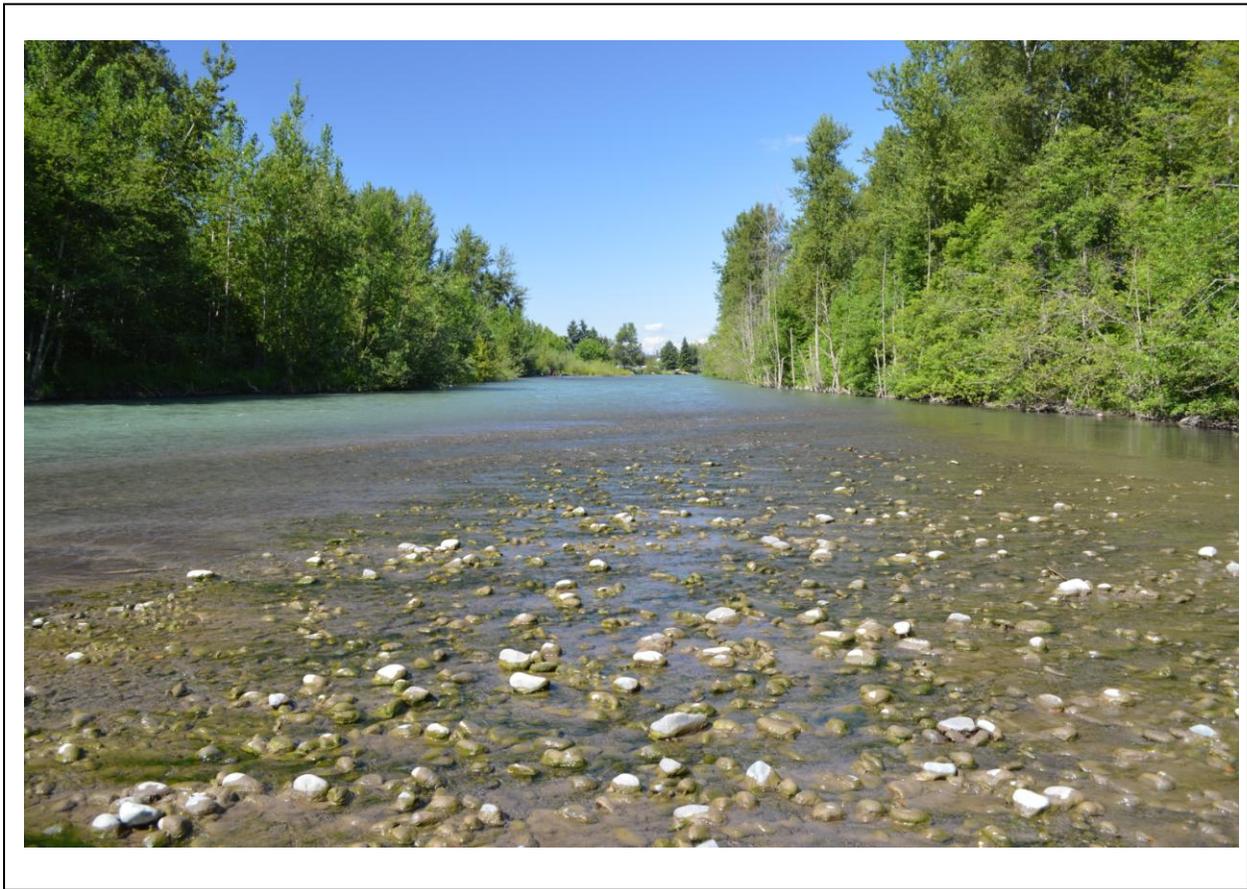


CHAPTER 3

NATURAL ENVIRONMENT



1. INTRODUCTION

1.1 Framework Goal

The first Framework Goal of this Comprehensive Plan is to:

Provide an effective stewardship of the environment by protecting critical areas and conserving land, air, water, and energy resources.

