SOUTHWEST HILLS RESOURCE PROTECTION PLAN

INVENTORY, ANALYSIS AND REGULATIONS for the PROTECTION OF WETLANDS, WATER BODIES, FISH AND WILDLIFE HABITATS, OPEN SPACE AND NATURAL AREAS

Adopted by City Council January 23, 1992
Effective January 23, 1992

Ordinance No. 165002

Bureau of Planning
Portland, Oregon
May 1992

To obtain a large-print version of this document, please call 823-7700

Printed on recycled paper

SOUTHWEST HILLS
RESOURCE PROTECTION PLAN

Adopted by City Council January 23, 1992
Effective January 23, 1992

Ordinance No. 165002

Bureau of Planning

Gretchen Kafoury, Commissioner-In-Charge
Robert E. Stacey, Jr., Planning Director
Robert E. Clay, Chief Planner, Long Range Planning and Urban Design

Project Staff

Tim Brooks, Project Manager
Gail Curtis, City Planner
Damian Syrnyk, City Planner
Esther Lev, Consulting Biologist
Kria Lacher, Planning Assistant
Dick Reynolds, Planning Assistant

Project Assistance

Duncan Brown, Senior Planner
Cary Pinard, Senior Planner
Chuck Beasley, Volunteer
Jim Cronan, Volunteer
Betty Woerner, Volunteer
Geoff Sauncy, Graphic Illustrator

May 1992

Table of Contents

CHAPTER 1

INTRODUCTION

PURPOSE •

RELATION TO OTHER NATURAL RESOURCE PROJECTS •

ORGANIZATION OF THE PLAN •

HOW TO USE THIS DOCUMENT •

Purpose

The *Southwest Hills Resource Protection Plan* provides the inventory, analysis and recommendations for protection of significant natural resources located in southwest Portland. The project study area covers 7,000 acres south of the Balch Creek basin and downtown Portland, including the areas which drain directly into the Willamette River (see Vicinity Map).

This document is one of several natural resource plans being completed by the City of Portland to comply with the State's Land Conservation and Development Commission (LCDC) Statewide Planning Goal 5 post-acknowledgement requirements. Statewide Planning Goal 5 requires all jurisdictions in Oregon to "conserve open space and protect natural and scenic resources." Included in this document are:

1) An inventory and evaluation of the location, quantity and quality of natural resources in the Southwest Hills (see Chapters 5 and 7);

2) An analysis of the economic, social, environmental and energy (ESEE) consequences of allowing, limiting or prohibiting land uses which conflict with identified resources (see Chapters 6 and 7); and

3) A program for protecting significant resources (see Chapters 2 and 8).

This document serves as a policy document for the Southwest Hills planning area. The plan guides development near natural resource areas.

Relation to Other Natural Resource Projects

The *Southwest Hills Resource Protection Plan* is one of a series of plans to protect significant natural resources in five major resource areas within the City of Portland. These five areas are: the Columbia Corridor, the Willamette River Greenway, the Johnson Creek Basin, the East Portland Buttes and Uplands and the West Hills. Resource protection plans have been implemented for each of these areas with the exception of ongoing studies in East Portland and the Tualatin Basin drainage.

The *Southwest Hills Resource Protection Plan* is integrated with other natural resource projects. The plan area is bounded on three sides by other resource and district planning areas: the Willamette River Greenway Plan (1987) to the east, the Balch Creek Watershed Protection Plan (1991) to the north and the Fanno Creek and Tributaries Conservation Plan (ongoing) to the west. The plan is also integrated with the Metropolitan Urban Greenspaces Program conducted by the Metropolitan Service District

(METRO), a project aimed at inventorying and protecting greenspaces within the four-county metropolitan region.

Organization of the Plan

The *Southwest Hills Resource Protection Plan* is organized into nine general areas or chapters:

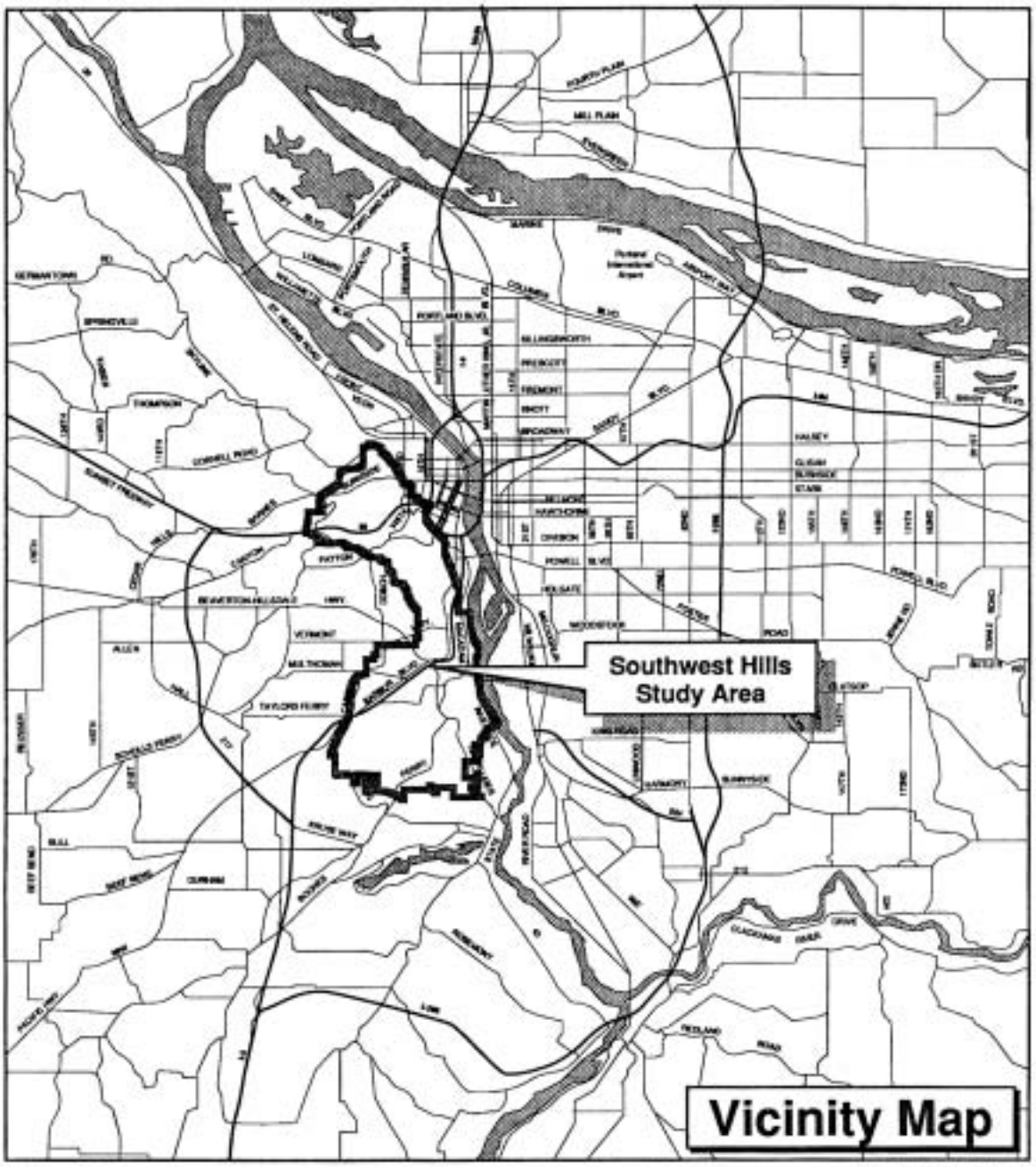
1) Introduction
2) Summary of City Council Actions
3) Background
4) Policy Framework
5) Areawide Resource Inventory
6) General Analysis of Economic, Social, Environmental and Energy Consequences (ESEE) of Resource Protection
7) Site Inventory and Analysis Summaries
8) Plan Protection Measures
9) Appendices (adopting ordinance, glossary and bibliography)

How to Use this Document

The *Southwest Hills Resource Protection Plan* serves as a policy document for planning staff in evaluating development proposals through environmental review. The plan also serves as a reference for property owners, developers, citizens and neighborhood groups. Following is a brief discussion on how to use this document.

Chapters 1, 3 and 4 provide an overview of the plan, its purpose, background and policy framework. Chapter 2 presents a summary of City Council actions. Chapters 5 through 7 cover the inventory and analysis of natural resources, and Chapter 8 presents the adopted regulations.

For a discussion of the resource site in which a particular property is located, refer to the Sites Map in Chapter 7 (page 89), locate the appropriate resource site, then turn to that site in the chapter. The site summary will include the resource inventory findings for the entire site (e.g., vegetation, forest cover, creeks or drainages, groundwater recharge area), an analysis of conflicting uses, and a conclusion which outlines which resources warrant protection and what level of protection is proposed. The Sites Map also contains a quarter section grid for cross referencing. An inventory and analysis of resources for the planning area as a whole is contained in Chapters 5 and 6. This information is intended to supplement and provide further detailed discussion of resources and conflicts identified in Chapter 7.



North

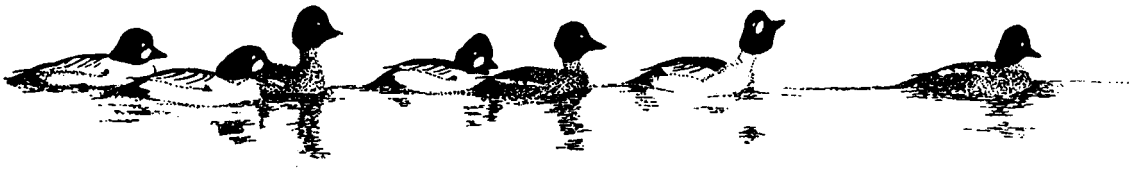
Southwest Hills

Resource Protection Plan

September 1991 City of Portland, Oregon Bureau of Planning

CHAPTER 2

SUMMARY OF CITY COUNCIL ACTIONS



Summary of City Council Actions

This brief chapter summarizes the implementation measures for the *Southwest Hills Resource Protection Plan*. These measures and adopted Zoning Code language are presented in more detail in Chapter 8.

On January 23, 1992, City Council adopted Ordinance No. 165002 which authorized the following actions:

- **Adoption of the *Southwest Hills Resource Protection Plan* report** including the Goal 5 inventory, analysis and recommendations;

- **Amendments to Portland's Comprehensive Plan Goals and Policies** to refer to the *Southwest Hills Resource Protection Plan;*

- **Adoption of the *Southwest Hills Resource Protection Plan* Policies and Objectives** as the policy document for the area;

- **Amendments to Title 33, Planning and Zoning,** to implement the *Southwest Hills Resource Protection Plan;*

- **Amendments to the Official Zoning Maps** to apply the environmental zones to designated resources;

- **Adoption of a resolution** directing the Bureau of Planning to study and prepare a recommendation on the concept of establishing a land bank for parks and natural areas acquisition; and

- **Repeal of Water Features designations** from the *Southwest Hills Resource Protection Plan* area upon plan acknowledgement.

CHAPTER 3

BACKGROUND

INTRODUCTION •

AREA HISTORY •

PAST PLANNING EFFORTS •

PUBLIC FACILITIES AND IMPROVEMENTS •

SUMMARY •

Introduction

Since the first human settlements along the Willamette River, the Southwest Hills have been, and continue to be, an area of public interest. This section reviews the area's history, past planning efforts in the area, and describes the existing and planned public facilities which serve the residents.

Area History

Human settlement of the Southwest Hills began approximately 10,000 years ago. The Chinook tribes lived in the Lower Columbia which included the Tualatin Mountains (Portland West Hills) as it was known to the Native Americans (Hummel et al. 1983).

The Chinook tribes consisted of approximately 12 smaller tribes including the Clatsop, Multnomah, Clackamas and Wasco. The various tribes were distinguished from one another by dialect and in some cases cultural differences. The base of Chinookan social organization was large, permanent and independent villages linked together by trade and marriage alliances. Social organization was also stratified by wealth and heredity.

The Portland area, located adjacent to the confluence of the Columbia and Willamette rivers, was one of the most densely populated in Oregon during this period. The rivers were rich in salmon and important for the tribes' trade network. Travel was accomplished by canoe. Nearby Sauvies Island provided abundant roots and edible plants such as wapato, a staple food for many local tribes.

As Europeans settled in Portland, the West Hills were chosen as home sites because of the terrain's beauty and the outstanding views over the Willamette and Tualatin Valleys (Bureau of Planning 1977). Land claims were made through the Federal Land Donation Act of 1850, a homestead act which allowed for claims of up to 640 acres. Several persons made claims on lands in Southwest Portland who are remembered through street names, including, P.A. Marquam, James Terwilliger and H. M. Humphrey.

Development in the Southwest Hills has continued ever since. Home building proceeded slowly as builders contended with the area's steep slopes and frequent landslides. Development picked up in the 1920's with the use of terracing and grading in building homes. It was during this time that public development took place as well. The Oregon Health Sciences University and Duniway Park were developed in the 1920's. Council Crest Park was completed in the late 1930's. Since the 1920's, development in the Southwest Hills has continued at a steady pace.

Past Planning Efforts

The neighborhoods in and around the Southwest Hills have an extensive history in planning. The earliest efforts involved developing neighborhood plans to respond to issues raised by community organizations. Elements of these previous studies identified the significance of the area's natural resources. The *Southwest Hills Resource Protection Plan* is an attempt to pull these elements together in a comprehensive manner. The following is a discussion of the past planning efforts completed for Southwest Portland. These plans are presented in chronological order.

Olmsted Brothers Report to the Portland Parks Board
In 1903, as part of the Report of the Park Board to the City of Portland, John Charles and Frederick Law Olmsted submitted their report from a study of the existing parks and a proposed system of parks for Portland. This report was the culmination of three weeks of intensive work, and provided the parks board a comprehensive framework for the development and maintenance of Portland's parks and parkways.

The report includes recommendations for the Park Blocks, a Terwilliger park, and a Southwest Hillside Parkway, which later became the Terwilliger Parkway. The Olmsted brothers wrote: "all agree that parks not only add to the beauty of a city and to the pleasure of living in it, but are exceedingly important factors in developing the healthfulness, morality, intelligence and business prosperity of its residents." (Olmsted 1903:13)

The Olmsteds found that: "a connected system of parks and parkways is manifestly far more complete and useful than a series of isolated parks." In addition to the scenic and aesthetic values of parks and parkways, the Olmsteds pointed out the public health and safety, and economic benefits, and noted how protection of natural resources "adds greatly to the value of adjoining properties."

Master Plan for Tryon Creek State Park
Tryon Creek State Park is located between SW Boones Ferry Road and SW Terwilliger Boulevard north of the Multnomah/Clackamas County boundary. In 1971, the State prepared a master plan for the park's use and maintenance. The park provides opportunities for the surrounding urban and suburban populations to appreciate the natural and scenic values of the lower Willamette Valley and enjoy the recreational values of the park.

The master plan addresses protection and enhancement of the park's resources and their values. The management objectives address the following elements:

- Natural resource protection;
- Compatible and detrimental park uses;
- Native wildlife and plant species protection;
- Park facilities development;
- Park access; and
- Citizen participation in park activities and projects.

The State of Oregon Parks and Recreation Department maintains and manages Tryon Creek State Park. The State and the City of Portland coordinate review of new development adjacent to the park.

Marquam Hill Policy Plan

The *Marquam Hill Policy Plan* was adopted by City Council in 1977. The plan area encompasses 1,140 acres and includes the Veterans Administration Hospital, Oregon Health Sciences University and Council Crest Park. This planning process, beginning in 1969, was stimulated by concerns raised by residents over the impacts of several proposed hillside developments.

The Portland City Planning Commission initiated the research to determine the requirements for future orderly development. Several research projects were completed, including the following:

- A study of the Marquam Hill ecology by Roger W. Redfern (presented below);
- A study performed by Daniel, Mann, Johnson and Mendenhall (DMJM) which outlined alternative future development scenarios and recommendations for development on Marquam Hill; and
- The *Homestead Neighborhood Association Report* which outlined the Homestead Neighborhood's recommendations for planning and development of Marquam Hill.

The Bureau of Planning reviewed, commented on, and incorporated the results of these projects in the final plan. The policy plan included recommendations for the following issues:

- Relocating the New Veterans Administration Hospital;
- Rezoning land adjacent to Oregon Health Sciences University;

- Regulating the issuance of building permits and soil stability;

- Encouraging planned unit developments rather than traditional subdivisions; and

- Restricting parking around the Oregon Health Sciences University.

The *Marquam Hill Policy Plan* is consistent with the city's Comprehensive Plan Goals and Policies. It is maintained and enforced under Comprehensive Plan Policy 3.6, Neighborhood Plans.

Marquam Hill Policy Plan-Environmental Geology
During the policy planning process, Roger Redfern, a graduate student in geology at Portland State University, completed an environmental geology study for the Marquam Hill area. The study collected and analyzed data on the Marquam Hill area's physical environment pertinent to planning and development.

This study concentrated on defining general areas in which particular geologic problems or limitations existed. These limitations included ground slope, bedrock and soil, bedrock structure, seismicity, soil thickness, ground stability, hydrology and vegetation.

The study recommended control procedures for grading operations and made specific recommendations for development. The specific recommendations addressed:

- Detailed engineering studies prior to development;

- Consideration of faults in the earth;

- Incorporation of earthquake standards in building design;

- Inclusion of the water table and vegetation in site examinations;

- Regulation of site disturbance during construction; and

- Investigation of block slide failure following the study.

The analysis of the environmental geology of the Marquam Hill area concludes that the area is severely limited in potential land uses.

Corbett-Terwilliger-Lair Hill Policy Plan
The *Corbett-Terwilliger-Lair Hill Policy Plan* was adopted by City Council in September of 1977. This was the culmination of five years of work in response to three major issues:

1. The effect of urban renewal in the South Auditorium area and its potential impact on the future development of the Lair Hill and Corbett Neighborhoods;

2. The construction of the Johns Landing Development and its effect on the surrounding Terwilliger residential neighborhood; and

3. The possible improvements to Macadam Avenue and their effects on business in the Macadam Corridor.

The planning process began in 1973, with the formation of a planning committee of homeowners, tenants, developers, business people and absentee owners. This committee worked with planning staff for approximately 20 months to develop the *Corbett/Terwilliger/Lair Hill Policy Plan*.

Through its policies and actions, the plan addressed several issues including preserving existing residential neighborhoods, urban renewal, rezoning, traffic management, physical improvements, and development and use regulations. In addition, the plan served in developing two other policy documents: the *Lair Hill Historic Conservation District and Design Guidelines (1980)* and the *Macadam Plan District and Corridor Design Guidelines (1985).*

The *Corbett/Terwilliger/Lair Hill Policy Plan* is consistent with the city's Comprehensive Plan Goals and Policies. It is maintained and enforced under Comprehensive Plan Policy 3.6, Neighborhood Plans.

West Portland Park Study

The City Council adopted the *West Portland Park Study* on December 14, 1979.
The study's purpose was to apply the appropriate city zoning for recently annexed areas including West Portland Park, Trio Addition, Comus Place, Mountain Fir and the Franciscan Condominiums. The process of study completion, review and adoption included several neighborhood meetings and public hearings.

The entire study area is bounded by SW Dickinson Street to the north, SW Stephenson Street to the south, SW 35th Avenue to the east and SW 55th Avenue to the west. The study dealt with several planning problems specific to this area:

1. The area was platted without taking into consideration the topography. This prevented development from occurring because many dedicated streets were too steep to build and because some lots would make precarious building sites;

2. While vacant land was a valued resource, necessary urban services were not available to support development and the area's topography and geology were obstacles to development;

3. The City of Portland and property owners both had multiple obligations dealing with annexation; and

4. The residents wanted to ensure the quality of the neighborhood but were opposed to increased density and improvements for which they would have to pay.

In addition to these problems, the study included examination of several issues which needed to be resolved before development could take place:

- Reconciling different residential zones (e.g., R5, R7, R10) and the possible numbers of households, people and automobile trips that would occur with different residential densities;

- Determining whether or not the proposed and existing sewage collection and treatment systems could handle these densities;

- Determining whether or not the proposed and existing street system could handle these densities;

- Examining how different densities would affect stormwater runoff and erosion and landslide potential; and

- Analyzing the effects of different densities on capital improvements and public expenditures.

Planning staff examined future transportation options, construction of sanitary sewers, storm drainage, fire and police protection for new and existing development and appropriate density for the newly annexed areas. The study conclusions and recommendations addressed these elements and provided recommendations for the following:

- Street vacations, improvements and design;

- Bicycle pedestrian improvements and safety;

- Planning for the area;

- Parks development and maintenance; and

- Crime prevention coordination for new development, including planned unit developments.

Terwilliger Parkway Corridor Plan
The City Council passed Ordinance No. 155241 in October 1983, adopting the *Terwilliger Parkway Corridor Plan.* Along with the plan, Council passed Ordinance 155245, adopting the *Terwilliger Parkway Design Guidelines*.
The plan was prepared by the consulting team of John Warner Associates, Ernest R. Munch and Nancy Fox in cooperation with the Bureau of Planning.

The planning process began when the Planning Commission directed the Bureau of Planning to perform a study of the Terwilliger Parkway. The study was recommended in response to problems and concerns encountered in 1980 during public hearings for a planned unit development (PUD) on Terwilliger Boulevard. These issues and concerns included access across the parkway, preservation of the parkway's character, buffering and protecting the Terwilliger Boulevard recreational path and design of buildings close to the parkway.

The completed plan includes polices for land use, landscaping, recreation, transportation, signs, capital improvements, boulevard and parkway maintenance and areas for public acquisition. The polices were developed to achieve the following goals:

1. Preserve and enhance the scenic character and natural beauty of Terwilliger Parkway and Boulevard;

2. Maintain and enhance unobstructed views from Terwilliger Boulevard and Trail;

3. Improve opportunities for a variety of recreational uses along Terwilliger and reduce conflicts between these uses;

4. Guide the siting, scale, landscaping, traffic impacts and design of new development to enhance the aesthetic experience of Terwilliger;

5. Manage the location and design of new vehicular and pedestrian access to Terwilliger in order to reduce traffic hazards and incompatible visual impacts;

6. Reinforce the primary transportation function of the parkway as a leisurely scenic drive and a bicycle commuting path, rather than a heavily used route for vehicular through traffic;

7. Improve public safety and protect citizens from crime; and

8. Reduce maintenance and improvement costs.

The *Terwilliger Parkway Corridor Plan* goals and policies are enforced under Comprehensive Plan Policy 2.22, Terwilliger Parkway Corridor Plan. This policy states: "Preserve and enhance the scenic character of the Terwilliger Parkway, Terwilliger Boulevard, and Terwilliger Trail by implementing the Terwilliger Parkway Corridor Plan and the Terwilliger Parkway Design Guidelines."

Historic Resources Inventory for the Far Southwest Neighborhoods
The Bureau of Planning completed an inventory of historic properties for the Far Southwest Neighborhoods in May 1984. The inventory was completed to satisfy the city's obligations for protecting historic resources as required by Statewide Planning Goal 5. The inventory for the city's southwest neighborhoods was the culmination of four years of field inventory and property ranking conducted by both planning staff and volunteers. The ten documents which constitute the citywide inventory are used in evaluating proposals for historic designation and for demolition.

Interim Resource Protection
In an effort to protect resources before completion of the city's Goal 5 resource protection plans, the City Council adopted Ordinance No. 163697, establishing the Interim Resource Protection Zone in Title 33, Planning and Zoning, of the City Code. A related ordinance (#163498) established a "Temporary Prohibition on the Disturbance of Forests" for areas where Goal 5 studies were underway. These regulations provide interim protection for natural and scenic resources until they can be reviewed as part of the Goal 5 update process. Upon implementation of the *Southwest Hills Resource Protection Plan,* the interim regulations were repealed and replaced by appropriate protection measures.

Balch Creek Watershed Protection Plan
In January 1991, the City Council passed Ordinance No. 163770, adopting the *Balch Creek Watershed Protection Plan*. The plan was completed to fulfill part of the city's Statewide Planning Goal 5 requirements. The purpose of the plan is to protect the natural resources of the Balch Creek Watershed. The plan covers the area north and adjacent to the *Southwest Hills Resource Protection Plan* study area.

Scenic Resources Protection Plan
In March 1991, as part of the city's Goal 5 resource protection work, the City Council adopted the *Scenic Resources Protection Plan.* The purpose of the plan is to protect significant scenic views, sites and corridors in Portland. Chapter 4 includes a discussion of the relationship between this plan and the *Southwest Hills Resource Protection Plan*.

Portland Future Focus

The City of Portland recently adopted the Portland Future Focus: Strategic Plan. The plan is a culmination of sixteen months work between the city and eighty citizens who served on a policy committee and working groups which dealt which specific topics (e.g., crime, managing growth). The purpose of the strategic plan is to guide the shared efforts of government, businesses, community organizations and citizens in ensuring a healthy city in the following decades.

The strategic plan includes an action plan for managing regional growth. Strategy #1 of this action plan is:

> "Maintain livability in the Portland Metropolitan region through an integrated planning process which focuses appropriate growth in the Central City, protects the natural environment and open spaces, strengthens cultural programs and enhances neighborhoods."

Several action items under Strategy #1 are consistent with the implementation of the *Southwest Hills Resource Protection Plan.* These action items include:

"1.2 Create a regional system of linked greenways and greenspaces. As part of its Metropolitan Greenspaces Program, METRO should institute a cooperative regional system of natural areas, open space, recreational trails, crop lands and greenways. The system should integrate landscape features, natural areas, wildlife refuges, rivers and streams. The Greenspaces network should be served by a regional trail system: the 40-Mile Loop, Chinook Trail and other trails.

1.3 Institute ecosystem protection, restoration and management program that integrates landscape ecology, protection of open space, wildlife refuge parks, crop lands and the maintenance of air and water quality with economic development. The programs should include waste management and recycling. Functions of the Bureau of Environmental Services, Planning, Parks and Recreation, Transportation and Water should be integrated as they relate to ecosystem protection."

The implementation of the *Southwest Hills Resource Protection Plan* will aid in reaching the goals of these actions items.

Public Facilities and Improvements

The *Southwest Hills Resource Protection Plan* area is served by the City of Portland service bureaus. The following is a brief discussion of the city's planned improvements and expansion of public facilities in the study area. Public works projects are also addressed in the General and Site-Specific Analysis of Economic, Social, Environmental and Energy Consequences (see Chapters 6 and 7).

Water Facilities
The Bureau of Water Works' *Capital Improvements Program (CIP) for FY 1991-1992 through 1995-1996* includes several maintenance and improvement projects for the southwest Portland water system. Water system improvements scheduled for fiscal year 1991-1992 include:

- Improvements to an existing pipeline from the Sellwood Pump Station to the Fulton and Carolina Pump Station; and

- Study and construction of a new pump station off the existing Washington County supply main.

Long term improvement projects include improvements to the Arnold Street pump main, the Capitol Highway water supply and the Garden Home Road main. The enhanced water supply and distribution capacity will be adequate to serve current and projected development in the Southwest Hills.

Sanitary Sewer Facilities
The Bureau of Environmental Services' *Sanitary Element* of the *Public Facilities Plan* was consulted to confirm potential improvements near resource areas. Most, but not all of the study area is served by public sanitary sewer collection and treatment facilities. The latest improvements to the sewer system were in the Arnold Creek neighborhood in the late 1970's. Several improvements are planned for the southwest sewer systems. These projects include:

- The Tryon Creek Wastewater Treatment Plan which includes work on diffuser modification, containment study, upgrading existing plant for automated operation and land purchases;

- Maintenance projects which include upgrading existing line from Cambridge Village to Fanno Creek interceptor;

- Improvements to storm drains and downstream drainageways and easements; and

- Relocation of sewer collector and interceptor lines for implementation of transportation projects.

The sanitary sewer systems and those areas within the city's combined sewer system have adequate capacity to serve the population through the year 2005. Long term planned improvements include:

- Improvements to the combined sewer system to augment line capacity and increase storage;

- In the Tryon Creek basin, completion of the Arnold Creek branch sewer system and rehabilitation of the current system; and

- In the Taylor's Ferry basin, improvements to the system and facilities.

Drainage Facilities
The *Drainage Element* of the city's *Public Facilities Plan* was consulted to determine where improvements to the drainage system may conflict with identified natural resources. The storm drainage system within the study area relies heavily upon the area's natural drainageways, roadside ditches, culverts and open channels to collect and transport stormwater. Most of the significant facilities identified are in good condition. Projected growth through 2005 will require additional capacity. This will take the form of instream stormwater storage and culvert facilities, storm sewers and improvements to existing culverts. Long-term projects include:

- Pipe construction and improvements in the Tryon Creek Basin (along Arnold Creek Rd., Maplecrest, and locations adjacent to Interstate Highway 5 and Highway 99 West) and in the Stephens Creek Basin (along Taylor's Ferry Road); and

- Stormwater storage facility improvements in the Tryon Creek Basin on Garden Street, south of Collins Court and on Arnold Street.

Transportation
The Bureau of Transportation's *Public Facilities Plan* was consulted to confirm potential improvement projects near resource areas. Most of short-term projects outlined in the *Transportation Public Facilities Plan* have been or will be completed during fiscal year 1991-1992. The short-term projects include:

- Road improvements: SW Terwilliger (from Sam Jackson to Capitol--construction of curbs, drainage inlets, retaining walls and street paving; Terwilliger Bridge to Interstate 5 (I-5)--new overpass bridge structure; SW Barbur Boulevard/ Terwilliger to I-5 ramps--ramp reconstruction

including SW Barbur from 5th to SW Canby; and SW Vermont/Capital Highway to 65th--reconstruction of SW Vermont Street; and

- Traffic Safety improvements on SW Multnomah Boulevard.

Long-term improvement projects are scheduled for after 1994. These projects consist of improvements along major city traffic streets, district collector streets and neighborhood collector streets. These projects include, but are not limited to, improvements to Taylor's Ferry Road, Macadam Avenue, Dosch Road and Barbur Boulevard.

Parks and Park Facilities

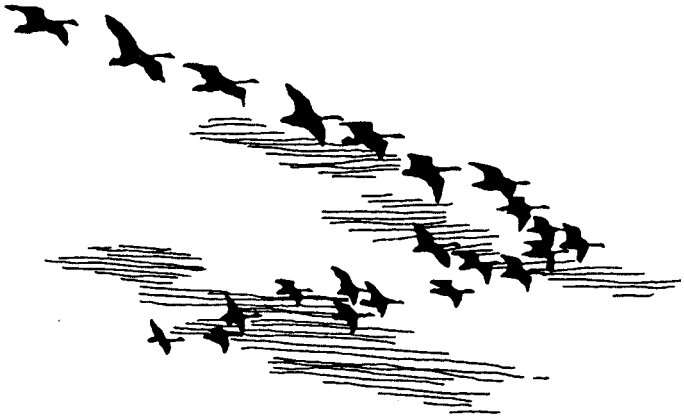
The Bureau of Parks and Recreation maintains the park land, facilities and trails in the study area. This responsibility includes the following parks and associated facilities: Hoyt Arboretum; Munger Park; Marquam Nature Park; Governor's Park; Council Crest; Hillsdale; DeWitt Park; George Himes Park; Fulton Park; Marshall Park; Albert Kelly Park; Portland Heights; Healy Heights; Haines Park; Maricara Park; Multnomah Art Center; and Woods Park. Capital improvements which are scheduled to begin after an environmental zone is applied to park land will be subject to environmental review.

Planning, Zoning, Building and Subdivision Control

The Portland Bureau of Planning is responsible for land use permits and reviews, zoning code administration, plan development and implementation, reviewing development plans and land divisions for compliance with the Comprehensive Plan, and regulating design of new developments. The Planning Bureau will implement the *Southwest Hills Resource Protection Plan* and use it to evaluate development proposals in the Southwest Hills.

Summary

The *Southwest Hills Resource Protection Plan* is the latest planning project undertaken for this part of the city. Past planning efforts emphasized preservation of neighborhood livability and character. These elements are present in this plan as are measures to balance preservation of natural resources with existing and potential development.



CHAPTER 4

POLICY FRAMEWORK

Introduction

This chapter presents the policy framework which guides the development and implementation of the *Southwest Hills Resource Protection Plan*. The discussion covers coordination with legislation and public agencies from the federal to the local level.

State

Statewide Planning Goals

Oregon's statewide land use planning program was established by Senate Bill 100 and adopted by the Legislature in 1973. The bill is included in the Oregon Revised Statutes (ORS) as Chapter 197. The legislation created the Land Conservation and Development Commission (LCDC) and gave it the authority to adopt mandatory Statewide Planning Goals. These goals provide the framework for Oregon's cities and counties to prepare and maintain comprehensive plans. There are 19 Statewide Planning Goals, 14 of which apply to the Southwest Hills.

After local governmental adoption, comprehensive plans are submitted to the Department of Land Conservation and Development (DLCD) for review to ensure compliance with and implementation of the Statewide Planning Goals. A comprehensive plan is acknowledged by DLCD when it is found to comply with the goals. The City of Portland's Comprehensive Plan was adopted by City Council in 1980, effective January 1, 1981, and acknowledged by DLCD in May 1981.

Periodic Review

In 1981, the Legislature amended ORS Chapter 197 to require periodic review by the State of acknowledged comprehensive plans. As stated in ORS 197.640 (1), the purpose of periodic review is to ensure that each local government's comprehensive plan and land use regulations are in compliance with the Statewide Planning Goals and coordinated with the plan and programs of other state agencies. Under Chapter 197, new Statewide Planning Goals or Rules adopted since a comprehensive plan was acknowledged must be addressed in the Periodic Review. In the fall of 1981, subsequent to acknowledgement of the city's Comprehensive Plan, the Land Conservation and Development Commission adopted, as part of the Oregon Administrative Rules Chapter 660, Division 16: Requirements and Application Procedures for Complying with Statewide Planning Goal 5. The steps through which a jurisdiction must proceed in order to comply with Goal 5 include:

- Inventory resource sites;
- Analyze the economic, social, environmental and energy (ESEE) consequences of resource protection; and
- Determine the level of protection required for the resource.

The *Southwest Hills Resource Protection Plan* updates the city's Comprehensive Plan inventory and analysis of wetlands, water bodies, open spaces and wildlife habitat areas in the Southwest Hills and addresses the new administrative rule requirements.

Statewide Planning Goal 5
Goal 5 requires cities and counties "to conserve open space and protect natural and scenic resources." Oregon Administrative Rules (OAR) Chapter 660, Division 16 is the administrative rule local governments must follow in meeting Goal 5 responsibilities. Division 16 states a three-step resource evaluation and protection process.

An inventory of resources is the first step. This involves determining the location, quantity and quality of the resources present. If a resource is not important, it may be excluded from further consideration for purposes of local land use planning, even though state and federal regulations may apply. If information is not available or is inadequate to determine the importance of the resource, the local government must commit itself to obtaining the necessary data and performing the analysis in the future. At the conclusion of this process, all remaining sites must be included in the inventory and are subject to the remaining steps in the Goal 5 process.

The next step is identification of conflicts with protection of inventoried resources. This is done primarily by examining the uses allowed in broad zoning categories. A conflicting use, according to OAR 660-16-005, is one which, if allowed, could negatively impact the resource. These impacts are considered in analyzing the economic, social, environmental and energy (ESEE) consequences of resource protection.

The final step is adoption of a program to preserve identified resources.
If there are no conflicting uses for an identified resource, a jurisdiction must adopt policies and regulations to ensure that the resource is preserved. Where conflicting uses are identified, the economic, social, environmental and energy (ESEE) consequences of resource protection must be determined. The impacts on both the resource and on the conflicting use must be considered as well as other applicable statewide planning goals. The ESEE analysis is adequate if it provides a jurisdiction with reasons why decisions are made regarding specific resources.

Other Applicable Statewide Planning Goals
There are 19 Statewide Planning Goals. Of these, 14 apply to the Southwest Hills study area. Some of these goals establish a decision-making process, such as Goal 1, Citizen Involvement, and Goal 2, Land Use Planning. These procedures were applied during the preparation, review and presentation of this protection plan.

Goals 3 through 14 address specific topics. These topics include: agricultural lands; forest lands; air, water and land resources quality; areas subject to natural disasters and hazards; recreational needs; economic development; housing; public facilities and services; transportation; energy conservation; and urbanization. Uses addressed by these goals are identified in this plan as conflicting with natural resource protection and require analysis under OAR 660-16-005. This protection plan incorporates the requirements of these goals with the ESEE analysis.

The requirements of Statewide Planning Goal 15, the Willamette River Greenway, were addressed in the *Willamette River Greenway Plan* (1987). Statewide Planning Goals 16, 17, 18 and 19 address coastal and ocean resources and therefore do not apply to the Southwest Hills.

Local

The City of Portland Comprehensive Plan
The city's Comprehensive Plan provides a coordinated set of guidelines for decision-making to guide future growth and development of the city. The Comprehensive Plan is implemented through the use of land use and public facilities policies, the Comprehensive Plan map, and the city's regulations for development and redevelopment, including the Zoning Code. The City Council, City Planning Commission, and city's hearings officers make all decisions affecting the use of land in conformance with the Comprehensive Plan. Since the State acknowledged the city's Comprehensive Plan in 1981, land use decisions in conformance with the policies and objectives of the Comprehensive Plan are in compliance with the Statewide Planning Goals. The *Southwest Hills Resource Protection Plan's* policies, objectives and recommendations are consistent with and further implement the Comprehensive Plan Goals and Policies. Several comprehensive plan policies are discussed, including their relationship to the Southwest Hills.

Portland Comprehensive Plan Goal 2 - Urban Development
The purpose of Goal 2 is maintenance of Portland's role as a major regional employment, population and cultural center through public policies that encourage expanded opportunity for housing and jobs, while retaining the character of established residential neighborhoods and business centers. Policy 2.22 "Terwilliger Parkway Corridor Plan" provides preservation and

enhancement of the Terwilliger Parkway, Terwilliger Boulevard and Terwilliger Trail. This policy is implemented through the Terwilliger Parkway Design Guidelines. The guidelines are discussed below.

Portland Comprehensive Plan Goal 3 - Neighborhoods
The purpose of Goal 3 is to "preserve and reinforce the stability and diversity of the city's neighborhoods while allowing for increased density in order to attract and retain long-term residents and businesses and insure the city's residential quality and economic vitality." Policy 3.6 "Neighborhood Plan" ensures maintenance and enforcement of neighborhood plans adopted by the City Council. There are two neighborhood plans included in the policy framework for the *Southwest Hills Resource Protection Plan:* the *Corbett-Terwilliger-Lair Hill Policy Plan (1977)* and the *Marquam Hill Policy Plan (1977)*. Development proposals in these neighborhoods are reviewed against the polices of these plans.

Portland Comprehensive Plan Goal 4 - Housing
The City of Portland is responsible for providing certain housing densities to meet its proportionate share of housing opportunities within the metropolitan area. Lands excluded from the housing goal consist of areas located in a floodway, 100-year flood plain, where land hazards are present, and in areas zoned Residential Farm/Forest (RF). This goal was addressed in the application of the environmental overlay zone in areas with housing development potential.

Portland Comprehensive Plan Goal 8 - Environment
The purpose of Goal 8 is to "maintain and improve the quality of Portland's air, water and land resources and protect neighborhoods and business centers from detrimental noise pollution." The policies and objectives of this goal generally meet or exceed the requirements of Statewide Planning Goal 5. Ordinances adopted through 1991 added new Comprehensive Plan Goal 8 policies committing the city to regulate development in groundwater areas, drainage ways, natural areas, scenic areas, wetlands, riparian areas, water bodies, uplands, wildlife habitats, aggregate sites, and in areas affected by noise and radio frequency emissions. These ordinances also established new Goal 8 objectives, which commit the city to:

- Control hazardous substances;
- Conserve aquifers, drainage ways, wetlands, water bodies, riparian areas, and fish and wildlife habitat;
- Prioritize properties for public acquisition;
- Coordinate city regulations with similar regulations state, federal and other local governments;
- Avoid harm to natural resources;
- Mitigate unavoidable harm to protected natural resources;
- Maintain vegetative cover;

- Improve water quality; and
- Prevent soil erosion and stormwater flooding.

The Remaining Portland Comprehensive Plan Goals
There are seven additional Comprehensive Plan Goals. These goals address metropolitan coordination, economic development, transportation, energy, citizen involvement, plan review and administration, and public facilities. As with the Statewide Planning Goals, required procedures were applied in the preparation, review and presentation of this Protection Plan.

Lair Hill Historic Conservation District
The City Council designated the Lair Hill neighborhood as the Lair Hill Historic Conservation District on August 7, 1977. The district was adopted to encourage the conservation and maintenance of the historical and architectural integrity of the neighborhood. Included with adoption of the district was establishment of the Lair Hill District Advisory Council. The council developed and recommended guidelines and criteria for development and/or preservation within the conservation district. These guidelines are the *Lair Hill Historic Conservation District Design Guidelines*. Development subject to design review in the district is reviewed against these guidelines.

Terwilliger Parkway Design Guidelines
In October 1983, the City Council adopted the *Terwilliger Parkway Design Guidelines*. The guidelines were developed to implement the *Terwilliger Parkway Corridor Plan*. The project involved two years of work by the Portland Parks Bureau and the Bureau of Planning. Development in the design zone in the Parkway is subject to design review using these guidelines.

Macadam Plan District
The Macadam Plan District was adopted in 1985 to implement the *Macadam Corridor Study.* The plan district contains regulations designed to preserve and promote the unique character of the Macadam area. Development standards include but are not limited to floor area ratio, view corridors and signs. All development within the district boundaries is subject to design review using the *Macadam Corridor Design Guidelines (1985).* The plan district is in Chapter 33.550 of the city's Planning and Zoning Code.

Scenic Resources
City Council adopted the *Scenic Resources Protection Plan* on March 20, 1991.
The plan's purpose is to preserve significant scenic resources. The plan consists of policy language, zoning regulations and maps that direct and regulate actions so that designated scenic resources are protected and enhanced for future generations. The plan protects specific scenic views, sites and corridors in compliance with Statewide Planning Goal 5.

The *Scenic Resource Protection Plan* identifies eight scenic corridors that are located within the boundaries of the *Southwest Hills Resource Protection Plan*. These designated scenic corridors are SW Canyon Road, SW Fairmount Drive, SW Skyline and Terwilliger Boulevards, SW Macadam Avenue, SW Taylors Ferry Road, Washington Park and the Zoo Train route from the Washington Park Zoo to the Rose Gardens.

A scenic corridor is defined as a linear scenic resource that may include streets, bikeways, trails or waterways (rivers, creeks, sloughs) through parks, natural or urban areas. The corridor may include scenic views along it, but may also be valued for its intrinsic scenic qualities such as a winding road through a wooded area. All development and vegetation within areas with a scenic corridor designation are subject to special regulations. The scenic corridor designation is intended to preserve and enhance the scenic character along corridors, and where possible, scenic vistas from corridors. This is accomplished by limiting the length of buildings, preventing development in side setbacks, screening mechanical equipment, and restricting signs.

The Southwest Hills study area also includes several scenic sites and views. These include, but are not limited to, Lewis and Clark College and SW Fairmount Drive. The location of scenic sites and viewpoints in the Southwest Hills can be found in the *Scenic Resources Protection Plan*.

When an environmental zone has been applied at the location of a designated scenic resource, the environmental review must include consideration of the scenic qualities of the resource as identified in the ESEE Analysis for Scenic Resources. The development standards of the *Scenic Resources Protection Plan* should be considered as part of that review.

The analysis of the *Scenic Resources Protection Plan* is incorporated by reference and is not repeated in the ESEE analysis in this report. Scenic value was only one factor weighed in the Bureau of Planning's decisions to recommend environmental protection for sites in the Southwest Hills. Scenic corridor development standards have already been adopted in the *Scenic Resources Protection Plan*.

Bureau of Buildings

The Bureau of Buildings, Plumbing Division, administers on-site septic systems requirements. Since portions of the Southwest Hills study area are not served by public sewer, development in those areas requires the use of on-site systems. Septic system requirements include a maximum 30 percent slope, adequate percolation, and generally over one-half acre of land (with less than 30 percent slope and adequate soils). The Bureau of Buildings also oversees geotechnical regulations for the city. Development on lands of severe landslide potential, for example, requires a geotechnical survey.

Bureau of Environmental Services
The Bureau of Environmental Services is currently performing a city-wide erosion control study. Eventually, all development in the Southwest Hills will employ the erosion control guidelines in the *Erosion Control Plans Technical Guidance Handbook.*

Regional

Metropolitan Greenspaces Program
The Metropolitan Greenspaces Program is underway to identify and protect natural areas within the Portland metropolitan area and Clark County, Washington. The project's study area includes the Southwest Hills. The program is a cooperative effort with cities, counties, special districts, nonprofit environmental and conservation organizations, and citizens. The goal is to establish a regional system of natural areas, parks and open spaces which are connected by trails and greenways.

METRO Regional Urban Growth Goals and Objectives
In addition to the Greenspaces Program, the Metropolitan Service District (METRO) has developed the *Regional Urban Growth Goals and Objectives,* adopted by the METRO Council on September 26, 1991. Goal 2 "Natural Environment" states:

> "Preservation, use and modification of the natural environment of the region should maintain and enhance environmental quality while striving for the wise use and preservation of a broad range of natural resources."

Objective 9, Natural Areas, Parks and Wildlife Habitat, requires local governments to acquire, protect and manage (1) open spaces to provide passive and active recreational opportunities, and (2) an open space system providing habitat for native wildlife and plant populations. Strategies 9.1 and 9.2 require local governments to accomplish several tasks to meet this objective. The development and implementation of the *Southwest Hills Resource Protection Plan* addresses the following strategies:

9.1 Open Space Assessment: This strategy calls for local governments to establish quantifiable targets for setting aside certain amounts and types of open space. The city's Goal 5 update process implements this strategy.

9.2 Corridor Systems: This strategy calls for the development of interconnected recreational and wildlife corridor systems within the metropolitan region. The *Southwest Hills Resource Protection Plan* will assist with achieving this objective through the preservation of natural areas where passive recreational opportunities exist. The individual site

inventories included in the *Southwest Hills Resource Protection Plan* will also aid in the development of recreational and wildlife corridors. This strategy also requires a detailed biological inventory of the region to be maintained to establish an accurate baseline of native wildlife and plant populations. The resource inventory contained in the *Southwest Hills Resource Protection Plan* provide new data for the regional inventory.

Metropolitan Housing-OAR Chapter 660 Division 7
In addition to regional coordination with METRO, the city is responsible for meeting its share of regional housing densities. Oregon Administrative Rules Chapter 660 Division 7 assures "opportunities for the provision of adequate numbers of needed housing units and the efficient use of land within the Metropolitan Service District (METRO) urban growth boundary, to provide greater certainty in the development process and so to reduce housing costs." The development and implementation of the *Southwest Hills Resource Protection Plan* will not prevent the city from meeting its housing density obligations.

Federal

The Federal Clean Water Act applies primarily to water resources in the Southwest Hills. The Act's primary objective is to maintain and restore physical, chemical and biological integrity of the nation's waters, including wetlands. Another objective of the Act is "to maintain a balanced indigenous population of species." The objectives of the *Southwest Hills Resource Protection Plan* are consistent with these objectives.

