of employees and the public and improve the visual characteristics of an area.
- Canopy cover inventories can be used to identify planting opportunities.

**Threats**

- Urban forest maintenance and improvement is not a priority for all property owners.

## ISSUES

- Heavy use of these sites makes it difficult to provide a healthy urban forest.

## GOALS, OBJECTIVES AND PERFORMANCE MEASURES

Urban forest management in this ULE focuses primarily on improving the health of individual trees, and adding to the urban forest in appropriate places. Note: Not every objective has a specific performance measure.

**Goal - Provide the benefits of the urban forest in a highly developed environment.**

Healthy trees and vegetation can improve the functional use of these sites, while accommodating the needs of the businesses.

***Objective: Provide urban forest elements, especially canopy cover, to improve site conditions.***

Increased canopy cover provides multiple benefits. Recommendations range from 0-40% with most around 10-15%.[78]

*Performance Measure - Canopy Cover*

15% canopy cover

There are some areas — such as downtown commercial areas — where it may not be possible to attain this level of coverage. Other areas may be able to achieve a much higher canopy cover than 15%.

[78]*See Appendix for information on recommendations.*

Portland's City Code landscape standards generally call for 15% landscape coverage of these areas.[79] While this is not the same as canopy cover, it is a measurable requirement.

- Select trees and vegetation appropriate to specific sites.
- Identify areas, such as parking lots, where canopy cover can be increased.
- Develop incentives to encourage development of healthy urban forest and retention of existing healthy trees and vegetation, especially large trees that provide maximum benefits. (See Chapter Three.)

**Goal - Educate property owners about the management and care of the urban forest.**
Knowledgeable property owners provide better care and maintenance and act as stewards for the urban forest.

***Objective: Provide information about best management practices for tree planting, preservation and care.***
Develop a variety of resources to educate property owners about the urban forest.

- Expand partnerships with other bureaus and agencies to inform property owners about the benefits of trees and vegetation including water quality management, erosion control and energy savings.
- Encourage the use of large canopy trees in appropriate areas.
- Encourage the use of native trees and vegetation in appropriate areas.

**Goal - Improve growing conditions.**
Growing conditions in this ULE can be particularly difficult.

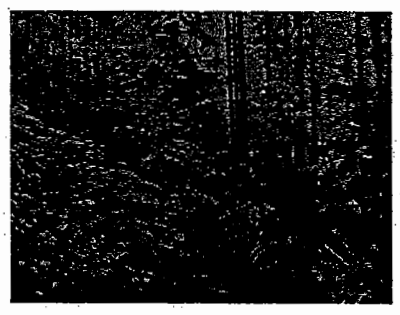
***Objective: Investigate and develop new techniques that provide better growing conditions.***

- Use structural soils to improve growing conditions.
- Provide extra protection for newly planted trees including curbs or protective barriers where necessary.

**Goal - Protect the urban forest from pests and diseases.**
The objectives and performance measures listed in the Residential ULE apply to this ULE.

*Tree silhouette*

[79]*City Code dictates the following landscaping standards as minimum requirements: Institutional: 25% of site landscaped; Commercial: 15% of site landscaped (for most zones); Industrial: 15% of site landscaped (for most zones); Parking lots: one tree for every 120 square feet of required landscaping. Chapters 33.248.020 and 33.266.130.*



*Natural areas and stream corridors*

## NATURAL AREAS AND STREAM CORRIDORS

*Undeveloped public and private natural areas, includes environmental zones.*

### DESCRIPTION

For purposes of this document, a natural area is defined as "a landscape unit composed of plant and animal communities, water bodies, soil and rock, largely devoid of human-made structures." Lands in this ULE are publicly or privately owned and include significant natural resources. Environmental overlay zones cover many of these areas.[80] This ULE includes wetlands and meadows as well as a variety of forested areas. Understory plants are as important as overall tree canopy in this ULE.

Very few, if any, of these areas are remnants of the pre-settlement landscape. Most are disturbed lands that have grown back over time, or that have been revegetated. All provide important wildlife refuges or fisheries habitat. Many natural areas and parks are linked by the 40 Mile Loop, a 140-mile trail system in and around the city.

In the other ULEs, trees are considered as individual specimen trees. In this ULE, they are elements of an interrelated ecosystem and need to be managed accordingly.