The purpose of the Natural Environment element is to guide the formation of regulations to protect and enhance the natural environment for present and future citizens of Pacific. This protection will be accomplished by:

- ◆ Identifying critical areas and updating maps;
- ◆ Updating the Critical Areas Ordinance and the Shoreline Master Program;
- ◆ Preserving or enhancing significant natural areas;
- ◆ Regulating new development to better integrate the built environment with natural features and conditions, and;
- ◆ Educating the public about the potential impacts of development on natural systems.

This element provides a framework for achieving land use and development practices that are compatible with and enhance the natural environment.

1.2 Objectives of the Growth Management Act and of Other Agencies

The Natural Environment element is intended to meet the objectives of the State Growth Management Act (GMA); Endangered Species Act (ESA); State Environmental Policy Act (SEPA); Countywide Planning Policies of King and Pierce counties; and other federal, state, and county policies. It also affirms the City's role in regulating land use; implementing federal and state statutes; obtaining funding from federal, state and local jurisdictions; and consistently managing impacts to the natural environment. The following GMA goals relate directly to the natural environment:

- ◆ Open space and recreation - Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities.
- ◆ Environment - Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

The GMA also requires adoption of development regulations that protect critical areas (RCW 36.70A.060), and use of the “best available science” in developing policies and development regulations to protect the functions and values of critical areas (RCW 36.70A.172).

1.3 Background and Context

The original environment of Pacific was a river valley covered with old growth forests that experienced seasonal flooding. Today, Pacific is largely composed of built features that are being redeveloped for the second or third time since the City's incorporation in 1909. Most of the original natural environment has been compromised.

Pacific was a rural agricultural town of under 1,577 people in 1960. The population of Pacific grew by nearly 70 percent to 2,261 in 1980, and more than doubled to 5,527 persons between 1980 and 2000. By 2010, Pacific’s population reached 6,606 persons. The 2014 population estimate is 6,830 (Based on the Office of Financial Management estimates). This was just one result of highway regional transportation facilities directing growth into the White River valley, combined with the availability of sewers in Pacific. As pressure for increased residential and commercial development intensifies from both the north and south, the protection or enhancement of the natural environment becomes more challenging.

This City must continually evaluate the relationship between the natural and built environments. Potential impacts of development on slope stability and erosion; air, water, and soil contamination; noise, emissions, and waste generation; resource consumption; and automobile dependence need consideration; along with the preservation and enhancement of open space, wildlife habitat, and recreation opportunities.

Environmental goals, objectives, and policies contained in this element address substantive issues, such as potential development on wetlands, floodplains, and steep slopes. These policies not only outline steps the City should take towards establishing policy direction and regulatory authority on environmental issues, but procedures they help to guide the property owner and citizen. One example of this is to encourage the combining of storm water storage areas to create more viable natural areas, instead of creating a patchwork of small detention ponds.

These goals and policies will be implemented through such measures as: sensitive area regulations, development review guidelines, storm water ordinances and programs, economic incentives for environmental protection, and economic development decisions.

2. GOALS AND POLICIES

REGULATORY CONSIDERATIONS

GOAL NE-1: Respect and protect the natural environment in any future development.

POLICIES

Policy NE-1.1: PROTECTION OF CRITICAL AREAS

Enact regulations and ordinances to protect natural resource lands and critical areas, including the streams and rivers, wetlands, slopes, groundwater recharge areas, watersheds, forest lands and other critical resource areas from the detrimental effects of development.

Discussion: Implement regulations that not only protect, but enhance the natural environment, and compliment the economic development of the community. This can only be accomplished by informing citizens and property owners of the standards which the City maintains to create a safe and stable community.

~~GOAL NE-2: Lead and support efforts to protect and improve the natural environment.~~

Policy NE-21.12:

Take a proactive role in addressing issues of the Endangered Species Act (ESA).

Discussion: The City will enforce federal, state, county, and City environmental policies and regulations to advance the goals of the ESA and encourage unique innovative approaches to issues that may impact salmon-bearing streams.

Policy NE-22 1.3:

Consider and evaluate the immediate, long-range, and cumulative environmental impacts of policy and development decisions.

Discussion: The City should look carefully at both long-term and cumulative impacts when making such decisions. These considerations should be evaluated as part of the environmental review of the policy and development decisions.