Permitting Agencies
Federal and state governments, as well as special districts, have jurisdiction over wetland modification. Following is a brief synopsis of the agencies involved, and their roles as they relate to the wetlands and water bodies.

<u>Oregon Division of State Lands</u>: In accordance with ORS 541.605 - 541.695 and 541.990, a state permit is required for any activity that proposes filling, removal or alteration of 50 cubic yards or more of material within the bed or banks of the waters of Oregon. This includes wetlands, defined as those areas that are inundated or saturated by surface or groundwater frequently enough that, under normal circumstances, they would support vegetation typically adapted for life in saturated soil conditions.

<u>U.S. Army Corps of Engineers</u>: The Clean Water Act, primarily through the Section 404 process, requires a permit for the dredge or fill of material into the waters of the United States.

Permits which are proposed for issuance by the Corps of Engineers under the Section 404 process are subject to review by the U.S. Environmental Protection Agency (EPA) and the U.S. Fish and Wildlife Service (USFWS). All three agencies have memorandums of understanding on the Section 404 process, and either the EPA or USFWS can pursue "elevation" of the 404 permit when in disagreement with the Corps over issuance.

U.S. Environmental Protection Agency: Under Section 309 of the Clean Water Act, EPA reviews environmental impact statements required for all developments involving federal funding and assessed as having significant impacts on the environment.

Summary

This chapter examined the policy framework within which the *Southwest Hills Resource Protection Plan* is developed and implemented. This framework includes compliance with Statewide Planning Goal 5 and Portland Comprehensive Plan Goals and Policies for the environment. Coordination with regional and federal agencies and regulations will occur during implementation.

CHAPTER 5

AREAWIDE INVENTORY OF NATURAL RESOURCES

- INTRODUCTION
- RESOURCE FUNCTIONS AND VALUES
- GEOLOGY
- SOILS
- TOPOGRAPHY AND SLOPES
- GROUNDWATER
- VEGETATION
- WILDLIFE
- MINERAL AND AGGREGATE RESOURCES
- SUMMARY

Introduction

This chapter presents the general inventory of natural resources of the Southwest Hills. The chapter begins with geologic resources and generally proceeds from the ground up; that is, from bedrock to soil, continuing up to vegetation and wildlife. Each resource subsection begins with a summary of inventory method and principle reference materials, and then presents an overview of resource characteristics including an overview of its location, quality and quantity.

Historic, scenic, educational and recreational resources are examined together with site-specific natural resources in the Site Summaries section in Chapter 7 of this report. Technical terms used in this section are defined in the Glossary (Appendix B).

Resource Functions and Values

The Southwest Hills forest protects and conserves important resources such as watersheds and soils. Forest vegetation moderates the effects of winds and storms, stabilizes and enriches the soil, and slows runoff from precipitation, thereby minimizing erosion and allowing the forest floor to filter out sediments and nutrients as the water soaks down into groundwater reserves or passes into streams. By decreasing runoff and increasing groundwater infiltration, the forest protects downstream neighborhoods from flooding. Also, by stabilizing the soil and reducing runoff and erosion, the forest protects the community from landslides and other land hazards.

By protecting watershed resources in this manner, the forest also protects habitat for terrestrial and aquatic organisms. The different layers of tree tops, branches, trunks, shrubs and plants on the forest floor provide breeding, feeding and refuge areas for many species of insects, birds and mammals. The forest cover helps to maintain stream flows, filter out potential pollutants and moderate stream temperatures, thereby sustaining viable habitat for fish, amphibians and aquatic organisms as well as protecting an important upland water source for terrestrial wildlife. Also, by filtering out water pollutants, the forest maintains good quality drinking water for local residents who use wells. The ability of these diverse and interdependent elements of the forest community to function properly is an important measure of the general health and vitality of the local environment. A healthy forest ecosystem is crucial to the forest's value as a scenic, recreational and educational resource, and to its continued contribution to Portland's high quality of life.

The forest provides additional values which accrue to local landowners and broader segments of society. The dense, coniferous and deciduous forest acts as a buffer from the sights and sounds of the large urban metropolis. The

forest mutes the noise of highways and nearby industrial activities and absorbs some air pollutants caused by auto and industrial emissions. The forest also moderates climate extremes. The microclimate of the forest, created in part by the shade of the vegetation and the transpiration of water from the leaves, keeps surrounding air at an even temperature. The forest thus acts as a natural "air conditioner" for adjacent residential areas, cooling the air during the day and warming it at night.

Natural resources described in this chapter all interact with one another and are interdependent elements of a complex natural system. Resources described in the following subsections, though reviewed individually, should be understood as interconnected strands of a complex ecological web.

Geology

Information on the geologic history of the Southwest Hills was compiled from four principal sources: *Portland Physiographic Inventory* (Redfern 1976), *Portland's Changing Landscape* (Price 1987), *Forest Park: One City's Wilderness* (Houle 1988), and *Open File Report 0-90-2: Earthquake-Hazard Geology Maps of the Portland Metropolitan Area, Oregon* (Madin 1990). Data on depth, thickness and water-bearing characteristics of geologic units is presented in Table 1 and Table 2.

The Portland Hills (Tualatin Mountains) are a narrow northwest-trending, complexly-faulted range that rises about 1,000 feet above the Tualatin and Portland basins on either side. The major events leading to the formation of these hills began 16 million years ago during the Miocene period. Volcanic fissures far to the east of Portland began discharging hundreds of cubic miles of molten lava which flowed through an ancient Columbia River Gorge, flooding the Willamette River Basin region. The solidified lava, known today as Columbia River Basalt, covered the Scappoose Formation, a siltstone and shale deposit which had formed 22 million years ago when the Portland area was submerged under marine waters. Today, after millions of years of weathering, the basalt measures roughly 700 feet in depth below the West Hills (Madin 1990; Houle 1988).

Geologic disturbances continued through the late Miocene period, when the present-day Cascade and Coast Ranges were formed. During the same period, a large upheaval of the Columbia River basalt base, under what is now Portland, created the Tualatin Mountain ridge and simultaneously formed the Portland and Tualatin valleys. The same mountain-building disturbances caused the formation of numerous parallel and transverse high-angle faults, and several southeast-dipping thrust faults along the ridge. The valley floors settled over the course of several million years until, in the Pliocene period,

their basins breached, forming eddies in the Columbia River into which large quantities of quartzite and granite river rock were deposited. Today these deposits, known as the Troutdale Formation, cover the original basalt layer along the lower half of the West Hills and provide an excellent aquifer (Madin 1990; Price 1987).

Later in the Pliocene period, the West Hills themselves became volcanically active. Small volcanoes at several locations along the Tualatin Mountain ridge began erupting Boring Lava, evident today in a layer of grey basalt found around these volcanoes.

The last major activity affecting the Southwest Hills area was the wind-blown deposition of up to 100 feet of loess, known as Portland Hills Silt. This silt was eroded from the Columbia River flood plain, carried down the gorge, and finally wind-deposited on the West Hills. Massive late Pleistocene flooding eroded this silt away from all areas below 300 feet, but replaced it with Lacustrine deposits of silt and sand. In the more recent geologic past, silt and sand (alluvium) deposits were formed along the Columbia and Willamette River flood plains (Madin 1990).

The presence of Portland Hills Silt along the Tualatin Mountains has important implications for land use and development. This silt becomes very unstable when wet, and the potential for slope failure is particularly high after winter rains have saturated the soil (Madin 1990). Landslides, mud slides and slumps are common on steep areas in the West Hills. These slope failures, often associated with logging and building activities, have substantially altered the face of the hillside over the last century.

Soils

Soils in the Southwest Hills belong to the Cascade-Goble series, as identified in the Multnomah County Soil Survey (Soil Conservation Service 1983). This soil group is comprised predominantly of silt loam high in aluminum-rich volcanic ash weathered from the parent material, Columbia River Basalt.

Approximately 90 percent of the study area is made up of Cascade and Cascade-Urban soils. Cascade soil is somewhat poorly-drained dark-brown silt loam to a depth of about eight inches, below which is a dark-brown silt loam subsoil about 19 inches thick, with a substratum of silt loam forming a dark-brown, mottled fragipan to a depth of 60 inches or more (SCS 1983:23). This fragipan is a hard, brittle soil layer with low permeability: a hardpan that impedes percolation of groundwater, causing a thin groundwater table to develop, perched above the regional water table. The fragipan layer restricts rooting depth for plants to 30 to 48 inches. The Cascade silt loams have severe limitations for building site development and sanitary facilities.

According to the Soil Conservation Service (SCS), this means that "soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, major soil reclamation, special designs or intensive maintenance is required" (SCS 1983:98).

Approximately five percent of the study area is made up of Cornelius soils. This soil is made up of moderately well-drained silt loams on remnants of terraces that have been dissected and are rolling. The surface layer is dark-brown silt loam about eight inches thick, below which is a substratum of a brown, mottled, silt loam fragipan to a depth of 60 inches or more (SCS 1983:32). Permeability is slow and effective rooting depth is limited by the fragipan layer.

Approximately two percent of the study area is made up of Delena silt loam. This poorly drained soil occurs on broad, high terraces. The surface layer is mottled, very dark grayish brown silt loam about 13 inches thick, with a subsoil of mottled, dark grayish brown over grayish brown silty clay loam about 10 inches thick. The substratum is a mottled, grayish brown silty clay and variegated silty clay loam fragipan to a depth of 60 inches or more (SCS 1983:36).

Topography and Slopes

The eastern face of the Tualatin Mountain range is dissected by creeks and creek channels flowing eastward to the Willamette River. In the study area, the terrain rises sharply from the lowlands near Willamette River to the crest of the hills (over 1,000 feet in elevation in certain places), with some slopes in excess of 50 percent. The western face of this range, by contrast, slopes more gently into the Tualatin Valley.

A physiographic inventory of Portland (Redfern 1976) classified slopes in excess of 30 percent as generally having "severe landslide potential." Between 60 and 75 percent of the upland slopes within the study area exceed 30 percent. Slopes of only 15 percent have been known to fail in the West Hills, particularly during the saturated soil conditions prevalent in mid-winter (Redfern 1976). In determining areas with "severe landslide potential," Redfern included slopes of less than 30 percent which had a history of failures (e.g., major slumps and landslides).

Groundwater[1]

Information of groundwater resources was compiled from U.S. Geological Survey (USGS) publications, Multnomah County Soil Conservation Service (SCS), and the *Portland Physiographic Inventory* (Redfern 1976). Water-bearing characteristics of geologic units are shown in Table 1. Groundwater resource data for the Tualatin Mountains and the Willamette River Flood Plain are presented in Table 2.

Southwest Hills Groundwater Reserves

The regional groundwater table in the Southwest Hills area rises in elevation from the valley floor, but at less of a gradient than the ground surface.

Residences and farms use groundwater in the Tualatin Mountains (Redfern 1976). Extensive use of groundwater reserves can result in a draw down of the water table. This, in turn, can impact watershed resources and aquatic life, particularly during the summer months when creek flow levels are largely dependent on groundwater contributions at the same time that farm and residential groundwater use are typically at their peaks.

Also, as water is withdrawn, materials making up the groundwater aquifer may become compacted resulting in a loss of storage capacity and subsidence of the land surface. Land subsidence may cause structural damage to buildings, roads, bridges, buried cables and well casings. A decline in groundwater levels also results in higher pumping lifts and lower well yields, both of which result in higher pumping costs.

As noted in the discussion on soils, the Cascade-Goble silt loams on the Tualatin Mountains develop a fragipan layer that impedes the downward movement of groundwater. The fragipan layer occurs between 2.5 and 4.5 feet below ground. Above the fragipan, a shallow, "perched" groundwater table develops, particularly during the rainy winter months. Shallow groundwater can create natural hazards, particularly when tapped or daylighted by road or building cuts. It can precipitate landslides and cause soil creep, with potentially serious consequences for development. Groundwater is also susceptible to pollution from a variety of sources: septic drain field effluent, pesticides, herbicides, fertilizers, solid waste leachate, and runoff from parking lots and other impervious surfaces. Groundwater can pass these pollutants into local creeks and degrade aquatic habitat.

---

1 Groundwater is a "non-site-specific" resource as noted in the Goal 5 Administrative Rule. It is important to remember that it is a complex natural system interconnected and interrelated with other parts of the Columbia-Willamette watershed ecosystem.

TABLE 1: Water-bearing Characteristics of Geologic Units
(Adapted from Hegenson 1962)

Rock Unit	Type of Material	Area(s) of Occurrence	Water-bearing Character
Columbia River Basalt	Dark basalt in accordantly layered flows that range from about 10 to 150 ft. thick	Throughout (at depth), exposed in and near creek beds.	Permeable zones at contacts between some flow layers yield moderate to large amounts of water to wells that penetrate the basalt below the regional water table, and lesser amounts of perched groundwater to wells and springs above the regional water table.
Troutdale Formation	Unconsolidated and partly consolidated gravel, sand, silt, and clay, commonly in the form of well-indurated sandy conglomerate.	At lower elevations in West Hills; overlain by quaternary alluvium.	Layers of loose sand gravel below the regional water table yield moderate to large amounts of water to wells and springs; similar beds above the regional water table yield smaller, less dependable supplies of perched ground water.
Alluvium	Principally silt and clay.	Willamette River flood plain.	Yields only small amounts of water to wells.
Younger Alluvium	Gravel, sand, silt, and clay, rudely stratified. Mostly well sorted beneath the flood plains of larger rivers; less sorted near smaller streams.	Flood plains of perennial streams.	Layers of well-sorted gravel and sand yield large amounts of water to wells; less sorted and finer materials yield smaller amounts.

TABLE 2: Groundwater Resource Data (after Redfern 1976)

Area	Principal water yielding formation	Depth to top of formation	Formation thickness	Range of yield	Recharge	Water quality problems/notes
Southwest Foothills of Tualatin Mountains	Valley Fill Portland Hills Silt	0 feet	0-100 feet	low 0-5 feet	• infiltration	Quality • moderately hard Potential Problems • septic contamination • overuse
	Boring Lava	0-36 feet	0-350 feet	low 0-20 feet	• infiltration • migration from overlying & underlying formations	Quality • soft to moderately hard Potential Problems • septic contamination
	Troutdale Formation	0-400 feet	180 to over 500 feet	low to moderate 0-50 feet	• infiltration • migration from other formations	Quality • moderately hard Potential Problems • local overuse
	Columbia River Basalt	100-630 feet	No data	low to moderate 0-100 feet	• migration from other formations	Quality • high chloride Potential Problems • saline contamination
Southern Willamette River Flood Plain	Quaternary sand and gravel (Oaks Park/ Ross Island Area)	0-70 feet	70 feet?	moderate to large 1000+	• infiltration • migration from Willamette River • migration from terraces	Quality • high in organics • locally contaminated by landfill by Oaks Bottom • underlying formations unexplored

TABLE 2: Groundwater Resource Data (continued) (after Redfern 1976)

Area	Principal water yielding formation	Depth to top of formation	Formation thickness	Range of yield	Recharge	Water quality problems/notes
Tualatin Mountains (Portland Hills)	Portland Hills Silt	0 feet	0-150 feet	low	• infiltration	Quality: no data Potential Problems: • septic drainfield pollution
	Boring Lava	0-80 feet	0-350 feet	low	• infiltration •migration from Portland Hills Silt	Quality: no data Potential Problems: • septic drainfield pollution • overuse (locally)
	Troutdale Formation	0-400 feet	180 to over 500 feet	low to moderate	• infiltration • migration	Quality: • moderately hard • water only in thin beds
	Columbia River Basalt	0-150 feet	430 to over 1,000 feet	low to high • usually 2 to 300 gallons per minute	• infiltration • stream infiltration • migration from neighboring formations	Quality: • moderately hard to hard • high chloride Potential Problems: • saline contamination from underlying formation

Vegetation

Information of plant communities, successional patterns and general vegetation resources was compiled from several sources. Data on vegetation types, distribution and resource values was gathered through aerial photo-interpretation and on-site reconnaissance. Field surveys were conducted throughout the study area between September, 1990 and January, 1992. Current scientific literature on the subject was consulted during this time, with primary sources including *Natural Vegetation of Oregon and Washington* (Franklin and Dyrness 1973), *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973), "Forest Park--One City's Wilderness: Its Wildlife and Habitat Interrelationships" (Houle 1982) and "Portland Bureau of Planning Goal Five Study: West Hills" (Lev 1986).

Community Characteristics

The eastern slopes of the Tualatin Mountains are clothed by coniferous forest of the *Tsuga heterophylla* (western hemlock) vegetation zone.[2] This zone extends throughout the wet, mild, maritime climate of British Columbia, western Washington and Oregon. A vegetation zone, as defined by Franklin and Dyrness (1973), delineates a region of essentially uniform macroclimatic conditions with similar moisture and temperature gradients where one plant association predominates. The lowlands immediately adjacent to the forest are part of the more prairie-like Willamette Valley Zone. Emergent, scrub-shrub and forested wetland plant communities reside along some of the creeks and in the palustrine wetlands that occur within the study area.

Western hemlock and western red cedar *(Thuja plicata)* are considered climax species within the Western Hemlock Zone based on their potential as dominants. The subclimax Douglas fir *(Pseudotsuga menziesii)*, however, tends to dominate large areas within this region. Historically, Douglas fir has dominated forest regeneration over much of the zone in the last 150 years (Munger 1930, 1940).

While virtually all of the plants characteristic to the Western Hemlock Zone occur in the Tualatin Mountain forests, two less common hardwood species, bigleaf maple and red alder, have become widely established as a result of repeated disturbance to the natural vegetation caused by logging, development and brush fires. Over time, these events have depleted nutrients from the soil. The depletion of nutrients, coupled with the depletion of mycorrhizal fungi which help to process nutrients for plant uptake and are particularly important to conifers, has given the hardwoods an edge over the firs, cedars, and hemlocks. Pioneer species such as red alder,[3]

---

2 Evidence of historic vegetation types is presented in Houle (1982) and Munger (1960).

3 Red alder helps to heal degraded land by replenishing the soil with nutrients: they can provide 40-150 kg/ha of nitrogen per year. Alders also colonize sites that are plagued by laminated root rot

alder,[3] above above a species common only in riparian areas under natural conditions, quickly colonize these disturbed areas and are now widely established on the upland slopes. Thus, past disturbances have strongly influenced the composition of the plant communities in the Southwest Hills.

The *Tsuga heterophylla/Polystichum munitum* (western hemlock/sword fern) association generally characterizes the herb-rich community found in the Southwest Hills forests.[4] Overstory species of this association typically include Douglas fir, western red cedar and western hemlock. The understory is dominated by a lush growth of herb species including sword fern, wild ginger, inside-out flower, Oregon oxalis, trillium, Smith's fairybells and deerfern. Shrubs occurring in the understory include red huckleberry, Oregon grape, trailing blackberry, Wood's rose and salmonberry (Franklin and Dyrness 1973:58)

Forest Succession

Early observations of Portland's Tualatin Mountains point to the dynamic pattern of successional stages active within the forest community over the past two centuries. The predominantly old growth coniferous forest that William Clark, of Lewis and Clark, recorded in 1806 has been transformed through logging and fire into a younger, mixed hardwood/coniferous forest (Munger 1960). Despite these disturbances, signs of a returning Western Hemlock climax forest community are widely apparent. The forest types occurring in the Southwest Hills can be seen as a sequence of successional stages of forest regeneration following logging and fire. These stages closely parallel those of the Western Hemlock Zone as described by Franklin and Dyrness (1973) and Hall (1980). Six distinct successional stages are evident within the West Hills; their patchwork distribution reflects the location, degree and chronology of past disturbances.

Houle (1982) describes the stages of the West Hills forest succession as: *Grass-forb, Shrub, Hardwood with young conifer, Hardwood topped by conifer, Mid-aged conifer,* and *Old growth* vegetation types (see Figure 1 below).

The *grass-forb* stage is comprised of low, herbaceous plants such as fireweed, bracken fern, and Canadian thistle which initially colonize an area after removal of vegetation. This stage lasts approximately two to five years and

---

and facilitate regeneration of the pre-existing plant community. Recent studies have shown that alders serve as hosts to mycorrhizal fungi, the same fungi which colonize Douglas fir roots, process nutrients and enable the trees to grow (Norse 1990).

4 Related West Hills plant associations include *Tsuga heterophylla/Berberis nervosa/Polystichum munitum, Tsuga heterophylla/Athyrium filix-femina, Tsuga heterophylla/Tiarella trifoliata, Tsuga heterophylla/Holodiscus discolor,* and *Tsuga heterophylla/Gaultheria shallon.*

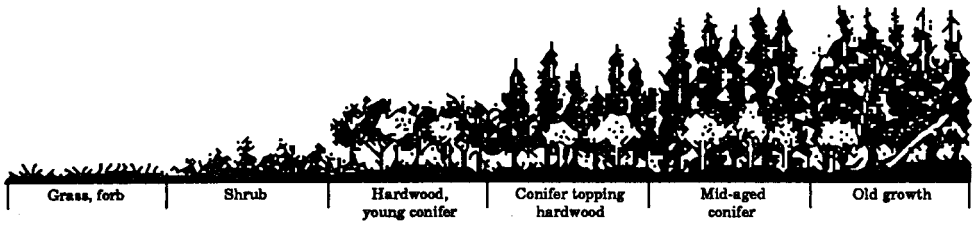


Figure 1. Stages of Southwest Hills forest succession

Figure 1. Stages of Southwest Hills forest succession

occurs along roads, power-line right-of-ways and in open fields throughout the study area.

The early seral *shrub* stage often develops as a thicket of such species as thimbleberry, salmonberry, blackberry, red huckleberry, salal and Indian plum. This stage typically lasts between three and ten years, but will persist as long as 30 years in the absence of conifer regeneration.

The *hardwood with young conifer* stage is a young, vigorous broadleaf forest predominantly made up of red alder and big-leaf maple, though often includes bitter cherry, black cottonwood and juvenile Douglas fir. Understory species include sword fern, Oregon grape and red elderberry. This young, second growth forest usually occurs ten to 35 years following a disturbance.

The fourth stage of succession, *conifer topping hardwood,* is still a vigorous, though now mixed, hardwood and conifer forest. While the alders and maples approach 100 feet in height during this stage, conifers, primarily Douglas fir, break through the hardwood canopy and grow to heights of 180 feet or more. Characteristic conifer species also include young western red cedar and western hemlock. This mixed stage of second growth forest follows 30-80 years after disturbance and is the most widely distributed vegetation type within the study area.

The next successional stage, *mid-aged conifer*, is dominated by Douglas fir. Young, shade-tolerant western hemlock, western red cedar and pacific yew are gradually making their way up through the understory, while some of the older hardwoods such as alder and cherry, are beginning to fall to the forest floor. Sword fern, salal, Oregon grape, red huckleberry and vine maple thrive as the older trees begin to fall. Eighty to 250 years have passed since the last major disturbance.

If the forest is left undisturbed following the mid-aged conifer stage, it progresses into an old growth forest community. The *old growth* stage is self-perpetuating and will continue indefinitely unless fire, logging or other disturbances set back the forest to an earlier stage of succession. Though western hemlock and western red cedar are climax species, long-lived seral species can remain a component of the community for several hundred years.

Several small areas within the study area are beginning to develop old growth characteristics such as the presence of large snags and downed logs in various stages of decay.

Special Features

The Tualatin Mountain forest is home to several special or unique flora features. The following discussion illustrates some of these features; others are described later in the report in connection with wildlife, scenic and educational resources.

Several species have special merit for other reasons. The pacific yew *(Taxus brevifolia)*, for example, is an exceptionally slow growing climax tree species most abundant in ancient forests of the Pacific Northwest. In recent years, a cancer-fighting substance known as "taxol" was discovered in the bark of the yew. Taxol has proven effective in fighting ovarian cancer[5] and early results indicate that the substance may also prove effective for treating leukemia and colon, lung, mammary, prostrate and pancreatic cancers (Wood 1990, Norse 1990). In September, 1990, a petition was filed with the U. S. Fish and Wildlife Service to list the pacific yew as a threatened species under the Endangered Species Act.

The western wahoo *(Euonymous occidentalis)* inhabits moist, creekside habitats in the Southwest Hills and is common in Tryon Creek State Park. The wahoo was placed on the "1976 Provisional List of Rare and Endangered Plants in Oregon." Its populations have now substantially recovered.

The forest as a whole represents a unique urban amenity. The West Hills provide a fine example of the Pacific Northwest's western hemlock forest community, unique among all temperate forests in the world (Waring and Franklin 1979).[6] In addition to its value as a recreational, educational and scenic resource (to be discussed later), the forested hills also help to define Portland as a place and contribute to the identity of the region.

Wildlife

This section provides a general overview of wildlife habitats and wildlife use of the Southwest Hills; more detailed information is contained in Chapter 7 and in the completed Wildlife Habitat Assessment (WHA) survey forms on file at Bureau of Planning offices. Wildlife resources were inventoried using WHA forms developed by a team of local biologists. Field surveys were

---

5 Ovarian cancer kills 12,400 women annually in the United States (High Country News 11/19/90).

6 The western hemlock forest of the Pacific Northwest has the greatest biomass accumulation of any plant community in the temperate zone and in it are found the largest and (usually) longest lived species of conifers within the zone.

conducted throughout the study area between September, 1990 and January, 1992. Resource experts and current scientific literature on the subject were consulted during this time, with primary sources including "Forest Park--One City's Wilderness: Its Wildlife and Habitat Interrelationships" (Houle 1982), "Portland Bureau of Planning Goal Five Study: West Hills" (Lev 1986), and *Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington* (USDA Forest Service 1985). Information on rare, threatened and endangered species was obtained from resource agencies.

Wildlife/Habitat Interrelationships

Wildlife use different portions of the Southwest Hills forest habitat to complete different portions of their life cycle such as mating, feeding and denning. The vegetative structure of the habitat (e.g., downed logs, snags, herb, shrub and tree layers) is a key factor in determining the distribution and abundance of wildlife (Thomas 1979). Each stage of forest succession in the Southwest Hills (see previous section) has its own specific structure. Wildlife species have known preferences for structural components found in distinct successional stages and use these vegetative types to meet all or part of their life cycle requirements (Maser and Thomas 1978; Harris 1984).

Mineral and Aggregate Resources

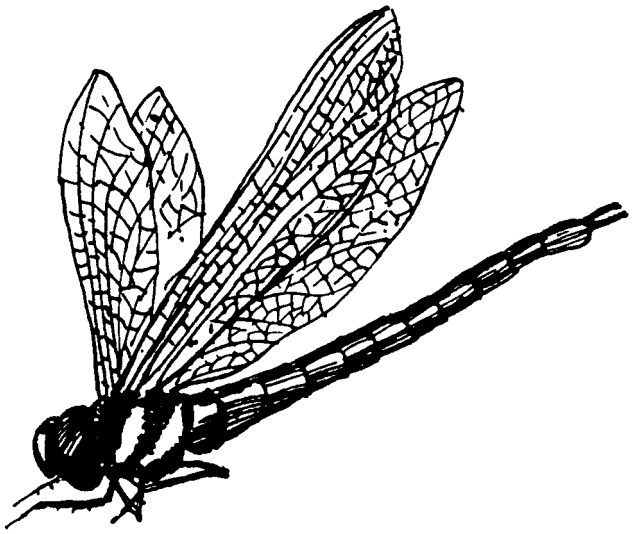
Mineral and aggregate resources in the Portland metropolitan area are identified in the 1988 *Mineral and Aggregate Resources Inventory* (MARI). This document, together with amendments to the Comprehensive Plan Policies and Zoning Code adopted in 1982, satisfies Statewide Planning Goal 5 requirements for mineral and aggregate resources.

Based on information collected from the State Department of Geology and Mineral Industries and the 1980 City Inventory of Aggregate Resources, no aggregate sites were identified within the Southwest Hills project study area.

Summary

The geologic history of the Southwest Hills can be traced back over 16 million years and includes a dramatic sequence of major flood events. Geologic formations store the area's groundwater and form the parent material for the soils covering the Southwest Hills. The balanced relationship between the area's geologic formations, soils and groundwater features is protected by the extensive canopy cover and root system of the forest which shelters and stabilizes the hillside slopes. Activities which disturb this fragile relationship can substantially degrade resource values by causing landslides, flooding, erosion and sedimentation. Groundwater and precipitation feed the many

creeks which drain the eastern slopes of the Southwest Hills. These creeks provide habitat for fish, amphibians and other aquatic organisms and, in turn, a source of food and water for terrestrial wildlife. The mosaic of Southwest Hills forest types provides a range of habitat for a diverse population of indigenous wildlife. These interacting, interdependent elements play vital roles in protecting the balance, health and vitality of the Southwest Hills forest and watershed ecosystem.



CHAPTER 6

GENERAL ANALYSIS OF ECONOMIC, SOCIAL, ENVIRONMENTAL AND ENERGY CONSEQUENCES OF RESOURCE PROTECTION

- INTRODUCTION
- COMPATIBLE USES
- CONFLICTING USES
- ECONOMIC CONSEQUENCES
- SOCIAL CONSEQUENCES
- ENVIRONMENTAL CONSEQUENCES
- ENERGY CONSEQUENCES
- APPLICABLE STATEWIDE PLANNING GOALS
- SUMMARY

Introduction

This section analyzes the land use consequences of protecting Southwest Hills[7] natural resources or allowing these resources to be diminished or lost.
Statewide Planning Goal 5 states that "programs shall be provided that will 1) insure open space, 2) protect scenic and historic areas and natural resources for future generations, and 3) promote healthy and visually attractive environments in harmony with the natural landscape character." According to the Oregon Administrative Rules (OAR) Chapter 660, Division 16, the next step in the Goal 5 process after resource inventory is identification of potential land use conflicts with inventoried resources. This is done primarily by examining the uses allowed in broad zoning categories. A conflicting use is one which, if allowed, could negatively impact the resource. These impacts are considered in analyzing the economic, social, environmental and energy (ESEE) consequences of protecting the resource fully, allowing the conflicting use fully, or allowing the conflicting use with conditions which would lessen the adverse impacts.

If there are no conflicting uses for an identified resource, State law requires the jurisdiction to adopt policies and regulations to ensure that the resource is preserved. Where conflicting uses are identified, the ESEE consequences must be determined. Impacts on both the resource and conflicting use must be considered. Other applicable Statewide Planning Goals are also considered in the discussion of impacts. The ESEE analysis is adequate for purposes of meeting Administrative Rule standards if it provides a jurisdiction with reasons why decisions are made regarding the protection of specific resources.

Chapter 660, Division 16, of the OAR outlines the steps to be followed in complying with Goal 5. However, the administrative rule provides limited direction as to what factors should be considered as having potential economic, social, environmental or energy consequences. This is due to the fact that relevant ESEE factors vary greatly, depending on the type of resource that is being evaluated and potential conflicting uses that are allowed.

The following section examines land uses and activities permitted by existing zoning. Uses which are compatible with resource protection are described first. An analysis of the general consequences of resource protection to both the resource and existing or potential land uses in the Southwest Hills follows. Additional site-specific impacts are discussed in the next chapter which summarizes individual resource sites and their values. It is the combination of these general and individual site consequences which is used to arrive at the conclusions in this plan regarding the level of protection for resource sites, and the Southwest Hills forest ecosystem as a whole.

---

7 Here and in the following text, "Southwest Hills" refers to the Southwest Hills study area.

Compatible Uses

Compatible uses are those that can be conducted in a manner which would not result in resource degradation. Three uses allowed by present zoning are compatible with every resource in the Southwest Hills. These uses are the following:

1. Aesthetic enjoyment of natural features from existing roads and trails;

2. Educational use of natural areas by individuals and groups; and

3. Low intensity recreation on established trails or roads, such as walking, hiking and nature observation.

Conflicting Uses

Conflicting uses are those uses which are incompatible with natural resource protection but allowed by present City of Portland zoning. The following uses pose conflicts with identified resources as allowed under existing zoning: housing, commercial businesses, industrial development, agriculture, forestry, landscaping, intensive/consumptive recreation, developed open space and public facilities and utilities. These uses and their impacts on natural resources are described in the Environmental Consequences section of this chapter.

Economic Consequences

In general, the economic consequences of protection of a resource will involve a comparison of the value of the resource to the economic impact to the local jurisdiction and the region if the land were used for development permitted by zoning. Economic factors considered in this analysis include the impacts on property values and development potential; impacts on development costs and savings; impacts on the city's business climate and on quality of life; impacts on the tax base; impacts on tourism and convention-related activities; impacts on infrastructure improvement and maintenance costs; impacts on recreation-oriented business; and impacts on farm and forest uses.

Property Values and Development Potential
Property values are largely determined by demand. Market demand, in turn, is a product of many factors, including development potential and aesthetics, character, and desirability of a property and surrounding neighborhood.

For the purposes of this study, development potential is defined as how much development can be placed on a property. Protecting natural resources may reduce development potential if it cannot be redistributed elsewhere on site through such mechanisms as clustering or planned unit development. All zones in the Southwest Hills planning area have floor area ratios or unit density limits which allow transfers or redistribution to take place on site, unless entire properties were precluded from development. Industrial uses are not allowed by right on the commercial-zoned lands in the Southwest Hills. However, some industrial uses such as warehouse and freight movement are allowed in the CG zone and may be affected by resource protection measures. These effects may include limiting expansion of business into resource areas.

Aesthetics, character and natural resource amenities are intrinsic values and difficult to quantify. They represent amenity values that increase demand, and therefore land prices, in a particular area. Districts in Portland acknowledged as desirable today and commanding higher average residential dwelling prices than the average citywide (Eastmoreland, Alameda, Overlook, the West Hills, etc.) all have natural resources as major amenities (e.g., street trees, parks and open spaces, creeks). Protection of these amenities can result in increased property values over areas having no natural resource amenities. Even in industrial areas such as the Koll Business Center in Beaverton, natural resource amenities have been integrated into the development in such a way as to increase its desirability, and therefore value. "Reflections at Summer Creek" in Beaverton is an example of a residential development with a stream corridor passing through it that was protected as a natural amenity and successfully marketed that way.

Numerous studies have illustrated the positive effects on property values resulting from parks and natural area protection:

- Economic Research Associates of San Francisco recently found in a review of several studies that inclusion of greenspaces in new developments increased land values of surrounding properties and accelerated the absorption of real estate.[8]

- In a Philadelphia study property values were shown to decrease proportionally with distance from open space: the 1,294-acre Pennypack Park accounted for 33 percent of the land value at a 40-foot distance, 9 percent of the value at 1,000 feet and only 4.2 percent at 2,500 feet.[9]

---

8 Steven E. Spickard, Economic Research Associates The Economic of Greenways Paper presented at the 1991 Country in the City Conference (Portland, Oregon).

9 T. R. Hammer, et al. "The effect of a Large Urban Park on Real Estate Values," Journal of American Planning Association 40 (1974): pp. 274-277.

- A study of property values near greenbelts in Boulder, Colorado showed that housing prices declined an average $4.20 for each foot a house was located away from a greenbelt. The study concluded that, other factors held constant, the average value of property adjacent to the greenbelt would be 32 percent higher than those 3,200 feet away.[10]

- The Boise River Greenbelt in Idaho was shown to be directly responsible for property improvements which raised the appraised value of properties within the Greenbelt to over $200 million. Property values of undeveloped land were $26,000 to $34,000 per acre near the Greenbelt versus $10,000 to $17,000 elsewhere.[11]

- Another study suggests that properties adjacent to protected woods have a faster selling time. Hunters Brook, a 142-unit cluster development set aside 97 acres of pine forest to be protected in common open space. Care was taken to preserve the rural character of the setting and to encourage a herd of deer and hundreds of birds to remain. Homes were found to be easier to sell because of their proximity to the protected woods.[12]

While differences exist between the above mentioned study areas and Portland, the results of these studies indicate that green spaces and natural areas located near real estate add an amenity value.

Protecting resources fully would not necessarily have an adverse impact on Portland's ability to meet its Comprehensive Plan housing obligations. Resource protection measures exist in the Zoning code which include development standards for resource areas. However, precluding development under all conditions would reduce opportunities of choice in the market place. This could possibly drive up housing costs throughout the metropolitan area due to unmet demand.

Development Costs and Savings

Development in Southwest Hills involves spending more time and money than in other, flatter areas of Portland. Builders and developers incur costs associated with building on steep land and unstable slopes. Land use reviews are currently required for development within 25 feet of a water feature (e.g., creek, drainage) and within forests protected by interim forest regulations. These review processes are repealed within the Southwest Hills planning area as part this plan's implementation. In most cases, the environmental zones and corresponding review processes will replace these regulations.

---

10 Mark Correll et al. "The Effects of Greenbelts on Residential Property Values: Some Findings on the Political Economy of Open Space." Land Economics, May 1978.

11 John D. Cooper, Director of Parks, Boise, Idaho 1989.

12 "Cluster Builders' New Enticement: Adjacent Woods." New York Times, May 8, 1987.

Existing reviews, and those proposed by this plan, include fees for processing, and potential mitigation and additional site planning requirements which involve extra time and money. In addition, development in or near resource areas may involve the use of consultants (e.g., architects, soil engineers) to guide development.

These costs are often offset by the scenic, recreational and other values natural resources contribute to a development. The presence of natural resources (e.g. trees, creeks, vegetation, wetlands) may increase the value of a potential home site. These features may also add to the final sales price of a home. Clustering dwellings on a site to conserve resources can also yield savings. This type of development involves lower expenditures on road and utility construction because of the reduced distance to access properties with infrastructure.

Tax Base

Tax base to local jurisdictions is directly related to market value of land. As property values fluctuate, property taxes vary in direct proportion. One exception to this rule is the case of special tax assessments. Some West Hills property owners currently have such assessments for open space, farm or forest deferral. As mentioned in the previous section, market values of both land and improvements are likely to increase as a consequence of resource protection. The assessed value of improvements will normally follow this change in market value. For properties where development opportunities are restricted under the Protection Plan, however, land assessments may not be significantly affected or may be reduced.

Business Climate and Quality of Life

According to corporate real estate executives, "quality of life" issues are now as important as cost when choosing new office or factory locations.[13] A location which will help attract and retain key personnel was cited as the most important factor in choosing new office locations and the fifth most important in choosing manufacturing locations.[14] The Joint Economic Committee of the United States Congress reports that a city's quality of life is more important than purely business-related factors when it comes to attracting new businesses, particularly in the high-tech and service industries.[15]

Recently, Portland was ranked the third-best city in the United States to locate a business by the 1990 Cushman & Wakefield Monitor, an annual nationwide

---

13 San Fransisco Chronicle, June 8, 1989.

14 Ibid.

15 Fact Sheet: Sign Control and Economic Development, Scenic America, Washington, D.C. November-December 1987.

survey of 400 chief executive officers on economic and business-related issues. According to Thomas Usher, Cushman and Wakefield senior vice president, quality of life was a key factor in Portland's high popularity. The extensive scenic and recreational opportunities provided in the Southwest Hills contribute to Portland's high quality of life and to the city's attractiveness as a place to do business.

Commercial areas in southwest Portland, especially those along Macadam Avenue and Barbur Boulevard, have access to the scenic views and aesthetic character of the nearby hills.

Tourism and Convention-Related Impacts

Several parks in the Southwest Hills draw thousands of tourists each year. Attractions such as Washington Park, the Japanese Gardens and the Hoyt Arboretum are major components in the overall network of open spaces and natural areas which help define Portland as an integrated urban and natural environment with a "country in the city character." Protection of these scenic and natural resources provides tourists opportunities for recreation and sightseeing while in Portland.

Environment-related conferences often use Portland because of easily-accessed natural resources within the city limits. The 1990 Country-in-the-City Symposium, attracting international participants, used the Willamette River and Johnson, Fanno and Balch Creeks which border the Southwest Hills planning area as field sites for conference sessions. The recent 1991 Symposium included field trips and workshops through Oregon State parks and the Willamette Greenway. Conferences such as County-in-the-City draw participants and speakers from the metropolitan area and around the country.

Dollar expenditures on tourism and convention-type activities are difficult to identify. However, in 1988, Defenders of Wildlife conducted a survey of Oregon households on the economic impact of nongame wildlife and concluded that an average annual household expenditure of about $348 was attributed to travel and over $600 to photography and optical equipment directly related to wildlife enjoyment.[16] Tourist or convention-related activities related to these expenditures could occur in the city within protected natural resource areas.

In summary, natural resources within the City of Portland can provide a local destination for tourists or a reason for locating a conference or convention in the city. This, in turn, can bring significant money into the local economy.

---

16 "Nongame Wildlife Assessment Survey." Defenders of Wildlife, 1988.

Infrastructure Costs and Land Hazards
Resource protection measures can assist in reducing the costs of providing and maintaining infrastructure. Measures designed to protect resources can also guide development away from areas subject to landslides and flooding. Clustering development away from steeps slopes and natural drainages reduces the expenditures necessary for construction and maintenance of infrastructure. Guiding development closer to existing infrastructure also reduces the costs of providing services to properties (e.g., police, fire protection, roads, sewer and water).

Flood levels and landslide hazards can be reduced or managed through the protection of natural resources and open space. Resource protection can reduce public health and safety hazards caused by flooding and landslides. Storm drainage infrastructure costs can be minimized by allowing open spaces and wetlands to provide flood retention and detention, and aquifer recharge. Road and public utility repair costs resulting from landslide damages can be reduced through resource protection. Development in landslide-prone areas requires more expensive solutions for initial construction, as well as increased maintenance costs.

Recreation
Retaining and enhancing recreational opportunities through resource protection can also have a significant impact on local business sales. According to a 1988 survey conducted for the Defenders of Wildlife, Oregon households spent an average of over $8,600 on recreation activities related to nongame wildlife. Of these annual expenditures, over $2,300 (photographic and optical equipment, bird seed, clothing, magazines and books, landscaping for wildlife, boats, etc.) could be used on wildlife-related activities in Portland, and $1,100 (same as above except for boats) in the Southwest Hills. Similar studies have also illustrated a positive economic impact on local businesses as a result of expenditures on recreation activities.

Forest Uses
Resource protection can have positive economic impacts as a result on some forest uses (e.g., recreation, wildlife observation, open space and watershed protection) and can have negative impacts on forestry activities. Commercial forestry operations and wood lot practices are economic activities permitted in the Open Space zone (OS), the Residential Farm/Forest zone (RF), and in the Limited Single Dwelling zone (R20). Commercial forestry is also allowed as a conditional use in the Low Density Single Dwelling (R10) and in the Medium Density Single-Dwelling (R7). Lots with either the R10 or R7 zoning designation are often not large enough to support a commercial forestry operation.

With the exception of RF, lands in the study area are zoned with one of the above zones. Lands zoned for open space uses in the study are under both

private and public ownership. Much of the land zoned R20 also has a R10 Comprehensive Plan designation. Parcels which have a R10 Comprehensive Plan designation are designated for future residential development on lots of 10,000 square feet.

Prior to implementation of this Protection Plan, interim forest regulations applied to properties greater than two acres in size in the Southwest Hills. Forest operations in areas subject to these interim regulations are subject to review but limited forestry would be permitted. The interim regulations are repealed upon implementation of the Protection Plan.

Farm Uses
Under present zoning, agricultural opportunities are limited to areas zoned R20, Limited Single Dwelling Residential. Lands zoned R20 are interspersed within the study area. Lots in the study area vary in size from one-half acre to nine acres. Steep slopes make some of these areas uneconomic for agriculture. In some areas, small lot sizes also constrain opportunities for commercial agricultural activities. Resource protection will not have negative economic impacts on existing agricultural operations but may affect opportunities for new or expanded uses.

Summary
Protection of natural resources will have both positive and negative economic impacts. Positive impacts include retention and increase of natural amenities, which increase property values, accelerate the absorption of new real estate, bolster the tax base, attract tourists, conferences, business and industry, result in more efficient use of public services and utilities, and increase recreation opportunities and expenditures.

Potential negative impacts are high in commercial zones, where development potential is limited by land area. While there are potential positive economic impacts on residential development, potential negative impacts can also be significant, particularly if development cannot be redistributed elsewhere on the site. Negative impacts on agriculture and forestry are limited to new or expanded activities. Impacts on residential, commercial and other uses are analyzed on a site-by-site basis in Chapter 7.

Social Consequences

Social consequences considered in this analysis include impacts on recreation and environmental education opportunities; impacts on historic, cultural and aesthetic values; regional identity and local landscape character; impacts on incompatible land uses; impacts on housing and education; and impacts on public health, safety and welfare.

Recreation and Environmental Education Opportunities
The Southwest Hills contain several regional parks. These include, but are not limited to, Washington Park and the Zoo, Rose Gardens, Japanese Gardens, Hoyt Arboretum, Marquam Nature Park and Tryon Creek State Park. The parks provide public greenspaces where visitors can recreate and enjoy the natural amenities of the Pacific Northwest. Unique attractions such as the Japanese Gardens and the Hoyt Arboretum provide visitors the opportunity to examine and learn about Northwest and Japanese horticulture here in Portland.

Protection of Southwest Hills forest and open space resources will retain and increase the recreational and educational values of the parks. Ecological management will ensure that most of the "nature park" resources will remain undisturbed and its forests allowed to mature into an condition which will enhance the urban wilderness experience of park users. Retention and increase in abundance and diversity of native wildlife will mean greater aesthetic pleasure and educational benefits for area residents, and can interest and entice citizens to do things to enrich the environment. Recreational and educational values will continue and perhaps increase over time and will be preserved for the enjoyment of future generations.

Historic, Cultural and Aesthetic Values
The Southwest Hills have historic, cultural and aesthetic values. Many residents have chosen to live in the area because of the presence of resources such as forest and open space, the numerous birds and other wildlife, and the country-in-the-city atmosphere provided by these resources. The Southwest Hills natural resources provide a valuable link between natural and urban processes.

In addition to the aesthetic values of natural resources, the Southwest Hills have historic and cultural value as well. The study area contains numerous historic sites and scenic views, sites and corridors. These resources contribute to both the historic character and culture of the area. Resource protection measures would preserve these resources and their values which are identified in the site summaries found in Chapter 7.

Without resource protection, these historic, cultural and aesthetic values may be diminished or lost. Development which degrades or destroys natural resources of the Southwest Hills would reduce the intrinsic heritage and scenic value of the area.

Regional Identity
The forested Southwest Hills form a backdrop to the city, helping to define Portland as a place and contributing to the identity of the region. Portland is known around the country for its Rose Gardens and attractions such as the

Japanese Gardens and Hoyt Arboretum. Continuation and enhancement of natural resources will add to the image of Southwest Portland neighborhoods and the identity of the Portland region, while their destruction would result in loss of identity, and therefore uniqueness, character and value.

Screening and Buffering of Incompatible Uses
Natural resources act as an edge between different land uses, separating and buffering them from each other both visually and physically. Protection of natural resources allows for incompatible land uses to locate more closely with less potential for conflicts. Forest cover and/or native vegetation can be used as a natural buffer between land uses so extra landscaping will not be needed to buffer uses.

Housing and Education
The residential development potential under present zoning and Comprehensive Plan designations would have a positive effect on housing and a positive effect on education by enhancing the school district tax base. School districts would also benefit from the protection of natural areas for field trips. Short-term employment would increase in the construction trade and home service industries.

Protection of natural resources will have negative effects on housing and education if development is prohibited or cannot be redistributed elsewhere on site through such mechanisms as clustering or planned unit development. Clustering of development can also reduce police and fire response times. Only where entire properties are precluded from development, or where residential densities are reduced through zone changes, would resource protection have significant adverse impacts on housing and education.