**Property Owners, Managers and Principal Partners**

| Owner/Manager | Acres* | Primary Activities |
|---|---|---|
| PP&R - Natural Resources and Districts | 7,300 | Districts Habitat protection and enhancement of natural areas |
| BES | 500 | Water quality improvement; stormwater mitigation; revegetation program on public and private land, flood management and storage; partners for PP&R's natural areas |
| Metro | 2,000 | Habitat protection and enhancement |
| Oregon State Parks (Tryon Creek) | 650 | Habitat protection and enhancement |
| Private Property Owners | 4,050 | Protecting environmental zones |

*These numbers are *very rough estimates*, gleaned from a variety of sources, and are only *general indications* of the distribution of land in this ULE.

[80]*Environmental Zones are overlay zones that protect more than 19,000 acres of environmentally sensitive areas in Portland — including wetlands, upland forests, steep slopes and areas along streams. Development is regulated in these zones.*

| Additional Partners | Role |
|---|---|
| ESA Program | Ensures that City activities comply with ESA obligations and regulations |
| FOT | Habitat restoration on public and private lands |
| Fire and Rescue | Reduce fire threats in areas of urban/wildland interface |
| BOP | Healthy Portland Streams — environmental zones |
| BDS | Regulations, enforcement of environmental zoning code |
| PP&R - Urban Forestry Program | Regulates trees planted or removed on public lands and in rights-of-way; places large wood in restoration stream sites |
| Watershed Councils | Advise on management of particular watersheds |
| PP&R - Horticulture Services | Restoration activities |
| Land Trusts | Assist in acquiring and protecting natural resources |
| Friends Groups | Assist in acquiring and protecting natural resources |

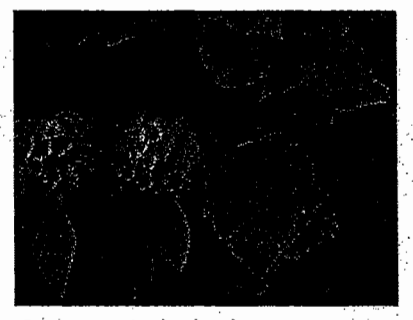
## ANALYSIS

### Strengths

- Many of the City's natural areas are in public ownership, where it is often easier for government agencies to restore natural functions than on private lands.
- Much of Portland's urban forest canopy is in the forested natural resource areas.[81]
- Resource agencies have high levels of awareness of the ecological value of natural areas.
- Public interest in participating in restoration efforts is increasing. Organizations like Friends of Trees and others organize and coordinate volunteer projects and stewardship activities.
- Planting in natural areas is relatively inexpensive and has a high benefit- to-cost ratio.[82]

### Weaknesses

- There is lack of clarity about the different roles and responsibilities of various bureaus.
- Follow-up maintenance for planting and revegetation projects is inconsistent or lacking.
- Management techniques for natural areas are not standardized.
- It is difficult to evaluate progress over time because of lack of performance measures, as well as lack of staff to monitor and measure change.



*Common ninebark (Physocarpus opulifolius)*

[81] *McPherson et al. (1993), p. 25.*
[82] *McPherson et al. (1993), p. 85.*

**Opportunities**

- Providing better information to private property owners may help restore natural areas on their property.
- Volunteers are available and eager to improve or restore publicly owned natural areas.
- Active management such as eliminating non-natives, and planting and maintaining appropriate natives can restore natural areas.
- Some ecosystem interventions such as thinning dense stands, changing plant communities or altering hydrology can restore ecosystems and improve habitat and overall urban forest health.

**Threats**

- Invasive non-native species seriously threaten most natural areas. Species such as English ivy, wild clematis, blackberries, and Scot's broom have out-competed native plant species in many areas.
- Some natural areas are at high-risk for wildfires (caused naturally and by humans), threatening resources and nearby residential areas.
- Inappropriate uses such as illegal camping, dumping and disposing of yard debris in and around natural areas threatens and disturbs both flora and fauna.
- Some privately owned open spaces function as natural areas but are not protected from development or invasive non-native species.

## ISSUES

The need for people to have access to publicly owned natural areas often conflicts with the need to protect natural areas from human disturbance.

*Ivy removal*

Differences of opinion exist about the desired future condition and appropriate management of natural areas, e.g., thinning of trees in dense stands.

Some identified City regulations and goals are in conflict with each other, e.g., increasing tree canopy competes with clearing for scenic view protection. Title 33 environmental zone regulations do not always recognize other Bureau of Planning regulations and goals.