Policy NE-23 1.4:

Encourage the use of a variety of technologies that minimize environmental degradation and protect public health.

Discussion: In working with developers, the City has a wide variety of possible options available to mitigate the impacts of new development.

Options include the use of “Low Impact Development” (LID) techniques to mitigate the impacts to the environment due to new development. Options such as the use of permeable pavers in parking areas could be used.

~~For example, the use of vegetation or grinding of sewage may allow for more development than would be otherwise allowed for certain areas.~~

The City can implement this policy by revising its codes to recognize options for complying with regulations and mitigating environmental impacts. Technical manuals regarding LID development can be found on the Washington State Department of Ecology (DOE) website and the King County website under the Department of Permitting and Environmental Review.



Permeable Pavers - Photo by Collen Owen

Policy NE-24 1.5:

Conduct all City operations in a manner that minimizes adverse environmental impacts and promotes a safe workplace for employees.

Discussion: The City can implement this policy by reducing its consumption and waste of energy and materials, minimizing its use of toxic and polluting substances, reusing and recycling, and disposing of all

waste in a safe and responsible manner. The City should give preference to recycled products, within budget constraints.

Policy NE-2.51.6:

Support, promote, and lead public education and involvement programs.

Discussion: Public education and involvement raises public awareness about environmental issues, and encourages individual and Community efforts to protect the environment.

Policy NE-2.61.7:

Cooperate with local, state, federal, and tribal governments; international agencies, business groups, and non-profit organizations to protect and enhance the environment.

Discussion: Many environmental issues affect areas beyond Pacific's boundaries. The City needs to negotiate, communicate, and cooperate with other organizations in order to address these issues. The City should also participate in local and regional programs to protect environmentally sensitive areas.

ENVIRONMENTAL ENHANCEMENT

GOAL NE-32: Enhance the natural environment in the community.

POLICIES

Policy NE-32.1:

The following shall be considered critical areas and regulated through the Pacific Municipal Code: critical wildlife habitat areas, flood and landslide hazard areas, steep slopes, streams, and wetlands.

Discussion: Title 23 of the Pacific Municipal Code (PMC) defines the categories of critical areas and specifies how each category will be regulated.

Policy NE-32.2:

Enhance and facilitate not only the preservation, but the coordinated restoration and/or creation of new critical areas, as part of the planning process.

Discussion: Title 23 of the Pacific Municipal Code (PMC) outlines mitigation for development in or around wetlands. These regulations not only outline the degree of mitigation required but also outline ratio's to create new wetlands as necessary. These ratio's should be reviewed annually to ensure they conform with the latest recommendations by the Department of Ecology (DOE).

Policy NE-32.3:

Provide incentives for development that is designed, sited, and constructed to minimize environmental impacts.

Discussion: Incentives may include density bonuses for cluster development, open space tax incentives, incentives for design, and a transfer of development rights (TDR) program. Incentives may also include reduced mitigation requirements in exchange for reduced impacts.

Policy NE-32.4:

Require mitigating measures for new development that creates environmental impacts.

Discussion: Mitigation measures should be appropriate for the type of impact and proportionate to the amount of impact. They may involve the retention or restoration of significant habitats or other critical areas. They can also include the construction or improvement of private capital facilities.

Policy NE-32.5:

Encourage private open space preservation in the City.

Discussion: The encouragement of open space preservation could be achieved through density credits and criteria that connect open space corridors with adjoining properties within the City. Such corridors could help facilitate the migration of wildlife from one area of the City to another.

SURFACE WATER MANAGEMENT

GOAL NE-43: Encourage measures that improve surface water management.

POLICIES

Policy NE-43.1:

Prohibit development in areas where frequent surface flooding occurs, unless adequate engineering and institutional controls are implemented.

Discussion: Structures built within flood hazard areas decrease flood storage capacity. Increasing building density in these areas generally results in a larger area threatened by seasonal flooding. The City may require a “no net loss” approach to maintaining floodwater storage capacity.

Policy NE-43.2:

Continue development review for surface water compliance. All costs associated with surface water review shall be recovered from development applicants.