Public Health, Safety and Welfare
Protection of natural resources located on steeply-sloped hillsides will protect the general public from possible disasters caused by landslides and floods. This reduces potential demand on disaster relief agencies and bureaus (and subsequent demand on tax dollars), as well as individual expenses for replacement of destroyed property and treatment for injury. Retention of the abundance and diversity of native wildlife will also control and reduce populations of disease-carrying pests such as rats.

As the metropolitan area grows over the next decade, the preservation and maintenance of the area's green spaces will be crucial to maintaining the population's health. Green spaces such as those in the Southwest Hills provide people with opportunities for recreation and exercise. People can also go to these spaces to escape the stresses of urban life. The parks, trails and natural open spaces of the Southwest Hills provide such amenities for keeping a growing population physically and psychologically healthy.

Summary
Protection of natural resources in the Southwest Hills will result in generally positive benefits in terms of continued and enhanced recreation and environmental education opportunities; preserved historic, cultural and aesthetic qualities; enhanced sense of place, uniqueness and character; increased protection from incompatible land uses; protection from disasters, and reduced disaster relief costs. Housing and education values will diminish only where resource protection reduces or eliminates opportunities for residential development. These and other social impacts are discussed further in Chapter 7 of this report.

Environmental Consequences

Natural resource functions and values were outlined in Chapter 5. This section provides further information on resource values and analyzes the impact of general human activity on these values. Impacts of individual conflicting uses are analyzed at the end of the section.

Overview of Water Resources and Impacts
The Southwest Hills forest protects watershed values. Forest vegetation, wetlands, creeks and drainageways act as filters, cleansing water and maintaining water quality within the watershed. Soils, humus and organic matter on the forest floor filter and absorb surface water runoff, which recharges groundwater reservoirs and reduces erosion caused by surface runoff. Groundwater discharge, in the form of springs and seeps, supplies water to creeks and wetlands and helps sustain surface waters during low flow periods. Wetlands, water bodies and adjacent flood plains provide flood storage and desynchronization, reducing overall flood levels. Vegetation traps sediment from surface runoff, provides soil anchoring, and absorbs certain hazardous chemicals and heavy metals, thereby reducing water pollution and turbidity. Vegetation also dissipates erosive forces of surface runoff, allowing deposition of suspended solids and increasing bank stabilization, which both increase water quality. Protection of these resources maintains the physical, chemical and biological integrity of the Southwest Hills forest and watershed ecosystem.[17]

The construction of buildings and impervious surfaces and other human activities which disturb or remove natural resources such as forest vegetation and soils can affect watershed resources in the following ways:

- *Increases in erosion, sedimentation and landslides;*

[17] This is a primary objective of the Clean Water Act, as noted in Chapter 4.

- The unstable soils and steep slopes of the Southwest Hills become highly susceptible to erosion, slumping and failure when forest cover is removed and when cuts and fills are made for roads and buildings;
- These activities can result in public safety hazards and can degrade wildlife habitat and increase sediment transport, creekbed siltation and degradation or loss of fish spawning grounds.

- *Decreases in creek flows during dry months;*
  - Reduced forest cover and increased impervious surfaces reduce groundwater recharge and lower the volume of water in creeks contributed by groundwater during low flow periods;
  - This may alter stream characteristics by causing portions of affected creeks to dry up earlier in the season, removing a local source of water and moisture essential to the survival of fish, amphibians and aquatic organisms, and preventing salmonids from reaching spawning grounds.
- *Increases in peak runoffs;*
  - Increased impervious surfaces increase surface runoff, reduce vegetative detention functions and compact soils, resulting in increased peak flows;
  - Increased peak flows increase erosion, bank undercutting, creekside landslides, sediment transport, siltation of spawning beds and flooding.
- *Increases in creek temperature;*
  - Heated runoff from roads, roofs and compacted soils combined with reduced vegetative cover raise summer water temperatures;
  - Water temperatures in the high 60°s and 70°s can be lethal to salmonids and are likely to reduce fish runs (ideal temperatures for salmonids are between 56°F and 62°F); high water temperatures can also degrade habitat for amphibians and other aquatic organisms.
- *Increases in water pollution;*
  - Septic drain fields can contaminate ground and surface waters;
  - Pesticides, herbicides and fertilizers applied to agricultural crops or landscaped areas can pollute groundwater and nearby creeks;
  - Contaminants from commercial, industrial and other urban uses can degrade surface and groundwater quality;
  - Leaks (oil, gas, tar, antifreeze, etc.) from autos and farm equipment, heating and cooling systems, and roofs also degrade water quality;
  - Dirt and mud eroded from cultivated land or deposited from autos and farm equipment can drain into nearby creeks and contribute to sedimentation.

Overview of Plant and Animal Resources and Impacts

Plants provide food and cover for fish and wildlife. Their roots, bark, foliage, nuts and fruits provide food for a variety of wildlife species. Twigs, leaves and bark are used for nest building and insulation. Large trees, especially

snags, are prime perch sites for hawks and owls which feed on small mammals on the ground below. Although plants are at the bottom of the food chain, they are a crucial element of the entire system. Algae in the Southwest Hills creeks is eaten by tiny macro-invertebrates, which are in turn eaten by fish and amphibians, which may be eaten by herons, kingfishers or other birds. On land crickets, beetles and small mammals feed on vegetation, and in turn provide food for raptors and larger mammals.

When vegetation begins to die and decay, it becomes home and food to mites, earthworms, fungi and millipedes which aid in the decomposition process. The older Southwest Hills forest has complex structure with multi-layered canopies, dead and downed logs, large trees and snags. Hollow trees laying on the ground provide cover for rabbits and voles, salamanders and snakes. Tree trunks lying partially submerged in a creek or pond provide cover and shading for fish, attachment sites for aquatic insects, sunning areas for western pond turtles, snakes and dragonflies.

The vegetative cover and waterways provide travel corridors for the fish and animals. Safe access to and along the waterways is crucial. Habitat diversity and connectivity between the habitats is the key to a healthy ecosystem. Interspersion of the Southwest Hills natural areas with surrounding forests and natural areas is critical to its continued viability as habitat for wildlife. Interspersion provides opportunities for migration and recruitment of wildlife which sustains the flow of genetic material and reduces vulnerability to disease, predation and local extinction.

The following environmental changes and human activities degrade natural resources of the Southwest Hills forest ecosystem:

- Loss of vegetation;
- Replacement of native vegetation with invasive species or lawns;
- Escape and encroachment of exotic plants (e.g., ivy, holly) into forest;
- Replacement of vegetation with ecologically barren buildings, fences, driveways, parking lots, other impervious surfaces, etc.;
- Reduced groundwater recharge through impervious surfaces;
- Reduction of the structural diversity of forest plant communities;
- Removal of dead vegetation in all strata (creek, ground, tree canopy);
- Erosion and deterioration of stream banks;
- Litter and garbage in water courses and along trails;
- Presence of domestic cats, dogs and destructive human activity;
- Increasing human population density and noise;
- Leaching of toxic materials, deposition of sewage, leaching of herbicides, pesticides and fertilizers from cultivated landscapes;
- Fences and streets which limit wildlife access and passage; and
- Noise, light and other development impacts which disturb the breeding and predator instincts of terrestrial animals.

Resource protection would have a positive effect on ecologically significant forests, fish and wildlife habitat, riparian areas, streams, wetlands and groundwater resources. Flood storage, desynchronization functions and groundwater recharge and discharge functions would be enhanced. Hazard areas would be avoided and natural heritage values would be protected. Minimum and maximum stream flows would be maintained within suitable ranges. Nutrient trapping and removal functions would be maintained and enhanced. Open space, recreation opportunities and scenic values would be retained. The erosive forces of flooding would also be dissipated and sediment trapping functions would be enhanced. Water purity and water quantity would be maintained and eventually increased.

Environmental Impacts of Conflicting Uses

Human activities alter stream erosion processes, sedimentation patterns, nutrient flows and water quality. They also create changes to drainage patterns, soil chemistry, plant and animal communities. Ten such activities or "conflicting uses" have been identified in the Southwest Hills: agriculture, forestry, landscaping, housing, businesses, industry, developed open space, recreation and public facilities and utilities. If these uses actually occurred at the intensities allowed by city land use regulations, without mitigating measures to protect resources, they would diminish or destroy identified values of one or more resources in the Southwest Hills. The impacts of each conflicting use on natural resources are analyzed in this section. Where the same impacts are identified for different conflicting uses, the text references the first appearance of the impact analysis and, when appropriate, does not repeat that analysis.

1) <u>Agriculture</u>

Agricultural uses are allowed by right in the city's Limited Single Dwelling (R20) zone. Clearing of vegetation, plowing of fields, exposing bare soils and other farm practices cause erosion which degrades water quality and can adversely impact aquatic habitat for fish and amphibians.

The conversion of forest to farm land replaces diverse forest plant communities with only a few cultivated species. Forest cover is needed to prevent the synchronization of flood events, to prevent bank erosion and to prevent silting of stream beds. Forest cover is also needed to reduce maximum and increase minimum stream flows to maintain proper levels. Forest leaf mass and decaying organic matter on the forest floor function as a sponge, trapping and absorbing rainwater during wet periods and releasing stored water during drier periods. Cover removal may also precipitate landslides which pose hazards to people and property.

Preparing land for planting or grazing often includes filling of wetland areas and removal of riparian vegetation from stream banks. This increases stormwater runoff and eliminates the purifying effects of vegetation.

Vegetation is particularly valuable on farmland where herbicides, fertilizers and pesticides are used because it acts as a filter, cleansing runoff which can degrade habitat and harm aquatic wildlife. These chemicals may also contaminate groundwater reserves. Animal fecal contamination occurs as a result of pasture use and has similar environmental effects.

Agriculture also takes irrigation water from streams and wells. Extensive use of groundwater can result in draw down of the water table, which in turn can reduce creek flows. Adequate water flow levels are needed to support fish, amphibians and aquatic organisms. Reduced water flows can also reduce or eliminate sources of water for terrestrial animals.

Farm use normally does not diminish open space, but can degrade scenic areas and reduce recreational opportunities by limiting access. Removal of forest cover destroys native vegetation. Removal of forest cover and planting of agricultural crops provides opportunities for non-native and intrusive plants to become established in adjacent forest.

Removal of forest cover also denudes or eliminates habitat for many native animals. Lost habitat includes feeding, nesting, perching and roosting places for birds. Forest clearing removes plants which produce edible seeds, berries, nuts, bark, leaves, stems and roots for animals. Forest clearing also removes important structural features of the forest such as multiple layered canopies, dead and downed logs, large trees and snags. These important habitat components are removed when the forest is cleared. Other detrimental impacts include poisoning of wildlife caused by chemicals used on plants and in the soil in agricultural processes, and lights, loud noises and other farm activities which disturb the breeding and predator instincts of animals.

Forest fragmentation caused by the clearing of vegetation for agricultural uses increases the isolation of one habitat area from another. This can impede or form barriers to wildlife migration and can limit the flow of genetic material. As the range of habitat for indigenous wildlife becomes restricted and isolated, opportunities for recruitment from other areas are limited and wildlife populations become vulnerable to disease, predation and local extinction. Clearing can also result in reduction or local extinction of forest interior species which required larger forested tracts or habitat.

2) <u>Forestry</u>
Most common forest culture and harvest practices are allowed in Limited Single Dwelling (R20) zones. Because forestry is generally feasible on steeper slopes than farming, harvest practices can cause more erosion than farming. Forestry also uses irrigation water to establish tree plantations. The erosion, sedimentation and water withdrawal effects of tree harvesting can be at least as detrimental to water-related resources as the farm practices described above.

Forestry can replace multifunctional forest ecosystems with more simple systems or monoculture tree plantations. Cultured forests and tree plantations often are less structurally diverse and have less leaf mass than the natural forests they replace. Tree plantations have less ability to prevent the synchronization of flood events, bank erosion and the siltation of stream beds than do natural forests. Stream temperatures and flows can also be more variable in tree plantations.

Monoculture plantations are also more vulnerable to forest diseases and pests than natural forests. The loss of natural forests have the same effects on wildlife and flooding as described in the analysis of agriculture above.

Forestry also involves the use of herbicides, fertilizers and pesticides which may contaminate ground and surface waters. Contaminated surface runoff can degrade wildlife habitat and harm aquatic life in nearby creeks.

Forestry does not diminish open space, but degrades scenic values and diminishes recreational opportunities by limiting or eliminating access. The harvest of trees also fragments, degrades or destroys wildlife habitat. Tree cutting and planting provide opportunities for non-native and intrusive plants to become established in adjacent natural forest. Tree cutting and the storing and transport of logs destroys forest plants. Timber harvest has the same effects on native plants, fish and wildlife as the clearing activities described in the analysis for agriculture. The establishment of tree plantations can provide habitat for species which prefer early successional forests, or benefit from the forests fringes around clearings. However, tree plantations rarely have the plant diversity found in early successional natural forests; hence, the diversity of food and cover resources is limited. Noises and lights caused by forestry activities can further degrade habitat values as described in reference to farm practices.

3) Landscaping

The clearing of native forest and the establishment of lawns and other non-native landscape features is allowed in residential, commercial, industrial and open space zones. The clearing of forests, whether for homes, businesses or parks has the same effects as clearing done for agriculture or forestry. Like farming and forestry, the maintenance of landscaping often requires the use of irrigation water. The erosion, sedimentation, flooding and water withdrawal effects of clearing forests to establish landscapes are similar to those of the farm and forest practices described above. The impacts of the loss of structural diversity, leaf mass and related habitat components are also analyzed above.

Landscaping does not diminish open space, but can degrade scenic areas and diminish recreational opportunities. The effects of landscaping on fish and

wildlife habitat is similar to the effects of forestry described above. Landscape trees, shrubs and groundcover often invade adjoining native forests. English ivy, holly, laurel and clematis are commonly used in landscaped areas and are particular problems in the Southwest Hills.

Some animals benefit from the proximity of landscaping to forests. These species feed on seeds and berries produced by landscape plants, and while they are not feeding they find protective cover in the forest. This feeding pattern is, however, responsible for the spread of exotic seeds to the forest and the resulting degradation of natural forest habitat.

Urban landscaping rarely involves the re-establishment of multiple layered canopies, dead and downed logs, large trees and snags found in mature native forests. The loss of older forests have the same effects on wildlife and flooding as described for agriculture and forestry above.

The maintenance of landscapes also involves the use of herbicides, fertilizers and pesticides which may contaminate groundwater. Contaminated surface runoff can degrade wildlife habitat and harm aquatic life in nearby creeks.

4) Housing

Housing is the predominant land use in the Southwest Hills. Homes are allowed in residential and commercial zones. Residential use can have all the landscape effects described above. It also has aggravating effects on stormwater detention and retention, erosion and sedimentation. These effects are most pronounced during construction, but continue afterward. Unstable soils, steep slopes and a shallow, perched water table in the Southwest Hills are very susceptible to residential construction activities. Excavation and fill for roads or buildings can precipitate landslides and cause erosion. Landslides and erosion can damage or destroy downstream watershed resources and property.

Some areas of the Southwest Hills where residential uses are allowed are not served by public sewers. These areas are located in the southern portion of the study area near Arnold Creek. Septic drain fields can pollute both ground and surface waters.

Impervious surfaces such as streets, sidewalks and roof tops raise runoff time-of-concentration, reduce vegetative detention functions, and compact soils. This increases surface water runoff and peak flows. Increased peak flows, in turn, increase erosion, landslides, sediment transport, creekbed siltation and flooding.

Impervious surfaces permit less rainfall to infiltrate the soil, reducing groundwater recharge and lowering volume of water in creeks contributed by groundwater. This may cause neighboring creeks to dry up early in the

season, which can damage or destroy habitat for resident fish, amphibians and invertebrates, and eliminate a source of water for terrestrial animals. Heated runoff from impervious surfaces and reduced vegetative cover can raise water temperatures in nearby creeks and degrade aquatic habitat. Runoff can also carry pollutants into these creeks. Impervious surfaces also interfere with the transfer of air and gases.

Residential development can impair travel routes for terrestrial vertebrates. By creating inhospitable environments, these developments, particularly when in conjunction with large subdivisions, can isolate wildlife or cut off some species from a significant portion of their range. This limits or cuts off the flow of genetic material for these species, and in some cases may lead to local extinction. Roads, traffic and fences can also form barriers to wildlife migration.

Household pets can kill and harass native wildlife. Lighting and evening activities can also disturb wildlife.

5) Businesses

Businesses are allowed in commercial zones, which are found along Macadam Boulevard, Barbur Boulevard, Terwilliger Boulevard, Multnomah and the Beaverton-Hillsdale Highway. Removal of forest cover is allowed in commercial zones and generally has the same effects as described under agriculture above. Residential use is allowed in commercial zones at multifamily densities. Commercial use has all the landscape and residential effects described above, but increased lot coverage allowances compound the problem of impermeable surfaces. Businesses also generate more traffic than residences, and diminish or destroy open space, scenic values and recreational opportunities.

6) Industry

Industrial uses are allowed with special limitations or as conditional uses in commercial-zoned areas along Barbur Boulevard and Macadam Avenue. The allowed uses include manufacturing and production, warehouse and freight movement and wholesale sales. Industrial use has all the landscape and residential effects described above. Increased lot coverage allowances compound the problem of impermeable surfaces (e.g., reduced water penetration and supply of nutrients to the soil, lower groundwater levels and interference with the transfer of air and gases).

7) Developed Open Space

Under the new city zoning code effective January 1, 1991, the new Open Space (OS) base zone was applied to land that had an OS Comprehensive Plan designation. Large areas within the Southwest Hills planning area had such an OS designation. This zone applies primarily to city parks, but has also been applied to cemeteries, to open space and to some residential lots at the request

of the landowner. Developed open space, such as lawns and planted landscape beds, are limited in the Southwest Hills. These areas have the same effects described for landscaping. Park uses also generate traffic which can pose hazards to wildlife.

The Open Space zone allows activities such as the clearing of vegetation, the creation of impervious surfaces such as parking lots and the building of certain structures. The potential environmental consequences of Open Space uses are similar to but not as significant as those described for residential uses above.

8) Recreation

Trail construction and maintenance practices on steep slopes or near creeks can cause erosion and disturb vegetation. Recreational use of natural areas can degrade wildlife habitat values. Unleashed pets can kill and harass wildlife. Intensive recreation such as cycling, motoring and equestrian sports occur on trails designed for hiking, where they often cause erosion. Camping in public parks, although not allowed by park rules, does occur and degrades natural, recreational and scenic values. Particularly dangerous is the use of camp fires during dry seasons. Illegal trash dumping and littering also occurs in parks. Trash degrades natural, recreational and scenic values. Trash can also pollute water, harm wildlife and provide a seed source for non-native intrusive plants.

9) Public Facilities and Utilities

Construction and maintenance practices for roads, stormwater control structures, sewers, water lines and reservoirs, gas and utility lines have a variety of detrimental effects. These activities create cleared corridors which increase wind and light penetration into the forest, and can degrade natural plant and animal communities. These practices degrade streams and wetlands and block fish passage. These activities can also cause erosion and provide opportunities for the establishment of non-native plant species by disturbing soil and destroying perennial plant species.

The establishment and maintenance of roads and utilities often fragment wildlife habitat as described under agricultural impacts above. These activities also increase stormwater runoff; pollute water and reduce forest cover needed to maintain adequate stream flows, clarity and temperature for aquatic life. Maintenance removes important structural components from forests and removes vegetative cover. This cover is needed to prevent bank erosion, stream bed siltation, and the synchronization of flood events, as well as to maintain adequate stream flows.

Sand[18] used to keep roads clear of snow and ice, and herbicides used to control roadside vegetation can contaminate soils, degrade the health of plants and the animals which feed on them, and degrade the quality of ground and surface waters.

Summary
Several conflicting uses are identified in the Southwest Hills planning area. If these uses occurred at the intensities allowed by existing city land use regulations, they would have significant detrimental impacts on natural resources of the Southwest Hills.

Energy Consequences

This section provides a general analysis of the energy consequences of resource protection. Energy consequences analyzed below include impacts on the heating and cooling of structures and impacts on transportation and infrastructure costs.

Heating and Cooling of Structures
Resource protection may alter energy consumption for heating and cooling of structures. If resource sites were protected from development, then development would have to occur elsewhere. To do this, urban boundaries could be expanded and the same building density and form could be built. This would have no net change on energy consumption for heating and cooling of structures. However, this may result in negative consequences if development occurs outside the urban growth boundary. Energy consumed for transportation would increase due to longer automobile trips.

If it were desirable or necessary to locate the development on or near the same site as the resource, structures could be located closer together outside of the resource area. This could be accomplished through clustering of buildings, which could result in more common wall construction and reduced surface area for a given volume. Heat transfer between indoors and outdoors would be reduced, resulting in energy savings.

Vegetation provides a tempering effect on climate and reduces energy needs for heating and cooling structures. Trees shade nearby buildings in the summer, reducing energy demands for cooling. Plants also absorb sunlight and transpire during growing seasons, reducing ambient air temperatures. Trees and shrubs also act as a wind break during winter. By slowing or diverting winter winds around and over buildings, heat loss from convection is reduced, resulting in lower energy needs.

---

18 Sand also contains salt which can further degrade wildlife and watershed resources.

In summary, resource protection would result in overall positive consequences. Energy needs for heating and cooling structures would be reduced. A positive impact would result from clustering. Energy savings would be realized as a result of the ameliorating effects of resource vegetation on the local climate. The extent of energy savings will depend on many factors, including type of resource protected, proximity of resource to development, structure type, heating source, construction materials, design and activities.

Transportation

Energy expenditures for transportation are related primarily to distance of travel between origin and destination and mode of transportation available. These variable can be affected by natural resource protection.

Public transportation is available throughout the study area. The Tri-County Metropolitan Transportation District (TRI-MET) provides public bus service along several regional transitways and/or major city transit streets including Macadam Avenue, Barbur Boulevard, Taylors Ferry Road, Capital Highway and Multnomah Boulevard. If new residential development was located away from resource areas and along or closer to public transit routes, energy needs for transportation could be reduced. Residents would have access to public transportation.

Employment opportunities in Southwest Portland exist along Macadam Avenue, Barbur Boulevard and locations along the Beaverton-Hillsdale Highway and Multnomah Boulevard. Major commercial areas are located along Macadam Avenue from downtown to the intersection of Macadam and Taylors Ferry Road.

If resource protection limited or precluded future residential development in the Southwest Hills, and it were not replaced with increased densities nearby, impacts on energy consumption for transportation would depend on where the displaced housing would be located and whether residents would need to travel greater distances between home and employment or shopping. If development were allowed to expand beyond the urban growth boundary (UGB), development outside of the UGB would continue and energy consumption for transportation would increase.

The location of the Southwest Hills urban natural area allows easy access to large populations for recreation, wildlife observation and educational purposes. Because this resource is closer to users, less transportation energy is required and a greater range of transportation modes, including bicycling and walking, can be used. Designated bicycle, equestrian and pedestrian trails within Southwest Hills make these alternative, nonconsumptive forms of transportation more attractive.

In summary, resource protection impacts on transportation energy costs depend upon where needed and potentially displaced housing will relocate. If potential housing units can be located nearby protected resource areas, located closer to employment centers and/or located closer to public transit routes, a net positive benefit from protection would result. If urban boundaries were expanded in areas far from employment, commercial and recreation destinations to compensate for lost needed development opportunities, more energy would be required for commuting and other automobile travel. Protection of urban natural areas of high recreational value will also reduce energy costs and encourage energy-efficient modes of transportation.

Infrastructure
Clustering of development outside of natural resource areas in an efficient manner will result in less infrastructure needed to serve sewer, water, transportation and other needs. It can also result in faster fire and police response times and reduce energy costs associated with these services.

Maintaining permeable soils and forest cover reduces peak flood levels and the potential for landslides. Resource protection would therefore reduce associated energy costs if development occurs away from flood and landslide hazard areas, fewer hazard control structures would be needed. Energy savings from reduced infrastructure materials and maintenance needs would result.

Summary
Considerable savings of energy can be achieved through natural resource protection, particularly in terms of infrastructure provision and structure heating and cooling. Transportation savings can also be substantial if needed development were located near destination points and public transit routes and energy-efficient travel modes were integrated into the natural resource protection plan.

Applicable Statewide Planning Goals

Oregon Administrative Rules Chapter 660, Division 16, calls for local governments to consider the applicability and requirements of Statewide Planning Goals where appropriate in the ESEE analysis. The applicable Statewide Planning Goals considered are: 3, Agricultural lands; 4, Forest Lands; 6, Air, Water and Land Resource Quality; 7, Areas Subject to Natural Disasters and Hazards; 8, Recreational Needs; 9, Economic Development; 10, Housing; 11, Public Facilities and Services; 12, Transportation; 13, Energy; and 14, Urbanization. Goal 1, Citizen Involvement, and Goal 2, Land Use Planning, were addressed throughout the plan development process and do not apply to the ESEE analysis. Goal 15, Willamette Greenway, was

previously addressed with the implementation of the Willamette Greenway Plan (1987). Goals 16 through 19 address ocean and coastal resources and therefore do not apply to the Southwest Hills.

Goal 3 requires local governments to preserve and maintain agricultural lands. Goal 3 applies to land zoned for Limited Single Dwelling (R20) use where agriculture is an allowed use. Agricultural use is preserved on sites where it exists. New or expanded agricultural uses where environmental zones are applied are subject to an environmental review process where impacts must be controlled and mitigated.

Goal 4 requires conservation of forest lands by maintaining the forest land base and protection of the state's forest economy by making possible economically efficient forest practices that assure the continuous growing and harvesting of forest tree species as the leading use on forest land consistent with sound management of soil, air, water and fish and wildlife resources and to provide for recreational opportunities and agriculture. Goal 4 applies to land zoned for Limited Single Dwelling (R20) use. Most of these lands are planned for low density residential use. Small lot operations would be feasible on some of the lots. Commercial forestry operations in areas where environmental zones are applied are subject to an environmental review process where impacts must be controlled and mitigated.

Goal 6 provides for maintenance and improvement of the quality of the air, water and land resources of the state. The proposed environmental zones will ensure that these resources are maintained, Federal Clean Water Act requirements are met, and coordination with permitting agency occurs.

Goal 7 requires protection of life and property from natural disasters and hazards. Resource protection measures are designed to meet this goal by guiding residential development away from sensitive resource areas subject to landslides and flooding.

Goal 8 requires local governments to satisfy the recreational needs of the citizens of the state and visitors, and where appropriate, to provide for the siting of recreational facilities including destination resorts. Protection of natural areas and open space resources will enhance the recreational values of the Southwest Hills. Visitors and tourists will benefit from protection of recreational values.

Goal 9 calls for provision of adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare and prosperity of Oregon's citizens. Resource protection will have positive consequences for real estate values, tourism, recreational activities, corporate relocation and convention-related activities. Potential negative impacts are high in commercial zones, where development potential is limited more by land area

than floor-area ratios or number of units per acre. Potential negative impacts in residential zones can also be significant, particularly if development cannot be redistributed elsewhere on the site. Negative impacts on agriculture and forestry are limited to new or expanded activities.

Goal 10 provides for the housing needs of citizens of the state. Resource protection measures are designed to allow housing construction which includes measures to mitigate impacts on Goal 5 resources. Residential development and resource protection are balanced through the ESEE process.

Goal 11 requires local governments to plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development. Plan regulations require Planned Unit Developments under certain conditions which are designed to protect natural resources. Clustering and/or limiting development will result in reduced need for construction and maintenance of infrastructure.

Goal 12 provides for and encourages a safe, convenient and economic transportation system. Resource protection measures do not prevent the city from meeting its Goal 12 responsibilities. Planned Unit Developments required by plan provisions will allow efficient use of existing transportation facilities.

Goal 13 calls for the conservation of energy. Limiting or prohibiting development near sensitive natural areas results in reduced residential and industrial energy consumption from heating and cooling systems and transportation or infrastructure use. Clustering residential development also results in less energy consumption for construction and promotes use of common wall construction. Protection of significant natural resources close to an urban center encourages use of alternative forms of transportation such as public transportation, bicycling and walking.

Goal 14 requires local governments to provide for the orderly and efficient transition from rural to urban land use. The entire study area is within the urban growth boundary. Lands zoned for residential and commercial use are accommodated with public facilities and services and policies to ensure urbanization. The impacts of urbanization on Goal 5 resources will be controlled and mitigated through the application of environmental zones.

Summary

Resource protection measures are designed to meet Goal 5 requirements as well as requirements for Goals 3, 4, and 6 through 14. Goals 1 and 2 were addressed throughout the development of the plan. Goal 15 was previously addressed with the implementation of the Willamette Greenway Plan (1987). Goals 16 through 19 address ocean and coastal resources and therefore do not apply to the Southwest Hills.

Summary

Protection of natural resources will have both positive and negative consequences. In general, the positive economic, social, environmental and energy consequences of resource protection outweigh the potential negative consequences. Housing faces the highest potential economic consequences in the form of reduced development potential. However, this consequences is partially offset by the economic benefits which result from resource protection. The potential economic, social, environmental and energy consequences of resource protection on housing and other conflicting uses are analyzed in further detail in Chapter 7, Site-Specific Inventory and Analysis.

Following the inventory and the analysis of Goal 5 natural resources, which continues in the next chapter, a program must be developed to protect these resources. Under the Goal 5 administrative rule (OAR 660-16), this program or plan must make one of three decisions for each inventoried resource based on the resource inventory and analysis findings:

1. **Allow the conflicting use fully.**
   This action occurs in areas where the conflicting use, notwithstanding the impact on the resource, is sufficiently important to warrant allowing the uses fully and without restrictions;

2. **Limiting conflicting uses in a manner which protects the resource.**
   This action occurs in areas where both the resource and the conflicting uses are important relative to each other, and restrictions are placed on conflicting uses which would protect resource values while at the same time allowing for needed conflicting uses; or

3. **Protecting the resource fully.**
   This action occurs in areas where the resource, relative to the conflicting use, is sufficiently important that the resource should be protected and all conflicting uses prohibited.

Plan policies and objectives, and regulations needed to protect Goal 5 resources are presented in Chapter 8 of this document.

CHAPTER 7

SITE-SPECIFIC INVENTORY AND ANALYSIS

- INTRODUCTION
- SITE SELECTION
- METHOD OF DETERMINING RESOURCE LOCATION, QUANTITY AND QUALITY
- METHOD OF CONFLICTING USE ANALYSIS
- SITE SUMMARY OVERVIEW
- SITE SUMMARIES

Introduction

The two previous chapters identified general resource components, their importance in the overall forest ecosystem, and the general impacts of conflicting uses and of resource protection. This chapter describes how each resource site was selected, inventoried and evaluated. The inventory and analysis of individual resource sites are then summarized. These summaries provide information on resource location, quality and quantity and on the economic, social, environmental and energy consequences of resource protection. This site-specific information supplements the areawide inventory and analysis of the two preceding chapters. Some of the terminology used in this chapter is referenced to the areawide discussion (e.g., vegetation types); other terms, such as those used for habitat classification, are defined in the glossary (Appendix B).

Site Selection

In 1986, a city-wide inventory of natural resources was conducted by biologists Esther Lev and Michael Jennings. A technical advisory committee consisting of natural resource experts from conservation groups, private industry and public agencies was established to review inventory methodology and inventory areas. Local wildlife literature was consulted and letters were sent to neighborhood associations, special interest groups and city agencies informing them of the study. With the information compiled by Planning Bureau staff, the technical advisory committee, biologists and neighborhood residents, inventory sites were then delineated and mapped. In 1990 and 1991, detailed field inventories of natural resource areas in the Southwest Hills were conducted.

This chapter summarizes site inventories and analyses for the portion of the Southwest Hills that drains directly into the Willamette River. These resource inventories include information on fish and wildlife habitats, plant communities, wetlands and water bodies and open space. Additional information is provided on scenic, recreational, educational, historic and cultural resources.

The Southwest Hills study area is approximately 7,000 acres in size and is divided into 14 resource sites which are based largely on watersheds. The nine largest watersheds, which range from 72 to 4,477 acres in area, form the major divisions for the resource sites. The sites are numbered in a general north to south direction, beginning with Resource Site 110, Johnson Creek, bordering Balch Creek watershed and ending with Tryon Creek (Resource Site 123) at Portland's southern city limits. Additional information on site

assessments, field notes and habitat scores is compiled in the Wildlife Habitat Assessment sheets.[19]

Method of Determining Resource Location, Quantity and Quality

Inventories of the watershed-based sites were made along transects chosen to encompass the variation in environmental characteristics (e.g., vegetation, soil, slope and habitat) over the area of concern. Field inventory work was conducted between October, 1990, and January, 1992, with assistance from biologist Esther Lev. Other sites were previously evaluated by biologists Michael Jennings and Esther Lev in June of 1986 or by Esther Lev and Lynn Sharp as part of the METRO Urban Greenspaces Inventory (1990-1991).

A Wildlife Habitat Assessment sheet which is a narrative description of the site, including information on weather, topography, vegetation, wildlife, habitat function, human use and management potential was completed for each site. Sites were rated numerically for wildlife habitat value using a form originally developed by the City of Beaverton and subsequently modified with input from state and federal resource agencies and the Audubon Society of Portland. This rating system was previously used by the City of Portland for resource inventories along the Willamette Greenway and in other parts of the city. It has also been used with minor modifications by Multnomah County and the cities of Gresham, Milwaukie, Eugene, Springfield, Hillsboro and other Oregon jurisdictions in the course of their Goal 5 inventory process.

The habitat assessment process involves analysis of physical environments for which wildlife have known preferences. The Wildlife Habitat Assessment sheets rate habitat values numerically based on the presence and availability of three basic elements: food, water and cover. Values for human and physical disturbance, interspersion with other natural areas, and unique or rare habitats or plant and animal occurrences are also noted. Scores for all sites within the city range from a low of six to a high of 106, with the vast majority lying in the 30 to 80 point range. Inventory site scores for the Southwest Hills ranged from a low of 50 to a high of 86.

The location, quantity and quality of Goal 5 resources were also determined using United States Geologic Survey (USGS) and city topographic maps, National Wetlands Inventory maps, Multnomah County Soil Conservation Service maps, 1989 infra-red aerial photographs, as well as through field reconnaissance. Additional references are cited in Chapter 5 and in the Bibliography (Appendix C).

---

[19] On file with the Bureau of Planning, SW Hills Inventory notebook.

In summary, the methodology used for determining the location, quantity and quality of identified natural resources is one which provides an acceptable base of information, while allowing augmentation from other sources. It has been used in the same general form with success by the city and other jurisdictions in the state, and has been reviewed by LCDC and found acceptable for Goal 5 compliance.

Method of Conflicting Use Analysis

The following individual site summaries provide information on the site-specific economic, social, environmental and energy (ESEE) consequences of allowing, limiting or prohibiting conflicting uses. The general ESEE analysis in Chapter 6 formed the foundation of the site-specific analysis in this chapter. Based on the site inventory summaries which identify the quantity, quality and location of resources, the following steps were taken to prepare the site-specific analysis:

1. Identify the conflicting uses allowed in the base zones of the specific resource site;

2. Determine the consequences of allowing existing and potential conflicting uses on the site's resources;

3. Determine the positive and negative economic, social, environmental and energy consequences of limiting or prohibiting conflicting uses; and

4. Conclude which resources warrant protection and determine the appropriate level of protection (e.g., the appropriate environmental overlay zone).

Site Summary Overview

The site inventory summaries contained in this chapter represent material gathered during field visits, as well as technical and other resource data collected from additional sources. The site summaries provide information on both resource inventory and ESEE consequence analysis for the specific resource sites. The recommendations of this plan are based on the general analysis of the previous chapter and the site-specific analysis of this chapter.

Several sections of the summaries warrant brief explanation. The "habitat rating" box offers a summary of the individual Wildlife Habitat Assessment (WHA) field sheets on file at the Bureau of Planning. At the top of the box, the site's WHA score and the range of scores for all sites in the study area are

indicated. The functional value of the three principal habitat components (water, food and cover) is then summarized with assessments ranging from "low" to "high" based on the following WHA scores for these sections:

	Low	Low	Medium	Moderately High	Moderately High
Water	2 - 7	8 -12	13 - 18	19 - 24	25 - 30
Food	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24
Cover	0 - 5	6 - 11	12 - 16	17 - 22	23 - 28

The three remaining categories, interspersion, uniqueness and disturbance, are classified in a similar fashion using "low," "medium" and "high." *Uniqueness* is a combination of the site's unique features (habitat type, flora and fauna); *disturbance* is a combination of physical and human disturbance (note: a high score corresponds to a site with "low" disturbance); *interspersion* (with other habitats) is assessed directly from the interspersion score from the WHA form. Rating interspersion, uniqueness and disturbance helps describe the quantity, quality, and in some cases, the location of the resource values.

	Low	Medium	High
Interspersion	0 - 1	2 - 4	5 - 6
Uniqueness	0 - 3	4 - 8	9 - 12
Disturbance	8 - 6	5 - 3	2 - 0

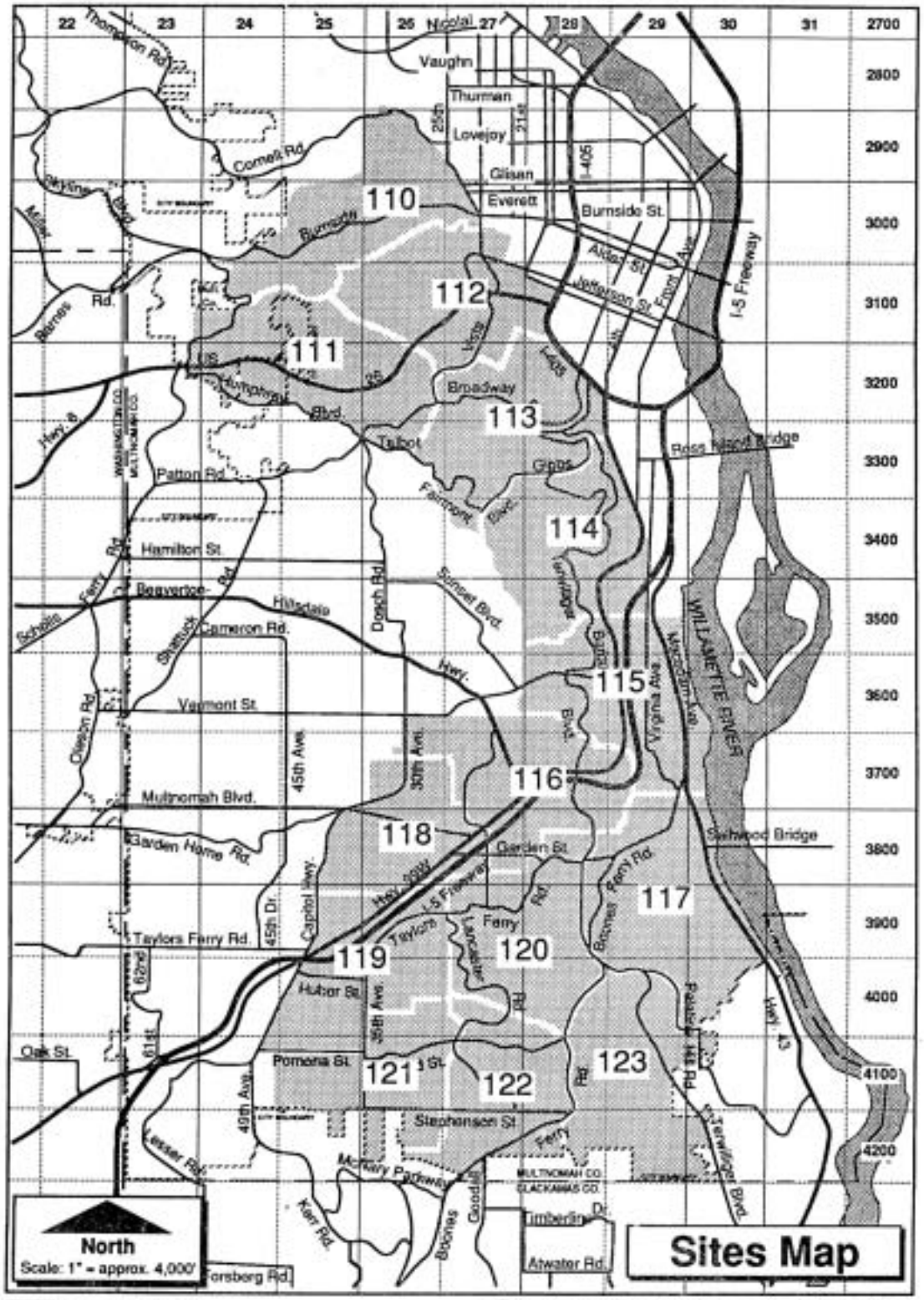
Second, the "Habitat Classification" section is based, in part, on the National Wetlands Inventory (NWI) classification model. Some of the terms commonly used in this section are defined below (see also Appendix B, Glossary).

Riverine: Related to, formed by, or resembling a river.

Palustrine: Wetlands dominated by trees, shrubs, persistent emergent herbs, emergent mosses or lichens.

Upper Perennial: One of four subsystems of the Riverine System, where the gradient is high, water velocity is fast, and some water flows throughout the year.

Resource Site Summaries



110 S.W. Hills Study Area
(Sites are indicated by numbers)

Southwest Hills
Resource Protection Plan

September 1991 City of Portland, Oregon Bureau of Planning

Site No. 110: Johnson Creek[20] **Maps:** 2926, 3025-27, 3124-25

SITE SIZE: 450 acres

BOUNDARIES: Summit Ave., north; Westover, east; Fairview Blvd., south; Barnes and Skyline Rd. intersection, west

NEIGHBORHOODS: Hillside, Arlington Heights, Upper Highland, Washington Park

INVENTORY DATE: July 29, 1991

HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Intermittent Streambed

TYPES OF RESOURCES:
Intermittent creek, groundwater, scenic, open space, wildlife habitat and corridor, forest, cultural and historic heritage.

SITE LOCATION & DESCRIPTION:
Site 110 is the most northerly site in the study area and is where the northwest and southwest hills connect. This site has two parallel east/west ridge lines that are divided where Burnside Street is located. Walls of exposed bedrock and areas of slope instability can be seen along Burnside. The site elevations range from 200 to 950 feet. The highest elevation point is on the northern hillside.

The 450-acre site forms the Johnson Creek drainage basin. Johnson Creek is a natural creek that flows north through the Hoyt Arboretum and then east along the south side of Burnside Street. A major tributary to Johnson Creek flows from near Skyline and Fairview Roads northeast to near Burnside Road where it joins Johnson Creek in the Hoyt Arboretum. Johnson Creek enters the combined sanitary and storm system west of the Burnside and Tichner Street intersection.

The major resource areas are located in the western half of the site where about 150-acres of the Hoyt Arboretum and Pittock Mansion and Acres are located. Both of these natural areas extend north and south of Site 110 connecting to other habitat areas including Macleay and Washington Parks. The Wildwood hiking trail provides north/south pedestrian access through these areas. This trail system is a part of the regional 40-Mile Loop Trail.

---

[20] This reference is to the smaller west side creek, *not* the major east side Johnson Creek.

The eastern half of Site 110 is almost fully urbanized in the form of Kings Heights, Arlington Heights, and other residential neighborhoods. The homes are typically on steep, terraced lots that are 7,000 square feet or less in size. The neighborhoods are generally landscaped with non-native plants except for the areas which border Hoyt Arboretum and Washington Park. These areas tend to have a more natural character and greater amount of native vegetation including Douglas fir, bigleaf maple, and cottonwood along the drainageways.

About 85 percent of Site 110 is classified as having "severe landslide potential" with the remaining 15 percent in the "moderate" potential classification.[21] In 1987, about 25 percent of the residentially designated areas were undeveloped.[22] Ninety percent of the remaining vacant areas designated for residential development is classified as having "severe landslide potential."[23] The physical constraints include steep slopes and unstable geologic conditions (see Chapter 5 for discussion).

RESOURCE QUALITY & QUANTITY:
This 450-acre site connects the northwest and southwest hills wildlife habitats. The adjacent northwest hills and Balch Creek have significant habitat values as documented in the Bureau of Planning studies, *Northwest Hills Natural Areas Protection Plan* and the *Balch Creek Watershed Protection Plan.*

The Kings Heights and Arlington Heights neighborhoods located on the eastern side of the site contribute relatively little to the area's wildlife habitat quality. Other resource values are also limited.

The habitat resource areas primarily exist on the western part of the site where there are approximately 180 acres of forest. This site is a part of a 444-acre drainage basin.

Portions of the 214-acre Hoyt Arboretum and 135-acre Pittock Mansion are located in the middle of the site. These sites form a wildlife corridor that connects habitat areas north and south of this site. Johnson Creek and the headwater tributary provide water resources for the area wildlife as well as associated riparian vegetation that contributes to habitat diversity.

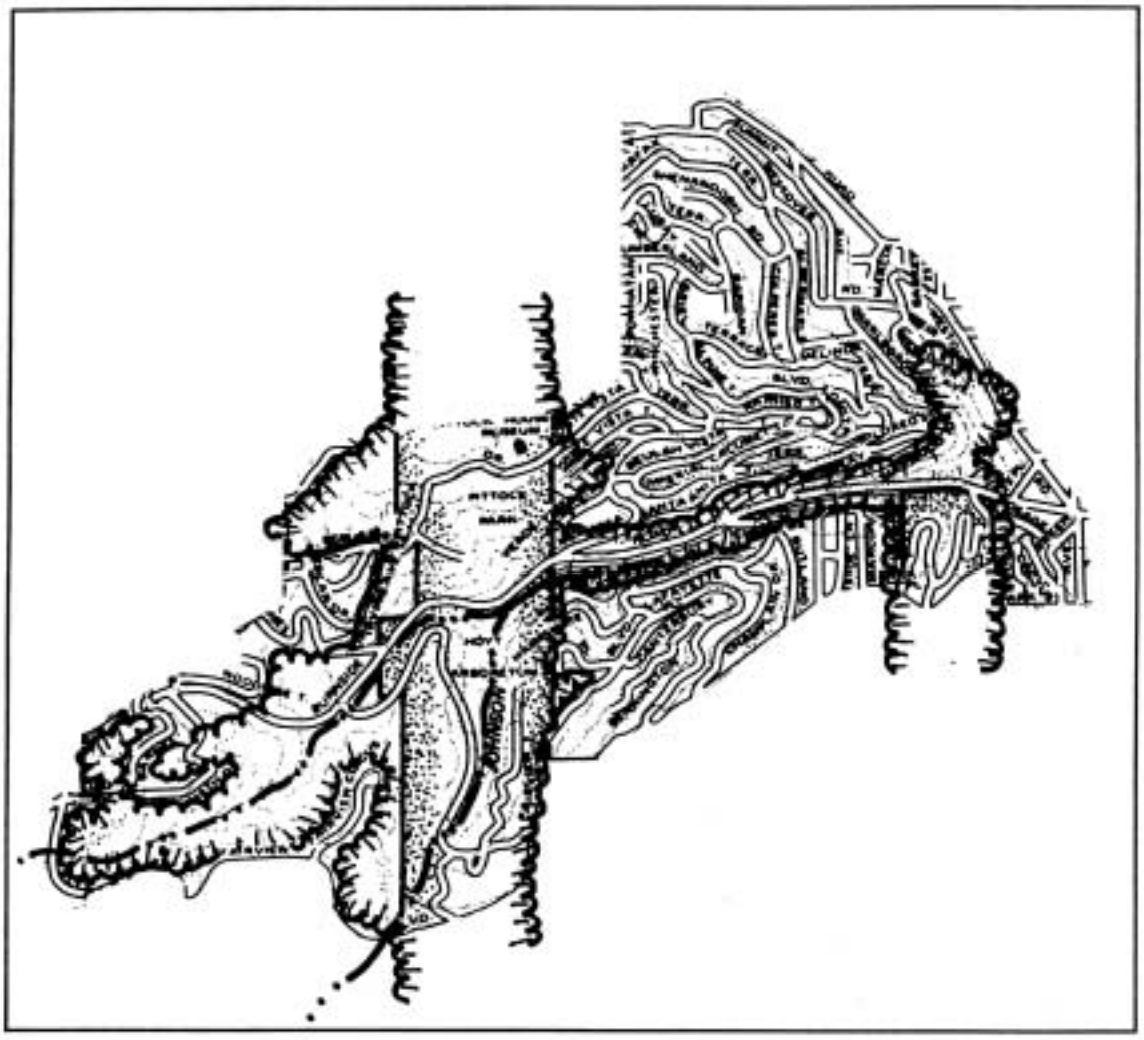
The forest representative of the site has a tree zone with 80 percent closed canopy consisting of bigleaf maples that are typically twelve inches in

---

21 Landslide Potential Inventory (atlas), Bureau of Planning. Part of Portland Physiographic Inventory, A Study of the Physical Environmental and Implication To Planning and Development, R.A. Redfern, 1976.