Best Management Practices (BMPs) for street trees and individual public trees differ from BMPs for trees in natural areas. Regulations that were developed for street trees and specimen trees in parks and other public areas are applied to trees in publicly-owned environmental zones.[83] The result is duplication of permits and occasional conflicts in code requirements.

Changing or modifying established active uses in order to restore or protect the resource is sometimes difficult.

## GOALS, OBJECTIVES AND PERFORMANCE MEASURES

Urban forest management in this ULE focuses on the health of systems rather than on individual trees. Note: Not every objective has a specific performance measure.[84]

**Goal - Maintain and restore healthy habitats.**
Protect and enhance healthy natural areas dominated by native species and restore areas that are primarily dominated by non-natives.

***Objective: Control invasive non-native plants.***
Non-native species such as English Ivy, Himalayan blackberry, wild clematis and Scot's broom are highly invasive, and a rapidly growing problem. Since control of non-native species is a developing management regime, it is difficult to set a specific target for this objective. However, the following actions are important.

- Map the extent and severity of the problem to develop benchmarks for future evaluations and to prioritize removal and restoration projects.
- Determine target percentages of cover of non-native species that will be managed in selected habitat areas.
- Protect areas without invasive species from encroachment.

***Objective: Increase structural and species diversity.***
Greater structural diversity — multiple layers of canopy, shrubs and groundcover — provides more habitat opportunities for wildlife. Structural diversity is achieved through species and age diversity.

- Assess areas where multiple layers are appropriate and plant accordingly.

***Objective: Leave as much dead wood and large wood in place as possible.***
Large wood is beneficial for habitat restoration in streams and along stream banks and in healthy forests. The role and management of large wood may vary from one area to another.

- Leave all dead wood in place unless it poses hazards such as increased flooding or fuel loading for fire. Monitor effects to prevent unwanted flooding or hazards.
- Place large wood where recruitment is not sufficient or in areas where it has been removed.
- Stockpile large wood for use in appropriate areas.

[83]*Chapter 20.40 of the City Code regulates street trees and other public trees. Chapter 33.430 regulates environmental overlay zones.*
[84]*The City of Portland's Framework for Integrated Watershed Management Plan (the Framework) has goals, indicato, and targets that are applicable to portions of this ULE.*

## URBAN LAND EVIRONMENTS

*Salal (Gualtheria shallom)*

***Objective: Use ecosystem management principles to manage natural areas and stream corridors.***

Ecosystem management principles[85] provide best management practices for this ULE. This management allows these areas to be self-sustaining and to perpetuate their natural conditions as much as possible.

- Develop ecosystem management plans and monitoring for all city-owned natural areas.
- Work with other natural resources management groups to ensure consistent plans and policies.

***Objective: Establish a Natural Areas Work Group to coordinate projects.***

Include representatives of appropriate bureaus, agencies and groups to meet regularly to discuss and agree on appropriate projects and methods to expedite work and results.

- Develop long-term, follow-up maintenance plans for each planting and revegetation project.
- Evaluate structure, threats, human impacts, presence of invasive non-natives, species that are regenerating and overall functional level for each habitat type.
- Work with Metro in the development of their Fish and Wildlife Habitat Protection Plan.
- Look at ways to eliminate duplication of permits and conflicts in code requirements that govern trees and vegetation in environmental overlay zones.

***Objective: Increase the effective size and stability of natural areas.***

Larger ecosystems can sustain larger and more diverse populations of plants and wildlife.

- Acquire important privately-owned lands or enter into permanent conservation easements with property owners.
- Connect small natural areas to form larger ecological units.

***Objective: Educate the general public about the values, benefits and management of natural areas.***

Education is an effective tool to promote stewardship and assist property owners in restoring natural areas.

- Build on existing programs to develop better information about the value of natural areas for property owners, and ways to maintain and restore natural areas.
- Expand and develop new public and private partnerships with schools and friends groups to enhance stewardship of natural areas.

[85]*Ecosystem Management is based on an adaptive management cycle of inventory, statement of desired future condition, assessment, prescription, intervention and monitoring.*

**Goal - Improve water quality and provide flow control in streams.**
Natural areas provide important natural filtering and infiltration, cooling of surface water and recharge of ground water. Management activities that improve ecological health also improve water quality.