Discussion: Surface water review is needed to ensure that the use of one property does not unreasonably infringe upon the use of neighboring properties. Surface water can be retained on site or managed through community surface water systems.

Policy NE-43.3:

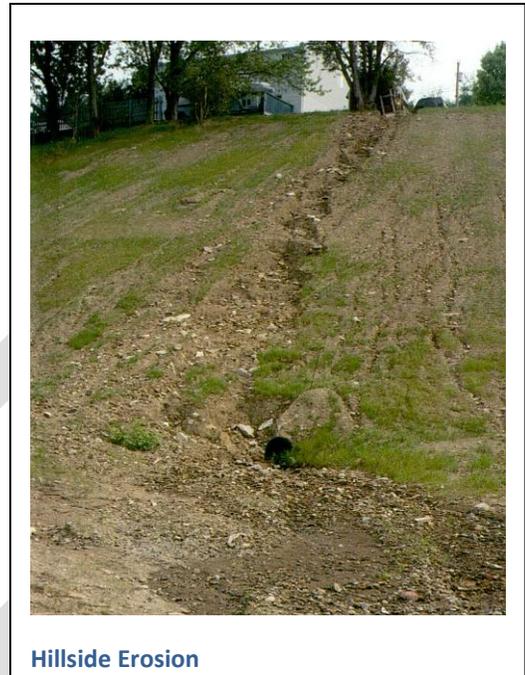
Require appropriate engineering and institutional controls for development in flood hazard areas.

Discussion: Proper controls will help alleviate impacts to future property owners who reside in Pacific. These controls should meet the requirements of the Federal Emergency Management Agency (FEMA).

Policy NE-43.4:

Ensure that erosion control measures function during and after construction, and that approved surface water management and septic systems are installed by conducting routine building and development review inspections.

Discussion: Proper erosion control measures will help to ensure that storm drainage will not impact existing and proposed development located on our adjacent to the property. Inspections of these facilities are necessary to determine that these measures are adequately maintained to the specifications required of the construction of the erosion control facilities.



WETLANDS PROTECTION

GOAL NE 54: Provide for the protection of wetlands.

POLICIES

Policy NE-54.1:

Implement a ranking and classification system for wetlands which rates wetlands based on size, vegetative complexity, ecological and hydrological function, and presence of threatened or endangered species.

Discussion: Work with neighboring jurisdictions to establish a consistent regional classification system for wetlands that allows for the designation of both regionally important and locally unique wetlands. This system should incorporate the latest state Department of Ecology’s wetland rating criteria.

Policy NE-54.2:

Identify and classify the diverse functions and values of wetlands in the City.

Discussion: The City can implement this policy by identifying all wetlands on public property and establishing a voluntary program to identify wetlands on private land, as well as requiring wetland studies of potential wetlands as development is proposed.

Policy NE-54.3:

Achieve “no net loss” of wetland acreage, functions, and values within each drainage basin over the long term.

Discussion: "No net loss" means that total wetland acreage, functions, and values are preserved over the long term. The City should:

- ◆ Encourage educational opportunities that increase public understanding and appreciation for the values of wetlands;
- ◆ Advise citizens of measures they could take to maintain wetlands on their properties.
- ◆ Consider off-site mitigation for wetlands, such as creating a new wetland, only within the same drainage basin.

Policy NE-54.4:

Existing degraded wetlands should be restored where practicable, or consolidated in a drainage basin plan.

Discussion: Restoration of degraded wetlands, or participation in a community-wide mitigation planning program, may be required as a condition of new development or redevelopment. The City should consider creating a “mitigation utility” to implement a neighborhood plan.

FISH AND WILDLIFE HABITAT PROTECTION

GOAL NE 65: Protect fish and wildlife habitat and native vegetation.

POLICIES

Policy NE-65.1:

Develop a vegetation preservation and enhancement program.

Discussion: Vegetation in the City of Pacific provides and protects habitat for fish and wildlife. Vegetation also plays an important role in surface water management and stabilizing soils in critical areas. The City can preserve and enhance vegetation through some of the following methods:

- ◆ Encourage the use of native vegetation as an integral part of development plans.
- ◆ Limit the removal of healthy trees in critical areas and critical area buffers.
- ◆ Encourage the use of native and low maintenance vegetation in residential and commercial landscapes.
- ◆ Require tree replacement on private property as project mitigation.
- ◆ Replace removed trees on public land.