22 1987 Vacant Lands Inventory (atlas), Bureau of Planning.

23 Landslide Potential Inventory (atlas), Bureau of Planning.



Resource Areas

Site 110

North

Scale: 1" = 1200'

Contours (50' Intervals)
Forests/Habitat
Creeks
Wetlands

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

diameter at breast height (dbh). The Douglas firs are 16-inches dbh on average. There are also mid-aged, climax forest species including western red cedar and grand fir. The shrub layer with 30 percent canopy closure consists of Oregon grape, oceanspray, thimbleberry, elderberry, red huckleberry, Indian plum and western hazel. English holly, English ivy and Himalayan blackberry are non-native species that are present. This site area includes an abundance of fallen wood, an important resource that provides escape and nesting places plus habitat for large insect populations that serve as a food source for other insects, birds and animals.

A 93-year old forest is located in the western portion of the site near the east border of Hoyt Arboretum. The forest was last cut in 1898. The second growth is in its later seral *mid-aged conifer* stage. It has good to excellent habitat quality, is relatively undisturbed, and is composed of a 50/50 mix of deciduous and evergreen trees including Douglas fir, western red cedar, bigleaf maple and vine maple. The less common pacific yew tree is also present. The tree and herbaceous layers are well defined with 70 to 90 percent canopy closure. The shrub layer is also well defined with about a 40 percent closure. This area has an abundance of dead wood (e.g., downed trees) which enhances its habitat value. The area also contains a cave believed to have been used by Native Americans.

Wildlife movement is constrained by Burnside Street's four traffic lanes and adjacent steep canyon walls. Passage can best occur in the western portion of the site particularly over the tunnel. Burnside Street's dramatic, wooded hillsides form a view corridor that contributes to the visual quality of the area and helps maintain slope stability.

Habitat Rating:

Wildlife Habitat Score: 70 **Range for All Sites:** 50 to 86

Water	: Medium
Food	: Moderately High
Cover	: Moderately High
Interspersion	: Moderately High
Uniqueness	: Low
Disturbance	: Low

Summary: This site contains wildlife, scenic and environmental resources with approximately 200 forested acres that are primarily in a natural condition. This site is significant as a connection between the southwest hills, northwest hills and Balch Creek drainage basin. This physical link increases the habitat range and, potentially, the gene pool. The habitat value in the eastern half of the site is limited due to urban development and the vertical

hillsides. However, the wooded character of Burnside Street warrants protection for its scenic, slope stabilization and habitat corridor values.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Commercial; Landscaping; Agriculture; Forestry; Open Space Uses

Consequences of Allowing Conflicting Uses:
The value of the resource site as wildlife habitat would be diminished. The connection to Forest Park, Balch Creek Watershed and Washington Park habitats would be disturbed by park improvements and/or recreational use. Residential development would affect the links to the northwest hills and Balch Creek by impeding wildlife migration and degrading habitat. Further development of public open spaces may diminish the area's value as wildlife habitat (e.g., removal of snags and downed logs). All of the conflicting uses may involve replacing native vegetation with non-native or invasive species. Agriculture and forestry would also involve clearing land for new crops, and the use of pesticides and herbicides. Erosion from harvest would carry these pollutants into wetlands, creeks and natural drainages.

Cultural and historic values of public open space may be diminished if development occurs which degrades the natural character of the site. Residential development will degrade the scenic and aesthetic values of forest cover near Washington Park and Hoyt Arboretum. The character of the neighborhood would be diminished by forest clearing.

Johnson Creek would be affected in several ways. Residential development, landscaping, agriculture and forestry would involve clearing land which would increase erosion and stormwater runoff. Runoff would carry pesticides, herbicides and other pollutants into the creek, reducing water quality, damaging habitat and harming wildlife.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce infrastructure and public facility construction and maintenance costs. Clustering dwelling units together would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development reduces the potential for flooding and landslides and would yield savings in water and maintenance costs. Preserved forest cover and native vegetation would add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists and visitors and for recreational activity.

Limiting development in resource areas could yield the potential savings mentioned above. Additional costs would be incurred to protect resources during development (e.g., erosion control measures), but these costs may be offset through potential savings. Prohibiting development would reduce development opportunities for landowners and local builders and would have significant economic consequences.

Social Consequences: The cultural and historic values of Pittock Mansion and the surrounding forest would be preserved. The recreational and environmental education values of Pittock Mansion, Washington Park, Hoyt Arboretum and Johnson Creek would also be preserved.

The scenic values of the forest surrounding Pittock mansions would be preserved. These natural areas would also be close to a large urban population. The identified scenic values of Burnside Road and the forest cover surrounding Washington Park and Hoyt Arboretum would be protected through the development standards of the environmental zone. These resources would continue to contribute the neighborhood's identity. The forest cover and vegetation separating the public open spaces and residential uses would continue to buffer and screen these uses. Quality of life considerations which include scenic and aesthetic values, nearby green spaces, and the area's country in the city character would be protected and maintained for the neighborhood's benefit.

Development would be guided away from areas characterized as having severe landslide potential. Prohibiting development would prevent new housing construction and reduce choices in the local housing market.

Environmental Consequences: Protection measures would preserve the link between this resource site and the northwest hills and the Balch Creek watershed. The wildlife habitat in public open space would be protected from being degraded by development and recreational use. Johnson Creek would be preserved and protected from detrimental impacts of erosion and stormwater runoff. The wildlife and fish which use Johnson Creek would be protected from the harmful effects of pollution and erosion. The Hoyt Arboretum's natural areas would not be disturbed by development.

Energy Consequences: Forest cover would moderate local temperature for residences. Forest cover could also reduce the solar access of some properties. Clustering development would save energy through common wall construction, reduced utility usage and reduced distances required for services and infrastructure to access individual properties. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, if development were prohibited, there would be negative economic, social and energy consequences causing development to occur farther from established neighborhoods (e.g., beyond the urban growth boundary). Resource protection would not increase the costs of development significantly because the physical features of the land (e.g., steep slopes, unstable soils) and existing regulations (e.g., water features) already require additional conservation measures.

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for portions of the parks, and for properties located in the northern portion and in the western portion of the site.

The more restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection. These areas are the portions of Washington Park which link the Northwest Hills with the Southwest Hills habitat, and Johnson Creek and its tributaries. Approximately 57 acres of residential land and 1.4 acres of commercial land are affected by proposed environmental zones (see chart below).

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R20	4.1	3
R10	13.5	5
R7	23.4	0
R1	8.4	0
CG	1.4	0

MANAGEMENT RECOMMENDATIONS:
Strengthen the link between the northwest and southwest hills along Burnside Street. Opportunities exist between the Hoyt Arboretum and the Pittock Mansion Acres and by the Burnside tunnel near SW 48th Avenue. Consider underpasses or land bridges (i.e., additional tunnels). Remove nuisance and exotic plant species (e.g., clematis, ivy, morning glory) throughout the site. Plant native plants on the banks of Johnson Creek especially through the Hoyt Arboretum to retard erosion and increase habitat. The portions of Johnson Creek that are culverted should be daylighted to provide increased riparian habitat area and sediment trapping. Install signage of Johnson Creek to increase environmental awareness and protection.

Site No. 111: Canyon Headwaters **Maps:** 3123-25, 3223-26, 3325-26

SITE SIZE: 540 acres *(113 acres are in Multnomah Co.)*

BOUNDARIES: Fairview Blvd., north; 57th Ave, west; Highland Dr., east; Humphrey Blvd. and Talbot Rd., south

NEIGHBORHOODS: Southwest Hills, SW Hills Residential League, Sylvan, Upper Highland, Washington Park, Westwood Hills

INVENTORY DATE: July 29, 1991

HABITAT CLASSIFICATION:

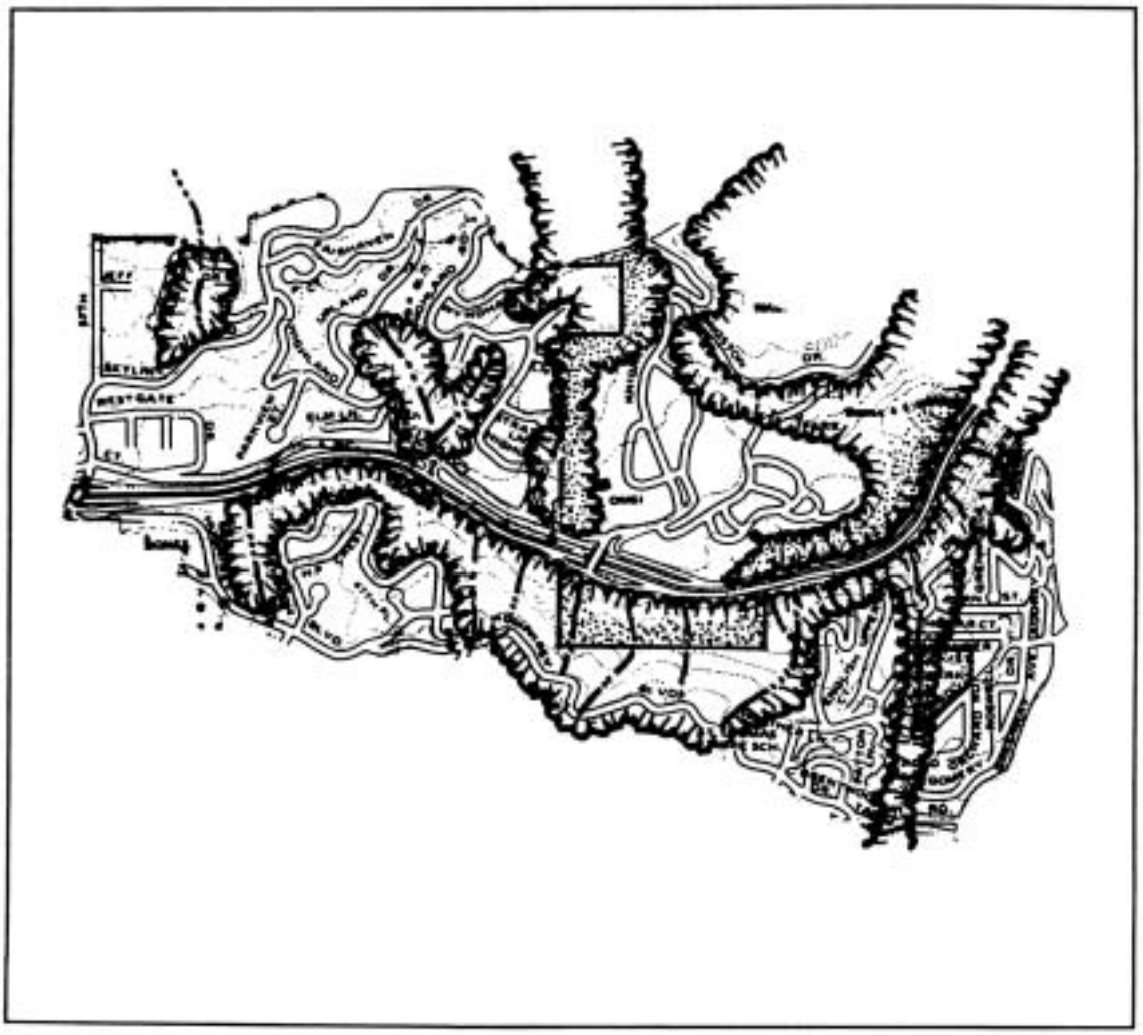
- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Intermittent Streambed

TYPES OF RESOURCES:
Cultural, scenic, open space, intermittent creeks, groundwater, wildlife habitat and corridor, and forest.

SITE LOCATION & DESCRIPTION:
This 540-acre site includes 1,200 feet of the Highway 26 canyon. This site has high visual quality affecting the estimated 125,000 commuters traveling in the canyon per day. The canyon has distinct knolls, ravines and canyon walls that rise 300 feet above the roadway. The more distant hills at the west end, north along Skyline Road, rise to 1,000 feet.

The natural areas of the site are primarily on the south side of the highway and east of the Washington Park Zoo. About 220 acres are designated open space. The habitat quality of the open space areas vary. The 20-acre tract of open space on the south side of the highway is primarily a deciduous forest. The 40-Mile Loop recreation trail goes from Highway 26 through this site to Patton Road. Portland Heights Park, a developed 5.30 acre park, provides pedestrian access into Site 111 and is located in the southeastern portion of the site. The park is connected to the adjacent forested ravine by a foot path where there are signs of erosion. The ravine has a creek which empties near Highway 26.

Highway 26 has cultural importance. Once called "The Great Plank Road," the location of Tanner Creek and a dirt (and planked) road has connected the rural Tualatin Valley with the city since 1851. The natural beauty of the canyon provides a unique travel experience and contributes to the livability of the city.



Resource Areas

Site 111

North

Scale: 1" = 1200'

Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

RESOURCE QUALITY AND QUANTITY:
The majority of the site is in forest cover. The predominant trees are Douglas fir and bigleaf maple. The forest is 75 to 85 years old as indicated by tree sizes and the predominant forest composition of *conifer topping hardwood*. The representative forest composition is 60 percent deciduous and 40 percent coniferous. One 20-acre area is 90 percent deciduous with some bigleaf maple with up to 40-inch dbh. There is another 20-acre parcel that has primarily conifer cover with dbh sizes ranging from eight to 40 inches. There are springs and eleven or so intermittent creeks located along the canyon walls throughout the site. At least a half-dozen of the uncommon but native pacific dogwoods are located within the canyon.

On the southeast corner of the site is an established neighborhood. The deeply cut V-shaped ravines and curving streets divide the neighborhood into small neighborhood units containing five to seven homes. The steepness of the ravines limits pedestrian access and allow the natural areas to remain largely undisturbed. The physical conditions of the area contribute to the neighborhood character, provide water resources, storm drainage, and provide visual and physical buffers from noise generated by traffic on Highway 26.

Highway 26 bisects the site and creates a barrier for terrestrial wildlife. The north side of the site connects to the habitat areas of Hoyt Arboretum, Pittock Mansion Acres and northern points of Washington Park. Farther north these habitats connect to the Balch Creek Watershed and Forest Park. There are about 220 acres of contiguous forest covering the south wall of Canyon Road.

Habitat Rating:

Wildlife Habitat Score: 72 **Range for All Sites:** 50 to 86

Water	: Medium
Food	: Moderately High
Cover	: Moderately High
Interspersion	: Medium
Uniqueness	: Low
Disturbance	: Low

Summary: This site provides a connection between the northwest and southwest hills. However, the importance of the connection is diminished by the presence of Highway 26, especially for terrestrial wildlife species. The forest is in the later, *conifer topping hardwood* successional stage. The eleven or so intermittent creeks located along the canyon walls and throughout the site provide habitat. This site, in combination with Site 112, has high scenic value created by the forested hillsides, knolls and valley floor.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Landscaping; Agriculture; Forestry; Open Space Uses

Consequences of Allowing Conflicting Uses:
The forest cover which serves as wildlife habitat near Washington Park Zoo would be diminished. Expansion of the Zoo and Washington Park could encroach on surrounding habitat, removing vegetation and disturbing wildlife. Residential development near migration corridors will impede migration between the northwest and southwest hills. Pesticides, herbicides and other pollutants used in farming, forestry and residential activities would harm surface and groundwater.

The 40-Mile Loop's scenic and recreational values may be diminished. Residential development along the top of the Highway 26 canyon would diminish the canyon's value as a scenic corridor. The historic and cultural values of Highway 26 as a scenic corridor between the city and the Tualatin Valley will be diminished as development continues.

The construction of the Westside Light-Rail Line tunnel portal may result in permanent removal of trees and habitat. The forest cover's scenic and aesthetic values could be lost if forest vegetation were not retained before or replaced after construction.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce infrastructure and public facility construction and maintenance expenditures. Clustering dwelling units together or in a planned unit development would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development reduces the potential for erosion and landslides and would yield savings in water and maintenance costs. Preserved forest cover and native vegetation would add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists, visitors and local residents.

Limiting development in resource areas could result in the potential savings mentioned above. Additional costs would be incurred to protect resources during development (e.g., erosion control measures), but these costs may be offset through potential savings. Prohibiting development would reduce development opportunities for landowners and local builders.

Social Consequences: The scenic values of the habitat surrounding the Washington Park Zoo, 40-Mile Loop, Highway 26 and Portland Heights park would be preserved. In addition, the historic and cultural values of Highway

26 would be preserved and protected through the environmental zones. The identified scenic values of SW Canyon Road in the *Scenic Resources Protection Plan (1991)*would receive additional protection. The contribution of the southwest hills resources to Portland's quality of life would be sustained.

The recreational and environmental education values of the park, the 40-Mile Loop and the Arboretum would be enhanced through resource protection. Educational values of forest cover surrounding the pubic parks and Zoo would be preserved for opportunities such as field trips.

Development would be guided away from areas characterized as having severe landslide potential. Prohibiting development altogether would prevent new housing construction and possibly reduce choices in the local housing market. This could also adversely affect the school district tax base.

Environmental Consequences: The wildlife habitat surrounding the Washington Park Zoo and the Hoyt Arboretum would be preserved. Existing links to the Northwest Hills and Balch Creek Watershed would also be preserved for wildlife migration. Habitat and riparian areas around the intermittent creeks would be protected through erosion control measures. The mature forest would be preserved in its natural state. Vegetation will continue to offset the affects of automobile emissions from Highway 26.

Energy Consequences: Forest cover would moderate local temperature for residences. Forest cover could also reduce solar access of property in some cases. Clustering development would save energy by reducing the distance required for services and infrastructure, reducing utility usage and using common walls. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, negative economic, social and energy consequences would result if development were prohibited and influenced to occur farther from established neighborhoods. Resource protection would not increase the costs of development significantly because the physical features of the land already make development expensive (e.g., slopes, trees to be cleared).

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as

impacts on resources are controlled and mitigated. The EC zone is proposed for the forested areas south and adjacent Washington park, some of the forested areas south of Highway 26 and land surrounding the site's creeks.

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are the natural forested areas adjacent to the Washington Park Zoo and some of the forested slopes and creeks south of SW Canyon Road. Approximately 142 acres of residential land would be affected by proposed environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R20(R10)	30.7	0.3
R10	83.95	11.5
R7	8.35	0
R5	7.4	0

MANAGEMENT RECOMMENDATIONS:
Remove exotic shrub and herbaceous plant species. Implement erosion control. An animal underpass (under Highway 26) would help to connect the south and north portions of the Portland Hills habitat. Create a visual buffer between Highway 26 and south boundary of Zoo by planting Douglas fir and western red cedars.

Site No. 112: Canyon Road East **Maps:** 3026-27, 3125-28, 3227

SITE SIZE: 418 acres

LOCATION: Fairview Blvd., north; eastern border of Zoo, west; Spring St., south; I-405, east

NEIGHBORHOODS: Goose Hollow, Southwest Hills, Upper Highland, Washington Park

INVENTORY DATE: July 29, 1991

HABITAT CLASSIFICATION:

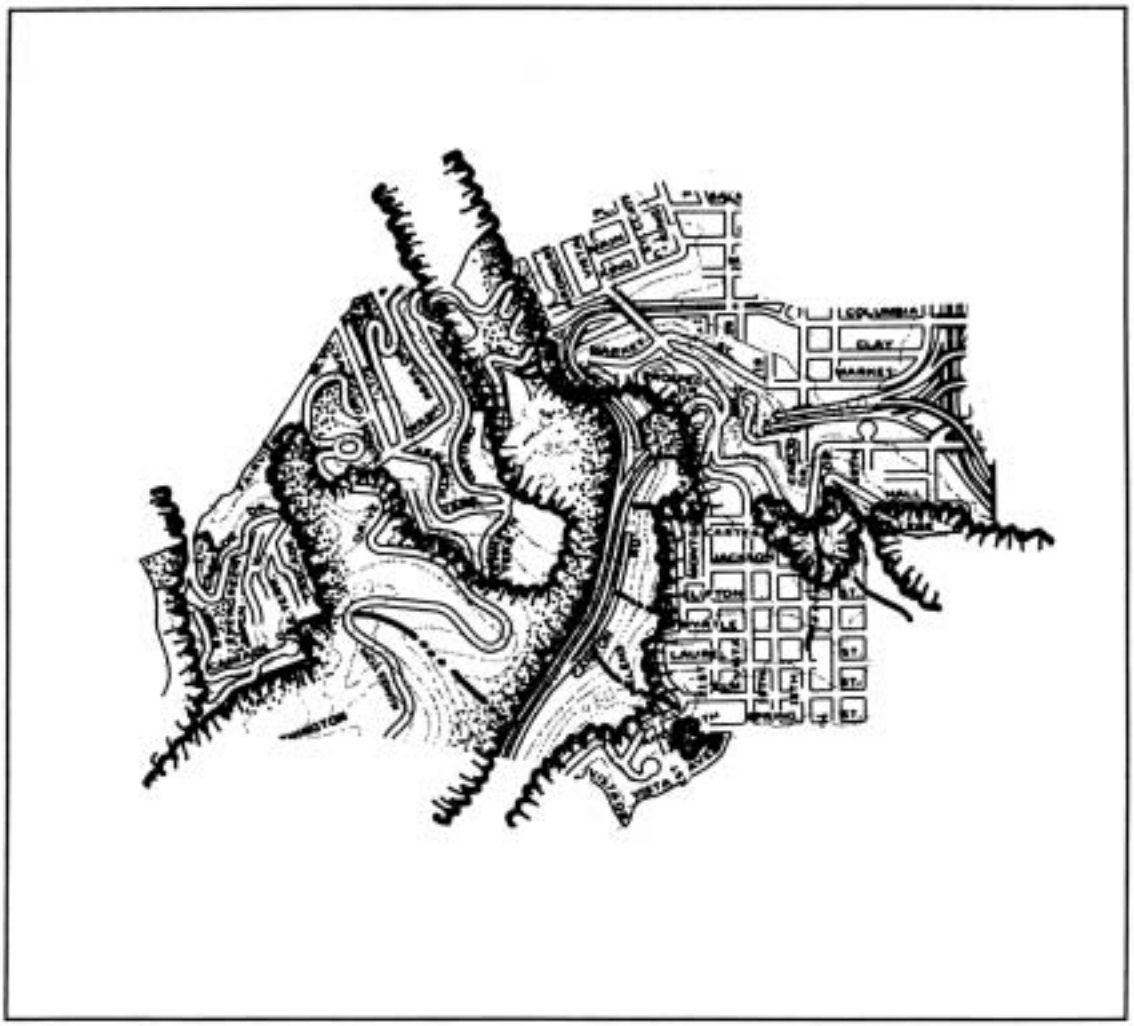
- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial/Intermittent Streambeds
- Palustrine, Forested Wetland

TYPES OF RESOURCES:
Open space, cultural, scenic, historic, recreation, wildlife habitat, seasonal creeks, groundwater recharge and forest.

SITE LOCATION & DESCRIPTION:
This site is includes portions of Washington Park, Highway 26 and Portland Heights residential neighborhood. The curvelinear streets, variety of architectural styles and park land contribute to the area character and quality. In some areas of the site the homes are interspersed with naturally occurring ravines.

A public park site exists on top of the Highway 26 tunnel. This land bridge physically links the north and south side of Highway 26 and serves as a habitat connection.

RESOURCE QUALITY & QUANTITY:
The site resources include forest uplands and ravines that have perennial and intermittent creeks. These natural features provide habitat for local wildlife. The predominant trees are Douglas fir and bigleaf maple plus the uncommon climax species, grand fir. The forest ranges from early to later seral stages, 40 to 80 years old with *hardwood with young conifer* and *conifer topping hardwood.* The representative forest has an 80 percent tree canopy closure, 20 percent shrub closure and 90 percent herbaceous closure. Approximately one snag per acre exists providing important nesting and food resources. Exotic plant species are invading and threatening the health of the habitat. The two large tracts of contiguous forest that occur on this site increase the habitat quality. One such area exists in the form of two ridges located south of



Resource Areas

Site 112

North

Scale: 1" = 1200'

650 Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands

Key Map

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

Highway 26 that cover approximately nine acres. The other area is the undeveloped portion of Washington Park that abuts the north side of Highway 26. It is about 200 acres in size (including the area that extends beyond the site boundary).

Habitat Rating:

Wildlife Habitat Score:	63	**Range for All Sites:**	50 to 86
Water	: Medium		
Food	: Moderately High		
Cover	: Moderately High		
Interspersion	: Medium		
Uniqueness	: Low		
Disturbance	: Low		

Summary: The significant site habitat features include all ravines and the contiguous forested areas. A limited but important north/south habitat link is provided on top of the Highway 26 tunnel. The forest cover, canyon walls, knolls and ridge-tops create a unique visual corridor along Highway 26. The natural beauty contributes to the area livability for residents and commuters.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Commercial; Landscaping; Open Space Uses

Consequences of Allowing Conflicting Uses:
Residential and commercial development would result in loss of forest cover and native vegetation through site clearing. Landscaping with non-native and/or invasive plant species would deteriorate the scenic and habitat values of forest cover. Development would continue to impede wildlife migration over the Highway 26 land bridge and disrupt the flow of genetic material. The forested area's value as wildlife habitat would be degraded or lost. This link between the northwest hills and the Balch Creek watershed would also be disrupted. Stormwater runoff could carry pollutants into the site's creeks. The site's groundwater recharge capacity would be affected by new impervious surfaces.

The scenic and aesthetic values of forested areas would be diminished through further development. Loss of these values would diminish neighborhood identity and character. The loss of Highway 26's scenic values would diminish the corridor's contribution to the area's regional identity.

Traffic associated with nearby commercial uses constitutes a threat to migrating wildlife and further degrades the resource site's scenic character

through automobile emissions. The noise level from traffic may increase if forested cover and topography are altered as a result of development.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce infrastructure and public facility construction and maintenance expenditures. Clustering dwelling units together or in a planned unit development would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development would reduce the potential for flooding and landslides and would yield savings in water and maintenance costs. Preserved forest cover and native vegetation would add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists, visitors and local residents.

Limiting development in resource areas could result in the potential savings mentioned above. Additional costs would be incurred to protect resources during development (e.g., erosion control measures), but these costs may be offset through potential savings. Prohibiting development would reduce development opportunities for landowners and local builders, and would have a negative impact on the city's tax base.

Social Consequences: Protection of the forest's scenic and aesthetic values would enhance the surrounding residential neighborhood character and contribute to the neighborhoods' identity. The land area in the Highway 26 canyon receiving scenic protection would be expanded. Quality of life would be protected and maintained for the benefit of the citizens of Portland.

The recreational values of unprotected forest cover would be preserved. The forested cover and ridge would continue to serve as a noise buffer. Improvements to public park land would be completed in a manner which preserves the forest's natural character.

Development would be guided away from areas characterized as having severe landslide potential or unstable soils. Prohibiting development altogether would prevent new housing construction and possibly reduce choices in the local housing market.

Environmental Consequences: The wildlife habitat surrounding Washington Park and the Portland Heights neighborhood would be preserved. Existing migration corridors linking the southwest with the northwest hills and the Balch Creek watershed would be preserved as well. Ravines would be protected from development-related landslides. Wildlife movement could be enhanced through removal of fences and/or improvement of corridors around Highway 26. The resource site's

groundwater recharge capacity would be protected through impervious surface limitations and erosion control measures.

Energy Consequences: Forest cover would moderate local temperature for housing. Forest cover could also reduce solar access of some properties. Clustering development would save energy through reducing the distance for services and infrastructure to access individual properties. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive consequences. However, resource protection would result in negative economic and energy consequences if development were prohibited and located farther from established neighborhoods. Resource protection requirements would not increase the costs of development significantly because additional measures are already required to build homes in this area.

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for properties located in the center of the resource site from its northern boundary to its southern boundary. The EC zone is also proposed for the forest cover adjacent to Washington Park and for some of the site's creeks and adjacent riparian areas. The restrictive environmental protection (EP) overlay zone is proposed for forests near the parks, creeks and drainages. Approximately 45 acres of residential and 0.75 acres of commercial land are affected by proposed environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R10	24.31	6.79
R7	12.2	0.8
R5	1.14	0.05
CG	0.75	0

MANAGEMENT RECOMMENDATIONS:
Recognize the park site on top of the Highway 26 tunnel as an important habitat link by preserving the connection and improving the habitat conditions. Remove fences to increase wildlife movement. Remove garbage. Provide erosion control measures along ravines and intermittent creeks. Daylight drainages.

Site No. 113: Marquam Hill Ravine **Maps:** 3326-28, 3426-27

SITE SIZE: 499 acres

BOUNDARIES: Spring St. and College St., north; Talbot Rd., west; Council Crest Dr. and Marquam Hill Rd., south; Barbur Blvd., east

NEIGHBORHOODS: Homestead, Southwest Hills

INVENTORY DATE: May 16, 1991

HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial/Intermittent Streambeds
- Palustrine, Forested Wetlands

TYPES OF RESOURCES:
Wildlife habitat, groundwater recharge, scenic, recreation, perennial and seasonal creeks, and forested wetlands.

SITE LOCATION & DESCRIPTION:
Most of Site 113 consists of the north, east and west slopes of Marquam Hill, a prominent feature of the Portland Hills. The lower east slope of Council Crest is also part of Site 113. The total site acreage is 499 acres and characterized by steep, unstable slopes. Marquam Nature Park forms the centerpiece for the site natural habitat and serves to protect its unstable hillsides from development. It is a 71-acre forested upland area bisected by multiple ravines. It is designated as open space on the city's Comprehensive Plan. Other open space includes Duniway Park, an 11.14-acre developed park located at the bottom of the Marquam Ravine near Barbur Boulevard and Governors Park, a six-acre forest near SW 13th and Davenport.

The natural areas including Marquam Nature Park are located in the middle and west portions of the site. The northern third of the site is primarily a north facing slope that is developed with single-family homes. It is in this area that Governors Park is located. The northern part of the Oregon Health Science University (OHSU) campus is located within this site.

RESOURCE QUANTITY AND QUALITY:
Approximately 60 percent or 273 acres of Site 113 has a mixed conifer and deciduous forested cover. Marquam Nature Park, a 71-acre designated open space area serves as a significant center piece to the surrounding natural areas within the site and connecting to adjacent sites. Marquam Creek which is the

main drainage is in an open, natural condition until it reaches the Sam Jackson Road and Terwilliger Boulevard intersection where it joins a major tributary flowing from the south. The southern tributary is an one-mile long perennial creek that extends from Fairmont Street near Marquam Hill Rd.

The forest is a mid-aged coniferous forest (60 to 100 years old) with climax species present and intermittent creeks flowing through it. This site has about two dozen seasonal creeks that are tributaries of three watersheds. The creeks are associated with ravines that have 40 to 60 percent side-slopes. The ravines and waterways provide an important source of water for the plants and animals of the area. Generally, a higher quality of habitat exists along the creeks as a result of the diversity in plant species supported by the creek.

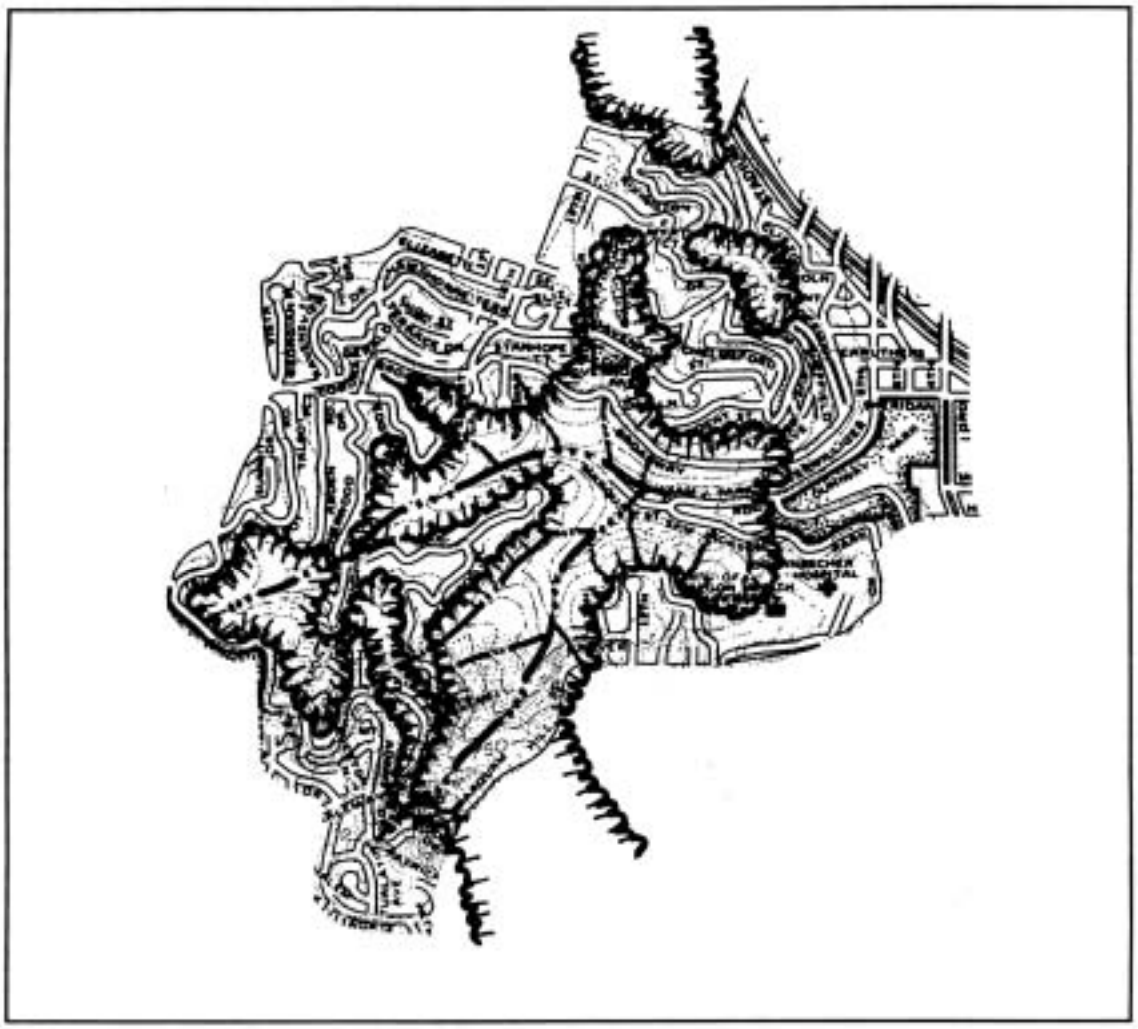
The forested areas are well represented throughout the site ranging from 80 percent canopy closure in the vicinity of Marquam Gulch to 60 percent closure near SW Fairmont and Mt. Adams Streets. Climax species of hemlock, cedar and grand fir are well established in the east side of the site. The herbal, shrub and tree layers are well defined by each having a 70-80 percent canopy closure. Each layer has good diversity of species indicating a healthy forest community. However, non-indigenous plants such as ivy and blackberries have invaded the area.

The observed bird species include: downy woodpecker, rufous-sided towhee, orange crown warbler, black-throated grey warbler, varied thrush and kinglets as well as more commonly seen birds.

The forest provides open space, recreational, scenic and educational resources. The Marquam Hill Nature Trail provides pedestrian access through the park in the form of an unpaved path that is a part of the 40-Mile Loop regional bike and trail system. In addition to the path system, there is a shelter and interpretive information. Signs of erosion are present along the Marquam Trail. Other signs of erosion are found throughout the site in the form of slumping and bowed trees.

There are about four miles of unimproved right-of-way in Site 113. The majority of these rights-of-way are undisturbed natural areas that contribute to the habitat quality of the area and in some cases provide pedestrian and wildlife passage. A portion of the unimproved rights-of-way is part of the Portland Homestead Addition that is designated open space.

Marquam Nature Park located in the Marquam Gulch is located north of Barbur Boulevard and south of Broadway Drive. Two creeks in the Marquam Gulch are designated wetlands on the 1989 National Wetland Inventory. The most northerly creek which runs in a northeast direction is defined as a riverine, intermittent streambed with cobble-gravel. The southerly wetland



Resource Areas

Site 113

North

Scale: 1" = 1200'

Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

which runs in a northern direction into the above mentioned creek/wetland is defined as a palustrine, forested wetland with an aquatic bed.
In total there are two dozen tributary creeks associated with the three watersheds in Marquam Gulch. The creeks provide storm drainage, habitat and groundwater recharge.

Other resources include the scenic value of the natural vegetation that covers over 60 percent of the site. Visual resources also include views into the wooded ravines and hilltops as well as views out to the city. Included are views of Mt. Hood and Mt. St. Helens, the eastern buttes, the Columbia and Willamette Rivers and the cityscape. As mentioned above, Marquam Hill is a prominent hill within the West Hills. The area open space contributes to the image of the West Hills as a whole. The visual impact of the greenery of the West Hills when viewed from the east, north and south sides of the city or when flying over the city, contributes to the image of Portland as a "City of Roses" and a livable city.

Governors Park, located in the northern part of the site, is six acres in size and has a stand of mature Douglas fir. This park provides wildlife habitat, marks the top of the hill and creates a gateway into the neighborhoods on each side of it. All of these elements contribute to the urban design and quality of the area.

Retention of natural vegetation helps maintain soil and slope stability. Gross removal of vegetation has been noted as a major contributing cause of land instability on the slope of the Portland Hills.[24] The geology and landslide potential of Marquam Hill has been well documented in the *Environmental Geology for Planning of the Marquam Hill Area,* prepared by Dr. Leonard Palmer for the Bureau of Planning in 1973. Extensive areas on Marquam Hill are in the extreme hazard classification.[25] Many of these areas were either purchased or given to the city in the late 1970's in order to remain undeveloped.[26] These areas now exist as designated open space.

---

24 Ibid.
25 Ibid.
26 Bureau of Planning, City of Portland, Marquam Hill Policy Plan, May 1977.

Habitat Rating:

Wildlife Habitat Score:	76	**Range for All Sites:**	50 to 86
Water	: Medium		
Food	: Moderately High		
Cover	: High		
Interspersion	: Medium		
Uniqueness	: Medium		
Disturbance	: Medium		

Summary: The unique and unstable conditions that exist in Marquam Gulch have been well understood since the late 1970's when a 71-acre area was set aside as open space. This open space provides the framework for the natural areas that extend out from Marquam Gulch. This site has a relatively high habitat quality. The abundance of water helps support the indigenous, northwest forest species present that include Douglas fir, hemlock, cedar and grand fir as well as a variety of shade-loving herbaceous plants and ferns. The visual greenery of the open space contributes to the overall character of the West Hills and image of the city. The West Hills juxtaposed with the downtown is particularly visually powerful.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Institutional; Commercial; Landscaping; Open Space Uses

Consequences of Allowing Conflicting Uses:
Residential development would involve removal of vegetation and forest cover which serve as habitat and have scenic and aesthetic values. Landscaping may involve replacing native vegetation with invasive plant species. Erosion from development could pollute nearby Marquam Creek as well as the smaller creeks and drainages. Erosion could also affect the site's wetlands. Removal of vegetation during site clearing and landscaping could undermine the soil's stability, and increase landslide potential.

Residential and commercial development adjacent to Marquam Nature Park could degrade the park's scenic and aesthetic values. Forest cover and vegetation which screen and buffer residential, commercial and open space uses could be lost. Some recreational activities allowed in Marquam Nature Park would degrade the aesthetic qualities of nearby forest and disturb resident wildlife.

Expansion of institutional uses would increase additional facility users and traffic. This would degrade wildlife habitat area and degrade vegetation and forest cover.

Traffic associated with nearby commercial uses constitute a threat to migrating wildlife and further degrade the resource site's scenic character. The noise level from traffic may increase if forested cover is removed for development of a conflicting use.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce infrastructure and public facility construction and maintenance expenditures. Clustering dwelling units together would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development reduces the potential for flooding and landslides and results in savings in water and maintenance costs. Preserved forest cover and native vegetation will add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists, visitors and local residents.

Limiting development in resource areas could result in the potential savings mentioned above. Additional costs would be incurred to protect resources during development (e.g. erosion control measures), but these costs may be offset through potential savings. Prohibiting development would reduce development opportunities for landowners and local builders.

Limiting where development could occur on the OHSU campus would reduce options for expansion. The draft OHSU master plan (May, 1991), shows one site (Site L) that is in a resource area. Protection of these resources may reduce development options and certainty of where development could occur. In addition, alternative development options of OHSU might no longer be feasible. An additional review process would be added to conditional use and design review. All three reviews can be conducted concurrently, so the review process can be completed in a timely manner. In terms of additional time an expense, the mitigation required for development approval could increase the development costs.

Prohibiting development on the physically constrained OHSU property could yield some savings because construction would not take place on steep slopes (e.g. >25%) and the use of expensive materials and design during construction would not be necessary.

Social Consequences: The scenic values of the Marquam Nature Park, the wooded ravines and hilltops, the nearby forest and the Marquam Trail would be preserved. The scenic views of Mt. Hood and Mt. St. Helens, the eastern buttes and the Columbia and the Willamette Rivers would be protected

beyond what the scenic zone currently protects. The recreational and educational opportunities in Marquam Nature Park would be preserved and protected from nearby conflicting uses. Public improvements to the park would be subject to environmental review. Preservation of Marquam Nature Park would contribute to the livability of the surrounding neighborhood.

Quality of life considerations which include scenic and aesthetic views, air shed, country in the city character, neighborhood identity and close green spaces would be protected and maintained for the neighborhood's benefit. Portions of this resource site are included within the boundaries of the *Corbett/Terwilliger/Lair Hill Policy Plan* and *the Marquam Hill Policy Plan*. Resources would be preserved through enforcement of policies in both plan documents.

Development would be guided away from areas characterized as having severe landslide potential. Prohibiting development would prevent new housing construction and possibly reduce choices in the local housing market.

The Oregon Health Sciences University is the only medical school in the state of Oregon. Limiting development to the campus' development sites would allow new educational and medical facilities to be constructed and would preserve the forest cover's scenic and habitat values. Maintaining the scenic values of the forest cover surrounding the OHSU campus would enhance OHSU's competitiveness in attracting students and faculty. Prohibiting development on the campus would prevent construction of new medical and/or educational facilities, and would not permit further growth at this important state resource.

<u>Environmental Consequences</u>: Marquam Creek and its tributaries, forested areas, ravines and wildlife habitat would be protected. Interspersion with the surrounding forest would be preserved. The wildlife habitat values of Marquam Nature Park would be preserved as well. The riparian areas around Marquam Creek and its tributaries would be protected and would continue to serve as habitat for local wildlife.

<u>Energy Consequences</u>: Forest cover would moderate temperature for housing. Forest cover could also reduce solar access of some properties. Clustering development would save energy by reducing the distance required for services and infrastructure to access individual properties, reducing utility usage and using common walls. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, resource protection would result in negative economic, social and energy consequences if development were prohibited, resulting in development occurring farther from established neighborhood (e.g. beyond the urban growth boundary). Resource protection would not increase the costs of development significantly because additional measures are already required to deal with the area's topography when building houses.

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC is proposed for portions of Marquam Nature Park and the forested areas of the site.

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are Marquam Nature Park, Marquam Creek and its tributaries.
Approximately 138 acres of residential land are affected by proposed environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R10	81	5
R7	21	1
R5	2	0
R2	3	0.5
R1	24	0.3

MANAGEMENT RECOMMENDATIONS:
Remove non-native plants. Require erosion control measures for all development. Daylight creeks.

Site No. 114: Terwilliger Parkway, Central **Maps:** 3327-28, 3427-29, 3527-29

SITE SIZE: 455 acres

BOUNDARIES: Gibbs St., north; Council Crest Dr. and 14th Ave., west; Barbur Blvd. and Corbett St., east; Westwood Court and Menefee Drive, south

NEIGHBORHOODS: Bridlemile-Robert Grey, Corbett-Terwilliger-Lair Hill, Healy Heights, Homestead

INVENTORY DATE: May 16, 1991

HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial/Intermittent Streambeds

TYPES OF RESOURCES:
Wildlife habitat, forest, perennial and seasonal creeks, groundwater recharge, scenic, historic, cultural, recreational and open space.

SITE LOCATION & DESCRIPTION:
This 455-acre site contains the greatest amount of potentially developable land in the study area. The western half or about 200 acres of Site 114 is unsewered, representing the largest unsewered area in the study area and a constraint to development. These undeveloped hillsides have primarily a mixed coniferous/deciduous forest cover. This site has three additional unique features: portions of the Terwilliger Parkway, the Oregon Health Sciences University (OHSU), and the 40-Mile Loop Trail. The middle section or about 1.2 miles of the three-mile long Terwilliger Parkway is located in Site 114. The Terwilliger Parkway is a 77-acre parkway envisioned in 1903 by John Olmsted[27] and presently part of a design overlay zone. The parkway is primarily tree covered, has lookout points, a bike path and a two-lane roadway. Terwilliger Parkway is the most popular and well-used jogging/walking corridor in the city. The middle portion of the parkway has little development with the exception to the new OHSU eye clinic at the Campus Drive entrance.

Oregon Health Sciences University is a multi-institutional center located on 116 acres (Sites 113 & 114) containing over 26 buildings. According to the *Framework Master Plan* (May, 1991) there is one site identified as having development potential that is in a natural resource area. It is referred to as

---

27 Bureau of Planning, City of Portland, *Terwilliger Parkway Corridor Plan*, 1983.

Site L and is about a 50-acre undeveloped, wooded site on the southeast slope of Marquam Hill south of OHSU.