***Objective: Provide canopy cover throughout Portland's watersheds.***
Chinook and Steelhead require cold water to survive. The urban forest helps to mitigate the "urban heat island" effect that results from solar energy absorbed by pavement and roofing and transferred to streams by stormwater runoff.[86] Shade in all parts of the watershed helps to lower water temperatures and provides better habitat that aids in the recovery of the ESA-listed salmonids.

*Performance Measure* - Use targets set by the City's Framework Plan and watershed plans.
- Provide shade along streams and in other critical areas.

***Objective: Increase riparian[87] vegetation.***
Riparian vegetation provides food and habitat while preventing erosion and sedimentation of the stream. The amount of shade that should be provided will vary between streams and between watersheds. (See specific BES watershed plans for additional guidelines.) Trees also help filter pollutants and reduce stormwater runoff — further enhancing water quality and the livability of streams.[88]

*Performance Measure* - Use targets set by the City's Framework Plan and watershed plans.
- Continue to plant and restore riparian areas.


*Nature-based recreation*

**Goal - Ensure public safety from potential wildfires.**
Under certain conditions, some natural areas are at risk for fire — both natural and human caused. Management can improve the condition of the natural area and improve public safety.

***Objective: Reduce fire hazards near homes and structures.***
- Adopt an Urban Wildfire Hazard Plan.
- Encourage the use of fire-resistant native plants in areas near structures and habitation.

[86]*These heat islands are generally six to eight degrees hotter than the rural areas surrounding them.*
[87]*Riparian: Areas adjacent to rivers, streams, lakes, ponds, and other water bodies. They are transitional between aquatic and upland zones, and as such, contain elements of both aquatic and terrestrial ecosystems.*
[88]*"Portland's Urban Forestry Program: Endangered Species" brochure has information on the relationship between endangered species and the urban forest.*

**Goal - Provide appropriate nature-based recreation.**
Natural areas provide opportunities for hiking, wildlife watching and environmental education.

***Objective: Include appropriate recreation that is compatible with restoring and improving water and air quality and providing healthy fish and wildlife habitat.***
Protect the resource and its functions while allowing compatible recreation opportunities and facilities.

- Establish appropriate levels of recreation for specific areas. Limit use to designated areas.

## TRANSPORTATION CORRIDORS AND RIGHTS-OF-WAY

*Major highways, local commercial streets, light rail rights-of-way, median strips and large interchanges, neighborhood and residential streets, bike paths and pedestrian trails.*

### DESCRIPTION

This ULE includes transportation uses from major highways to pedestrian paths. These public rights-of-way (ROW) accommodate automobiles, trucks, transit, pedestrians and bicycles, and include utility corridors. Increasingly, these areas are planted and modified to perform stormwater management and water quality functions to reduce the volume of water in pipes and cool water before it reaches the streams and rivers.

*Transportation corridors*

It is difficult to obtain definitive numbers on the size of this ULE, but estimates can be made based on the following information. Portland's Office of Transportation is responsible for 3,686 lane miles of improved public roads, 132 lane miles of gravel roads and 2,100 miles of sidewalk. Using 14' for a lane width and assuming 4' for an average sidewalk, those add up to approximately 6,480 acres of paved streets and 1,020 acres of sidewalks. The Oregon Department of Transportation is responsible for about 1,210 acres of freeways and major roads in the city. This adds up to at least 8,700 acres of impervious surface or 10% of the city land base and is probably a conservative number. The Stormwater Advisory Committee estimates that 18% of the city is covered by street surfaces.[89] Hundreds of acres of impervious surface exist in other areas of the city — from large parking lots to the thousands of buildings.

The street trees and other landscaping in these rights-of-way are key elements of the city's green infrastructure and a highly visible and valuable component of the urban forest. Trees along the transportation corridors are vital to maintaining attractive neighborhoods and livable communities. Presently, there are estimated to be 200,000 street trees on the streets of Portland, with room for 150,000 more. There are no estimates available for the amount of unpaved right-of-way that is or could be planted.