Policy NE-65.2:

Implement measures to provide appropriate protection of fish and wildlife habitat.

Discussion: Fish and wildlife have similar needs as humans. They need clean water, fresh food and clean safe habitat area to raise their young. For fish, this means that there is an adequate supply of clean cool water. This can be provided through the retention of shading vegetation on the banks of streams and rivers. Clean water can be retained through stormwater control structures that remove sediment and pollutants. Streamside vegetation can also provide safe habitat through the provision of hiding places for adult and juvenile fish.



Stream Buffer

Policy NE-65.3:

Plan for and protect wildlife corridors as part of an open space and parks master plan.

Discussion: Maintenance of wildlife corridors provides feeding areas and escape routes for animals. The City can implement this policy through public education, land use designations, incentives, regulation, and code enforcement.

Policy NE-65.4:

Actively participate in regional species protection efforts, including salmon habitat protection and restoration.

Discussion: The City will implement this policy by working with citizen volunteers, county, state and federal agencies, and tribal governments to identify, prioritize, and eliminate barriers to anadromous fish spawning and rearing habitat.

Policy NE-65.5:

Protect and enhance critical wildlife habitat and, where practical, preserve existing wildlife habitat.

Discussion: Critical wildlife habitat refers to areas identified as priority habitats by the Washington Department of Fish and Wildlife or by the City of Pacific. The City can implement this policy through regulation, code enforcement, acquisition, incentives, and other techniques.

Policy NE-65.6:

Establish buffers to preserve aquatic and riparian habitats in a natural state.

Discussion: Buffers around wetlands, lakes, creeks, ditches, and streams protect native vegetation, water quality, habitat for fish and wildlife, and hydrologic function. They provide greater areas of habitat for fish and wildlife, and natural undisturbed areas for public enjoyment.

Policy NE-65.7:

Prohibit alterations to streams unless they are part of approved restoration efforts.

Discussion: Stream alterations, such as filling or redirection of a watercourse, are likely to result in adverse impacts to the natural environment. Impacts can include sediment transport and flooding on adjacent properties. Where practical, streams should be allowed to return to natural channel migration patterns. The City will implement this policy through code enforcement.

WATER QUALITY

GOAL NE 76: Preserve and enhance water quality.

POLICIES

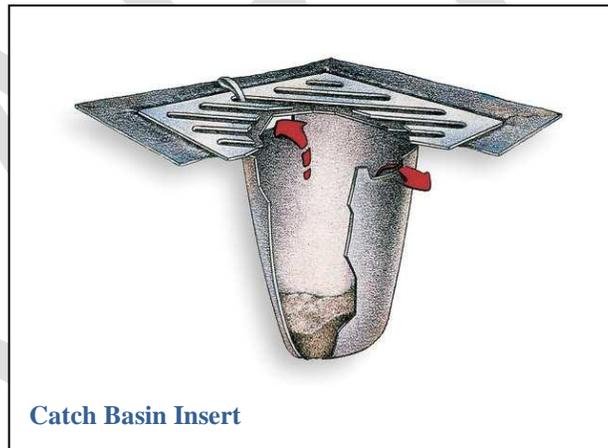
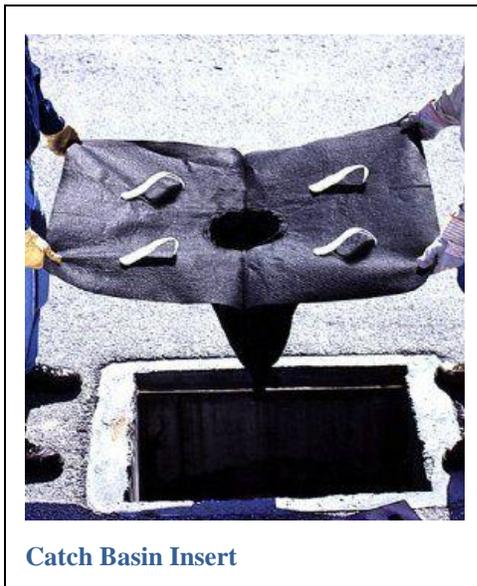
Policy NE-76.1:

Prevent pollution of both surface and groundwater resources.