RESOURCE QUANTITY AND QUALITY:
This site has a series of ten ridges that form three watersheds. The elevations vary between 150 and 850 feet. Site 114 has documented shallow[28] and unstable soils[29] as well as fault lines[30] (also see Site 114, Resource Areas Map). The shallow soils in Site 114 are located on both sides of Terwilliger Boulevard and in conjunction with rock outcroppings. These features occur on the eastern slope of OHSU for about 2,800 feet in Site 114 (see Geomorphology Map, Redfern 1972). Slopes with moderate to extreme landslide hazard conditions exist throughout the site and are mapped in a Planning Bureau atlas. The rock outcroppings are a scenic resource as well as a constraint to development due to the increased labor cost necessary for blasting or building into bedrock.

The representative forest is second growth *conifer topping hardwood*. The forest is 30 to 50 years old and is generally half conifer and half deciduous. A layer of downed woody debris provides food and cover and increases habitat quality. Canopy closure in the herb zone is 90%, in the shrub zone, 15%, and in the tree zone, 60%. Pileated woodpeckers and evening grosbeaks have been observed in the area.

Today the Terwilliger Parkway is recognized as an important open space system and recreation corridor. The parkway includes a heavily used walking/jogging path and is a bicycle commuter route. In 1983, the City Council adopted the *Terwilliger Parkway Corridor Plan* which specifies design treatment anticipated for the private and public land along the parkway within the adopted design overlay zone. While the corridor plan was adopted as policy and intended to be enforceable, the inherent flexibility of the guidelines and allowance for exceptions has resulted in recent developments which do not fully meet the guidelines. Notwithstanding, the parkway provides great civic pride and is a visual and wildlife corridor. The Terwilliger Parkway links two miles of the six-mile length of the Southwest Hills. This forested corridor provides a great deal of civic pride and contributes to a sense of place and to Portland's identity as forested city.

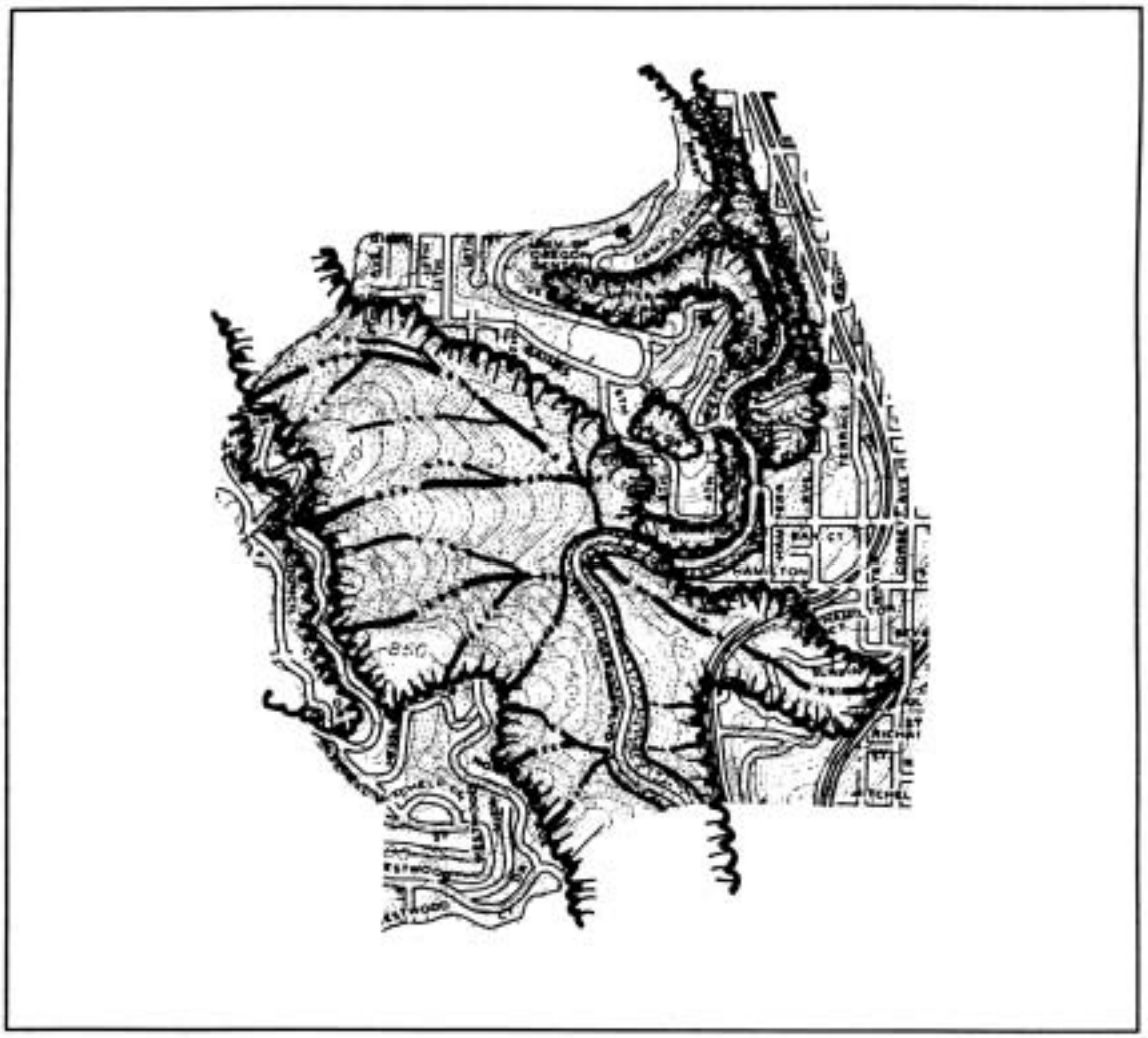
A visual assessment of the Terwilliger Parkway was conducted and mapped in great detail as a part of the *Terwilliger Parkway Inventory* (1983). The viewshed is shown on Figure 20 in the inventory. This information

---

28 See *Map of Marquam Hill & Vicinity showing Bedrock Structure, Geomorphic Lieantions and Soil Thickness*, by R.A. Redfern, 1972; Bureau of Planning files on Terwilliger Parkway (1983).

29 *Terwilliger Parkway Inventory*, pages 20-23, 26, 28, 31-32, Bureau of Planning document.

30 *Map of Marquam Hill & Vicinity*, by R.A. Redfern, 1972; Bureau of Planning files on Terwilliger Parkway (1983).



Resource Areas

Site 114

North

Scale: 1" = 1200'

450 Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands

Key Map

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

provided the location of visual resources along Terwilliger and has been important in the environmental protection analysis.

The Marquam section of the 40-Mile Loop runs through Site 114. The trail system is mapped on the official zoning maps. It connects the Zoo and a 20-acre designated open space parcel located on the south side of Highway 26 with Patton Road, Council Crest and Marquam Nature Park. It passes through unbuilt portions of SW 14th, SW Lane and SW 10th streets, and through undeveloped portions of the OHSU property (i.e., tax lots 55 and 35) to Terwilliger Boulevard. The trail continues south to George Himes Park (Site 115) where it cuts east to Willamette Park and the Sellwood Bridge. The trail system is in place in its entirety. In Site 114, large portions of the trail exist on private property in the form of easements. This trail system forms a habitat, scenic and recreation corridor. It is a portion of a regional asset and trail system that is over 140 miles long.

A particularly visually prominent knoll is "Eagle Point" located east of the Terwilliger and Homestead intersection where Lowell Terrace and Lowell Lane are today. It was a major element of Olmsted's 1903 plan and is identified in the *Terwilliger Parkway Corridor Plan.* Unfortunately, the northern loop of the "Eagle Point" was vacated in 1963,[31] effectively eliminating this public resource (see Management Recommendations). The knoll is 380 feet in elevation, 90 percent forested with a *conifer topping hardwood forest,* and is the most easterly extending portion of the Southwest Hills (with the exception of the River View Cemetery area). These characteristics make it significant.

Another site resource exists in the form of natural access points to and from properties adjacent to Terwilliger Boulevard formed by the natural topography. "Natural Future Access Points" and "Existing or Approved Private Access" points have been mapped as a part of the *Terwilliger Parkway Corridor Study.* This is important inventory and parkway development guideline information which if followed will help increase development opportunities in a rational way while protecting the more difficult to develop and fragile locations. As of 1982, there were 42 private existing or approved access points within the Terwilliger Corridor study area and ten "Natural Future Access Points." Five identified "Natural Future Access Points" occur in Site 114.

---

31 See Ordinances 117662 and 40597.

Habitat Rating:

Wildlife Habitat Score:	75	**Range for All Sites:**	50 to 86
Water	: Medium		
Food	: Moderately High		
Cover	: Moderately High		
Interspersion	: High		
Uniqueness	: Low		
Disturbance	: Low		

Summary: This site contains a portion of the Terwilliger Parkway which is the most significant habitat, scenic and recreation corridor in the West Hills if not the city. Over time, steps have been taken to reduce development potential on both private and public lands within Site 114 either temporarily or permanently. Terwilliger Parkway is connected to the 40-Mile Loop, regional trail system. The trail system through Site 114 provides a significant connection to the regional system as well as a connection to Marquam Nature Park and Terwilliger Parkway. This site has the second largest contiguous habitat area in the study area. The habitat quality is relatively good based on the vegetative cover that received "moderately high" ratings in terms of food and cover. Portions of Site 114 are poorly suited for development due to shallow bedrock, steep slopes and ravines. The extensive tree-covered open space, the Terwilliger Parkway and the forest quality make this a significant site. Also of significance is the site's contribution to the visual integrity of the West Hills and to the overall visual quality and identity of the city.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Institutional; Landscaping; Open Space Uses

Consequences of Allowing Conflicting Uses:
Expansion of the Oregon Health Sciences University Campus into resource areas could result in degradation of forest and scenic resources. Development of new roads, parking lots and other impervious surfaces could contribute to stormwater runoff which may harm nearby creeks. Potential open space uses such as parking lots would contribute to stormwater runoff and would degrade the scenic and aesthetic qualities of nearby open spaces. Erosion could degrade the site's creeks. Expansion of institutional uses would increase additional facility users and traffic. This would degrade wildlife habitat area and degrade vegetation and forest cover.

Residential development which involves site clearing will remove vegetation and forest cover which serves as habitat. Septic systems would contribute to groundwater pollution and potential pollution of drainages

which function as water sources for wildlife. Construction of sanitary sewers would involve permanent removal of trees and native vegetation. Landscaping may involve replacing native plant species with non-native or invasive species.

Planned road improvements to Terwilliger could degrade the parkway's scenic value if trees and vegetation are not replaced. Development along the Terwilliger Parkway would continue to degrade the scenic values of the parkway. Removal of trees for access and development would alter the forested character[32] that now prevails over a more urbanized character. Terwilliger Parkway would become less of a refuge from the city. The Parkway's contribution to the city's regional identity would be diminished. The neighborhood's identity in relation to the Terwilliger Parkway would be diminished as well.

Development would result in increased automobile traffic and congestion on Terwilliger Boulevard. The 7,000 to 10,000 vehicles per day currently using Terwilliger degrade the recreational, scenic and habitat resources. Increased traffic would further degrade identified resources through the additional noise, auto emissions and increase in access drives which would reduce vegetation and increase physical intrusion.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce public and private facility construction and maintenance costs. The shallow soils and bedrock located along Terwilliger Boulevard and the east slope of OHSU present a development constraint due to the labor involved in blasting and/or building into bedrock.

Limiting where development could occur on the OHSU campus would reduce options for expansion. The draft OHSU master plan (May, 1991) shows one site (Site L) that is in a resource area. Protection of these resources may reduce development options. In addition, alternative development options of OHSU might no longer be feasible. An additional review process would be added to conditional use and design review. All three reviews can be conducted concurrently, so the review process can be completed in a timely manner. In terms of additional time and expense, the mitigation required for development approval could increase the development costs.

Prohibiting development on the physically constrained OHSU property could yield some savings because construction would not take place on steep slopes (e.g., >25%) and the use of expensive materials and design during construction would not be necessary.

---

32 Forest character and amount of development is documented in the Terwilliger Parkway Inventory (1983).

The five "Natural Future Access Points" identified in the *Terwilliger Parkway Corridor Study* (and map) provide an opportunity for access to properties along Terwilliger where the land areas are less constrained (or previously approved). This is potentially pertinent to about 200 acres in Site 114 which are currently unsewered, undeveloped and located on both sides of Terwilliger Boulevard. Allowing access, following the appropriate land use and environmental reviews, will reduce the negative economic consequences if no access were allowed, while appropriately guiding development and providing certainty for the community and property owners.

The environmental protection (EP) zone essentially requires full resource protection and provides certainty to developers. The environmental mapping effectively informs developers and property owners of the development potential of a site at an early point in the development process. In this manner the resource quality and location is known, enabling developers and property owners to formulate appropriate development plans which would not intrude into these valuable resources.

Eliminating conflicting uses through the application of the environmental protection (EP) zone may in many cases have the economic benefit of lowering individual property taxes. The EP zoning is mapped on the zoning maps used by the tax assessor to determine development potential. Lower property taxes resulting from the EP zone would likely have a minor effect on the local tax base because relatively few privately owned areas are zoned EP and/or open space (OS) within the city.

Clustering dwelling units together in order to protect the resource would reduce the amount of roads, water and sewer lines resulting in reduced construction costs. The economic climate for developing clustered units may lag behind the time in which a property owner wishes to develop his or her land. Clustering needs that may be ahead of the market could have a temporary negative economic impact on property owners. Clustering units would however, be only one of several methods of protecting the site resources. Prohibiting development altogether could have a negative economic impact on individual property owners as well as the local economy, and may have serious legal implications. Landowners would likely experience a loss in anticipated revenue and local builders would have fewer infill lots in which to develop.

Limiting development in resource areas could yield the potential savings mentioned above. Additional costs would be incurred to protect resources during development (e.g., erosion control measures), but these costs may be offset through potential savings.

Preserved forest cover and native vegetation would add amenity value to existing properties and to future homes built in the area. The protected forest cover would provide a buffer between development and the heavily used Terwilliger Parkway. The privacy created would likely enhance the property value. Preserving native vegetation during and after development would reduce the potential for flooding and landslides and would reduce environmental degradation to the area soils and watershed.

By limiting the conflicting land uses, open spaces such as the Terwilliger Parkway would be preserved in a natural state for tourists, visitors and recreationalists. As Olmsted envisioned, Terwilliger Parkway can serve as a pleasure drive for local residents as well as visitors. It is a likely destination for a convention center visitor wishing to tour the city. Attracting tourists to the city has a significant and growing importance to our state and local economy.

Social Consequences: By limiting the conflicting land uses, the scenic values of Marquam Hills, the Terwilliger Parkway and the forested uplands would be preserved. Recreational and educational opportunities would also be preserved. The Terwilliger Parkway would continue to act as a buffer between housing and traffic along Terwilliger. The historic resources along Terwilliger would also benefit from resource protection measures. Portions of this resource site are included within the boundaries of the *Corbett/ Terwilliger/Lair Hill Policy Plan* and the *Marquam Hill Policy Plan*. Resources would benefit from enforcement of policies from both plan documents. Development would be guided away from areas characterized as having severe landslide or flood potential.

Quality of life considerations which include scenic and aesthetic views, air shed, country in the city character, neighborhood identity and close green spaces would be protected and maintained for the neighborhood's benefit.

The Oregon Health Sciences University is the only medical school in the state of Oregon. Limiting development on the campus' development sites would allow new educational and medical facilities to be constructed and would preserve the forest cover's scenic and habitat values. Maintaining the scenic values of the forest cover surrounding the OHSU campus would enhance OHSU's competitiveness in attracting students and faculty. Prohibiting development on the campus would prevent construction of new medical and/or educational facilities, and would not permit further growth at this important state resource.

Terwilliger Parkway provides significant public viewing points from which to view the city. The view of Terwilliger Parkway and the West Hills as a whole was not included in that process. The visual image formed by the greenery of the Terwilliger Parkway and the West Hills contributes significantly to the

regional and local identity of the city. Loss of the forest cover would degrade the overall image of the city and would likely effect the desirability of living, locating and visiting the city and region resulting in a negative economic as well as social impact.

Environmental Consequences: The seasonal creeks, forested uplands and wildlife habitat on the site and around OHSU would be preserved. In addition, the seasonal creeks would be protected from stormwater runoff and erosion which may carry pollutants. Wildlife which live near the creeks would still be able to use the creeks for water and food. The site's groundwater recharge capacity would be protected from any negative affects of development.

Preserving native vegetation during and after development would reduce the potential for flooding and landslides and would reduce environmental degradation to the area soils and watershed.

Energy Consequences: Forest cover would moderate local temperature for housing. Forest cover could also reduce solar access of some properties. Clustering development would save energy by reducing the distance required for services and infrastructure to access individual properties, reducing utility usage and using common walls. Residents along the Terwilliger Parkway would likely utilize the jogging and bicycling facilities and possibly locate there in order to use these facilities as an alternative, non-energy-consumptive method of travel to and from downtown. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, if development were prohibited, negative economic, social and energy consequences would result. Resource protection would not increase local area costs of development significantly because additional measures are already required to address the area's topography when building houses.

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for properties located in the areas where the "natural future access points" or "existing or approved access" along Terwilliger have been identified (and mapped) in the *Terwilliger Parkway Corridor Study.* The EC zone is also proposed for areas where the negative consequences of full resource

protection would be too great. Areas appropriate for EC zoning have been identified where development and resource protection can simultaneously and reasonably occur. This level of protection generally applies to resource areas that have either already been developed or are on large parcels (Site 114 has five parcels that are over 20 acres in size).

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection. It is applied in such a way as to allow reasonable development and, at the extreme, clustering of development. An effort has been made to identify and protect the most extreme and obvious physically constrained areas of Site 114. These areas are the creeks throughout the site and, specifically, south and west of the Oregon Health Sciences University campus; areas with rock outcroppings and shallow bedrock areas on slopes that generally exceed 40 percent; and along two known fault lines.

Along Terwilliger Parkway the environmental protection (EP) zone has been applied where properties are vacant. Three occupied parcels have homes and each lot has the potential for the creation of an additional building site in the form of flag lots. The application of the EP zone is intended to provide partial protection of the Terwilliger Parkway, a well established scenic, recreational and wildlife corridor, and a land mark and unparalleled resource. The parkway is a unique and significant environmental resource that warrants protection. There is no other scenic, habitat, and recreation corridor in the city that so effectively encapsulates the variety of resources present while contributing to the city's identity in a manner highly prized by its residents.

Approximately 266 acres of residential land would be affected by environmental zones.

Current Zoning	**Estimated Acreage Affected by EC Zone**	**Estimated Acreage Affected by EP Zone**
R10	138	42
R7	21	4
R5	10	0
R2	5	2
R1	35	9

MANAGEMENT RECOMMENDATIONS:

- Implement the *Terwilliger Parkway Corridor Plan* and *Terwilliger Parkway Design Guidelines.*
- Apply the Southwest Hills Scenic Policy to ensure that the visual impacts of development are analyzed as a part of the environmental review for projects that have the potential to negatively impact the visual quality of the Southwest Hills.

- Recognize that the scenic protection of the West Hills' wooded character has precedence over creating private views.
- Require that the OHSU and institutions submit visual impact analyses of the West Hills as a part of their master plan review process.
- Over time implement John Olmsted's original 1903 plan for the Terwilliger Parkway by creating a public viewpoint at "Eagle Point" located along SW Lowell Lane and Terrace.
- Work with non-profit groups to support restoration projects on public property.
- Continue to work with non-profit groups such as the 40-Mile Loop and Friends of Marquam Nature Park to protect, enhance and provide access where appropriate to natural areas.
- Increase coniferous cover, remove garbage and remove nuisance plants (such as ivy and blackberry).

Site No. 115: George Himes Park **Maps:** 3528-29, 3627-29, 3728-29

SITE SIZE: 472 acres

BOUNDARIES: Westwood Ct., Menefee, and Mitchell Streets, north; Cheltenham St., west; Willamette River, east; Vermont, Chestnut, Nevada, and Canby Streets, south

NEIGHBORHOODS: Bridlemile-Robert Gray, Corbett-Terwilliger-Lair Hill, Healy Heights, Wilson

INVENTORY DATE: May 5, 1991

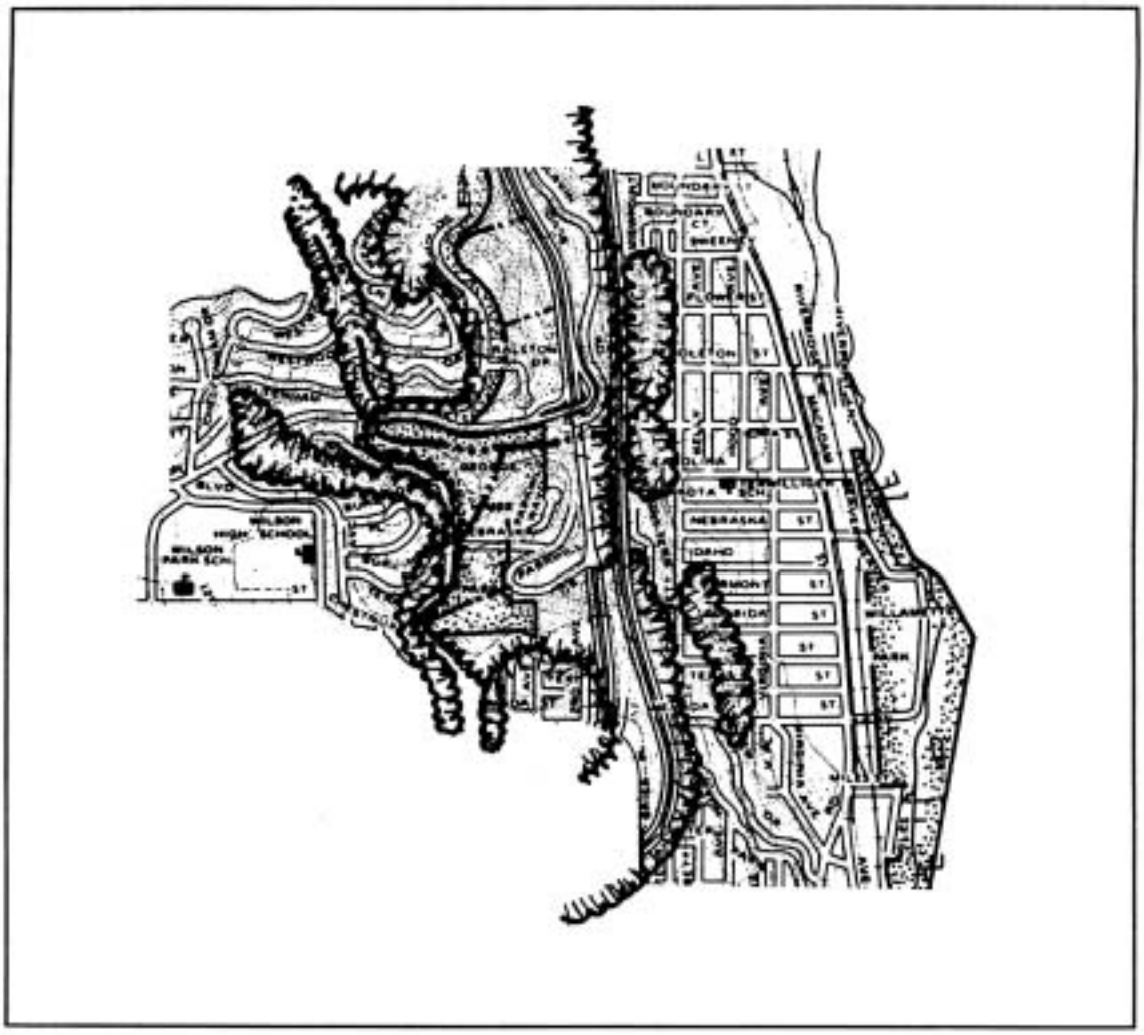
HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial/Intermittent Streambeds

TYPES OF RESOURCES:
Wildlife habitat, forest, scenic, cultural, historical, recreation, seasonal and perennial creeks, wetland, groundwater recharge and open space.

SITE LOCATION & DESCRIPTION:
This 472-acre site includes a portion of the Willamette River as well as uplands. The site is bisected east and west by Interstate 5 and Barbur Boulevard. The elevations are about 35 feet along the river, 450 feet in the the middle of the site (around George Himes Park), extending to 650 feet near Westwood Drive. A major break in the west hills occurs in this site where Capitol Hwy. and George Himes Park are located. This natural draw is a part of the Sentinel Hill Fulton drainage where a perennial creek is located. This site has the greatest diversity of land uses. The resources are typically intermingled with developed residential areas or open space designated areas. There is, however, an approximately 20-acre resource area located west of Barbur. The western half of the site is generally developed with residential neighborhoods on hillsides made up with single-family homes built in the 1950's. Wilson High School is located on the southwest corner of the site.

RESOURCE QUANTITY & QUALITY:
This site includes 6,000 feet of the Willamette River shoreline (from Boundary St. to south of Miles St.) and the river terrace (shore line to Corbett St.). Thirteen seasonal creeks and one perennial creek occur on this site with associated springs and riparian and upland forests. The creeks are dispersed across the site and intermingle with established neighborhoods except for the 20-acre site west of Barbur that is undeveloped. This site is primarily forested, has three seasonal streams and has a 40 percent slope. Ralston, an unbuilt



Resource Areas

Site 115

North

Scale: 1" = 1200'

650 Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands

Key Map

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

street, runs through the site between Barbur and Terwilliger Boulevards.

The upland area is a western hemlock forest. The forest canopy is 80 to 90 percent closed and the dominant trees are bigleaf maple and Douglas fir. Generally, the forest is 10 percent coniferous with greater amounts of Douglas fir located higher in the basin and along NW Nebraska Street in George Himes Park. The forest includes old Douglas fir (over 36" dbh). The shrub layer is 30 percent closed and the herbaceous layer is 90 percent closed.

George Himes Park is 35 acres in size and is located in the middle of the 472-acre site. Four of the seasonal creeks are located in the park. The longest of the creeks extends east through the park, under Barbur Boulevard and Interstate 5 (I-5), and into the Corbett neighborhood near Iowa and Corbett Streets. Both a wildlife and a pedestrian link exists. The park commemorates George Himes, an early pioneer, with a monument located in the park.

There is little habitat connection for terrestrial animals between the Willamette River and elsewhere in the study area due to obstacles such as I-5 and Barbur Boulevard. The bridges over I-5 and Barbur Boulevard provide a pedestrian link to the Corbett neighborhood. Between Corbett Street and the river, there are no habitat connections. There is, however, a strong avian link between the upland areas of the site (plus points farther west) and the river. Birds such as great blue heron, kingfisher and osprey travel west from the river via this site through the natural break in the West Hills.

The confluence of Stephens Creek and the Willamette River occurs on the southeast corner of this site where a wetland is located (Stephens Creek flows south of Interstate 5 in Site 117). The wetland is about 1,000 square feet in size and designated on the National Wetland Inventory (PFO1W).

In addition to George Himes Park, the southern section of the Terwilliger Parkway is located in Site 115. It serves as a significant wildlife, scenic and recreation corridor that contributes to the livability of the city, as well as the immediate area. (See Site 114 for more resource information on Terwilliger.)

Habitat Rating:

Wildlife Habitat Score: 69 **Range for All Sites:** 50 to 86

Water	:	Medium
Food	:	Moderately High
Cover	:	Moderately High
Interspersion	:	Medium
Uniqueness	:	Low
Disturbance	:	Low

Summary: This site is a mosaic of hillsides and drainageways some of which have been protected through public acquisition and open space designations. There are, however, resource areas outside of the designated open space areas that form contiguous forest and stream corridors. These areas serve the important function of conveying stormwater, providing habitat, screening adjacent neighborhoods and adding to the scenic quality of the city. The natural passage between the West Hills creates a flight path for birds traveling between the Willamette River and points west. George Himes Park and the Terwilliger Parkway provide a framework for the protection of the surrounding areas.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Landscaping; Open Space Uses

Consequences of Allowing Conflicting Uses:
Residential development would involve clearing forest cover and removal of native vegetation which serves as habitat. Landscaping could involve replacing native plant species with non-native or invasive species. Erosion from residential development would affect the perennial creek and riparian areas. Garbage dumping will continue to degrade the area's value as wildlife habitat (e.g., degrading food sources and cover). Removal of snags and down woody material will result in removal of shelter and nesting areas for wildlife. Some recreational uses would affect the resources in the area such as hiking in undisturbed vegetation.

Development adjacent to George Himes Park could degrade the park's scenic and cultural values. Forest cover and vegetation which screen and buffer residential from open space uses could be permanently removed. The stormwater storage, habitat and scenic values of these resources could be lost.
Planned road improvements to SW Terwilliger Boulevard and SW Barbur Boulevard could also involve the loss of forest cover and its scenic value.

Consequences of Limiting or Prohibiting Conflicting Uses:
<u>Economic Consequences</u>: Guiding development away from hazardous areas would reduce expenditures for infrastructure construction and maintenance. Clustering dwelling units together would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development reduces the potential for flooding and landslides and would yield savings in water and maintenance costs. Preserved forest cover and native vegetation would add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists, visitors and local residents.

Limiting development in resource areas could yield the potential cost savings mentioned above. Additional costs would be incurred to protect resources during development (e.g., erosion control measures), but these costs may be offset by savings resulting from a reduction in infrastructure. Prohibiting development would have significant economic consequences for landowners and local builders.

Social Consequences: Portions of this site are within the *Marquam Hill Policy Plan* and the *Terwilliger Parkway Corridor Plan*. Enforcement of resource protection policies from both plans would help preserve the site's scenic and aesthetic qualities. Preservation of these resources will contribute to the quality of life of nearby neighborhoods. The *Macadam Plan District* and *Design Guidelines* apply to selected properties as well.

The forest cover adjacent to George Himes Park would continue to screen and buffer open space and residential uses. The forest scenic qualities would be preserved as well. Quality of life considerations which include scenic and aesthetic views, air shed, country in the city character, neighborhood identity and close green spaces would be protected and maintained for the neighborhood's benefit. This would help make up for the deficiency in open space.[33]

Development would be guided away from areas characterized as having severe landslide potential or unstable soils. Prohibiting development altogether would prevent new housing construction and possibly reduce choices in the local housing market.

Environmental Consequences: The drainages and riparian forests would be preserved and protected from the adverse effects of development. Snags and down woody debris would be preserved for wildlife habitat. George Himes Park's natural areas would be preserved. The forest cover surrounding the park would continue to serve as wildlife habitat and filter stormwater.

Energy Consequences: Forest cover would moderate local temperature for housing. Forest cover could also reduce solar access of some properties. Clustering development would save energy by reducing the distance for services and infrastructure, reducing utility usage and using common walls. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

---

[33] According to the City of Portland Comprehensive Plan, adopted January 1, 1981.

CONCLUSION:
Resource protection would result in positive economic, social, environmental and energy consequences. However, resource protection would result in negative economic, social and energy consequences if development were prohibited, resulting in development occurring farther from established neighborhoods. Resource protection would not increase the costs of development significantly because additional measures are already required to address the area's topography when building houses.

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for properties located in the northern and central portions of the site around George Himes Park.

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are George Himes Park and the site's creeks and drainages. Approximately 143 acres of residential and one acre of commercial land are affected by environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R10	24	0
R7	52	5
R5	54	1
R2	7	0
CN2	1	0

MANAGEMENT RECOMMENDATIONS:
In order to insure that the social, environmental, economic and energy values associated with the Terwilliger Parkway and surrounding West Hills are preserved, apply the EC and EP zones to significant resource areas within the corridor. Continue to promote alternative transportation on Terwilliger Boulevard in order to reduce the high automobile use. Create a gateway and visual screen at Terwilliger and Capitol Highway intersection by planting native conifer trees. Develop a scenic policy which identifies the need to protect and retain the native tree cover of the West Hills as a visual amenity to the city and region. Increase coniferous cover; remove the debris; retain snags and down woody material; add plants with persistent seeds, fruits and other edible parts; and take measure to preclude erosion. Develop a creek signage program to increase public awareness.

Site No. 116: Capitol Hill/Burlingame **Maps:** 3726-28, 3827-28

SITE SIZE: 460 acres

BOUNDARIES: SW Vermont St., north; Brier Pl. (Fulton Park), east; Dolph, Spring Garden, and Hume Streets, south; SW 31st & 33rd Ave., west

NEIGHBORHOOD: Burlingame, Multnomah, Wilson

INVENTORY DATE: May 5, 1991

HABITAT CLASSIFICATION:

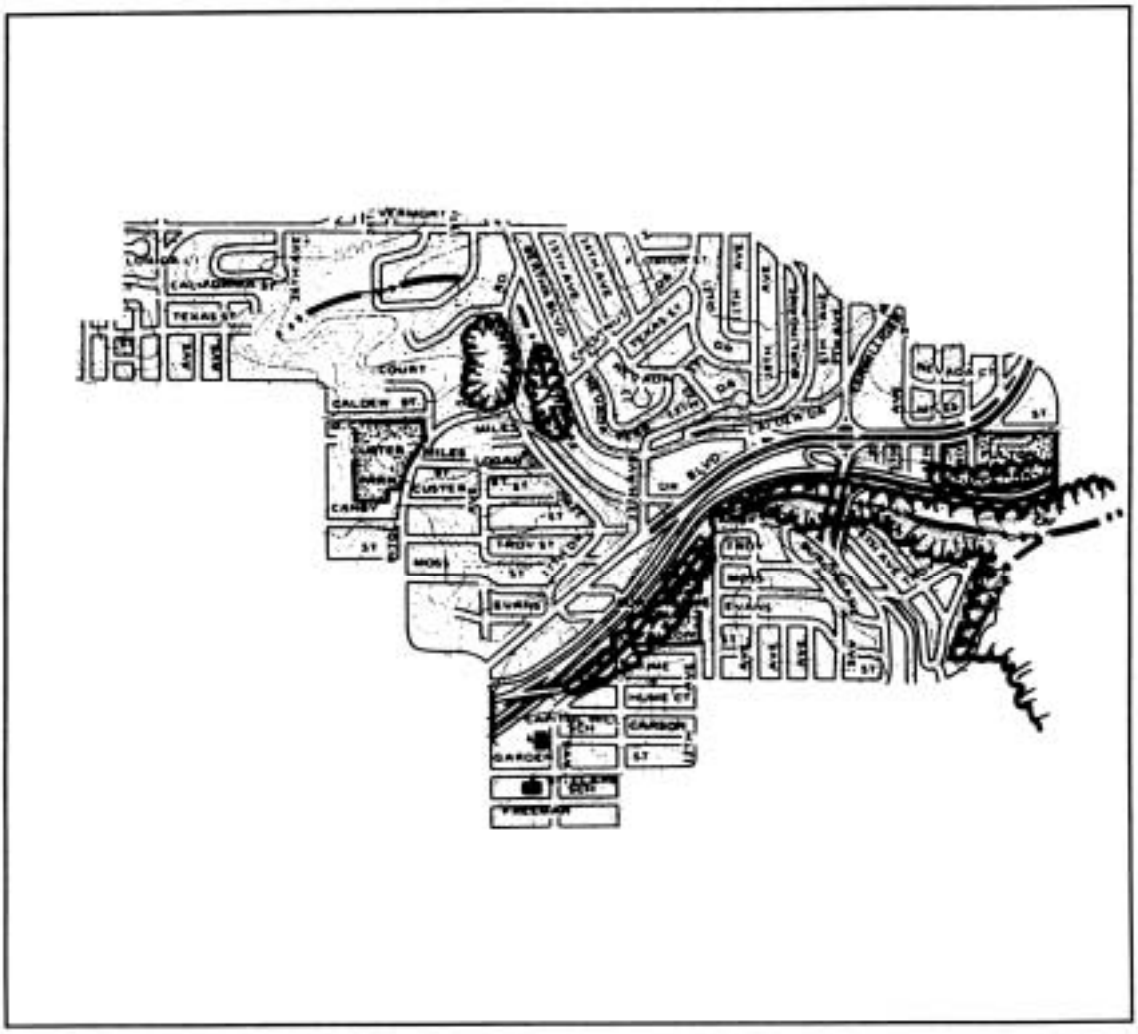
- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial
- Palustrine, Forested Wetland

TYPES OF RESOURCES:
Perennial creek, open space, forest, wildlife habitat, wetland, groundwater recharge, scenic, recreation and cultural.

SITE LOCATION & DESCRIPTION:
This site has a diversity of natural relief defined by four knolls. Three of the knolls are north of Interstate 5 (I-5); the fourth is south. The gulch that is formed by the knolls contains Stephens Creek, a perennial creek that flows on the south side of I-5, north of the River View Mausoleum, and then into the Willamette River. South of Miles Street (Site 115), there is a National Wetland Inventory (PFO1W) designated wetland.

The site elevations range from 500 feet on the west to 200 feet on the east. Five remaining natural areas ranging from two to 11 acres have been identified. Three of these areas are located in drainageways and two are hillsides above Interstate 5 that are either right-of-way areas or undeveloped parkland.

RESOURCE QUANTITY & QUALITY:
Eighty percent of Site 116 has been developed, leaving only about 30 acres in a natural condition. Three of the sites have water courses of which Stephens Creek is the most significant. All five areas have groves of native trees including Douglas fir, cottonwood, bigleaf maple and some alder. These areas provide cover and food for animals such as raccoon, marmots and mice. The presence of water in the three drainage courses increases the area's habitat quality since water is essential for wildlife survival. West of SW Bertha Boulevard is a half-acre wetland. Wetlands are rare and valued resources



Resource Areas

Site 116

North

Scale: 1" = 1200'

650 Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands

Key Map

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

because of the high plant, animal and insect species to land area ratio. Wetlands also improve water quality by trapping sediment.

This site includes the southern 1,000 feet of the Terwilliger Parkway. Terwilliger is a significant scenic and recreation corridor that also provides habitat (see Site 114 & 115 for more discussion).

Habitat Rating:

Wildlife Habitat Score: 68 **Range for All Sites:** 50 to 86

Water	: Moderately High
Food	: Moderately High
Cover	: Medium
Interspersion	: Medium
Uniqueness	: Low
Disturbance	: Medium

Summary: Site 116 natural areas are limited and fragmented compared to the other resource sites. These natural areas do, however, contribute to the character of the area and help define the edges and slopes of the diverse area topography. This site forms a gateway into the city that should be reinforced by the retention and planting of native vegetation. Stephens Creek is the major creek that helps support much of the native vegetation and forms a habitat corridor. The southern section of the Terwilliger Parkway, an important cultural resource, is in this site.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Commercial; Landscaping; Open Space Uses

Consequences of Allowing Conflicting Uses:
Residential and commercial development would involve removal of forest cover and native vegetation through site clearing. Landscaping may involve replacing native plant species with non-native or invasive species. Several drainages in the area would be affected by residential and/or commercial uses. Open space uses could degrade the scenic and environmental education values of forest cover.

Traffic associated with nearby commercial uses constitutes a threat to migrating wildlife and further degrades the resource site's scenic character. The noise level from traffic may increase if forested cover is removed for development of a conflicting use.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce infrastructure and public facility construction and maintenance. Clustering dwelling units together would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development reduces the potential for flooding and landslides and results in savings in water and maintenance costs. Preserved forest cover and native vegetation will add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists, visitors and local residents.

Limiting development in resource areas could result in the potential cost savings mentioned above. While new costs would be incurred to protect resources during development (e.g., erosion control measures, review processes), these costs may be offset through these potential savings. An environmental review will add a relatively minor cost to the total development costs. Prohibiting development would have significant consequences for landowners and local builders.

Social Consequences: This resource site is located within the *Terwilliger Parkway Corridor Plan* area. Enforcement of the plan's design guidelines and other resource protection measures will help preserve the scenic and aesthetic qualities of the parkway. Quality of life considerations which include scenic and aesthetic views, country in the city character, neighborhood identity and close green spaces would be protected and maintained for the neighborhood's benefit. This would make up the deficiency of open space in the neighborhood according to the *1980 Comprehensive Plan Map*.

Development would be guided away from areas characterized as having severe landslide potential or unstable soils. Prohibiting development altogether would prevent new housing construction. This would reduce choices in the housing market.

Environmental Consequences: The gulch formed around Stephens Creek would be protected. Its value as habitat would be preserved. The creek would be protected through erosion control measures. The resource site's groundwater recharge capacity would be protected from the harmful effects of erosion or pollutants from stormwater runoff. The wetland's habitat and sediment trapping values would also be preserved.

Energy Consequences: Forest cover would moderate temperature for housing but would also reduce solar access in some cases. Clustering development would save energy by reducing the distance needed for services and infrastructure, reducing utility usage and using common walls. Prohibiting development could result in development occurring elsewhere, such as

outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, if development were prohibited, negative economic, social and energy consequences would result. Resource protection would not increase the costs of development significantly because the physical features of the land already make development expensive (e.g., slopes, trees to be cleared).

In order to balance the consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for parts of the site's drainages and the forested areas located in the southeastern portion of the site near Interstate 5. The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are the site's significant creeks. Approximately 43 acres of residential and one acre of commercial land would be affected by environmental zones. The commercial acreage affected consists of a single drainage.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R10	9	2.5
R7	13	1
R5	10	2
R2	5	0.5
CO2	1	0

MANAGEMENT RECOMMENDATIONS:
Recognize that this site is a gateway to the city; reinforce with major evergreen tree plantings. Preserve native vegetation and drainageways. Remove and/or limit fences along drainages, especially Stephens Creek, to increase wildlife movement. Extending the Terwilliger Parkway south of I-5 to Tryon Creek State Park was proposed at neighborhood meetings. Because I-5 creates a visual and physical separation, such an extension may not be plausible. The right-of-way south of I-5 is too narrow for a parkway and the existing development pre-empts opportunities for widening the right-of-way. The recent right-of-way improvements appear to maximize the opportunities to improve the visual character of Terwilliger. The improvements include new sidewalks, street trees and allowing the landscape strip to have a natural character.

Site No. 117: Stephens Ck/River View Cem. **Maps:** 3828-30, 3928-30, 4028-30

SITE SIZE: 554 acres

LOCATION: Canby St., north; Terwilliger Blvd., west; Macadam Ave., east; Palatine Hill Road and Comus Street, south

NEIGHBORHOODS: Collins View, South Burlingame

INVENTORY DATE: June 7, 1991

HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial
- Palustrine, Forested Wetland

TYPES OF RESOURCES:
Perennial creek, groundwater, scenic, open space, wildlife habitat and corridor, forest, education and historic.

SITE DESCRIPTION:
This site is the northern portion of a broad, massive ridge that is about two miles long, includes Palatine Hill and extends south to Lake Oswego. The ridge is about 1,500 feet wide, 550 feet high and consists of a series of ravines. About half of the site is in a natural condition. The west slope forms the east face of the Tryon Creek Canyon and the east side drops vertically to the Willamette River and Macadam Avenue. Stephens Creek flows through the northern part of this site in a deep ravine that separates Fulton Park and Burlingame neighborhoods. The major land uses include River View Cemetery, Lewis and Clark College and low density residential.

RESOURCE QUALITY AND QUANTITY:
The representative forest cover is in its mid-seral second growth stage, with a 70 percent deciduous and 30 percent coniferous composition. Red alder and bitter cherry are common associates of the maple. Several unusually large specimens of pacific dogwood and cascara are present. Understory shrub species include serviceberry, thimbleberry, Indian plum, wild rose and snowberry that provide wildlife food and cover. However, the non-native Himalayan blackberry is a dominant understory plant. Blackberry plus English ivy, clematis, morning glory, English laurel, English holly and European hawthorn are suppressing the growth of native flora. The site soils are prone to slides and slumps when saturated. At particular risk are the steep, sloped ravines. Erosion caused by the failure of these slopes would negatively impact the habitat and water quality.

There are six perennial creeks including Stephens Creek, plus several seasonal creeks. Crawfish and aquatic insects inhabit these streams. There are also small ponds throughout the site which support newts, salamanders and frogs. Three of the creeks are included on the National Wetland Inventory (PFO1Y). All three flow into Stephens Creek near the Willamette River. Bird species observed include great blue heron, cedar wax wing, pileated and downy woodpeckers, Oregon junco, golden eagle, redtail hawks, flickers, owls and ducks. Mammals in the area include mule deer and foxes. Over 40 plant species are present at the site and 15 wildlife species were observed during an one-hour visit. Over 60 bird and 30 mammal species have known proclivities for the vegetation type found at the site, both in terms of breeding and feeding activities.

This site has important visual resources. The tree-covered condition of the site contributes to the neighborhood character. Because of the relatively high ridge elevation, broadness and tree cover, this ridge is an important feature of the West Hills and to the surrounding region. Palatine Hill provides a foreground to the Cascades Mountains when viewed from areas near Council Crest.

Habitat Rating:

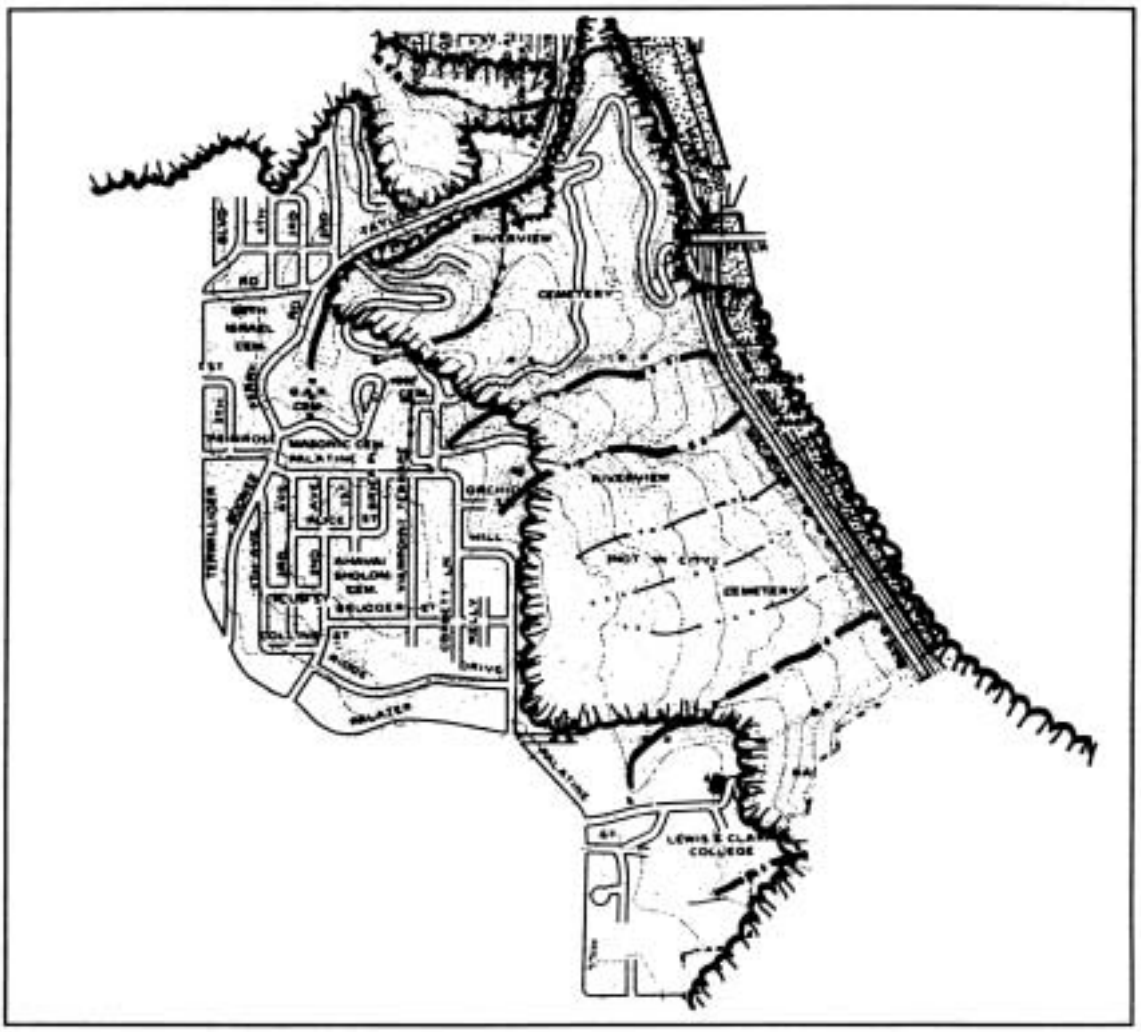
Wildlife Habitat Score: 62 **Range for All Sites:** 50 to 86

Water	: Medium
Food	: Moderately High
Cover	: Moderately High
Interspersion	: Medium
Uniqueness	: Low
Disturbance	: Low

Summary: The wildlife habitat interspersion with Tryon Creek State Park and surrounding forests is a significant feature of this site. The high amount of perennial creeks (i.e., six) provide a large quantity of surface water which supports high habitat quality. This site has important visual resources that contribute to the surrounding neighborhood, city and region.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Commercial; Landscaping; Open Space Uses; Agriculture; and Forestry



Resource Areas

Site 117

North

Scale: 1" = 1200'

Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

Consequences of Allowing Conflicting Uses:
The use of open space as a cemetery will have an adverse impact on certain types of wildlife and habitat if this use removes or disturbs habitat. However, a cemetery use can also support certain types of wildlife and habitat, particularly in older, mature landscaped areas. Logging on the cemetery site would remove trees and vegetation which serve as wildlife habitat and also have scenic value. A discussion of the impacts of logging operations is presented in Chapter 6 of this report.