**Property Owners, Managers and Principal Partners**

| Owner/Manager | Primary Activities |
|---|---|
| Private Property Owners | Street tree care and maintenance |
| PDOT/ODOT | Planting street trees |
| PDOT Bureau of Maintenance | Street and rights-of-way maintenance |
| Private utilities | Tree canopy pruning for line clearance |

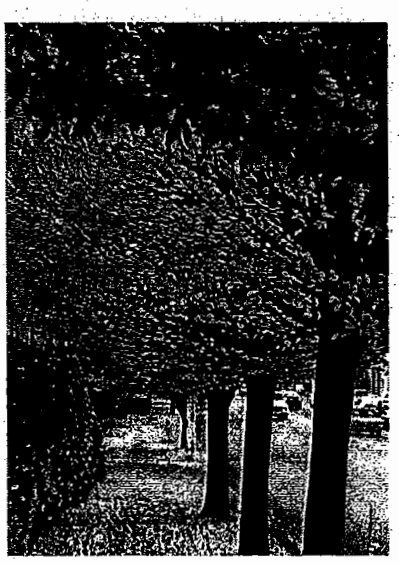
[89]*Status Report to Council, June, 2002.*

| Additional Partners | Role |
|---|---|
| OSD | Air quality |
| BES | Water quality improvement; stormwater mitigation, pipeline mitigation |
| FOT | Tree planting |
| PP&R - Urban Forestry Program | Regulations and enforcement (permitting of street trees) |
| Metro | Green Streets Program |

## ANALYSIS

### Strengths

- Many streets are well-treed, and the trees are well cared for.
- Utility companies provide consistent, high-quality care for the trees under their power lines.
- Street trees create desirable environments and contribute to the character of neighborhoods.[90]
- PDOT's Bureau of Maintenance produces compost certified for use in organic gardens at their leaf composting facility.
- Metro's Green Streets guidelines provide information that links land use, transportation and natural resource protection.



*Street trees*

### Weaknesses

- Some areas have little species or age diversity among their street trees.
- Some trees are over mature or have outgrown their planting spaces.
- Many street trees receive minimal care because private property owners are unaware that they are responsible for them.
- Some contractors have problems finding trees of the size and species to meet the development standards for street trees.
- Leaf removal is considered a nuisance by many property owners and is costly for the City. The City only assists in leaf removal in those neighborhoods with a high concentration of mature street trees.
- Street trees often need to be replaced more frequently because they endure harsher growing conditions and do not usually live as long as trees in other areas.
- Tree roots can damage sidewalks and may affect drain pipes. The City is responsible for repairs to the street and the curb. Property owners are responsible for repairs from the curb to the house side of the sidewalk.

### Opportunities

- Coordinate the use of street trees for multiple purposes — shading, stormwater management, traffic control and others.

[90]*Portland Pedestrian Design Guidelines, June 1998. Plantings and street trees should create desirable microclimates and contribute to psychological and visual comfort of sidewalk users.*

- Street trees and vegetation in rights-of-way can reduce the need for major capital projects, e.g., trees retain water so sewer pipelines may be reduced in size.
- New technology such as structural soils can provide larger root zones and better growing conditions.
- Many large areas such as interchanges and large medians are available to be planted.

**Threats**

- Room for street trees in the ROW is limited by the need to accommodate other elements.[91]
- Vandalism, including topping or girdling of trees, can be a problem.
- Reduced gas taxes have severely reduced care for over 400 publicly owned Transportation Landscapes.[92] Many of these areas provide significant canopy and landscaping and are important neighborhood assets.
- The requirement for planting street trees as a condition of development is often avoided due to limited inspection and enforcement abilities, especially in residential areas.

## ISSUES

- Native tree species are desirable but not necessarily appropriate as street trees. Although they are adapted to the local climate, they are not necessarily adapted to the harsh conditions found along city streets.
- Some non-native street trees may naturalize and displace natives in natural areas.
- The cost of street area landscape maintenance is increasing and funds are decreasing, or non-existent. Since funding for a proactive program is not available, maintenance is largely reactive.
- The cost of maintaining street trees and repairing unintended damage to sidewalks and drain pipes is a burden for many property owners.

## GOALS, OBJECTIVES AND PERFORMANCE MEASURES

Urban forest management in this ULE focuses on improving the health of individual trees, adding street tree canopy and educating property owners about street tree care and maintenance. Note: Not every objective has a specific performance measure.

[91]*Other ROW elements include pavement, sidewalks, furnishings, traffic signals and lights, meters, driveways, utility poles, signs, shelters, vaults and utilities.*
[92]*These include boulevards, traffic islands and other elements.*
[93]*USDA Northeastern Area (1993), p. 31, also recommends 50% coverage.*

**Goal - Provide the benefits of street trees to all residents.**
Healthy and abundant street trees improve the quality of life for residents and visitors.