Discussion: Whether it is located in streams, wetlands, or underground sources of water supply, clean water is one of Pacific’s important characteristics. The City can protect surface and groundwater resources through some of the following methods:

- ◆ Control development in areas of high water table.
- ◆ Encourage the retention of vegetation along waterways.
- ◆ Reduce or control surface water runoff from paved and other impervious surfaces.
- ◆ Encourage the use of properly designed ditches and swales.

- ◆ Encourage innovative ditch maintenance activities, such as the rotation of segments for ditch cleanings in adjacent areas.
- ◆ Require the use and maintenance of sedimentation traps and filters to prevent the movement of silt and other materials into the surface water system. This could be done using catch basin inserts that help filter out sediments and pollutants from street and parking lots.



- ◆ Emphasize public education on how to maintain water quality.
- ◆ Consider water quality issues in planning for parks and open space.

Policy NE-76.2:

Work with neighboring jurisdictions and other agencies and organizations to enhance and protect water quality in the region.

Discussion: Enhancing and protecting clean water throughout a watershed often requires joint efforts between jurisdictions. For example, preserving water quality in the City of Pacific will have a positive impact on the water quality of the White/Stuck River, and the Cities of Algona, Auburn, and Sumner.

Policy NE-76.3:

Protect areas that are critical for aquifer recharge.

Discussion: Recharge occurs via slow percolation through soils. Areas of highly permeable soil are vulnerable, and the potential for contamination of perched groundwater is greater in these areas. Planning should consider the types of development permitted in certain areas of the City. For example, a gas station or an industrial site with potential contaminants could pose a significant risk in certain permeable soils.

Policy NE-76.4:

Actively pursue funding for baseline monitoring and improvement of water quality in waterways in the City, with waterways connected to salmon-bearing waters receiving priority funding.

Discussion: Funding could be obtained through the Washington Wildlife Recreation Program (WWRP) administered through the Washington State Recreation and Conservation Office (WRCO). This funding is a 50% match grant with at least 10% of the total project cost from a non-state, non-federal contribution .

EARTHQUAKES, STEEP SLOPES AND VOLCANIC HAZARDS

GOAL NE 87: Reduce potential hazards associated with earthquakes, **and** steep slopes **and volcanic hazards**.

POLICIES

Policy NE-87.1:

The City ~~requires~~ appropriate standards for site development in areas with moderate and steep slopes, based upon site specific information.

Discussion: Development review for buildings on slopes requires site specific information on soil type and water content, as well as the degree of slopes. Development on steep slopes causes impacts to surface water, may cause erosion of soils, and increased the probability of landslides. Mitigating measures for such development can include clustering development, decreasing the amount of impervious surface, the planting trees and other vegetation and the use of appropriate erosion control measures.

Policy NE-87.2:

Regulate land clearing and other significant removal of vegetation on steep slopes in identified landslide hazards areas.

Discussion: The City will implement this policy through a critical areas or significant tree ordinance, and/or applicable development regulations. These areas will be identified as part of any geotechnical studies that are required for new development.

Policy NE-83:

Require mitigating measures for new development on steep slopes.

~~**Discussion:** Development on steep slopes causes impacts to surface water, erosion, and increased probability of landslide hazards. Mitigating measures for such development can include clustering development, decreasing the amount of impervious surface, or planting trees and other vegetation.~~

Policy NE-87.43:

Enforce building codes to minimize the risk of structural damage, fire, occupant injury, and prevent post-seismic collapse in areas subject to severe seismic hazard.

Discussion: The best available methods should be used to identify and evaluate seismically hazardous areas. Requiring appropriate soil analysis and construction methods can minimize the hazard and avoid seismic-related structural damage and injuries.

Policy NE-87.54:

Promote educational efforts to inform landowners about site development, drainage, and yard maintenance practices that impact slope stability.