Residential development and use would involve removal of native forest and vegetation and interference with wildlife migration between the resource site and Tryon Creek. Commercial uses along Macadam would disturb wildlife and expansion of commercial uses would result in removal of vegetation with scenic and/or habitat value. Agriculture and forestry in the R20 zone would have similar effects and could also affect seasonal creeks through erosion and use of pesticides and herbicides. Groundwater would also be affected by pollutants from stormwater runoff and from unregulated use of chemicals used in agriculture, forestry and landscaping.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce infrastructure and public facility construction and maintenance. Clustering dwelling units together would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development reduces the potential for flooding and landslides and results in savings in water and maintenance costs. Preserved forest cover and native vegetation will add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists, visitors and local residents.

Limiting development in resource areas could result in the potential cost savings mentioned above. While new costs would be incurred to protect resources during development (e.g., erosion control measures, review processes), these costs may be offset through these potential savings. An environmental review will add a relatively minor cost to the total development costs. Prohibiting development would have significant consequences for landowners and local builders.

Limiting the use of cemetery land would increase the costs of standard cemetery activities (e.g., grave sites). Existing development and maintenance activities would not be affected by resource protection measures. New cemetery activities can be accommodated in protected areas so long as impacts on resources can be controlled and mitigated. Logging opportunities and clearing of areas for cemetery expansion would not be precluded, but would be subject to review within protected areas. A draft long-range master plan being prepared by the cemetery is intended to provide for future development

to be located in less sensitive areas of the property. An environmental review process for the entire cemetery should be done as part of a Conditional Use Master Plan thus reducing costs associated with multiple reviews, and providing the cemetery with certainty regarding where future development will be allowed. Preserving existing native vegetation, particularly along stream corridors, during cemetery expansion would reduce potential costs for landscaping and erosion control and would reduce costs associated with site clearing and grading. Preserving established vegetation can also enhance the attractiveness of the cemetery for future clients.

River View Cemetery is preparing an updated draft master plan which shows three proposed stream crossings in areas proposed for an Environmental Protection (EP) designation. Unique operational needs including the desire to loop internal access roads to allow for orderly burial processions, the need for intensive maintenance, traffic impacts on surrounding residential areas, and steep terrain may require the crossing of some of these streams. The proposed changes to Section 33.430.340.D. make it possible for these stream crossings to occur, subject to more detailed environmental review and mitigation.

Social Consequences: Scenic values along Macadam Boulevard would be preserved. Enforcement of the *Macadam Plan District* and *Design Guidelines* would aid in preserving these values. Preserving vegetation separating the cemetery and residential and commercial areas would serve to screen these uses from each other. Quality of life considerations which include scenic and aesthetic views would be protected and maintained for the neighborhood's benefit.

Preserving the vegetation and trees on the cemetery would also preserve the use of the grounds as neighborhood open space. Resource protection would allow the cemetery to expand while protecting the scenic values of the trees and vegetation which contribute to the neighborhood's character.

Environmental Consequences: The seasonal creeks and significant coniferous and deciduous forest stands would be protected, as would their functional and habitat values. Wildlife habitat on and around the cemetery site would be preserved. The resource site's value as groundwater recharge area would also be preserved.

Energy Consequences: Clustering development would save energy by reducing the distance for services and infrastructure to access individual properties, reducing utility usage and using common walls. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, resource protection would result in negative economic, social and energy consequences if development were prohibited, resulting in development occurring farther from established neighborhoods. Resource protection would not increase the costs of development significantly because additional measures are already required to address the area's topography when building houses.

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for portions of the River View Cemetery and adjacent forested areas and creeks.

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are the significant habitat areas and drainages located within the River View Cemetery. Approximately 70 acres of residential land and 250 acres of private open space would be affected by environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R20(R10)	33	3
R10	22.2	7
R7	3.5	1.1
R5	0.3	0.2
OS	110	140

MANAGEMENT RECOMMENDATIONS:
Require or encourage that a visual impact analysis be conducted in the preparation of the River View Cemetery Master Plan. The objective would be to determine the loss or alteration of scenic resources as a result of tree removal and/or building construction when viewed from major public viewpoints including Sellwood Park; above Oaks Bottom (near Milwaukie and Mitchell St.); Mt. Tabor; and Council Crest. Work with the River View Cemetery to implement the 40-Mile Loop trail through the cemetery property. Remove nuisance plants so natives can flourish without causing erosion.

Site No. 118: Multnomah **Maps:** 3726, 3825-27, 3925, 3926

SITE SIZE: 320 acres

BOUNDARIES: Nevada St., north; Capitol Hwy., west; SW 25th, 19th, Capitol Hill Rd., east; Marigold and Dolph Ct., south

NEIGHBORHOOD: Multnomah

INVENTORY DATE: May 6, 1986

HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Intermittent Streambed

TYPES OF RESOURCES:
Groundwater recharge, wetlands, intermittent creek, forest, open space, wildlife habitat, education and scenic.

SITE LOCATION & DESCRIPTION:
This 320-acre site is a broad, gently-sloping draw. It is the south-facing portion a low-lying area that occurs between Mt. Sylvania and its associated hills on the south, and the West Hills including Council Crest on the north. The only significant remaining natural areas are 1) a water collection area where four drainages converge, and 2) a wetland north of Marigold Street. The site is nearly fully developed. The natural area lies between two streets with single family homes and a street system that wraps around it. The wetlands is between Marigold and Dolph Court, from 30th to 35th Avenues.

RESOURCE QUALITY & QUALITY:
There are two significant natural areas within Site 118. They are between two and four acres in area and form part of a 320-acre drainage basin. The remainder of the creek has been piped until it passes under Interstate 5. From I-5, the creek re-emerges as an open system again and joins with Falling Creek which is the drainage off of the hills north of Mt. Sylvania. Site 118 creek and Falling Creek are part of Tryon Creek's 4,477-acre drainage basin.

This relatively small creek, wetlands and pond system provides storm drainage, sediment trapping and forms an enclave for resident wildlife. Typha willow and salamanders live here. The creek banks have native ash and non-native willow trees. Blackberry, willow and grass species form the understory. The riparian vegetation along the waterway forms an urban edge and gives a sense of place. The water provides potential recreation for the children of the area. These environmental qualities contribute to the

neighborhood's identity. This site received a wildlife habitat score of 50, the lowest score in the study area. The low score reflects how the habitat has been compromised as a result of development. The scarcity of remaining habitat in this part of the city should be a considered in the ESEE analysis.

Habitat Rating:

Wildlife Habitat Score:	50	**Range for All Sites:**	50 to 86
Water	: Moderately High		
Food	: Medium		
Cover	: Medium		
Interspersion	: Low		
Uniqueness	: Low		
Disturbance	: High		

Summary: Site 118 is a low lying area that has largely been developed. There are two natural areas remaining. They provide sediment trapping functions, habitat for the small, resident wildlife population and contribute to the neighborhood identity. They also are important due to their scarcity and hydrological connection to Tryon Creek.

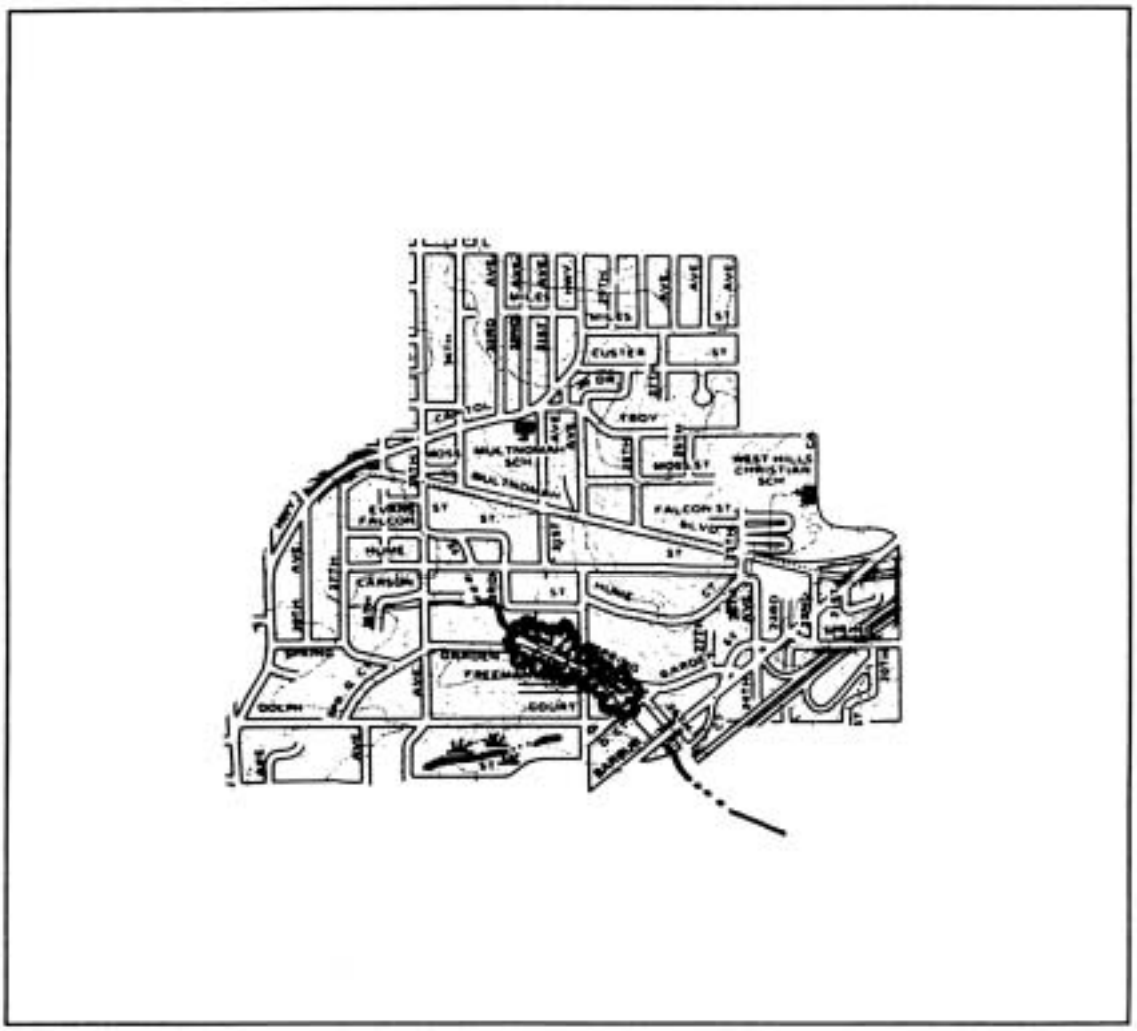
SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Landscaping

Consequences of Allowing Conflicting Uses:
Erosion from residential development and landscaping would degrade the wetland and would also affect the site's drainages. Landscaping involving non-native or invasive plant species could degrade the wetland's value as habitat and may lead to erosion which would also affect the wetland.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Protecting this site's resources could lead to a potential loss of housing units. If these resources were to receive full protection, housing construction could not take place within the resource area.

Social Consequences: Protection of the wetland would preserve its scenic values. Quality of life considerations which include scenic and aesthetic views and close green spaces would be protected and maintained for the neighborhood's benefit.



Resource Areas

Site 118

North

Scale: 1" = 1200'

Contours (50' Intervals)
Forests/Habitat
Creeks
Wetlands

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

Environmental Consequences: The wetland would be preserved. The four drainages which flow into Tryon Creek would be protected through erosion control measures.

Energy Consequences: Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would result in negative economic, social and energy consequences if development were prohibited and could not be relocated on the site.

In order to balance the economic, social, environmental, and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for a small drainage located in the southern portion of the resource site. Approximately eight acres of residential land would be affected by environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R7	3	1
R2	4	0

MANAGEMENT RECOMMENDATION:
Increase length of creek by daylighting storm drainage system to the extent practical as area redevelopment occurs. Remove blackberries. Work with Bureau of Environmental Services to improve creek water quality. Develop a creek signage program.

Site No. 119: Falling Creek **Maps:** 3925-26, 4025-26, 4124-25

SITE SIZE: 426 acres

BOUNDARIES: Marigold St., north; Capitol Highway, west; 26th Ave., east; Trasche, Maricara and Pomona, south

NEIGHBORHOODS: Markham, Multnomah, West Portland

INVENTORY DATE: May 10, 1991

HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial/Intermittent Streambed
- Palustrine, Forested Wetland

TYPES OF RESOURCES:
Groundwater recharge, seasonal creek, wetlands, forest, wildlife habitat, open space and scenic.

SITE LOCATION & DESCRIPTION:
This site includes portions of two small hills located north of Mt. Sylvania. The elevations are 725 feet for the most westerly hill (near SW Galeburn and 42nd); and 550 feet for the other hill (located near SW Luradel and 32nd Place). Marquam Middle School (previously Jackson High School) is located between the two hills. The site elevation drops to 350 feet near Interstate 5 where the drainage from Site 118 feeds into Falling Creek near SW 26th and Taylors Ferry. The confluence of these two creeks forms the headwaters of Tryon Creek and flows through Marshall Park.

RESOURCE QUALITY & QUANTITY:
Falling Creek and its tributary are the two primary creeks on this site. Both flow through forested, relatively narrow (50-100 feet), parallel canyons. These shallow canyons were inventoried as having hydric soils and mapped on the National Wetlands Inventory (PFO1Y). The associated forest is 80 percent deciduous with a 70 percent canopy closure. The tree species include bigleaf maple, alder, cottonwood, red cedar, Douglas fir and pacific dogwood (the latter of which is less common). The creek corridors have an estimated two snags per acre that are two feet in diameter. Mammals in the area include a small herd of mule deer. Bird species include woodpeckers, hawks and owls. In combination, the vegetation, snags and perennial creeks provide good wildlife habitat. The canyons in which the creeks are located create edges to the surrounding neighborhoods and contribute to the urban design of the area.

Habitat Rating:

Wildlife Habitat Score:	60	**Range for All Sites:**	50 to 86
Water	: Medium		
Food	: Moderately High		
Cover	: Moderately High		
Interspersion	: Medium		
Uniqueness	: Low		
Disturbance	: Medium		

Summary: Falling Creek and its tributary on this site feed into Tryon Creek. These two drainageways should be protected in order to retain the relatively small amount of habitat that remains and to protect Tryon Creek's water quality by providing sediment trapping and groundwater recharge in the tributary streams.

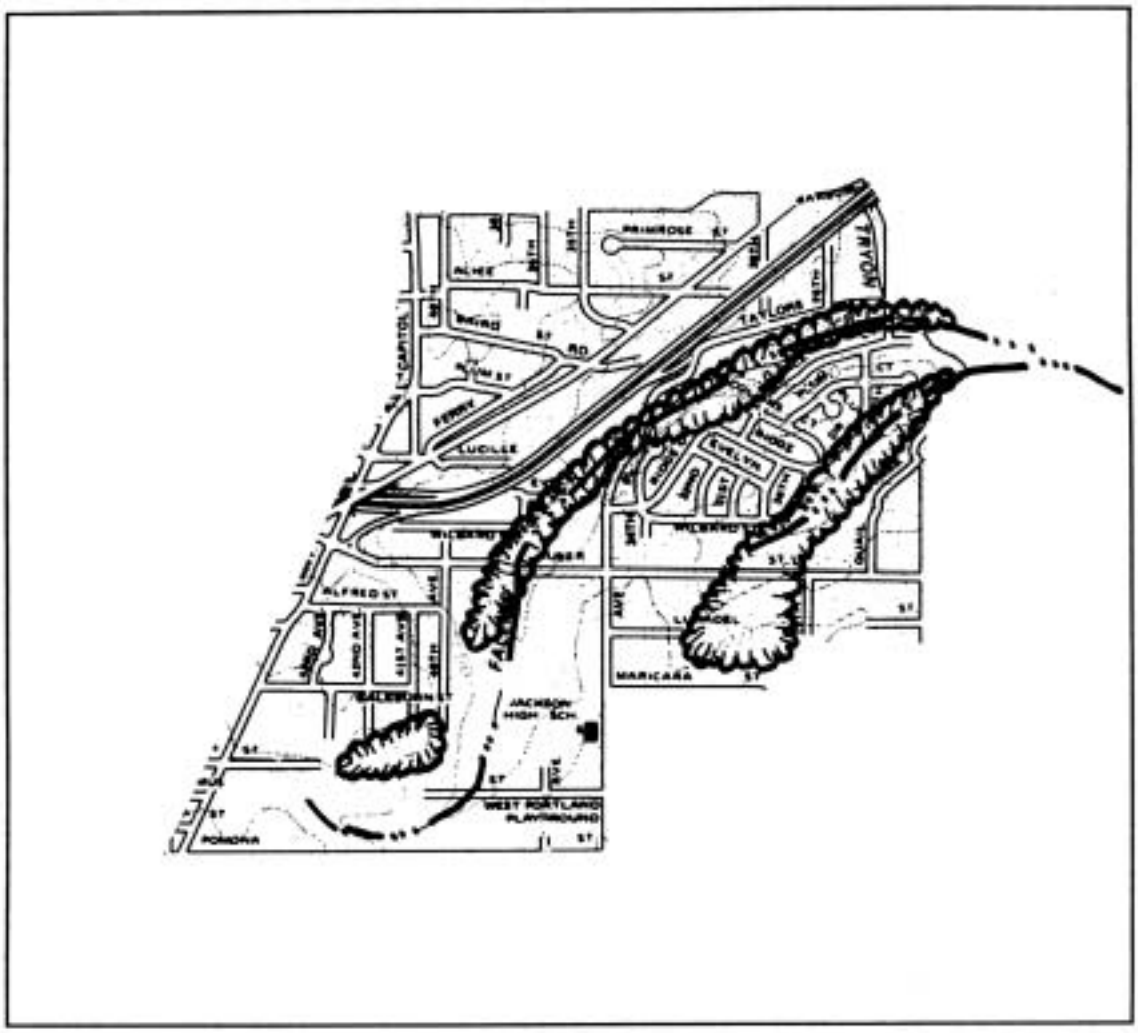
SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Commercial; Landscaping; Open Space Uses

Consequences of Allowing Conflicting Uses:
Residential uses and development of new commercial uses would involve removal of vegetation and forest which serve as wildlife habitat and have scenic value. Landscaping which involves non-native or invasive plant species would disturb the wetland and riparian ecosystems. Falling Creek and its tributaries may be affected by erosion and by pollutants carried by stormwater runoff. The resource site's groundwater recharge capacity would also be affected by erosion and possibly through stormwater runoff. The site's wetland would be negatively affected by all conflicting uses.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce expenditures for infrastructure construction and maintenance. Clustering dwelling units together would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development would reduce the potential for landslides and yield savings in water and maintenance costs. Preserved forest cover and native vegetation would add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists, visitors and local residents.

Limiting development in resource areas could yield the potential costs savings mentioned above. Additional costs would be incurred to protect resources during development (e.g. erosion control measures), but these costs



Resource Areas

Site 119

North

Scale: 1" = 1200'

Contours (50' Intervals)
Forests/Habitat
Creeks
Wetlands

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

may be offset through potential savings. Prohibiting development would have significant economic consequences for landowners and local builders.

Social Consequences: The scenic values of Falling Creek and the forested areas would be preserved. Vegetation which serves to screen and buffer residential use from open space uses would also be preserved. Quality of life considerations which include scenic and aesthetic views, country in the city character, neighborhood identity and close green spaces would be protected and maintained for the neighborhood's benefit.

Development would be guided away from areas characterized as having severe landslide potential or unstable soils. Prohibiting development altogether would prevent new housing construction and possibly reduce choices in the housing market.

Environmental Consequences: The groundwater recharge and sediment trapping values of the wetlands would be preserved. Wildlife habitat would be protected from disturbance from residential and commercial development. The headwaters of Tryon Creek would be protected from erosion and stormwater runoff. The creek would also be preserved as a water resource for wildlife. Requiring new development to use erosion control measures will also protect the resource site's groundwater recharge functions.

Energy Consequences: Clustering development would save energy by reducing the distance for services and infrastructure to access individual properties, reducing utility usage and using common walls. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, negative economic, social and energy consequences would result if development were prohibited and could not be redistributed elsewhere on the site. Resource protection would not increase the costs of development significantly because additional measures are already required to deal with the area's topography when building houses

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for portions of Falling Creek and its tributaries located in the southern portion of the resource site.

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are Falling Creek, its tributaries and banks. Approximately 29.5 acres of residential land would be affected by environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R10	7.6	2.0
R7	13.1	4.8
R2	1.3	0.7

MANAGEMENT RECOMMENDATION:
To increase habitat and wildlife diversity plant native coniferous trees, shrubs and plants with persistent seeds, fruits and other edible parts. Develop signage program indicating "Tryon Creek Headwaters" to help educate the residents of the area that storm drainage affects the local creeks water quality and fisheries. Remove invasive, non-native plants including English ivy, laurel and blackberries. Remove and limit fencing to increase wildlife movement; remove garbage; decrease lighting to assist nocturnal wildlife; and require erosion control measures during construction. During the land development or permit process, obtain "natural drainage reserve" easements that allow access for maintenance.

Site No. 120: Marshall Park/Capitol Hill **Maps:** 3828, 3927-28, 4027-28, 4128

SITE SIZE: 447 acres

BOUNDARIES: Dolph, Garden, and Hume Streets, north; SW 25th and 26th, west; Terwilliger Blvd. and Boones Ferry Rd., east; Luradel, Ridgeview Ln., and Kari, Dick Ct., south

NEIGHBORHOOD: Collins View

INVENTORY DATE: January 15, 1991

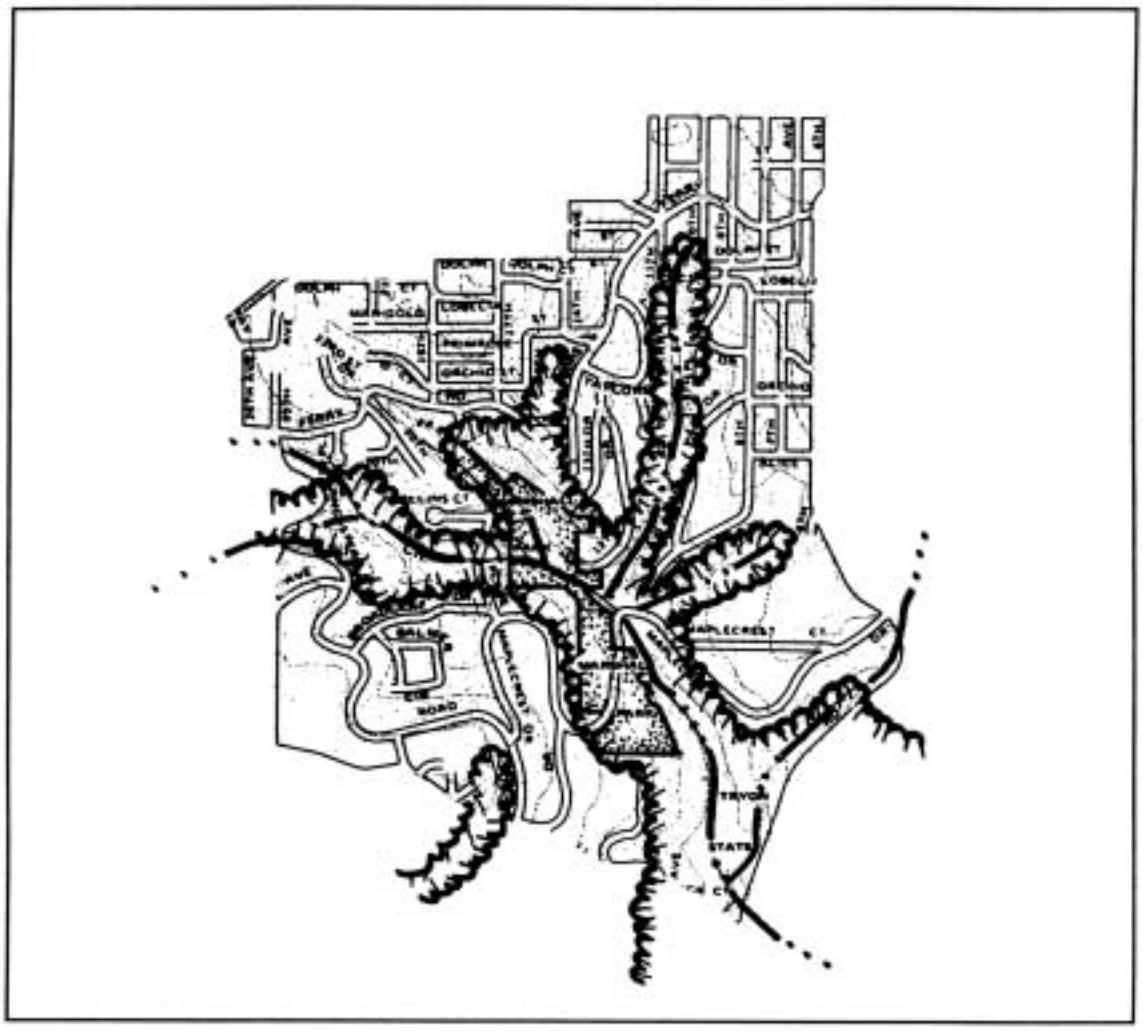
HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial
- Palustrine, Open Water

TYPES OF RESOURCES:
Fisheries, perennial creek, forest, rare flora, wildlife habitat, groundwater recharge, scenic and recreation.

SITE LOCATION & DESCRIPTION:
Marshall Park forms the backbone of this part of the city's natural area. Marshall Park is an undiscovered jewel located in the middle of a 4,000-foot wide canyon. The canyon is a natural drainage basin formed by the west slope of the Palatine Hill, the hills northwest of Mt. Sylvania and by Tryon Creek that runs through it. The surrounding area has a mixture of low density residential development and/or no development. There is also a wholesale plant nursery. The street system appears incomplete in the south half of the site where the creek canyon leaves the site.

RESOURCE QUANTITY AND QUALITY:
This site and Site 123 (location of Tryon Creek State Park) both received a wildlife habitat score of 86, the highest score in the inventory. About half of Site 120 or 200 acres is undeveloped and has a forested cover. Thirty-seven acres are designated open space. Marshall Park is 23.25 acres in size and 14 acres of Tryon State Creek Park are in the southeast corner of this site. Site 120 has approximately 2.5 miles of open waterway and as much as 1.5 miles has year-round flow. Marshall Park has a waterfall that has white water flowing year-round and is framed by rock boulders and fallen trees. This stretch of Tryon Creek has several species of fish including coho salmon and spawning steelhead.



Resource Areas

Site 120

North

Scale: 1" = 1200'

650 Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands

Key Map

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

The forest is 40 percent coniferous defined by Douglas fir, hemlock, pacific yew, and western red cedar trees. The Douglas fir are typically three feet in diameter at breast height (dbh). The forest tree canopy and herbaceous layer both have 90 percent closure and the shrub layer has a 40 percent closure. A diversity of shrub types are present including the western wahoo, an uncommon native shrub. The native banana slug was also observed.

The confluence of Falling Creek and its tributary north of Marshall Park occurs in a narrow, forested canyon.

Habitat Rating:

Wildlife Habitat Score:	86	**Range for All Sites:**	50 to 86
Water	: Moderately High		
Food	: High		
Cover	: High		
Interspersion	: High		
Uniqueness	: Medium		
Disturbance	: Low		

Summary: This site is rich in water resources, forest cover and wildlife habitat. This is one of two highest rated sites in the study area. The retention of natural areas has been reinforced by Marshall Park, a nature park that provides habitat and passage of Tryon Creek.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Landscaping; Agriculture; Forestry; Open Space Uses

Consequences of Allowing Conflicting Uses:
Residential development, agriculture and forestry would involve removal of forest cover and native vegetation which have habitat and scenic value. Landscaping could involve removal of native vegetation and planting of invasive or non-native species. Erosion from agriculture would carry pesticides and herbicides into Tryon Creek, threatening coho salmon and other fish which live in the creek. Active recreational uses in public open space would disturb wildlife and possibly impede migration. The scenic and aesthetic values of the forest cover surrounding Marshall Park and the park itself could be diminished through adjacent development and/or recreational use.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce infrastructure and public facility construction and maintenance expenditures. Clustering dwelling units together or in a planned unit development would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development would reduce the potential for flooding and landslides and result in savings in water and maintenance costs. Preserved forest cover and native vegetation will add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for local residents.

Limiting development in resource areas could result in the potential costs savings mentioned above. While new costs would be incurred to protect resources during development (e.g. erosion control measures, tree preservation plans), these costs may be offset through potential savings. An environmental review would add a relatively minor cost to the total development costs. Prohibiting development would have significant consequences for landowners and local builders.

Social Consequences: Recreational opportunities in natural open spaces would be preserved. Environmental education opportunities would be protected. Development would be guided away from areas characterized as having severe landslide potential or unstable soils. Quality of life considerations which include scenic and aesthetic views, air shed, country in the city character, neighborhood identity and close green spaces would be protected and maintained for the neighborhood's benefit.

Environmental Consequences: The year-round creek and the species which live in and around it would be protected, especially the coho salmon. The forested area which serves as habitat and which aids in air quality would be protected. The resource site's groundwater recharge capacity would also be preserved.

Energy Consequences: Forest cover would moderate local temperature for housing. Clustering development would save energy by reducing the distance for services and infrastructure to access individual properties, reducing utility usage and using common walls. Forest cover could also reduce solar access of some properties. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, negative economic, social and energy consequences would result if development could not be

located elsewhere on the site. Resource protection would not increase the costs of development significantly because the physical features of the land already make development expensive (e.g., slopes, trees to be cleared).

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for the site's drainages and properties located in central portion of the site.

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are Marshall Park and the resource site's drainages. Approximately 147 acres of residential land would be affected by environmental zones.

Current Zoning	**Estimated Acreage Affected by EC Zone**	**Estimated Acreage Affected by EP Zone**
R20(R10)	38	17
R10	64.5	14.1
R7	5.7	2.3
R5	5.5	0

MANAGEMENT RECOMMENDATION:
Leave Marshall Park undeveloped as a natural area as recommended in the Bureau of Parks, *Parks Futures (Draft).* Recognize Tryon State Creek Park as an important environmental education center, a place for residents of the city to learn about the significance of our local natural areas. Strengthen the link between Marshall Park and surrounding open space area. Encourage property owners to plant native plants, to avoid fences which create barriers to wildlife movement, and to limit outdoor lighting in order to reduce impact on nocturnal behavior of resident wildlife.

Site No. 121: Arnold Creek Headwaters **Maps:** 4026-27, 4124-26, 4225-26

SITE SIZE: 235 acres

BOUNDARIES: Maricara and Pomona St., north; 47th Ave., west; 25th Ave., east; Stephenson St., south

NEIGHBORHOODS: Arnold Creek, West Portland Park

INVENTORY DATE: November 19, 1990

HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial

TYPES OF RESOURCES:
Groundwater recharge, perennial creek, open space, forest, wildlife habitat, fisheries, recreation and scenic resources.

SITE LOCATION & DESCRIPTION:
This area contains the headwaters of Arnold Creek and is a part of Tryon Creek's 4,447-acre drainage basin. Arnold Creek travels from near SW 45th Avenue east for about two miles to the Arnold Street and Boones Ferry Road intersection (Site 120) where it empties into Tryon Creek. This 235-acre site drains the northeast slope of Mt. Sylvania, the west slope of a small knoll and the south slope of the hill north of Pomona Street. These surrounding hills are 1/2 mile within the headwaters of Arnold Creek and are 660, 670 and 970 feet in elevation from north to south, respectively.

This site is sparsely populated and largely undeveloped. West of SW 35th Ave. the area is platted as West Portland Park into 25-foot by 100-foot lots in 250-foot by 450-foot blocks with 40-foot wide public rights-of-way. West Portland Park was platted in 1889 without regard for the topography, which resulted in a street and lot pattern that conflicts with development and protection of the natural topography. Developing according to the grid will result in environmental damage to the area and increased development costs due to cut and fill requirements necessitated by the steep slopes and creek.

RESOURCE QUANTITY & QUALITY:
With the exception of a few new developments along Stephenson Street, the site has a wooded character. The area forest is mature, second growth *conifer topping hardwood* forest, 80-100 years old, with a 60 percent deciduous/40 percent coniferous composition. Three areas within the site have forests that

are contiguous. These forest areas are 35, 10 and 18 acres in size (west to east, respectively).

Hydric soils are extensive throughout this site indicating possible wetlands. No wetlands in this area are inventoried on the National Wetlands Inventory. The area around Palatine between 35th and 37th forms a natural drainage basin which is part of Arnold Creek. Arnold Creek's drainage basin is 743.3 acres in size and extends outside of the city limits. A storm drainage storage reservoir exists on the west side of Arnold St., at SW 34th Ave.[34] The rare flora includes old western hemlock and grand fir trees, as well as Indian pipe plants.

The vegetation includes mature second growth Douglas fir, mature western red cedar, western hemlock, bigleaf maple, red alder and pacific yew. The forest is structurally diverse with a healthy understory. Bird species include: quails, pheasants, pileated and hairy woodpeckers. Deer have been observed in this area as recently as August, 1991.

Habitat Rating:

Wildlife Habitat Score:	65	**Range for All Sites:**	50 to 86
Water	: Medium		
Food	: Moderately High		
Cover	: Moderately High		
Interspersion	: Medium		
Uniqueness	: Low		
Disturbance	: Medium		

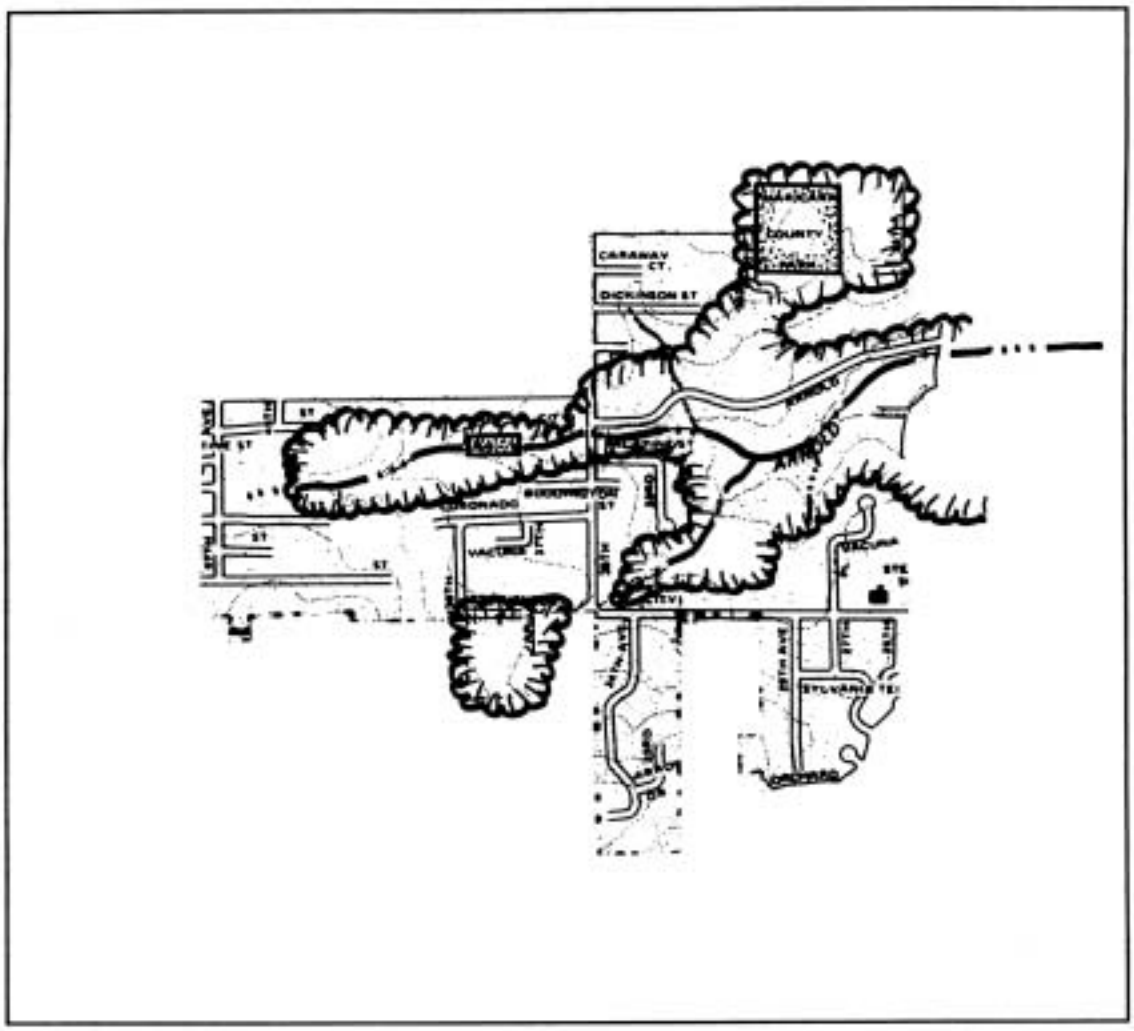
Summary: The wildlife habitat interspersion with Tryon Creek State Park and surrounding forests is a significant feature of this site. The high amount of well established seasonal creeks (at least five) provide a large quantity of surface water which supports high quality habitat. This site has important visual resources that contribute to the surrounding neighborhoods.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Landscaping; Agriculture; and Forestry

Consequences of Allowing Conflicting Uses:
Residential development and agriculture and forestry use would involve removal of forest cover and native vegetation. Landscaping may involve removal of native vegetation and replacing with non-native or invasive

[34] Ibid., Portland Drainage Study, July, 1982.



Resource Areas

Site 121

North

Scale: 1" = 1200'

Contours (50' Intervals)
Forests/Habitat
Creeks
Wetlands

Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

plant species. Both agriculture and forestry involve the use of pesticides and herbicides which may degrade groundwater and/or surface flow through erosion into the headwaters of Arnold Creek. This would threaten wildlife living in and around the creek. Groundwater recharge may also be threatened by septic system use if public sewer is not available. Hydric soils would trap pesticides and herbicides used in landscaping as well. Planned sewer and drainage improvements could permanently remove forest cover and vegetation along SW Arnold Street.

The resource site's link to other habitat would be threatened. Interspersion with Tryon Creek could be diminished. In addition, the scenic values of the forest cover would be diminished.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Guiding development away from hazardous areas would reduce expenditures on infrastructure construction and maintenance. Clustering dwelling units together or in a planned unit development would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development would reduce the potential for landslides and yield savings in water and maintenance costs. Preserved forest cover and native vegetation will add amenity value to existing properties and to future homes built in the area.

Limiting development in resource areas could result in the potential savings mentioned above. Additional costs would be incurred to protect resources during development (e.g., erosion control measures), but these costs may be offset through potential savings. Prohibiting development would result in significant economic consequences for landowners and local builders.

Social Consequences: The scenic views and aesthetic values of the forested areas would be protected. Quality of life considerations which include scenic and aesthetic views, air shed, neighborhood identity and close green spaces would be protected and maintained for the neighborhood's benefit. Preserving close green spaces would help make up the deficiency of open space in the neighborhood identified on the *1980 Comprehensive Plan Map*.

Development would be guided away from areas characterized as having severe landslide potential or unstable soils. Prohibiting development altogether would prevent new housing construction and possibly reduce choices in the housing market.

Environmental Consequences: The wildlife habitat in forested areas would be preserved. Tryon Creek and adjacent habitat would be protected from any effects of development. Wildlife could continue to use the creek and adjacent vegetation for food, water and habitat. Groundwater recharge would not be

affected by development, erosion or the negative effects of agriculture and forestry.

Energy Consequences: Clustering development would save energy by reducing the distance for services and infrastructure to access individual properties, reducing utility usage and using common walls. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, resource protection would result in negative economic, social and energy consequences if development could not be redistributed elsewhere on the site. Resource protection would not increase the costs of development significantly because additional measures are already required to deal with the area's topography when building houses

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed for properties located in the central portion of the resource site, as well as drainages and forested areas in the southeastern portion of the site.

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are the resource site's drainages which link habitat to Tryon Park.

Approximately 105 acres of residential land would be affected by the environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R20(R10)	30.3	11.6
R10	32.3	0.5
R7	26.7	3.75

MANAGEMENT RECOMMENDATION:
Help address area park deficiency by developing a program where interconnecting surplus or private open space can become part of a public open space system by purchase or donation.

Site No. 122: Arnold Creek **Maps:** 4027, 4127-28, 4226-28

SITE SIZE: 351 acres

BOUNDARIES: Luradel St., Kari St., and Dick Ct., north; 25th Ave., west; Boones Ferry Rd, east; city limits near Orchard Hill Rd. and Englewood Ct., south

NEIGHBORHOOD: Arnold

INVENTORY DATE: August 2, 1991

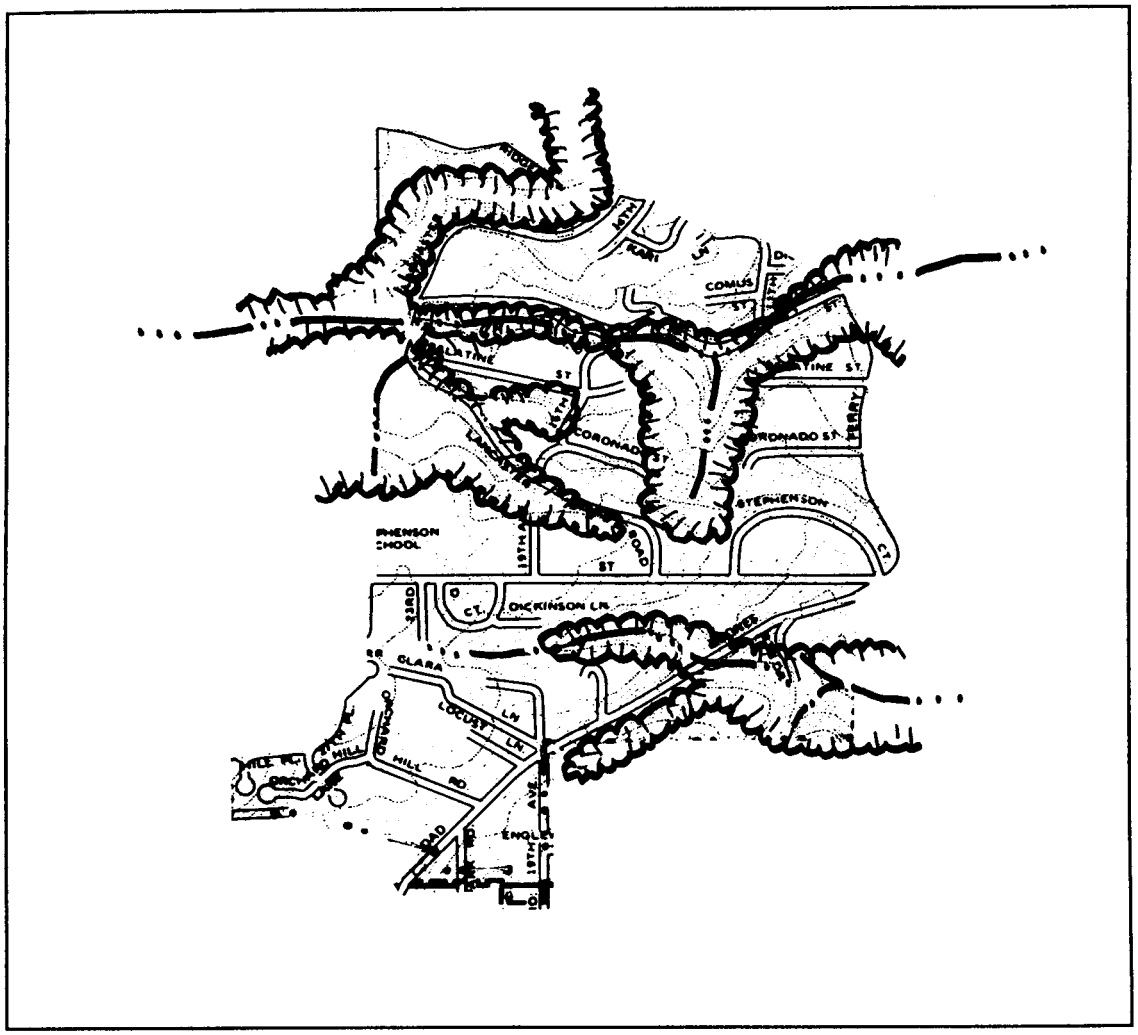
HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial/Intermittent Streambeds

TYPES OF RESOURCES:
Groundwater recharge, forest, open space, perennial and seasonal creeks, wildlife habitat, fisheries, recreation and scenic.

SITE LOCATION & DESCRIPTION:
This 351-acre site is made up of a portion of Mt. Sylvania's northeast slope and the south slope of the hills to the north of Mt. Sylvania. Between these hills in the middle of the site lies a deep canyon where Arnold Creek flows. Arnold Creek drops 500 feet over its two mile course between the headwaters (in Site 121) and the confluence with Tryon Creek near the junction of Boones Ferry and Arnold Street (in Site 120). The canyon is about 2,000 feet wide and, unlike the other canyons in the study area, runs east/west. The creek parallels the south side of Arnold Street. Prior to the 1980's this area was sparsely developed. Since that time, there have been 300-400 homes built (Sites 121 and 122). Arnold and Stephenson Streets are the only east/west streets through the site and there are no connecting north/south streets.