***Objective: Increase street tree canopy in all areas.***
Increased tree canopy offers multiple benefits to residents and travelers. Greg McPherson (Researcher, USDA Forest Service) concludes that 25% street tree canopy cover is a reasonable standard once the first generation of street trees begins to die and be replaced. Fifty-percent coverage by the first generation of street trees at maturity is a desirable goal.[93]

*Performance Measure - Canopy Cover*
35% canopy cover

- Plant trees that are long-lived and have large canopies at maturity where possible.
- Use native trees as street trees in appropriate areas, especially in larger planting areas near natural areas and stream corridors.
- Work with growers to obtain desired size and species of trees for particular street improvements.
- Plant appropriate numbers and species of trees in all available street tree spaces.

***Objective: Increase the stocking level for street trees.***
Stocking level is the percent of available planting spaces for street trees. The available spaces are limited to areas where street trees will not interfere with driveways, signs or intersections.[94]

Portland's present stocking level is estimated to be from 40%-60%.[95] Recommendations for stocking level range from 60%-90% of available locations.[96]

[94]*PP&R Urban Forestry Tree Location Guidelines specify the following: 20' or more from other trees; 25' from intersection; 20' from stop/yield signs; 5' from fire hydrants; 7' from driveways and alleys; 10' from directional traffic signs; 2' from property lines; 15'-25' from street lights; 5' above sewers or other utilities.*
[95]*Portland's Urban Forestry Coordinator and City Forester estimate that 3,200-3,700 street trees are planted annually from a variety of sources. Friends of Trees has been a major contributor to the planting of street trees, and it is estimated that this group planted 7,500 street trees between 1996 and 2000 as part of the "Seed the Future Campaign."*
[96]*Syracuse, NY's Master Plan calls for a stocking level of 60%; Phil Hoefer, retired Urban and Community Forestry Coordinator for Colorado recommends 75%; Davey Resource Group recommends 97-98%.*

*Performance Measure - Stocking Level*
Increase the stocking level of street trees to 100% of available locations.[97]

- Plant long-lived trees.
- Increase stocking levels by 10% in the next 10 years and 20% within the next 20 years.
- Plant appropriate species in all available street tree locations. Since planting strip widths vary from 2.5 to more than 10 feet, they can accommodate a wide variety of species.
- Develop covenants that require street trees to be planted as conditions of approval for development.

*Performance Measure - Planting versus Removal of Street Trees*
Maintain a planting to removal ratio of at least 2:1.[98]

- Plant two trees for every tree removed.

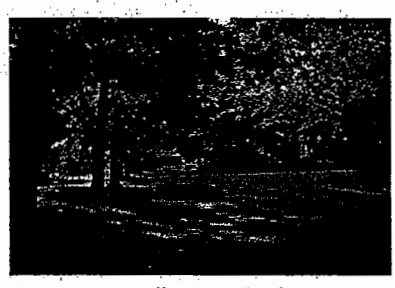

*Sargent cherry (Prunus sargentii 'columnaris)*

***Objective: Provide adequate rights-of-way that have sufficient room for street trees.***
Rights-of-way must accommodate many functions — vehicular traffic, cyclists, pedestrians, stormwater functions, street furnishings and trees.

- Create a Transportation Corridor Work Group to coordinate and address different bureaus' needs and concerns.
- Use PDOT's Transportation System Plan recommendations to redesign or enlarge some ROWs to better accommodate all needs and uses.[99]
- Increase minimum planting strip sizes to at least 4 feet to better accommodate tree needs. Provide large tree wells and 'bulb out' areas where feasible.
- Use structural soils[100] to improve growing conditions for street trees.
- Manage street trees to ensure good sight lines and clearance for traffic, street lights, traffic signals and signs.
- In areas of new construction or large redevelopment, encourage utility companies to install underground lines, as long as

[97]*The Northwest Industrial Area has a stocking level of approximately 46%, Cathedral Park is approximately 49% stocked and Irvington's stocking level is about 72%. These inventories have also shown that overplanting (40-50%) of Acer and Prunus species is common. (Poracsky (1999) and Poracsky and Scott (1999)). Phyllis Reynolds, author of "Trees of Greater Portland" has conducted an inventory of the "significant" trees in Irvington.*
[98] *With the goal of increasing the stocking level, this ratio needs to be greater than 1:1. The City of Salem has a policy of planting two trees per one removed. Portland's City Forester feels that this is a reasonable goal.*
[99]*The Stormwater Advisory Committee will be discussing stormwater management approaches for transportation ROWs starting in September 2002 and providing recommendations to City Council.*
[100]*Structural Soil/Engineered Soil: Specially mixed and graded fill soil intended to serve a particular purpose such as combining structural support for vehicles with a favorable root zone for street trees. Dell, Owen, "The New Watershed: Section 6. Glossary." County Landscape and Design. http://www.owendell.com/watershed6.html#engin*

they are not in the planting strip. In all areas, whether underground or overhead, encourage utility companies to bundle utility lines to leave as much room as possible for trees above and below ground.