RESOURCE QUANTITY & QUALITY:
The forest is densely wooded and dominated with mature western red cedars and hemlocks. The forest is in the *conifer topping hardwood* stage. The shrub layer is well established with 50 percent closure and the herbaceous layer is 70 percent closed.



Resource Areas

Site 122

North

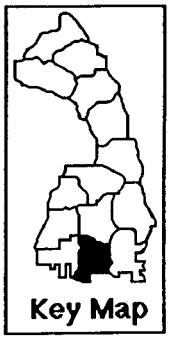
Scale: 1" = 1200'

650 Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands



Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

Habitat Rating:

Wildlife Habitat Score:	82	**Range for All Sites:**	50 to 86
Water	: Moderately High		
Food	: High		
Cover	: High		
Interspersion	: Medium		
Uniqueness	: Low		
Disturbance	: Low		

Summary: The broad, flat ridge line that occurs along Stephenson Street has made this area suitable for development. The creek systems have been given inadequate protection (drainage reserve easements only). The wildlife habitat score of 82 is relatively high. Preservation of the forested areas and drainageways will help offset the loss of habitat that has rapidly occurred over the past five to ten years.

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Landscaping; Agriculture; and Forestry

Consequences of Allowing Conflicting Uses:
Residential development and agriculture and forestry use would involve removal of forest cover and native vegetation. Landscaping may involve removal of native vegetation and replacement with non-native or invasive plant species. Agriculture and forestry involve the use of pesticides and herbicides which may degrade groundwater and/or surface flow in Arnold Creek, Tryon Creek and the site's small drainages. Hydric soils would trap pesticides and herbicides used in agriculture, forestry and landscaping. Groundwater recharge may also be threatened by septic system use if public sewer is not available. Palustrine habitat would be degrade by all conflicting uses unless their impacts were mitigated. Wildlife living in or near the palustrine habitat would also be threatened.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Clustering dwelling units together would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development would reduce the potential for landslides and yield savings in water and maintenance costs. Preserved forest cover and native vegetation would add amenity value to existing properties and to future homes built in the area.

Limiting development in resource areas could result in the potential savings mentioned above. Additional costs would be incurred to protect resources during development (e.g., erosion control measures), but these costs may be offset through potential savings. Prohibiting development would reduce development opportunities for landowners and local builders.

Social Consequences: The scenic and aesthetic values of the forest cover, the riparian areas near Arnold and Tryon Creeks, and the wetlands would be preserved. Quality of life considerations which include the views, air shed and close green spaces would be protected and maintained for the neighborhood's benefit.

Development would be guided away from areas characterized as having severe landslide potential or unstable soils. Prohibiting development altogether would prevent new housing construction and possibly reduce choices in the housing market.

Environmental Consequences: The forest cover and palustrine habitat would be preserved. The resource site's groundwater recharge capacity would be protected through erosion and stormwater control measures. Arnold and Tryon Creeks and the smaller drainages would also be protected through erosion control.

Energy Consequences: Forest cover would moderate local temperature for housing. Clustering development would save energy by reducing the distance for services and infrastructure to access individual properties, reducing utility usage and using common walls. The forest cover could also reduce solar access of some properties. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

CONCLUSION:
Resource protection would generally result in positive economic, social, environmental and energy consequences. However, resource protection would result in negative economic, social and energy consequences if development could not be relocated on the site. Resource protection would not increase the costs of development significantly because additional measures are already required to address the area's topography when building houses.

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC zone is proposed

for portions of Tryon and Arnold creeks and forested areas in the upper half of the site.

The restrictive environmental protection (EP) overlay zone is proposed only for limited, highly significant resources which warrant full protection and in such a way as to permit clustering of development on buildable lots. These areas are the drainages flowing into Tryon Creek.

Approximately 155 acres of residential land would be affected by the environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R20(R10)	75.3	32.3
R10	37.9	9.5

MANAGEMENT RECOMMENDATIONS:
Assist the Arnold Creek Neighborhood in preparing a neighborhood plan through the district planning process which addresses transportation, open space planning and zoning. Help preserve the natural character of the area, and address its park deficiency by developing a program where interconnecting surplus or private open space can become a part of a public open space system by purchase or donation. Preserve habitat corridor connections to Tryon Creek. Strengthen the link between this site, nearby natural areas and Marshall Park to the north. Encourage property owners to plant native plants, to not install fences which create barriers to wildlife movement, and to limit outdoor night lighting in order to reduce impact on nocturnal behavior of resident wildlife. Leashing animals would also help retain wildlife.

Site No. 123: Tryon Creek State Park **Maps:** 4028-29, 4128-30, 4228-30

SITE SIZE: 455 acres

BOUNDARIES: Palater Rd., north; Boones Ferry Rd., west; city limits, south and east

NEIGHBORHOODS: Arnold Creek, Collins View

INVENTORY DATE: November 19, 1990; May 5, 1991; (Oregon Dept. of Fish & Wildlife, 1986)

HABITAT CLASSIFICATION:

- Upland Coniferous/Broadleaf Deciduous Forest
- Riverine, Upper Perennial
- Palustrine, Forested Wetland

TYPES OF RESOURCES:
Wildlife habitat, forest, open space, fisheries, scenic, groundwater recharge, perennial creek, wetlands, education and recreation.

SITE LOCATION & DESCRIPTION:
Site 123 is primarily the a V-shaped canyon formed by the east slope of Mt. Sylvania and west slope of Palatine Hill. (The elevation of Mt. Sylvania's summit is 970 and located about 1.7 miles to the southwest. Palatine Hill reaches 450 feet in height where the ridge top is relatively wide and long. The east slope of Palatine Hill borders the Willamette River). The site elevations are 400 feet near Boones Ferry Rd.; 100 feet along Tryon Creek canyon floor; and 450 feet at the eastern border of the site. The majority of the 455-acre site is in Tryon Creek State Park which is 641-acres in size. Tryon Creek originates northwest of Barbur Boulevard and Terwilliger and flows into the Willamette River near the Boones Ferry and State Street in Lake Oswego. The remaining site acreage consists of sparsely developed low-density housing and the Lewis and Clark Law School. The law school is on 20 acres bisected by two tributary streams located near the Boones Ferry Road and Terwilliger Boulevard intersection.

RESOURCE QUANTITY & QUALITY:
Tryon Creek drainage basin is 4,477 acres in size and encompasses portions of Sites 118 through 123. In 1982 figures, the basin was estimated to have 22 percent of the land vacant.[35] Wildlife plant, animal and fish habitat

---

[35] "Vacant" land does not include parks, streets, and other public land. Source: Portland Storm Drainage Study, City of Portland, Dept. of Public Works (BES), 1982.

inventories have been conducted for Tryon Creek State Park since 1987.[36] Over 80 species of birds and small mammals including beaver live in the park. The second growth forest is 60 to 80 years old and has a coniferous and deciduous tree mixture (40 and 60 percent respectively). The sensitive pileated woodpecker inhabits the area. Plant species that are notable are western wahoo and pacific yew.

The park has eight miles of hiking trails, 3.5 miles of horse trails and three miles of bike trails for recreational uses.

Steelhead and coho utilize Tryon Creek for spawning.[37] It has not been determined whether the steelhead and coho present have strayed from the Willamette River or are residents. The lower 1.5 to two miles of the creek appears to be suitable habitat for these fish species, however, some have been inventoried farther upstream. Trout are found throughout the creek system but have the greatest population 0.75 miles up from the confluence with the Willamette River.[38] Tryon Creek is included on the National Wetland Inventory (PFOIY).

There are some disturbances in the surrounding area which affect the creek. There is periodic trash dumping, newly developed residential areas have caused some erosion in the area, and oil can be detected in the creek.

Habitat Rating:

Wildlife Habitat Score:	86	**Range for All Sites:**	50 to 86
Water	: High		
Food	: High		
Cover	: High		
Interspersion	: High		
Uniqueness	: Medium		
Disturbance	: Medium		

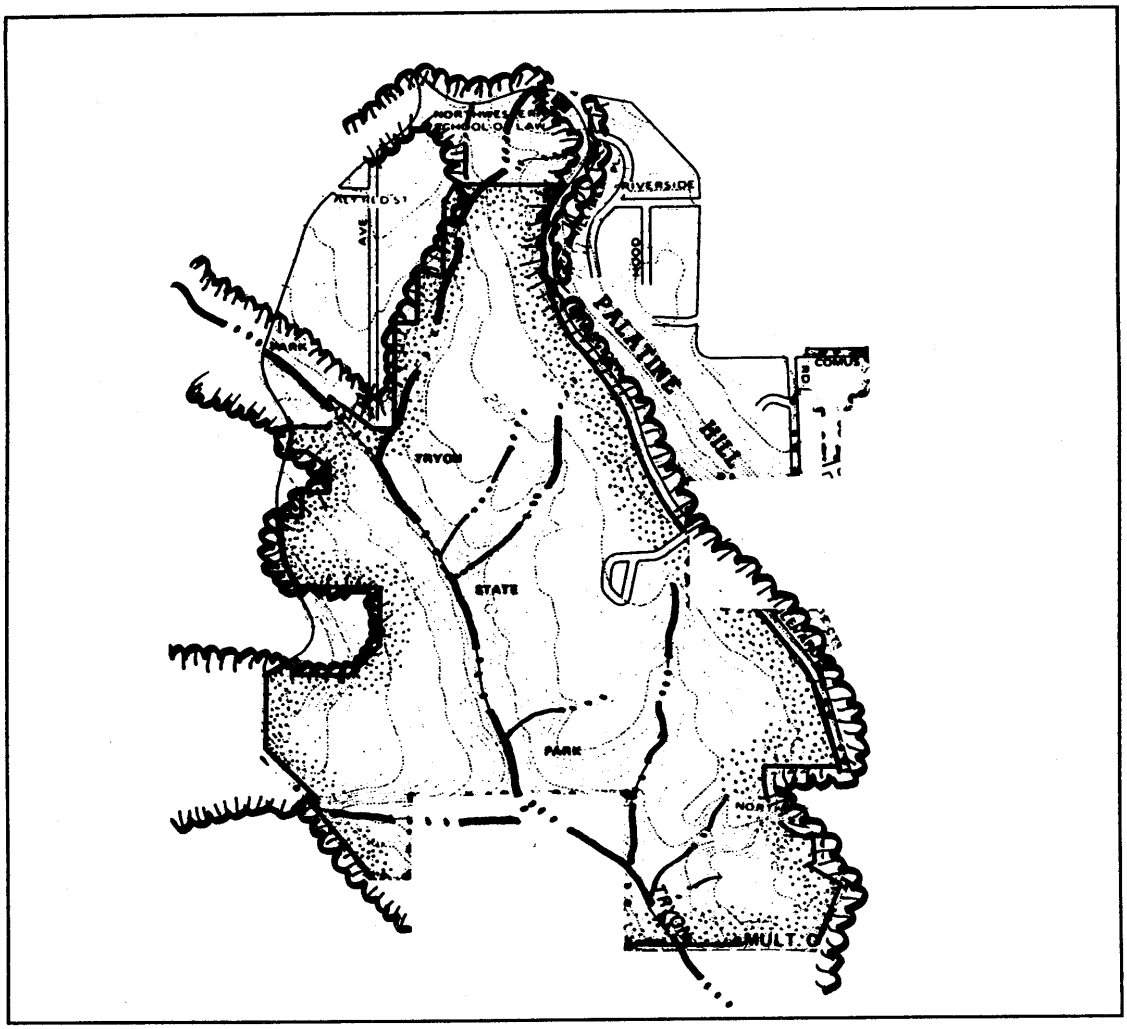
Summary: This site and Site 120 received an 86, the highest wildlife habitat scores in the planning area. The principle drainage, its tributaries and adjacent forest cover are of high significance.

---

36 See Bureau of Planning, Southwest Hills Environmental Inventory, Site 123,1991.

37 Warner, Stephen; General Stream Survey and Utilization of Spawning Habitat of Tryon Creek by Coho and Winter Steelhead. Copy available in SW Hill Inventory, Site 123.

38 Ibid, Warner, Stephen



Resource Areas

Site 123

North

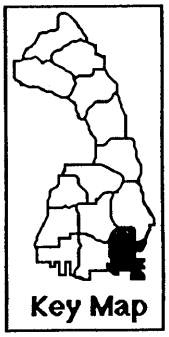
Scale: 1" = 1200'

650 Contours (50' Intervals)

Forests/Habitat

Creeks

Wetlands



Southwest Hills

Resource Protection Plan

September 1991 • Bureau of Planning • City of Portland, Oregon

SITE-SPECIFIC ESEE COMMENTS:

Conflicting Uses: Residential; Landscaping; Open Space Uses; Agriculture; and Forestry

Consequences of Allowing Conflicting Uses:
Residential development, agriculture and forestry would involve removal of forest cover and vegetation which have scenic and wildlife habitat value. Landscaping for residential use and in public park land may involve planting of non-native and/or invasive plant species. This would also degrade Tryon Creek State Park's value as habitat. Both agriculture and forestry would involve the use of pesticides and herbicides which could harm Tryon, Arnold, Falling and some smaller creeks. Erosion caused by farm and forestry operations would also harm fish species spawning in both Arnold and Falling Creeks.

The scenic and aesthetic values of the forest cover in Tryon Creek State Park would be degraded by development which did not utilize buffers between residences and the park. Certain consumptive recreational activities in Tryon Creek park would degrade the wildlife habitat and disturb wildlife migration.

Consequences of Limiting or Prohibiting Conflicting Uses:
Economic Consequences: Clustering dwelling units together or in a planned unit development would reduce the costs of building roads and installing water and sewer lines. Preserving native vegetation during and after development would reduce the potential for flooding and landslides and yield savings in water and maintenance costs. Preserved forest cover and native vegetation would add amenity value to existing properties and to future homes built in the area. Open spaces would be preserved in a natural state for tourists, visitors and local residents.

Limiting development in resource areas could result in the potential savings mentioned above. Additional costs would be incurred to protect resources during development (e.g., erosion control measures), but these costs may be offset through potential savings. Prohibiting development would have significant economic impacts on landowners and local builders.

Social Consequences: The scenic and aesthetic values of Tryon Creek State Park and the surrounding areas would be preserved. Recreational and environmental education opportunities in Tryon Park would be enhanced. Buffers between the park and residential uses would be preserved. Quality of life considerations which include scenic and aesthetic views, air shed, country in the city character and neighborhood identity would be protected and maintained for the neighborhood's benefit.

Environmental Consequences: The wildlife habitat in and around Tryon Creek State Park would be preserved. The fish species in Tryon, Falling and Arnold Creek would not be harmed from erosion. Clearcutting would not be allowed unless approved through environmental review. Groundwater recharge would not be affected by erosion or septic system use. Any new landscaping would involve only native plant species. This would maintain the integrity of the forested cover near Tryon Creek.

Energy Consequences: Forest cover would moderate local temperature for housing. Forest cover would also reduce solar access of some properties. Clustering development would save energy by reducing the distance for services and infrastructure to access individual properties, reducing utility usage and using common walls. Prohibiting development could result in development occurring elsewhere, such as outside established cities. Consequently, the distance covered and the energy needed to provide public services and facilities to properties would increase.

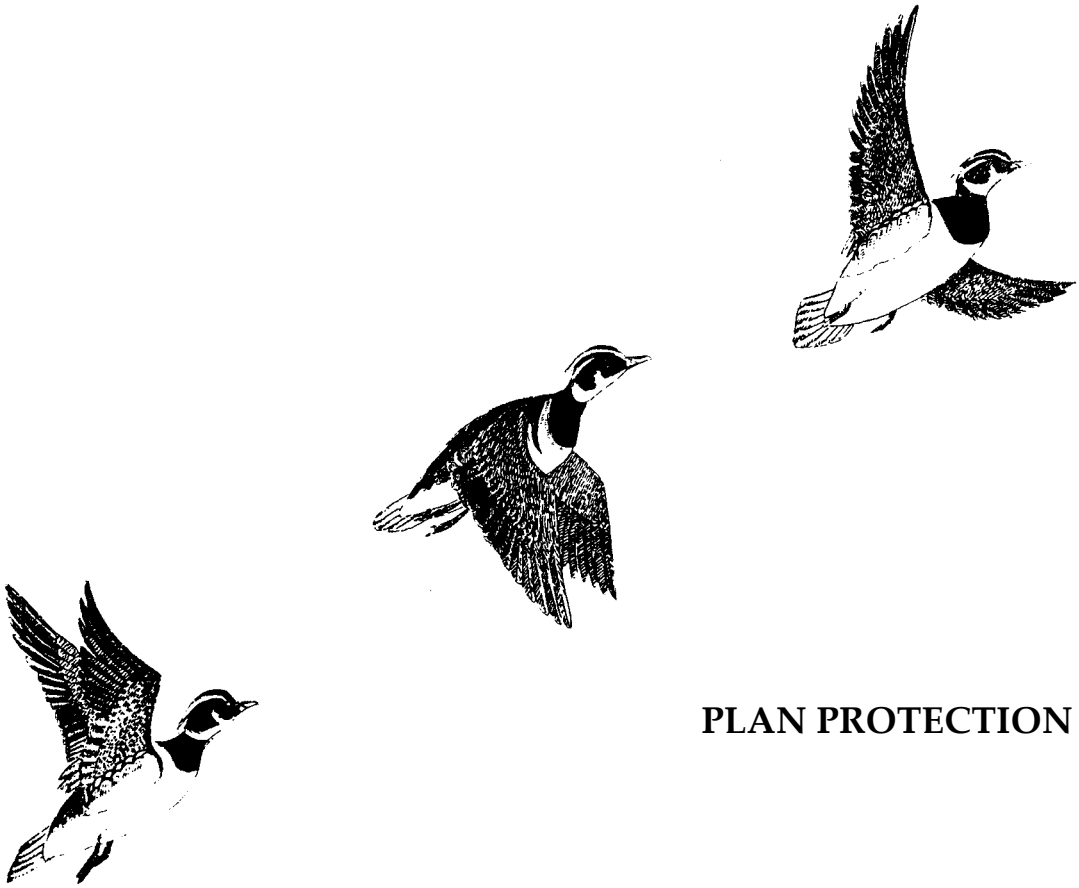
CONCLUSION:
Resource protection would result in positive economic, social, environmental and energy consequences. However, resource protection would result in negative economic, social and energy consequences if development were prohibited, resulting in development occurring farther from established neighborhoods. Resource protection would not increase the costs of development significantly because additional measures are already required to address the area's topography when building houses.

In order to balance the economic, social, environmental and energy consequences of resource protection, the environmental conservation (EC) overlay zone is proposed for all but the most highly rated resources which warrant protection. The EC zone allows development after review so long as impacts on resources are controlled and mitigated. The EC is proposed for portions of Tryon Creek State Park and the adjacent properties. The environmental protection (EP) overlay zone is proposed for most of the remaining park land and for Tryon Creek and its tributaries.

Approximately 82 acres of residential land would be affected by the environmental zones.

Current Zoning	Estimated Acreage Affected by EC Zone	Estimated Acreage Affected by EP Zone
R20(R10)	49.8	5.8
R10	18.1	8.4

MANAGEMENT RECOMMENDATION:
Remove exotic plants.



CHAPTER 8

PLAN PROTECTION MEASURES

- INTRODUCTION
- GENERAL SUMMARY
- AMENDMENTS TO COMPREHENSIVE PLAN GOALS AND POLICIES
- PROTECTION PLAN POLICIES & OBJECTIVES
- AMENDMENTS TO TITLE 33, PLANNING AND ZONING
- AMENDMENTS TO OFFICIAL ZONING MAPS
- ADOPTION OF A RESOLUTION ON THE CONCEPT OF ESTABLISHING A LAND BANK FOR PARKS AND NATURAL AREAS ACQUISITION

Introduction

This chapter provides a general summary of resource protection measures as they relate to the findings of earlier chapters. Plan policies and objectives which form a foundation for these protection measures are then presented, followed by adopted protection measures and code language.

General Summary

The Southwest Hills are made up of a complex system of human and natural resources. Development pressure is high in the area and threatens to degrade natural values and to sever critical biological links between integrated elements of the system. Measures are needed to limit and in certain areas prohibit conflicting uses so that development can be allowed to continue without degradation of important wetlands and water resources (including groundwater reserves), native plant and animal communities, and scenic and open space resources.

Statewide Planning Goal 5 requires that resources found to be significant, be protected. The administrative rule for the Goal requires that an inventory be conducted to determine the location, quantity and quality of resources, and that where conflicting uses are identified, these resources be analyzed to determine the economic, social, environmental and energy (ESEE) consequences of resource protection. In the course of this analysis, the various impacts of resource protection were weighed against each other, and reviewed by citizens and staff. From the analysis a plan was then formulated to balance the need for continued social, economic and energy uses with the need for resource protection. The resource inventory is contained in Chapters 5 and 7. The ESEE analysis is presented in Chapters 6 and 7. This chapter contains the policies, objectives and regulations necessary to implement the required protection of significant resources. The implementation measures include:

- **Amendments to Portland's Comprehensive Plan Goals and Policies** to refer to the *Southwest Hills Resource Protection Plan;*

- **Adoption of the *Southwest Hills Resource Protection Plan* Policies and Objectives** as the policy document for the area;

- **Amendments to Title 33, Planning and Zoning,** to implement the *Southwest Hills Resource Protection Plan;*

- **Amendments to the Official Zoning Maps** to apply the environmental zones;

- **Adoption of a resolution** on the concept of establishing a land bank for parks and natural areas acquisition; and

- **Repeal of the Interim Resource Protection Zone** (water feature designations) from the *Southwest Hills Resource Protection Plan* area upon plan acknowledgement.

Environmental Overlay Zones
The primary resource protection measure of the *Southwest Hills Resource Protection Plan* is the application of the city's environmental overlay zones. The environmental zones are applied to the resource itself and to areas necessary to protect the resource. The environmental zones protect identified natural resources and resource values from adverse impacts and provide a mechanism through which conflicts between resources and human uses can be resolved.

The Protection Plan applies the city's two environmental overlay zones to resource and impact areas within the Southwest Hills study area. In the transition area of the Environmental Protection (EP) zone, development is allowed after review, subject to transition area development standards. In the resource area, development may be permitted after review but approval criteria are extremely strict to ensure protection of resource functions and values. The same transition area standards apply to the Environmental Conservation (EC) zone but approval criteria are less strict for development within the resource area. In the resource area, development is allowed after review so long as impacts are controlled and mitigated.

The adopted environmental overlay zones are contained on the city's Official Zoning Maps.

Amendments to Portland's Comprehensive Plan Goals and Policies

The following amendment to Comprehensive Plan Goal 8 is necessary to acknowledge the adoption of *Southwest Hills Resource Protection Plan*. Language to be added shown in *italics*, language to be deleted shown in ~~strike through~~.

- Amend Comprehensive Plan Goal 8, Policy 8.11, to add a new policy area for the Southwest Hills, as follows:

  "8.11, Special Areas
  Recognize unique land qualities and adopt specific planning objectives for special areas.
  A. Willamette River Greenway (no change)
  B. Balch Creek Watershed (no change)

C. **Johnson Creek Basin** (no change)
D. **Northwest Hills** (no change)
E. Southwest Hills
Protect and preserve fish and wildlife, forest, and water resources through implementation of the Southwest Hills Resource Protection Plan."

Southwest Hills Resource Protection Plan Policies & Objectives

The *Southwest Hills Resource Protection Plan* recognizes the human and natural resource values of the Southwest Hills. The Protection Plan applies measures to protect the interrelated forest and watershed ecosystem while allowing human activity in locations that can sustain such activity, and guiding conflicting uses away from more sensitive resource areas. The Protection Plan's protection measures are based on a set of policies and objectives which are derived from the inventory and analysis of natural resources and human uses in preceding chapters.

The following policies and objectives will provide specific guidance for staff and applicants during review of development proposals within the environmental zones in the *Southwest Hills Resource Protection Plan* area.

Protection Plan Policies & Objectives
This section identifies specific policies and objectives for the *Southwest Hills Resource Protection Plan*. Protection measures needed to carry out these policies and objectives are listed in the following section. These measures are designed to protect significant functions and values of Southwest Hills natural resources.

#1 Overall Policy

Protect significant natural resources and resource values to preserve and enhance Southwest Portland's natural amenities and livability for residents and visitors.

#2 Natural Resource Policy

Protect significant natural resources by restoring creeks and native plant communities throughout the area, and protecting selected areas from unnecessary and deleterious human activities and land uses.

The Southwest Hills is made up of a system of mostly linear, often glove-shaped forested natural areas, providing habitat and travel corridors for fish and wildlife, slope stabilization, surface runoff filtration and sediment trapping, groundwater recharge and flood desynchronization in addition to other social values (e.g., aesthetic, recreational, educational and historical). Not only do creek corridors need to be protected to retain these values, but certain resource characteristics need to be integrated into the urban fabric throughout the area.

Objectives
The following objectives are intended to protect significant resources and resource values while allowing urban development to continue:

1. Protect creeks, creekside vegetation and significant wetlands and upland resources that provide food, water and cover for wildlife;

2. Establish development guidelines which encourage retention and enhancement of native plant communities and protect water quantity and quality; and

3. Avoid development of buildings and roads which adversely impact or cross creek corridors. When new creek crossings are necessary or existing ones replaced, use bridges wherever possible to provide a free-flowing waterway, passage of wildlife, reduced erosion and continuity of the resource.

#3 Development Policy

Integrate natural resource values and human uses in a balanced fashion into the urban fabric.

The Southwest Hills area is a mosaic of natural communities and human uses integrated with a connected system of watersheds. It is important to identify compatible and incompatible human and natural resource uses. Once identified, development can be guided in a way which is economically viable while protecting and enhancing identified natural, scenic and open space values.

Objectives
The following objectives can integrate development, neighborhood projects and natural resource restoration and enhancement:

1. Use development as a means of improving or repairing the natural and scenic qualities of the Southwest Hills by locating buildings on less

   sensitive or formerly disturbed sites, planting native vegetation to match surrounding natural conditions, and preserving healthier and more sensitive landscapes;

2. Protect and retain as much existing native vegetation as possible before, during and after site alteration or construction activities;

3. Guide development away from sensitive natural resource areas such as wetlands, creeks and creek headwaters, steep slopes, wildlife habitat and groundwater recharge areas;

4. Promote diversity of native plant species with varying flowering and fruiting seasons in community and backyard landscaping;

5. Avoid unnecessary erosion by prompt reseeding and revegetation using native species after construction;

6. Carefully remove topsoil in large intact units and replace them after construction is completed;

7. Promptly remove garbage, excess fill and construction debris from construction sites;

8. Manually remove English ivy, Himalayan blackberry and other invasive non-native species. Herbicides should be used only as a last resort and only in compliance with integrated pest management goals;

9. Use soil bioengineering or similar non-structural techniques (such as vegetation and shallow slopes) to stabilize banks;

10. In "park-like" areas characterized by tall trees and closely-trimmed ground cover and lawns, add native shrub and herbaceous species as an understory;

11. Reduce frequent mowing of lawns, permitting native wildflowers and herbs to grow, especially around edges between different habitats or land uses. Encourage buffering or structural diversity (trees or shrubs) between lawns and creeks;

12. Avoid lights which shine directly into natural resource areas;

13. Encourage passive non-consumptive recreation and environmental education in selected areas and avoid human impact on fragile or environmentally sensitive areas of the creek; and

14. Avoid fences which form barriers to wildlife movement.

#4 Livability Policy

Recognize significant natural resources in the Southwest Hills corridor as a major design element and scenic resource which connects neighborhoods through linear corridors along roadways and trails, provides edges to neighborhoods and districts, creates nodes of human activity by providing educational and recreational opportunities, and creates neighborhood identity and character with native vegetation and other resource features. Recognize the landscaped, wooded hillsides throughout the area as a major design element which make significant contribution to the visual impact and livability of the city.

Creeks throughout the Southwest Hills form edges to neighborhoods, providing definition and community identity, important urban design elements. Reestablishment of the riparian strip will intensify the edge element, as well as provide a sense of place and orientation for travelers on nearby roads and trails. Resources along roadways and pathways provide corridors which connect neighborhoods throughout the area and the Southwest Hills to other places in and around Portland. Parks, schools and other open spaces provide the opportunity for people to gather, to take advantage of the natural setting for aesthetic enjoyment, education or passive recreation.

Trees and other vegetation on hillsides provide a visual backdrop to Portland, and provide an atmosphere reflecting a physical setting unique to the Pacific Northwest. This is an important neighborhood value, appropriate to the area's location in a hillside setting.

Objectives

The following are development strategies which can be used to retain and enhance scenic and urban design qualities of natural resource elements:

1. Retain and re-establish riparian vegetation, including tree canopy, along Southwest Hills creeks and tributaries;

2. When new creek crossings are needed or existing ones replaced, use bridges where possible to give a greater awareness of natural resource presence and design them to allow viewing of the creek as it is crossed, thereby providing aesthetic value and orientation;

3. Retain and enhance native vegetation, particularly evergreen trees, along steep slopes of the area hillsides; and

4. Minimize disturbance of native vegetation, particularly evergreen trees, during and after development.

#5 Scenic Policy

Protect and retain the wooded character of the Southwest Hills as a visual amenity to the city and region.

The trees and vegetation on the Southwest Hills provide a visual backdrop to Portland and reflect a physical setting unique to the Pacific Northwest. The wooded character of the Southwest Hills contributes to the identity of the city and region as a high quality place to live, work and locate businesses. The public viewpoints identified below are recognized in the Scenic Resources Protection Plan. Methods to maintain these public views and the scenic character are also identified in the plan.

Objectives

1. Ensure that the wooded character the Southwest Hills is maintained as viewed from the following major public viewpoints: Sellwood Park; above the north end of Oaks Bottom; Mt. Tabor Park; the Hawthorne Bridge; and Council Crest.

2. Recognize that conflicts may arise between preserving trees and creating private views. In order to protect the regional identity, preserving the wooded character takes precedence over creating private views.

#6 Recreation Policy

Recognize Southwest Hills and related resources as passive recreational and educational opportunities related to the 40-Mile Loop, and as a major location for a variety of active and passive recreation opportunities for residents of the Portland metropolitan area.

The 40-Mile Loop Trail, Terwilliger Parkway and the necklace of parks and open space in the Southwest Hills planning area are important recreational resources. This Protection Plan acknowledges the value of natural resources in the area as recreation pathways and destinations.

Objectives

The following objectives can guide recreational use of the Southwest Hills area:

1. Support development of Natural Resource Management Plans for parks within the study area which protect natural resources while allowing appropriate continuation and expansion of recreation uses and activities.

2. Utilize rights-of-way and connected park land as major bicycle and pedestrian routes throughout the Southwest Hills to provide access to and between parks, neighborhoods and activity centers, and as a major component of the 40-Mile Loop, when other natural resource values can be protected;

3. Recognize the Terwilliger Parkway as both a significant natural resource and a scenic transportation corridor for Portland while promoting passive uses such as hiking, jogging and bicycling;

4. Promote passive and low-intensity activities in parks and other recreation facilities in a manner which will not adversely impact significant natural resources;

5. Preserve indigenous plant and animal communities by minimizing park improvements which remove forest vegetation, introduce non-native plants or add impervious surfaces;

6. Retain and enrich opportunities for learning about the western Oregon coniferous forest ecosystem by utilizing natural areas as resources that can increase the public's awareness of and sensitivity to its environment; and

7. Provide access to significant natural resources at selected points for passive recreational opportunities while minimizing potential conflicts with private property or environmentally sensitive areas:

   - Using existing improved and unimproved public rights-of-way wherever possible; and

   - Working with surrounding property owners in the design and development of recreation areas which are sensitive to neighborhood character, security needs and overall livability.

#7 Natural Hazards Policy

Protect soil and watershed resources and reduce the potential for landslides, land failures and flooding by minimizing disturbance to natural terrain, vegetation and drainageways and by directing site development away from natural hazards.

Portions of the Southwest Hills area are subject to natural disasters and hazards such as flooding and landslides. Often these hazard-prone areas also provide significant natural resource values. The Southwest Hills slopes and soils are in a balance with vegetation, underlying geology and local levels of

precipitation. Forest vegetation moderates the effects of winds and storms, stabilizes the soil and slows runoff from precipitation, thereby minimizing erosion and allowing the forest floor to filter out sediments as the water soaks down into groundwater reserves or passes into streams. By decreasing runoff and increasing groundwater infiltration, the forest protects downstream neighborhoods from flooding. Also, by stabilizing the soil and reducing runoff and erosion, the forest protects the community from landslides, slumps and mud flows. Maintaining this equilibrium reduces the potential danger to public health and safety posed by steep hillside slopes.

Clearing of vegetation, movement of earth and construction of houses, roads and other impervious surfaces can disturb the balance between vegetation, soils, geologic formations and climate. When this happens, mass earth movements, erosion and flooding often result, posing significant dangers to public health and safety. These events also increase public and private expenditures for repair of damaged buildings and property, slope stabilization, flood control and stormwater management. Hillside disturbance can also degrade or destroy the attractive and distinctive qualities of the community's setting, and reduce real estate values.

Human activities which avoid steep hillside slopes and which minimize disturbance of soil, rock and vegetative cover are less likely to trigger landslides or cause flooding. For all ground- or vegetation-disturbing activities, a thorough pre-disturbance investigation should be conducted, and appropriate construction practices and, if applicable, development design should be used.

Objectives

The following are objectives which can protect existing and future development from flood and landslide hazards in the Southwest Hills area, and at the same time preserve the balance of sensitive resources in the Southwest Hills:

1. Thoroughly investigate proposed development sites for land suitability and limitations, including potential impacts of vegetation removal, site grading, road and building construction, and septic system and utility construction;

2. Limit development to portions of sites located away from sensitive slopes, soils and other conditions identified in soils, geology and/or hydrology investigations and reports;

3. Plan and orient development and roads so that ground- and vegetation-disturbing activities are minimized and steep slopes are avoided;

4. Disturbance of existing site terrain and vegetation should be limited to the minimum area necessary to complete construction activities;

5. Manage and control on- and off-site water runoff and soil erosion impacts before, during and after construction;

6. When possible, complete all construction activities in one development season;

7. Revegetate bare soils as soon as possible after exposure; and

8. Prevent additional direct stormwater discharge to creeks and requiring, where appropriate, stormwater retention.

#8 Water Supply Policy

Develop programs which improve water quality and quantity in a manner which will support other goals and objectives of this protection plan.

Flood control, reduction in levels of water pollution and protection of wildlife habitat can all be products of water quality improvement in creeks throughout the Southwest Hills.

Objectives

The following objectives can be used to improve water quantity and quality, thereby achieving protection of both natural resources and affected land uses:

1. Increase creek flow during summer periods;

2. Enhance fish habitat through additional planting of native streamside vegetation to provide shade and help lower water temperature, retention and enhancement of existing native vegetation and reduction of impervious surfaces to provide a more balanced water regime with greater summer flows and reduced flooding and erosion;

3. Reduce sediment entering the creek;

4. Reduce or eliminate contaminant discharges into the creek which degrade water quality;

5. Provide filtration of stormwater prior to entry into the creek; and

6. Reduce flood levels.

#9 Daylight Creeks Policy

Open drainageways and reestablish riparian areas where appropriate.

Objectives

1. Reopen creeks, re-establish adjacent riparian areas, and provide protection of resources identified in this plan based on Bureau of Environmental Services analysis of environmental and stormwater impacts.

2. Increase wildlife habitat, improve water quality and enhance aesthetic values of the surrounding neighborhood.

Amendments to Title 33, Planning and Zoning

The following amendments to Title 33 are necessary to provide specific regulations for the area and clarify language in the Environmental Zones chapter. Language to be added shown in *italics*, language to be deleted shown in ~~strike through~~.

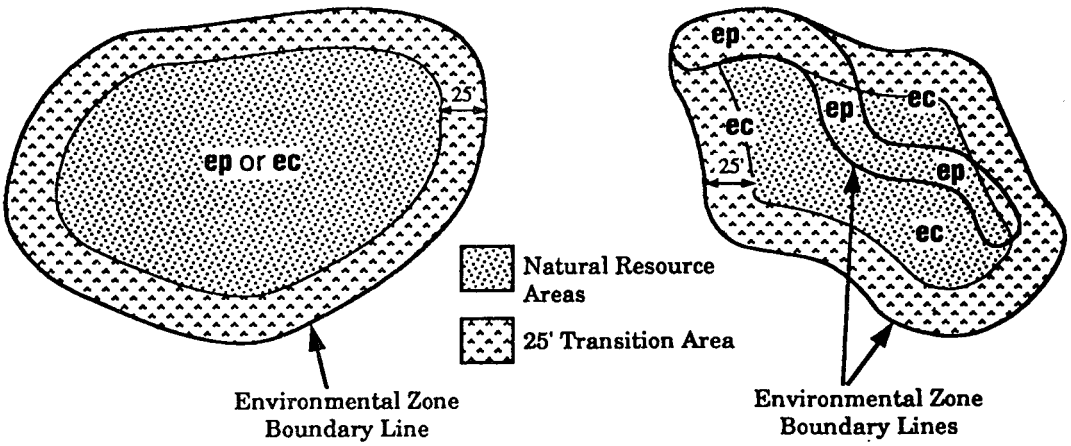
- Amend the language and map contained in Zoning Code Chapter 430, Environmental Zones (Subsection 33.430.020 B.), as follows. This amendment clarifies the location of the transition area when both environmental zones are applied together and border one another.

  "33.430.020 B. Subareas of the environmental zones. ~~Each Environmental zone consists of the~~ ***The environmental zones contain a*** **natural resource area and a transition area surrounding the natural resource area. The purpose of the transition area is to protect the adjacent natural resource. The transition area provides a buffer between the natural resource area and impacts of adjacent development.** ***Figure 430-1 illustrates two different situations: 1) when either the EC or EP environmental zone is applied, and 2) when the two zones are applied together and border each other.***

  1. Natural resource area. (no change)

  2 Transition area. This is the land around the edges of the natural resource area that constitutes a transition area for the natural resource area. The first 25 feet of the ***area covered by*** **environmental zones, measured inward from the zone boundary, is the transition area. See Figure 430-1."**

Figure 430-1
Environmental Zone Subareas



- Amend 33.430.040 C. to clarify which resources and values need to be addressed in an environmental review.

  "C. Additional site information. The City's adopted Goal 5 inventories and related economic, social, environmental, and energy (ESEE) analyses contain additional information about the natural resources and their values at individual sites. ***For purposes of environmental review, only those resources and values stated in the Goal 5 inventory and ESEE analysis for a particular resource site need to be addressed."***

- Amend Section 33.430.060 Items Exempt From These Regulations, by adding Subsection J. which exempts certain minor land divisions from environmental review. This amendment will permit a greater number of cases to be processed administratively in situations where the property is not significantly affected by environmental zones.

  "J. Minor land divisions when both of the following are met for each of the proposed lots or parcels.
  1. ***There is a buildable area that is outside of an EC or EP zone. For the purposes of this subsection, "buildable area" means an area at least 1,600 square feet in area with a minimum dimension of 40 feet; and***
  2. ***The provision of water, sewer, stormwater disposal, access including all vehicle areas, and public or private utilities will not involve development in an EC or EP zone."***

- Delete the following reference from 33.430.100 A. to maintain consistency with other references in the chapter:

  "A. The ~~amount and~~ placement of development may be restricted to ensure conformance with the regulations of this chapter."

- Amend Chapter 33.430.100 B. to permit transportation of limited quantities of hazardous substances through protected areas, as follows:

"B. Hazardous substances. ~~**Hazardous substances greater than consumer commodity quantity are prohibited in the environmental zones. See 33.140.120 for descriptions of hazardous material quantities.**~~

1. ***Except as stated in Paragraph 2. below, hazardous substances greater than consumer commodity quantity are prohibited in the environmental zones. See 33.140.120 for descriptions of hazardous material quantities.***
2. ***The transportation of package use quantities of hazardous substances through an environmental zone is allowed."***

- Amend Section 33.430.200, Development Standards, to modify the standards to reference the Portland Plant List for consistency with other references in the new zoning code, and to add certain standards for development activities in the Southwest Hills.

"33.430.200 Development Standards
The development standards of this section apply to all transition and natural resource areas.

A. through E. (no change)

F. Landscape materials.

1. ~~**The first 10 feet of landscaping, measured from the natural resource boundary line, must be planted with plant species native to the Willamette Valley or to the Pacific Northwest. Allowable plant species are described in Section IV.C, Landscaping, of the Willamette Greenway Plan.**~~ ***Landscaping must be of plant species native to the Portland Metropolitan Area and contained on the Portland Plant List. Where no appropriate Portland species can be found for a particular site or condition, species native to the Willamette Valley or to the Pacific Northwest may be used.*** **This requirement applies to all landscaping whether required or optional.** ***Where this requirement conflicts with plant lists identified in other plans, this requirement will take precedence.***
2. **The standard in Paragraph 1. above does not apply where the identified natural resource does not include native plant species as a characteristic or value. In these cases, landscaping may be similar in type and character to that in the natural resource area,** ***but may not include any "nuisance plants" or "prohibited plants" on the Portland Plant List.***
3. ***The propagation of any plant identified as a nuisance plant or prohibited plant on the Portland Plant List is prohibited.***

G. Lighting. Exterior and interior lights must be placed so that they do not shine directly into ~~**natural resource**~~ ***wildlife habitat*** **areas.**

H. through I. (no change)

J. Construction Management. Construction must be done in a manner which will ensure that the remainder of the site with environmental zoning will not be adversely impacted. ***A construction management plan must be followed which will incorporate best management practices as determined by affected city bureaus. This plan must contain measures to control***

sediment, pollution, and other actions which would, if uncontrolled, adversely impact the protected resource or resource values.

K. Development season ~~and prohibited plants~~. In the Balch Creek Watershed and in the Northwest Hills Natural Areas Protection Plan, ~~the following additional development standards apply~~.

~~1. Development Season. All~~ *all* ground disturbing activities regulated by this chapter must take place between May 1 and September 30 of any year. Any activity which exposes soil to direct contact with stormwater between October 1 and April 30 is prohibited. An exception to this standard allows emergency repair of existing structures during any time of year.

~~2. Prohibited Plants~~." (delete subsection)

- Amend 33.430.320 Procedures, to allow minor land divisions within environmental zones to be processed as Type II environmental reviews. This amendment also clarifies Subsection B. by dividing it into four discrete paragraphs.

"33.430.320 Procedures

Except as stated in Subsection C. below, environmental review is processed as indicated in Subsections A and B.

A. Transition areas (no change)

B. Natural resource areas. ~~Environmental review in a natural resource area is processed through a Type II procedure in the EC zone and a Type III procedure in the EP zone. An exception to this in the EP zone is a review of a recreational trail located in a natural resource area but not in the natural resource itself. When locating outside the natural resource, recreational trails are processed through a Type II procedure. A pre-application conference is required for all Type II and III procedures in both zones.~~

1. ***EC zone. Environmental review in a natural resource area is processed through a Type II procedure in the EC zone.***
2. ***EP zone. Environmental review in a natural resource area is processed through a Type III procedure in the EP zone. An exception to this is a review of a recreational trail located in a natural resource area but not in the natural resource itself. When locating outside the natural resource, recreational trails are processed through a Type II procedure.***

3. *A pre-application conference is required for all Type II and III procedures in both zones.*
4. **Special evaluation by a trained professional.** (change letter C to number 4 only, no change to content)

C. *Minor land divisions. All environmental reviews for minor land divisions are processed through a Type II procedure. This subsection applies only to applications for minor land divisions that are not accompanied by proposals to develop or alter the site."*

- Amend Section 33.430.330, Supplemental Application Requirements, to delete the following requirement. This requirement has been a source of confusion for staff and applicants because mitigation measures are usually not required in the transition area.

"33.430.330 Supplemental Application Requirements. All of the information listed below must be included with an environmental review application, in addition to the standard application requirements of 33.430.060.

A. (no change)

B. Additional plans and analyses. The following information is required in either a site plan or narrative form, or in a combination of the two:

1. (no change)

~~**2. If the development is proposed for a transition area, a detailed description of any proposed on-site or off-site mitigation measures;**~~**"**

(renumber existing 3 to 2; no change to content)

- Amend 33.430.340 Approval Criteria, to clarify cross-references within the section, to add criteria to permit roads, bridges and sewer connections to be built in the EP zone, and to add references to erosion control criteria. These amendments are designed to clarify code language, to add greater flexibility to existing EP regulations, and to provide guidance and clarification with respect to erosion control requirements.

"33.430.340 Approval Criteria

An environmental review application will be approved if the review body finds that the applicant has shown that all of the applicable approval criteria stated below are met.

A. Recreational trails.

1. Which approval criteria apply. Recreational trails to be located outside of a natural resource area are subject to the approval criterion stated in Paragraph 2. below. Recreational trails to be located in a natural resource area in the EP and EC zones are subject to the approval criteria stated in ~~**Subsection E.**~~ ***Subsections G, I, and J below.***

2. (no change)

B. (no change)

C. Excavations and fills. Excavations and fills are subject to the approval criteria ~~of Subsections D, E, or F below~~ *in the applicable subsections of this section* and the approval criteria for excavations and fills stated in Chapter 33.830, Excavations and Fills.

D. Roads, access drives, and connections to existing sewers through EP zones in the Southwest Hills Plan Area.

1. Other routes are considered impractical due to:

a. Operational needs unique to the proposed use or activity;

b. Impacts on adjacent land uses; and

c. Impacts on the resource.

2. Impacts are minimized. Placing of fill for crossing drainageways will be allowed if:

a. Stormwater flows will not be impeded;

b. Water quality is protected through compliance with all requirements of Section 33.430.365;

c. Passage of significant fish and wildlife as identified in the inventory (including field survey sheets) and ESEE analysis for the resource site will not be impeded; and

d. The volume of fill and the width of the roadway is the minimum necessary for projected traffic levels.

3. Adverse impacts are mitigated so that there is no net loss of resource value for the site identified in the inventory and ESEE analysis in which the crossing is proposed; and

4. All associated development, including excavations, fills, and recreation trails, meets the other applicable approval criteria of this section.

E. Erosion Control. All ground disturbing activity covering less than 1,000 square feet must employ erosion control measures of the City of Portland's <u>Erosion Control Plans Technical Guidance Handbook</u> (January 1991). All ground disturbing activity covering 1,000 square feet or more must comply with the measures stated in Section 33.430.365 below. In either case, existing topography and vegetation must be protected and retained to the greatest extent possible before, during, and after site alteration or construction activities.

(Reletter existing D through F to F through H; no change to content)

~~G.~~ I. Development in the Balch Creek Watershed. In addition to the approval criteria stated above, the following approval criteria must also be met in resource areas and transition areas in the Balch Creek Watershed.

1. through 3. (no change)

4. Soil Erosion. ~~Erosion control features effective as those described in the City of Portland's and Washington County's joint <u>Erosion Control Plans Technical Guidance Handbook</u> must~~

~~be employed during all ground disturbing construction~~. **Site clearing must be limited** (no change to remainder of paragraph).

5. (no change)

~~H.~~ **J. Development in the Northwest Hills. In addition to the other approval criteria stated in this section, the following approval criteria must also be met in resource and transition areas in the area covered by the Northwest Hills Natural Areas Protection Plan:**

1. (no change)

~~**2. Land Hazards and Erosion. Erosion control measures of the City of Portland's Erosion Control Plans Technical Guidance Handbook (January, 1991) must be employed during all ground disturbing construction.**~~**"**

(Renumber existing 3 to 2 and existing 4 to 3; no change to content)

- Add the following new section (33.430.365 Erosion Control) to the Environmental Zones chapter to set out erosion control and monitoring and reporting requirements.