*Street trees well maintained*

***Objective: Maintain healthy street trees that are appropriate for their location.***

Healthy trees are less likely to pose hazards from breakage due to weak limbs and poor condition.

- Select tree species that are appropriate for particular locations. Consider branching height, possible litter from leaves, seed and fruit and other elements that can affect the safety of the general public. Contact the City Forester for the required permit and assistance in selecting an appropriate tree(s).
- Replace over mature trees with appropriate species for the size of planting area.
- Educate the public about reporting possible tree hazards to the appropriate agencies.

**Goal - Provide the benefits of the urban forest in a highly developed environment.**

Street trees are very important elements of this ULE. They reduce the heat island effect from large amounts of pavement, reduce volumes of stormwater and improve water and air quality.

***Objective: Provide equitable distribution of street trees throughout the city.***

Street trees provide important benefits to residents and give neighborhoods a sense of place.

- Long Term Actions: Inventory the location, species, size and health of street trees and available planting spaces.
- Ensure that developers plant required street trees.

**Goal - Comprehensive and consistent care of street trees throughout the city.**

Street trees in some areas are well cared for, but their care in other areas is limited or non-existent. Street trees in poor condition or in the wrong location can be hazardous.

***Objective: Educate property owners about their responsibilities for the care of street trees.***

Knowledgeable property owners provide better care and maintenance and act as stewards for trees in their neighborhood.

- Provide information about best management practices for tree planting, preservation and care.
- Expand partnerships with other bureaus and agencies to educate property owners about their responsibilities for the planting, care and maintenance of street trees.
- Encourage the use of large canopy trees in appropriate areas.

- Educate the public about the choices available for trees.
- Encourage the use of native trees and vegetation in appropriate areas.
- Provide stable funding for the Neighborhood Tree Liaison program.

***Objective: Explore the possibilities of the City managing all street trees.***

City management and care of street trees would ensure equitable distribution and better health of street trees. Since trees are a benefit to all, costs to maintain them should be shared by all.

- Evaluate the pros and cons of the City taking over the care and management of all street trees. Investigate funding options for this.
- Look into various funding strategies, including a front foot assessment that would allow the City to contract the care of street trees. Care would include installation, inspection, pruning, removal and leaf pickup.
- Develop adequate funding to maintain city-owned street landscapes.

**Goal - Protect the urban forest from pests and diseases.**

The objectives and performance measures listed in the Residential ULE apply to this ULE.

## DEVELOPED PARKS AND OPEN SPACES

*Public parks and open spaces with developed recreation, highly structured or programmed areas, public and private golf courses, common open spaces — excluding natural areas. (See Natural Areas and Stream Corridors ULE).*

### DESCRIPTION

This ULE includes the active recreation and developed areas in Portland's parks, gardens and open spaces, as well as passive recreation areas that are *outside* the natural areas (see Natural Areas ULE). These areas include a wide variety of trees and vegetation — garden areas with a wealth of plants, passive use areas with lawns and large mature trees and open grassed sports fields. Lands in this ULE are generally publicly owned and may require high maintenance.

**Property Owners, Managers and Principal Partners**

| Owner/Manager | Acres* | Primary Activities |
|---|---|---|
| PP&R - Districts & Operations | 2,800 | General vegetation maintenance; tree care; planting of and Urban Forestry Program additional trees and management activities |
| Private and Metro Golf Courses | 1,200 | General vegetation maintenance |
| **Additional Partners** | **Role** | |
| BES | Water quality improve ment; stormwater mitigation | |
| FOT | Tree planting | |
| BOP | Healthy Portland Streams — environmental zones | |
| BDS/UF | Regulations and enforcement | |
| ESA Program | Limited assistance in habitat restoration | |

*These numbers are *very rough estimates*, gleaned from a variety of sources, and are only *general indications* of the distribution of land in this Urban Land Environment.

### ANALYSIS

#### Strengths

- Many park and open space areas have beautiful, large, mature trees.
- Many areas are well landscaped with a wide variety of plants.
- A rich variety of public gardens showcases a diversity of plants.
- Developed parks are generally well-stocked with trees.[101]

[101] *McPherson et al. (1993), p. 84.*

- Tree replacement is not keeping up with tree removal.
- Pre-existing conditions in some areas include large parking lots in parks without trees or vegetation.

**Opportunities**
- Some areas presently maintained as rough grass could be planted with trees and vegetation.
- There are many planting areas suitable for trees that reach large sizes at maturity.
- Many areas are available to showcase the wide variety of plants that can be grown in Portland's climate.

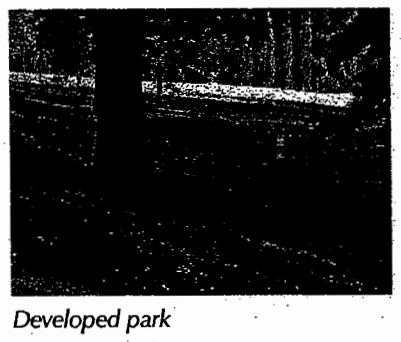
**Threats**
- Funding to maintain developed parks is limited and declining.
- Disease threatens older stands of trees.
- Some people top or kill trees on private and public properties to achieve scenic views.

## ISSUES

Balancing the different roles of trees in these limited areas can be difficult, e.g., aesthetics versus functions, natives versus ornamentals and maintaining open areas for active recreation versus planting additional trees.

## GOALS, OBJECTIVES AND PERFORMANCE MEASURES

Urban forest management in this ULE focuses primarily on providing trees to enhance human comfort, improving the health of individual trees and adding to the urban forest in appropriate places. Note: Not every objective has a specific performance measure.



*Developed park*

**Goal - Provide urban forest benefits that enhance high quality recreation experiences.**
Use trees and vegetation to add beauty, shade, cooling and shelter near programmed/active and unprogrammed/passive recreation areas.

***Objective: Provide canopied areas around large open recreational spaces in developed parks.***
Canopy cover will vary greatly in developed parks since each developed park has very different conditions and needs.

This objective takes into account the need for active recreation areas such as sports fields and courts, community centers and pools — all of which inhibit canopy cover. In some highly developed areas, a goal of 15%-25% canopy cover, similar to industrial/institutional areas is probably appropriate. In other developed parks such as the Park Blocks, a much higher canopy cover — probably over 50% in many cases — is appropriate.

*Performance Measure - Canopy cover*[102]
30% overall canopy cover

***Objective: Maintain existing canopy cover and increase it in appropriate areas.***
To maintain the current canopy level, each tree removed should be replaced. To increase the canopy cover level, increase the ratio or replace with species that are larger at maturity. If a tree is removed to make room for a new facility during the tree's prime years, it should be replaced on an inch-per-inch basis to attempt to achieve the same benefits. It may be necessary to find planting opportunities in other ULEs to meet the overall goal.

*Performance Measure - Planting versus Removal of Trees*
Maintain a planting-to-removal ratio of at least 1:1 and replace trees on an inch-per-inch basis when a tree is removed.

- Develop a plan to maintain stands of large trees — particularly stands of Douglas fir and other evergreens.
- Use large native trees in appropriate areas.

***Objective: Maintain the history, design, integrity and functional use of developed parks.***
Most of Portland's parks have been professionally designed and many — like the Park Blocks and Laurelhurst Park — have historically significant plantings and features.

- Preserve these features and plantings when replacing trees or redesigning elements of the parks.

***Objective: Improve parking lots in this ULE to meet current standards.***
Added vegetation will improve water quality, stormwater management and the aesthetics of all parking lots.
Bring all parking lots up to current landscape and stormwater management standards. [103]

**Goal - Ensure public safety.**
Dead and/or decaying trees can pose hazards to the general public, especially in high use areas and along trails.

***Objective: Organize and coordinate tree maintenance.***
Systematic maintenance will reduce hazardous situations.

- Develop a plan for each developed park that includes tree replacement and additional tree plantings. Include residents in the preparation of these plans.

[103]*The new Parking Lot ordinance allows the planting of smaller trees to satisfy the landscape requirement if the trees are included on the Parking Lot Tree List. See Appendix for information.*

- Ensure adequate staff and resources to inspect and maintain trees in high use areas.

**Goal - Protect the urban forest from pests and diseases.**
The objectives and performance measures listed in the Residential ULE apply to this ULE.