"33.430.365 Erosion Control

A. Controls and Limitations for Storm Water Discharges

1. Prior to commencement of construction, the applicant must prepare and implement an Erosion Control Plan (plan). The objective of the plan is to minimize the erosion of disturbed land during the construction and post construction activities.

2. The plan may include the use of settling ponds, berms, barriers, filters, covers, diversion structures, seeding, sodding, mulching, and/or other control structures or methods. Any plan which requires engineered facilities, such as settling ponds or diversion structures, or which is prepared for a construction activity which includes 20 acres or more in total land disturbance, must be prepared by a registered engineer. The erosion control plan must include at least the following items:

a. Site Description. Each plan must, at a minimum, provide a description of the following:

(1) A description of the nature of the construction activity, including a proposed timetable for major activities;

(2) Estimates of the total area of the site, and all other sites if a phased development project, and the area of the site that is expected to undergo clearing, excavation, and/or grading;

(3) A site map indicating areas of total development and, as a minimum, all areas of soil disturbance, areas of cut and fill, drainage patterns and approximate slopes anticipated after major grading activities, areas used for the storage of soils or wastes, location of all erosion control facilities or structures and areas where vegetative practices are to be implemented, the location of impervious structures (including buildings, roads, parking lots, outdoor storage areas, etc.) after construction is completed, springs, wetlands and other surface waters, and the boundaries of 100-year flood plains, if any;

(4) A description of the nature of fill material to be used, the soils on the site, and the erosion potential of such soils; and

(5) The names of the receiving water(s) and the size, type and location of each outfall or, if the discharge is to a municipal separate storm sewer, a letter of approval from the municipality which authorizes use of the storm sewer and the location of any storm sewer discharge to public waters.

b. Controls. Each applicant covered by this permit must develop, as part of the erosion control plan, a description of controls appropriate for the site and must implement such controls. The following minimum components must be addressed along with a schedule for implementation:

(1) A description, including a schedule of implementation, of vegetative practices designed to preserve existing vegetation where practicable and revegetate open areas as soon as practicable after grading or construction. In developing vegetative practices, the applicant must consider: temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffer strips, and protection of trees with protective construction fences.

(2) A description of structural practices which indicates how, to the degree practicable, the applicant will divert flows from exposed soil, store flows, or otherwise limit runoff from exposed areas of the site. In developing structural practices, the applicant must consider the appropriateness of: straw bale dikes, silt fences, earth dikes, brush barriers, drainage swales, check dams, subsurface drains, pipe slope drains, rock outlet protection, sediment traps, and temporary sediment basins. All temporary control structures, including silt fences and straw pile dikes, may not be removed until completion of permanent vegetation stabilization.

(3) Each site must have graveled access entrance and exit drives and parking areas to reduce the tracking of sediment onto public or private roads. All unpaved roads on the site carrying more than 25 vehicle trips per day must be graveled.

(4) When trucking saturated soils from the site, loads must be required to drain until drippage has been reduced to less than 1 gallon per hour before leaving the site.

(5) Each plan must include a description of procedures for prompt maintenance and repair or restoration of all grade surfaces, walls, dams and structures, vegetation, erosion and sediment control measures and other protective devices identified in the plan.

c. The erosion control plan must include procedures for meeting any Oregon Administrative Rules for storm water control specific to the applicable river basin or any local sediment and erosion requirements or storm water management requirements.

d. Visible or measurable erosion which leaves the construction site is prohibited. Visible or measurable erosion is defined as:

(1) Deposits of mud, dirt, sediment or similar material exceeding 1/2 cubic foot in volume in any area of 100 square feet or less on public or private streets, adjacent property, or into the storm and surface water system, either by direct deposit, dropping, discharge, or as a result of the action of erosion; or

(2) Evidence of concentrated flows of water over bare soils; turbid or sediment laden flows; or evidence of on-site erosion such as rivulets on bare soil slopes, where the flow of water is not filtered or captured on the site using the techniques in the approved erosion control plan; or

(3) Earth slides, mud flows, earth sloughing, or other earth movement which leaves the property.

e. If any measurable quantities of sediment leave the site because of the failure of the erosion control facilities, the sediment must be immediately cleaned up (within 24 hours) and placed back on the site or properly disposed of. The sediment may not be washed into the storm sewers or drainageways under any conditions.

B. Minimum Monitoring and Reporting Requirements

1. All erosion control facilities must be inspected by or under the direction of the applicant at least once every seven calendar days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24-hour period.

2. During stormy periods or periods of snow melt when runoff occurs daily, all erosion control facilities must be inspected by or under the direction of the applicant daily.

3. Storm water runoff discharges must be visually monitored at the above frequency to evaluate the effectiveness of the pollution control facilities or practices. If any measurable quantities of

sediment are leaving the property, corrective action must be taken to reduce the discharge of sediments.

4. *The applicant must keep a record of inspections. Uncontrolled releases of mud or muddy water or measurable quantities of sediment found off the site must be recorded with a brief explanation as to the measures taken to clean up the sediment that has left the site. This record must be made available to the Bureau of Planning upon request. If the construction activity lasts more than 12 months, a copy of the record must be sent to the Bureau of Planning by July 1 of each year."*

- Amend Chapter 33.750, Fees, to add Subsection 33.750.050 D. as follows. This amendment waives adjustment fees under certain conditions when an adjustment is proposed in order to avoid environmental impacts.

  "33.750.050.D. Adjustments to avoid environmental impacts. The Director will waive land use review fees for adjusting setback requirements in single dwelling residential zones if the following conditions are met:

  1. ***The purpose of the adjustment is to avoid adverse impacts on a natural resource protected by an environmental zone;***
  2. ***The adjustment is applied for concurrently with an environmental review for the site; and,***
  3. ***Opposite setback requirements are increased by the same dimension as the requested setback reduction."***

Amendments to the Official Zoning Maps

The adopting ordinance applies the environmental overlay zones within the study area (see Official Zoning Maps). The following regulations are removed from the zoning maps: 1) water feature designations within the study area, and 2) Scenic Resource overlay zone designations in areas where environmental zones are applied. The Temporary Prohibition on Forest Disturbance automatically expires within the study area upon plan acknowledgement.

The Environmental Protection overlay zone is proposed for resource areas with high functional values that are in need of protection according to the inventory and ESEE analysis findings. Generally, the Environmental Protection overlay zone is proposed for highly significant wetland, pond and creek systems, and high quality upland resources which include ecologically or scientifically significant natural areas, sensitive natural communities, fish and wildlife areas and habitats where sensitive, threatened or (locally) rare species are identified, and plant communities with old or (locally) rare species or which serve critical soil and slope stabilization functions. Additionally,

this zone is applied to highly significant riparian areas within the direct influence zone (based on the potential height of trees which provide shade, stabilize creek banks and adjacent slopes, or provide organic material to the water body). The Environmental Protection zone will insure the protection of the functional values of these resources, the continuation of critical fish and wildlife habitat elements, and the preservation of the integrity and viability of the Southwest Hills ecosystem as a whole. The application of this zone will also protect existing and future development from natural hazards such as landslides and flooding, and retain the natural character and regional identity which the Southwest Hills forest provides.

The Environmental Conservation zone is proposed for areas that, while not as highly rated as the Environmental Protection zone areas, are of significant value to the overall system and warrant protection. These areas are generally able to support certain levels of development where impacts are controlled and mitigated.

Adoption of a resolution on the concept of establishing a land bank for parks and natural areas acquisition

The City Council adopted a resolution directing the Bureau of Planning to prepare a recommendation on the concept of establishing a land bank for parks and natural areas acquisition. As part of that study, Planning staff will consult the Bureaus of Parks and Buildings, as well as other interested agencies and individuals. The impetus for this recommendation comes from concerns raised by citizens and neighborhood organizations over unlawful and unnecessary degradation of natural resources within the Southwest Hills planning area. It has also come from concerns raised by citizens and the Planning Commission over the city's ability and need to seek out and preserve through public acquisition highly valued natural areas in the Portland area.

Several ideas on how such a land bank might function have been discussed to respond to citizens' concerns. These ideas include a fund, administered by the Bureau of Parks, designated solely for the purchase of target natural areas. The Bureau of Parks, in this scenario, would maintain a prioritized list of properties warranting preservation which would be purchased using funds in the land bank. The Bureau of Parks testified before the Planning Commission and City Council in support of the land bank proposal.

There are several possible mechanisms through which the bank could be funded. One idea that was raised is that when a zoning code enforcement case is brought against a developer or landowner *for violations of environmental regulations,* a fixed, mandatory fine would be assessed if the hearings officer determines that a violation has occurred. This fine would

then go to the land bank. Citizens and neighborhood organizations have argued that often there are few perceived deterrents to zoning code violations or violations of conditions of an approved land use case. They believe that the required fines designated for the land bank could provide a substantial deterrent to unlawful and unnecessary degradation of natural resources.

APPENDIX A

ADOPTING ORDINANCE

165002

As Amended

ORDINANCE No.

Adopt Natural Resource Inventory, ESEE Analysis, *Southwest Hills Resource Protection Plan;* amend Comprehensive Plan and Tide 33 of the City Code; amend Official Zoning Maps of the City of Portland; and direct study on implementation of a land bank (Ordinance).

The City of Portland Ordains:

Section 1. The Council finds:

1. In 1974, the State of Oregon adopted Statewide Planning Goal *5,* Open Spaces, Scenic and Historic Areas, and Natural Resources, that requires jurisdictions to conserve open space and protect natural and scenic resources.

2. The City of Portland adopted its Comprehensive Plan on October 16,1980 (effective date, January 1, 1981) and was acknowledged as being in conformance with Statewide Goals for Land Use Planning by the Land Conservation and Development Commission on May 1, 1981. At the time of its adoption the plan complied with State Goals *5.*

3. The Land Conservation and Development Commission's (LCDC) administrative rules for Goal 5 (OAR 660-16-000 through 660-16-025) outline the process to be followed in identifying and evaluating resources and achieving compliance with Goal *5.* LCDC adopted these administrative rules in September 1981.

4. With the adoption of the administrative rule for State Goal 5 by LCDC, the City's Compiehensive Plan was no longer in compliance with State Goal *5.*

5. The City has undertaken a review of its Comprehensive Plan as part of Periodic Review to bring the plan into compliance with the State Goals, particularly Goal 5.

6. An inventory of wetlands, water bodies, open spaces, and wildlife habitat areas was developed by Planning Bureau staff and biologist consultants, and reviewed by neighborhood associations, individuals, and special-interest groups during the planning process.

7. Fourteen resource sites were evaluated.

8. The wetland, water body, open space, and wildlife habitat resources were further examined through the Economic, Social, Environmental, and Energy (ESEE) process outlined in the Goal *5* administrative rule to determine the appropriate level of protection.

9. The *Southwest Hills Resource Protection Plan* is a framework of Comprehensive Plan policy amendments and regulatory measures that protect and enhance the significant wetland, water body, open space, and wildlife habitat resources that were determined to require partial or complete protection through the ESEE Analysis.

State Goal Findings:

10. Goal 1, Citizen Involvement, requires opportunities for citizens to be involved in all phases of the planning process. Development of the Southwest Hills Resource Protection Plan meets this goal because it included citizen review of all phases of the project, including soliciting information on the location, quantity, and quality of potential natural resources, and impacts of conflicting uses. Planning Bureau staff has held or attended public meetings, including neighborhood association meetings, beginning in September of 1990. A summary of the plan recommendations was presented at a public meeting August 14, 1991. Notices of this meeting were sent to neighborhood associations, interested persons, and the Oregonian. newspaper. Notices of the September 24, 1991 Planning Commission hearing were sent on August 20, 1991 to over 2,000 affected property owners, neighborhood and business associations within and adjacent to the planning area, and people requesting notification. Notice was also published in the Oregonian and other local papers. The Planning Bureau Staff Report and Recommendations and the Proposed Draft were available ten days prior to the September 24th hearing. Notice of the October 23, 1991 City Council hearing was mailed on October 8, 1991 to all persons requesting notice and all persons participating in the Planning Commission hearings process.

11. Goal 2, Land Use Planning, requires the development of a process and policy framework which acts as a basis for all land use decisions and assures that decisions and actions are based on an understanding of the facts relevant to the decision. The Southwest Hills project conforms to this goal. The Southwest Hills Resource Protection Plan adopts policies to amend the Comprehensive Plan and implement zoning regulations that assures conformance with the Plan's policies and objectives. Development of the inventory, ESEE analysis, and protection measures for the Southwest Hills area followed established city procedures for legislative actions.

12. Goal 3, Agricultural Lands, provides for the preservation and maintenance of the State's agricultural land. The Southwest Hills Resource Protection Plan is consistent with this goal. The regulations of the Southwest Hills Resource Protection Plan will apply in areas zoned for farm and forest uses; they do not affect existing agricultural uses.

13. Goal 4, Forest Lands, provides for the preservation and maintenance of the State's forest lands. The Southwest Hills Resource Protection Plan is consistent with this goal. The regulations of the Southwest Hills Resource Protection Plan will apply in areas zoned for farm and forest uses; they will permit preservation and low-impact maintenance of forest lands.

14. Goal 5. Open Space, Scenic and Historic Areas, and Natural Resources, provides for the conservation of open space and the protection of natural and scenic resources. The Southwest Hills Resource Protection Plan implements this goal for areas within southwest Portland because the process identified in the Goal 5 Administrative Rule (ORS 660-16-000 to 660-16-025) for resource identification and conflicting use analysis was followed in developing this plan. Specifically, the City inventoried natural resources and identified conificting uses in the plan area; analyzed the economic, social, environmental, and energy consequences of resource protection; and developed a program to protect Goal 5 resources in the plan area, as detailed in Exhibit A and incorporated herein.

The *Southwest Hills Resource Protection Plan* will be the controlling document in the protection of wetlands, water bodies, open spaces, and wildlife habitat areas in the plan area and will ensure and enhance the City's compliance with this goal by doing the following:

a. The Southwest Hills Resource Protection Plan policies and objectives are designed to protect and preserve significant natural resources in the plan area by identifying specific natural resource values and the means by which they are to be protected.
b. Significant natural resources are protected through application of environmental zones on distinct resource features.
c. Amendments to Title 33 provide additional protection of Goal 5 resources while also providing greater clarity during implementation and administration of the environmental zones.

15. Goal 6. Air. Water and Land Resource Quality, provides for the maintenance and improvement of these resources. The *Southwest Hills Resource Protection Plan* protects water resources by limiting development in areas where these resources would be negatively affected, encouraging groundwater recharge to augment summer flow in Southwest Hills creeks, and retaining and enhancing riparian vegetation to provide shade and lower water temperatures, trap sediment, and absorb certain chemical pollutants. Protection of natural resource quality is consistent with maintaining and improving water quality. The Environmental zone includes provisions for the preservation of trees in the plan area. Trees help to preserve the land by reducing erosion and stabilizing soils and steep hillside slopes: The plan will contribute to air quality because the tree preservation provisions of the plan will help control smog and trap particulates. The plan also encourages, where appropriate, the reopening of streams which have, over time, been placed in culverts and storm sewers. This will allow for water temperature regulation, groundwater recharge, and pollution control through sediment trapping and nutrient uptake.

16. Goal 7, Areas Subject to Natural Disasters and Hazards, provides for the protection of life and property from natural disasters and hazards. The *Southwest Hills Resource Protection Plan* is consistent with the intent of this goal because it encourages development away from hazard-prone areas and guides development to more suitable areas of sites through the planned unit development process. It also protects wetlands, creeks, and flood plains to allow for stormwater retention or detention, and drainage of flood waters.

17. Goal 8, Recreational Needs, provides for satisfying the recreational needs of both citizens of and visitors to the State. The *Southwest Hills Resource Protection Plan* is supportive of this goal because Portland's natural resources contribute to the recreational enjoyment of the City by both citizens and visitors. Provisions of the plan call for protection of the recreational opportunities which exist in the parks and, forests of the Southwest Hills, and allow public visual and physical access to Southwest Hills at selected points away from sensitive resource areas.

18. Goal 9. Economy of the State, provides for diversification and improvement of the economy of the State. The natural resources ESEE Analysis has balanced the impact on economic development with the protection of each identified natural resource. Protection of natural resources identified in the plan will have limited impacts on development in the City because *Southwest Hills Resource Protection Plan* regulations and application of Environmental zones have been structured to allow

reasonable economic development opportunities on privately-owned parcels containing significant natural resources. The plan is in conformance with this goal -because where economic impacts outweigh the value of the natural resource, the resource has received limited or no protection and development is allowed.

19. Goal 10, Housing, provides for meeting the housing needs of the State. The natural resources ESEE Analysis has balanced the impact on housing development with the protection of each identified natural resource. Where potential housing impacts are significant, the planned unit development provisions of the City's land use regulations allow the transfer of residential densities elsewhere on site.

20. Goal 11, Public Facilities and Services, provides for planning and development of timely, orderly and efficient public service facilities that can serve as a framework for the urban development of the City. The *Southwest Hills Resource Protection Plan* conforms with this goal by balancing protection of resources with the need of the City to develop compactly. Protection of natural resources is limited where urban levels of development would be precluded. On lands with highly-valued natural resource areas, transfer of residential density is allowed to other areas on site through application of planned unit development provisions where urban services can be provided in a more orderly and efficient manner.

21. Goal 12, Transportation, provides for the development of a safe, convenient and economic transportation system. The *Southwest Hills Resource Protection Plan* is supportive of this goal by allowing needed transportation facilities through significant natural resources if adverse impacts on resources can be mitigated.

22. Goal 13, Energy Conservation, provides for the distribution of land uses in a pattern that maximizes the conservation of energy. The natural resources ESEE Analysis considered the impact on energy conservation for natural resources considered for protection. The *Southwest Hills Resource Protection Plan* conforms with this goal by considering the impact on energy conservation. The plan provides limited or no protection of natural resources where preservation could lead to an energy-inefficient use of land as identified by existing Comprehensive Plan Map designations. The plan is supportive of this goal because it preserves recreational opportunities close in to the major population center of the State, leading to less travel time. Because this resource is closer to users, less transportation energy is required and a greater range of transportation modes, including bicycling and walking, can be used. Designated bicycle, equestrian, and pedestrian trails make these alternative forms of transportation more attractive.

23. Goal 14, Urbanization, provides for the orderly and efficient transition of rural lands to urban uses. The *Southwest Hills Resource Protection Plan* conforms to this goal by allowing uses to develop consistent with present Comprehensive Plan Map designations.

24. Goal *15*, Willamette River Greenway, provides for the protection, conservation, and maintenance of the natural, scenic, historic, agricultural and recreational qualities of land along the Willamette River. The *Southwest Hills Resource Protection Plan* conforms to this goal because creeks and drainageways containing significant resources which empty into the Willamette River are protected, and resource values such as water quality, fish and wildlife habitat, and aesthetics will be preserved.

25. Goals 16, 17, 18 and 19 deal with Estuarine Resources, Coastal Shorelines, Beaches and Dunes, and Ocean Resources respectively. These goals are not applicable to the

Southwest Hills Resource Protection Plan because none of these resources are present within Portland.

Comprehensive Plan Findings:

26. The *Southwest Hills Resource Protection Plan*, including its implementing measures, is in conformance with the City's Comprehensive Plan and is especially supportive of certain goals and policies. The review of goals and policies in this section of the ordinance is limited to those which are directly relevant to the plan.

27. Goal 1, Metropolitan Coordination, provides for planning activities to be coordinated with federal, state and regional plans. The Southwest Hills Resource Protection Plan complies with the State's required post-acknowledgement review process and is part of the State-required periodic review of the City's Comprehensive Plan.

    a. The plan is consistent with Policy 1.2, Urban Planning Area Boundary, because it has inventoried and evaluated natural resources within its planning area inside the existing City limits in the Southwest Hills area.

    The Metropolitan Service District (METRO) is developing a plan to implement the Urban Growth Goals and Objectives. The Southwest Hills Resource Protection Plan addresses several of METRO's proposed policies under Goal 2 "Natural Environment of the Region."

    a. 7.1 Open Space Assessment: This policy calls for local govemnients to establish quantifiable targets for setting aside certain amounts and types of open space. The Southwest Hills Resource Protection Plan site inventories include data on land set aside for open space.
    b. 7.2 Corridor Systems: This policy calls for the development of interconnected recreational and wildlife corridor systems within the metropolitan region. The Southwest Hills Resource Protection Plan will assist with achieving this objective through the preservation of natural areas where passive recreational opportunities exist. The individual site inventories included in the Southwest Hills Resource Protection Plan will also aid in the development of recreational and wildlife corridors.
    c. 7.3 Wildlife Inventory: This policy requires a detailed biological inventory of the region to be maintained to establish an accurate baseline of native wildlife populations. The Wildlife Habitat Assessments and Site Inventory Summaries (Chapter 7) included in Southwest Hills Resource Protection Plan provide new data for the regional inventory.

28. Goal 2. Urban Development, provides for maintaining Portland's role as the region's major employment, population, and cultural center through expanding opportunities for housing and jobs while retaining the character of established areas. The Southwest Hills Resource Protection Plan conforms with this goal by minimizing impacts on employment areas and preserving natural resources which enhance the City as a place to live, work, and recreate.

    a The plan is consistent with Policy 2.1, Population Growth, because the plan minimizes the impact of preserving natural resources on existing and future land uses within the City.
    b. The plan is consistent with Policy 2.5, Natural Resource Area, because it protects wetlands, water bodies, open spaces, wildlife habitat areas and other natural resources in the plan area.

c. The plan is supportive of Policy 2.6, Open Space, because it will enhance enjoyment of designated open space areas by encouraging and enhancing the scenic and natural resource characteristics of these areas.
d. The plan is supportive of Policy 2.8, Forest Lands, because it provides for the preservation of forest resources.
e. The plan is consistent with Policy 2.18, Utilization of Vacant Land, because it protects significant natural resources while allowing vacant land to develop in accordance with its Comprehensive Plan Map designation.

29. Goal 3. Neighborhoods, provides for the preservation and reinforcement of the stability and diversity of the City's neighborhoods while allowing for increased densities. The *Southwest Hills Resource Protection Plan* conforms with this goal because it has evaluated, through the ESEE Analysis, the impact of protection of identified resources on opportunities for development within neighborhoods. Significant natural resources have been carefully mapped or given only limited protection where impacts on development opportunities outweigh impacts on resources. Natural resources are protected where neighborhood associations have identified those that are important to the livability and attractiveness of the neighborhood.

a. The plan is supportive of Policy 3.4, Historic Preservation, because the plan protects areas of historic and environmental significance, including the Terwilliger Parkway.
b. The plan is supportive of Policy *3.5,* Neighborhood Involvement, because all recognized neighborhood associations were notified at the onset of this project and solicited for information on potential resources and for comments on recommended regulations. Several neighborhoods responded and many of their recommendations are incorporated into the *Southwest Hills Resource Protection Plan.* In addition, neighborhood mectings were held on the plan and neighborhoods were notified of all public hearings.

30. Goal 4, Housing, provides for a diversity in the type, density, and location of housing in order to provide an adequate supply within the City. The *Southwest Hills Resource Protection Plan* is consistent with this policy because it has evaluated the impact of protection of inventoried natural resources on the supply of existing and potential housing. Significant natural resources are protected in a way to minimize theft impact on both existing housing and the potential for new housing development. In some instances, the environmental zones has been reduced in area or not applied to resources in order to preserve housing opportunities. Site development standards mitigate the impact of development rather than limit development opportunities. Where housing development is severely restricted, provisions of the planned unit development regulations allow the redistribution of residential development to mitigate these impacts.

31. Goal *5,* Economic Development, provides for increasing the quantity and quality of job opportunities through the creation of an attractive business and industrial environment The *Southwest Hills Resource Protection Plan* is consistent with this goal because it has evaluated the economic impact of protecting inventoried natural resources in the ESEE Analysis. Where the negative economic impact of protecting the resource outweighed the value of the resource, limited or no protection measures were included.

a This plan is supportive of Policy *5.2,* Economic Environment, because it promotes the image of Portland as a livable, attractive City which acts as a

positive aspect of business recruitment. The plan is consistent with the policy because it balances the importance of an adequate supply of land by minimizing the impact of protecting natural resources on areas that are the targets of business development.

b. The plan is supportive of Policy *5.5,* International Image, because it strengthens the attractiveness of the area thereby enhancing the City's reputation as a• destination for international tourists. It will protect the natural resources along the Terwilliger Parkway, a major destination for tourists to view the city and surrounding area.

c. The plan is supportive of Policy *5.8,* Public/Private Partnership, because it describes ways in which private activities can support natural resources and further enhance the City as an attractive place to work.

32. Goal 6, Transportation, promotes an efficient and balanced urban transportation system, consistent with the Arterial Streets Classification Policy. The *Southwest Hills Resource Protection Plan* is consistent with and supportive of this goal because it encourages the development of pedestrian and bicycle facilities in conjunction with designated natural resources and allows fuller enjoyment and use of both.

33. Goal 7, Energy, provides for increasing the energy efficiency of existing structures and the transportation systems of the City. The *Southwest Hills Resource Protection Plan* is consistent with this policy because it has considered the energy impacts of protecting scenic resources in the ESEE Analysis for each resource. The designation and protection of natural resources within the City will reduce the need to travel to enjoy or study wetlands, water bodies, open spaces, and natural areas, thereby reducing overall energy costs.

34. Goal 8, Environment, provides for maintaining and improving the quality of Portland's air, water and land resources and protecting neighborhoods and business centers from noise pollution. The *Southwest Hills Resource Protection Plan* is especially supportive of this goal and is designed to implement the policies of the goal as it relates to natural resources. In addition, the plan modifies existing policies to further clarify the City's intent in protecting and enhancing the natural resources of the Southwest Hills plan area.

a The plan is supportive of Policy 8.8, Groundwater Protection, because it encourages groundwater recharge by retaining vegetation, and reopening of culverted and piped storm drainage systems which in turn contribute to year-round flows in Southwest Hills creeks and theft tributaries.

b. The plan supports of Policy 8.9, Open Space, by providing additional protection for Portland Parks.

c. The plan is supportive of Policy 8.10, Drainageways, because it limits development within certain creeks, drainageways, and floodplains to protect watershed resources, meets water quality standards, and protects property from flooding. Riparian and upland areas along drainageways are protected to allow passage of wildlife into Southwest Portland.

d. The plan is supportive of Policy 8.11, Special Areas, because it adopts policies identifying and setting forth guidelines for the protection and enhancement of unique resource qualities for the Southwest Hills area.

e. The plan is supportive of Policy 8.13, Natural Hazards, because it protects significant resources in areas of steep slopes, unstable soils, and floodplains, and encourages the shifting of development to other portions of lots which are more easily built upon.

f. The plan is supportive of and implements Policy 8.14, Natural Resources, by protecting significant natural and scenic resources. The plan balances the conservation of natural resources with the need for other urban uses in the accompanying ESEE Analysis.
g. The plan is supportive of Policy *8.15,* Wetlands/Riparian/Water Bodies Protection, because it protects Southwest Hills creeks, tributaries, and associated wetlands and riparian areas for values related to flood protection, sediment and erosion control, water quality, groundwater recharge and discharge, education, vegetation, and fish and wildlife habitat.
h. The plan is supportive of Policy 8.16, Uplands Protection, because it identifies and protects forested, meadow, and other upland areas which serve significant wildlife habitat, slope protection, and groundwater recharge functions.
i. The plan is supportive of Policy 8.17, Wildlife, because it protects existing fish and wildlife habitat areas, and encourages enhancement of vegetation and open space throughout the Southwest Hills plan area for wildlife habitat.

35. Goal 9, Citizen Involvement, provides for improving the method for citizen involvement in the on-going land use decision-making process and providing opportunities for citizen participation in the implementation, review, and amendment of the the Comprehensive Plan. The *Southwest Hills Resource Protection Plan* and implementing measures are consistent with this goal because there has been extensive citizen involvement throughout the process of developing the plan. Public meetings were held to request input on the development of the plan and implementing measures. Staff met with individuals, interest groups, and neighborhood organizations to discuss the project. The Planning Commission held briefings, work sessions, and a public hearing to allow for public input Notice was sent to property owners potentially affected by the implementing measures as well as to neighborhoods, special interest groups, and interested individuals. The Planning Commission adopted the Plan unanimously, and recommended that the Portland City Council adopt and implement the plan provisions.

a. The plan is consistent with Policy 9.1, Citizen Involvement Coordination, because opportunities were provided throughout the planning process to change aspects of the process to increase opportunities for review. Staff reports were available to the public within the the required time frames and were provided free of charge. Notice of meetings and hearings were sent to neighborhood associations, property owners, and to the members of the public requesting such notice.
b. The plan is consistent with Policy 9.2, Comprehensive Plan Review, because the *Southwest Hills Resource Protection Plan* is part of the periodic review of the Plan called for in this policy.
c. The plan is consistent with Policy 9.3, Comprehensive Plan Amendment, because proposed changes to the Comprehensive Plan were discussed with the public and were a part of the notice that was mailed to groups and individuals. Proposed changes were discussed at Planning Commission hearings and the proposed language was modified in response to citizen review.

36. Goal 10, Plan Review and Administration, describes the process for maintaining the Comprehensive Plan as Portland's policy framework for land development The goal calls for periodic review of the Plan to assure that it remains an up-to-date and workable framework. The *Southwest Hills Resource Protection Plan* fulfills one aspect of the requirement for periodic review by providing an inventory, analysis, and implementing measures that address State Goal 5 and City Goal 8 as they relate to natural resources.

a. The plan is supportive of Policy 10.1, Major Plan Review, because the *Southwest Hills Resource Protection Plan* is part of periodic review of the plan.
b. The plan is supportive of Policy 10.2, Interim Plan Review and Amendment, because the amendments to the Plan and implementing regulations have been reviewed by the Planning Commission prior to action by the City Council, consistent with citizen involvement procedures and State law as required by this policy.
c. The plan is supportive of Policy 10.9, Revised Zoning Code, because the implementing changes and additions to the Zoning Code have been reviewed to be consistent with the new Zoning Code adopted by City Council in 1990.

37. Goal 11, Public Facilities, provides for a timely, orderly, and efficient arrangement of public facilities that support existing and planned land use patterns and densities. The plan conforms with this goal by evaluating the impact of natural resource protection on public facilities development in the ESEE Analysis of protecting each natural resource included in the inventory. The analysis has led to limiting protection of natural resources to ensure that an orderly and efficient pattern of development can occur.

General Findings:

38. Plan policies and objectives were developed from the inventory and analysis of natural resources and form the basis for the plan's protection measures. The policies and objectives provide specific policy direction for City Bureaus and guidelines (not mandatory approval criteria) for applicants during review of development proposals within the environmental zones.

39. The Bureau of Planning recommendation on the natural resources inventory, ESEE analysis, and protection plan, including implementing measures, was adopted unanimously as amended by the Planning Commission.

40. The *Southwest Hills Resource Protection Plan* is the result of extensive planning effort and citizen involvement The plan identifies and preserves significant natural resources that contribute to Portland's high quality of life.

41. The *Southwest Hills Resdurce Protection Plan* and its implementing regulations fulfill State requirements to protect significant wetlands, water bodies, open spaces, scenic areas, and wildlife habitat areas as part of State Land Use Planning Goal *5.*

42. The State post-acknowledgement requirements were followed in the development of the plan and its implementing actions. Notice of the proposed action was mailed to DLCD on September 20, 1991 along with copies of the proposed plan, the ESEE analysis, and the inventory.

43. The *Southwest Hills Resource Protection Plan* is part of periodic review of the Comprehensive Plan required by the State and the City's own Comprehensive Plan.

44. The Westside Corridor Project has completed environmental review through NEPA and the Oregon Action Plan. The plan as adopted by the city on April 12, 1991 is therefore exempt from further environmental review through City Code section 33.430.060.G. The Terwilliger Bridge Project has completed environmental review through NEPA and the Oregon Action Plan. The plan as adopted by the city on August 14, 1986 and modified by site and landscape plans entered into the record for

adoption of the Southwest Hills Resource Protection Plan is therefore exempt from further environmental review through City Code section 33.430.060.G.

45. The city has identified drainageways as significant natural resources which warrant the highest level of environmental protection. Due to unique operational needs of allowed activities, it may be necessary **to** allow roads to cross the protected resources. With proper restrictions, the roads could have less adverse impact on land use operations, adjacent land uses and activities, and the protected resource. The proposed changes to Section 33.430.340. D. make it possible for these stream crossings to occur, subject to more detailed environmental review and mitigation.

46. Citizens and the Portland Planning Commission have raised concerns over the City's ability to preserve through public acquisition highly valued natural areas in Portland. A study of the implementation of a land bank for natural areas acquisition to address these concerns is warranted.

47. ORS 227.178 (3) expresses the legislature's policy that newly adopted regulations not be applied to development review already applied for. It is necessary to describe circumstances under which this plan's standards will be applied to development applications.

48. It is in the public interest for the *Southwest Hills Resource Protection Plan,* including amendments to the Comprehensive Plan, amendments and additions to Title 33, and amendments to the Official Zoning Maps to be adopted and implemented.

NOW, THEREFORE, the Council directs:

a. The Recommended *Southwest Hills Resource Protection Plan* (Exhibit A) and Appendices (Exhibit B) is hereby adopted.

b. Ordinance No. 150580 is hereby amended by adding Policy 8.11 E of the Comprehensive Plan, to read as follows:

"8.11, Special Areas
Recognize unique land qualities and adopt specific planning objectives for special areas.

A. **Willamette River Greenway** (no change)

B. **Balch Creek Watershed** (no change)

C. **Johnson Creek Basin** (no change)

D. **Northwest Hills** (no change)

E. Southwest Hills
Protect and preserve fish and wildlife, forest, and water resources through implementation of the Southwest Hills Resource Protection Plan."

c. Ordinance No. 163608 enacting Tide 33, Planning and Zoning, of the Municipal Code of the City of Portland, is hereby amended as set forth in Exhibit A.

d. The Official Zoning Maps of the City of Portland are hereby amended as shown in Exhibit B.

ORDINANCE No. 165002

e. Applications for land use reviews for property within the plan area other than a land division, planned unit development, zoning map amendment or comprehensive plan map amendment, filed before the effective date of this ordinance, are exempt from the regulations of Chapter 33.430, Environmental Zones, if site plans are approved as part of the reviews. Modifications to previously approved site plans located within an environmental zone will require environmental review of the impact of the modification.

f. The Bureau of Planning shall study and prepare a recommendation **to** the Planning Commission concerning implementation of a land bank for parks and natural areas acquisition.

Section 2.

The Council declares an emergency exists because unprotected natural resources are threatened by degradation in areas within the Southwest Hills planning area. Natural values will be lost without protection afforded by the plan. The area covered by this plan contains steep, unstable slopes which are susceptible to landslides, particularly during the wet season beginning in November. Development without the controls required in this plan will result in erosion, landslides, and threats to public health and safety. Therefore, this Ordinance shall be in force and be effective upon adoption.

Passed by the Council, JAN 23 1992

Commissioner Gretchen Kafoury
January 23, 1992
Tim Brooks/tb

BARBARA CLARK
Auditor of the City of Portland
By D Barnera Deputy

APPENDIX B

GLOSSARY

Glossary

BANK	The rising ground surrounding a lake, river, or other water body.
CHANNEL	The bed where a stream of water runs.
COVER	Vegetation that serves to protect animals from excessive sunlight, drying, or predators.
DOMINANT	The species controlling the environment.
EDGE EFFECT	The opportunities afforded along the boundary (also ECOTONE) between two plant communities for animals that can feed in one and take shelter in the other. Also, disturbance to forest habitat through fragmentation, microclimatic changes, and altered predatory relationships caused by edge creation.
ENHANCE	To raise to a higher degree; improve quality or available capacity; intensify; magnify.
EMERGENT VEGETATION	Various aquatic plants usually rooted in shallow water and having most of their vegetative growth above water, such as cattails and bullrushes.
EUTROPHICATION	The process by which a lake becomes rich in dissolved nutrients and deficient in oxygen.
FRAGIPAN	A hard, slowly permeable silt loam soil layer that normally develops 2.5 to 4.5 feet below the ground surface in the Portland West Hills.
GALLERY FOREST	A strip of forest bordering a river or lake where tree growth is supported by water flowing through the soil for a short distance.
GOAL 5	A portion of the Oregon Land Conservation and Development Commission land use goals, dealing with the protection and conservation of open spaces, scenic and historic areas, and natural resources.
HABITAT	Place where a plant or animal species naturally lives and grows; its immediate surroundings.

HYDRIC SOILS	Soil that is wet long enough to periodically produce anaerobic conditions, thereby influencing the growth of plants.
HYDROPHYTE	A vascular plant that grows in water with its buds below the water surface.
INTERSPERSION	The proximity and interaction of one natural area to other adjacent areas.
INUNDATE	To flood; overspread with water; overflow.
LACUSTRINE	Related to or within lakes.
LIflORAL	Relating to, situated in or near a shoreline.
LIMNIC	Relating to or inhabiting a marshy lake.
MESIC	Of or pertaining to, or adapted to an environment having a balanced supply of moisture; being neither extremely wet nor dry.
MITIGATE	To make less severe. Mitigation means the reduction of adverse effects of a proposed project by considering, *in the following order:* a) Avoiding the impact altogether by not taking a certain action or parts of an action; b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation; c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment; d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action by monitoring and taking appropriate corrective measures; and e) Compensating for the impact by replacing or providing comparable substitute resources or environments.
MYCORRHIZAE	A mutual relationship between plant roots and certain kinds of fungi. The plants exude carbon compounds to the fungi, and the fungi provide the plants with soil nutrients, such as phosphorous.
PALUSTRINE	Wetlands dominated by trees, shrubs, persistent emergent herbs, emergent mosses or lichens.

PASSERINE	Birds of the Order Passeriformes, comprising more than half of all bird species, and typically having feet adapted for perching (sparrows, warblers, etc.).
RAPTORS	Birds of the families Accipitridae, Falconidae, Tytonidae, and Strigidae; birds of prey equipped with long hooked bills and strong talons (hawks, eagles, falcons, and owls) .
REDD	A fish spawning nest in river or stream gravel.
RIPARIAN	Relating to, living, or located on the bank of a natural water course (stream, river, etc.).
RIVERINE	Related to, formed by, or resembling a river.
SATURATED	Soaked, impregnated, or imbued thoroughly (soils).
SERAL STAGE	A characteristic association of plants and animals during succession and before climax.
SHOREBIRD	Birds of the Families Charadridae and Scolopacidae that are generally mud feeders and shore inhabiting.
SLOUGH	Usually a channel containing water which may or may not be moving, and often alluvial in nature.
SMALL MAMMALS	Fur covered animals that bear their young alive and nurse, those of the Orders Rodentia and Insectivores (mice, voles, shrews, etc.).
STRUCTURAL	Different habitat types within a Natural Area (i.e., Diversity; grasslands, forest, open water, etc.).
SUBSIDENCE	A sinking of part of the earths crust. Movement in which there is not free side and surface material is displaced vertically downward with little or no horizontal component.
UPPER PERENNIAL	One of four subsystems of the Riverine System, where the gradient is high, water velocity is fast, and some water flows throughout the year.

WATERFOWL	Birds of the Family Anatidae. Aquatic, web-footed, gregarious birds ranging from small ducks to large swans, including geese.
WETLANDS	Lands transitional between terrestrial and aquatic where the water table is usually at or near the surface or the land is covered by shallow water. Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.
XER!C	Of, pertaining to, or adapted to a dry environment.

APPENDIX C

BIBLIOGRAPHY

Bibliography

Adams, Lowell W. and Dove, Louise E. *Wildlife Reserves and Corridors in the Urban Environment: A Guide to Ecological Landscape Planning and Resource Conservation* National Institute for Urban Wildlife (Columbia, Maryland: 1989).

Adams, Lowell W. and Leedy, Daniel L. *Integrating Man and Nature in the Metropolitan Environment: Proceedings of a National Symposium on Urban Wildlife* National Institute for Urban Wildlife (Columbia, Maryland: 1986).

Bureau of Environmental Services and Washington County Dept. of Land Use and Transportation *Erosion Control Plans Technical Guidance Handbook* (Portland, Oregon: 1989).

Bureau of Environmental Services, City of Portland, Oregon *Public Facilities Plan: Combined Sewer Element* (Portland, Oregon: 1987).

Bureau of Environmental Services, City of Portland, Oregon *Public Facilities Plan: Drainage Element* (Portland, Oregon: 1987).

Bureau of Environmental Services, City of Portland, Oregon Public Facilities Plan: Sanitary Element (Portland, Oregon: 1987).

Bureau of Environmental Services, City of Portland, Oregon Portland Storm Drainage Study (Portland, Oregon: 1982).

Bureau of Planning, City of Portland, Oregon Comprehensive Plan Goals and Policies (Portland, Oregon: 1991).

Bureau of Planning, City of Portland, Oregon, Scenic Views, Sites, and Corridors: Scenic Resources Protection Plan (Portland, Oregon: 1990) nine parts, multiple volumes.

Bureau of Planning, City of Portland, Oregon Public Facilities Plan (Portland, Oregon: 1989).

Bureau of Planning, City of Portland, Oregon Inventory and Analysis of Wetlands, Water Bodies and Wildlife Habitat Areas for the Columbia Corridor (Portland, Oregon: 1989).

Bureau of Planning, City of Portland, Oregon Addendum to Mineral and Aggregate Resource Inventory (Portland, Oregon: 1989).

Bureau of Planning, City of Portland, Oregon, *Mineral and Aggregate Resource Inventory* (Portland, Oregon: 1988).

Bureau of Planning, City of Portland, Oregon *Willamette Greenway Plan* (Portland, Oregon: 1987).

Bureau of Planning, City of Portland,- Oregon *1987 Vacant Land Report* (Portland, Oregon: 1987).

Bureau of Planning, City of Portland, Oregon *Macadam Corridor Design Guidelines* (Portland, Oregon: 1985).

Bureau of Planning, City of Portland, Oregon *Historic Resources Inventory: Selected Properties of Far Southwest Neighborhoods* (Portland, Oregon: 1984).

Bureau of Planning, City of Portland, Oregon, *Historic Resource Inventory* (Portland, Oregon: 1984) 14 loose leaf volumes, inventory #2-888-03021.

Bureau of Planning, City of Portland, Oregon *Terwilliger Parkway Corridor Plan* (Portland, Oregon: 1983).

Bureau of Planning, City of Portland, Oregon *Terwilliger Parkway Design Guidelines* (Portland, Oregon: 1983).

Bureau of Planning, City of Portland, Oregon *Lair Hill Historic Conservation District Design Guidelines* (Portland, Oregon: 1980).

Bureau of Planning, City of Portland, Oregon *West Portand Park Study* (Portland, Oregon: 1979).

Bureau of Planning, City of Portland, Oregon *Powell Butte Mt. Scott Development Density Study, Development Manual* (Portland, Oregon: 1978).

Bureau of Planning, City of Portland, Oregon *Corbett, Terwilliger, and Lair Hill Policy Plan* (Portland, Oregon: 1977).

Bureau of Planning, City of Portland, Oregon *Marquam Hill Policy Plan* (Portland, Oregon: 1977).

Bureau of Transportation, City of Portland, Oregon *Public Facilities Plan: Transporttation Element* (Portland, Oregon: 1987).

Bureau of Water Works, City of Portland, Oregon *Capital Improvements Program: 1991-1996* (Portland, Oregon: 1991).

City of Portland, Oregon *Arterial Streets Classification Policy* (Portland, Oregon: 1990).

Defenders of Wildlife *Nongame WÜdlife Assessment Survey: Executive Summary* Intercept Research Corp. (Portland, Oregon: 1988).

Defenders of Wildlife *Preserving Communities and Corridors* (Washington, D.C.: 1989).

Fox, Tom *Urban Open Space: An investment that Pays* The Neighborhood Open Space Coalition (New York, New York: 1990).

Franklin, Jerry D. and Dyrness, C.T. *Natural Vegetation of Oregon and Washington* Oregon State University Press (Corvallis, Oregon: 1988).

Harris, Larry D. *The Fragmented Forest: Island Biogeography Theory and the Preservation of Biotic Diversity* University of Chicago Press (Chicago, illinois: 1984).

Hitchcock, C. Leo and Cronquist, Arthur *Flora of the Pacific Northwest* University of Washington Press (Seattle, Washington: 1973).

Hough, Michael *City Form and Natural Process* Routledge (New York, New York: 1984).

Leedy, Daniel L. and Adams, Lowell W. *A Guide to Urban Wildlife Management* National Institute for Urban Wildlife (Columbia, Maryland: 1984).

Lev, Esther *Bureau of Planning, City of Portland, Oregon Goal Five Study: West Hills* (Portland, Oregon: 1986).

Maser, Chris, Mate, Bruce R., Franklin, Jerry F. and Dyrness, C. T. *Natural History of Oregon Coast Mammals* Museum of Natural History, University of Oregon (Eugene, Oregon: 1984).

Mathews, Daniel *Cascade Olympic Natural History: A Trailside Reference* Raven Editions (Portland, Oregon: 1988).

Metropolitan Service District (METRO) *Regional Urban Growth Goals and Objectives* (Portland, Oregon: 1990).

Norse, Elliott A. *Ancient Forests of the Pacific Northwestt* Island Press (Washington, D.C.: 1990).

Oregon Administrative Rules Chapter 660, Division 16.

Oregon Revised Statutes Chapter 197, Section 640.

Price, Larry W. (ed.) *Portland's Changing Landscape* Portland State University Press (Portland, Oregon: 1987).

Redfern, Roger *Portland Physiographic Inventory* (Portland, Oregon: 1976)..

Redfern, Roger and Leonard Palmer *Environmental Geology of the Marquam Hill Area, Portland, Oregon* Portland State University (Portland, Oregon: 1973).

State of Oregon, Dept. of Geology and Mineral Industries *Geology and Geologic Hazards of Northwestern Clackamas County* (Salem, Oregon: 1979).

State of Oregon, Land Conservation and Development Commission, *Oregon 's Statewide Planning Goals* (Salem, Oregon: 1990).

Thurow, Charles, Toner, William and Erley, Duncan *Performance Controls for Sensitive Lands: A Practical Guide for Local Administrators* American Society of Planning Officials (Chicago, illinois: 1976).

United States Dept of the Interior, National Park Service *Economic Impacts of Parks and Recreation: A Resource Book* (Western Regional Office: 1988).

United States Dept of the Interior, National Park Service *Economic Impacts of Protecting Rivers, Trails and Greenway Corridors: A Resource Book* (Washington, D.C. : 1990).

United States Dept. of Agriculture, Forest Services *Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington: Part 1* Chapter Narratives and Part 2 Appendices (Washington, D.C.: 1986).

United States Dept. of Agriculture, Soils Conservation Service Soils Survey of Multnomah County, Oregon (Portland, Oregon: 1983).

Whitney, Stephen The Audubon Society Nature Guides: Western Forests Chanticleer Press (New York, New York: 1985).

Wood, Wendell "The Pacific Yew: Indicator of a Threatened Ecosystem" Wild Oregon (Portland, Oregon: 1990).