Discussion: Washington State Department of Ecology Publications 93-30, 93-31, and 95-107 are resource materials that also will be utilized for this purpose.

Policy NE-7.5:

Identify volcanic hazards evacuation routes from the lowland areas of Pacific to upland areas.

Discussion: Pacific is located within the “volcanic hazard zone” of Mt. Rainier. A lahar from Mt. Rainier inundated the area of Pacific approximately 500 years ago. Should Mt. Rainier become more active in the future, another lahar may reach the City. Signage identifying evacuation routes should be located at Jovita Boulevard E., 58th Pl. S., 56th Pl. S. and Peasley Canyon. This will give residents and visitors direction to escape potential future lahars.

AIR QUALITY

GOAL NE 98: Protect and improve local and regional air quality by reducing or eliminating sources of air pollution.

POLICIES

Policy NE-98.1:

Encourage the use of landscaping and the retention of existing vegetated areas to provide ~~for~~ filtering of suspended particulates.

Discussion: Retention of trees and other vegetation is vital to maintaining good air quality. Vegetation filters out suspended particles and purifies the air.

Policy NE-98.2:

Encourage non-motorized and public transportation and provide opportunities for reduced automobile travel.

Discussion: Vehicle emissions are a major local source of air pollution. Reducing the number of trips made by motor vehicles will reduce emissions. The City can implement this policy by encouraging non-

motorized transportation projects in capital facilities programs, and by providing in the zoning ordinance for development of Park & Ride lots in the Neighborhood Center and mixed use areas to reduce vehicular trips. This, together with encouraging carpooling, will result in less vehicles and emissions.

Policy NE-98.3:

Support federal, state, and regional policies intended to protect clean air in the Puget Sound area.

Discussion: State and regional agencies, such as Puget Sound Air Pollution Control Agency, the Puget Sound Regional Council, and the Washington State Department of Transportation, generally administer air quality regulations. The City will implement this policy by working with these agencies and by supporting public education regarding these issues.

Policy NE-98.4:

Consider the use of road treatments such as roundabouts and traffic circles to reduce the need for stop signs and traffic signals.

Discussion: The City may wish to investigate the impact of roundabouts and traffic circles on vehicle emissions, in comparison to traffic signals and stop signs.

NOISE AND GLARE

GOAL NE 109: Minimize excessive noise and light emitted from commercial and industrial land uses, and new construction.

POLICIES

Policy NE-109.1:

Reduce, and where possible, eliminate problems associated with major noise and light generating uses, especially those located near residences. Establish standards for noise and light generating land uses that address acceptable amounts of noise, light, and time and frequency of activities.

Discussion: Natural or manmade barriers should be placed between noise and light sources and residential land uses. Trees and natural vegetation should be retained along the perimeter of new subdivisions and along arterial streets to filter noise and light. Light shields can be used for building lighting and parking lots. This would help to mitigate the impacts from commercial and industrial development on adjacent residential areas. Noise and light control ordinances shall be enforced.

BIODIVERSITY

GOAL NE-10: Protect biodiversity along the White River in Pacific

POLICIES

Policy NE-10.1:

Finalize, implement actions, and track progress of the Lower White River Biodiversity Management Area (BMA) Stewardship Plan.

Discussion: The Lower White River BMA Stewardship Plan is a nonregulatory plan that can be used to guide the City to protect its biodiversity in coordination with new development. The City should adopt the plan for guidance as an appendix to the Comprehensive Plan.

Policy NE-10.2:

Identify partners and volunteer citizen groups who can advance the Lower White River BMA Stewardship Plan.

Discussion: The City should partner with the Pierce County Biodiversity Alliance (PCBA) and the Friends of the Lower White River. Partnering with the PCBA and Friends of the Lower White River will help to develop region wide cooperation in protecting the biodiversity of the Lower White River.

Policy NE-10.3:

Coordinate with other jurisdictions within the Lower White River BMA (Sumner, Auburn, Buckley, Pierce County, King County, Muckleshoot Tribe of Indians) and meet periodically to align goals, objectives and strategies, and monitor progress.

Discussion: Coordinating with other jurisdictions will be necessary to preserve the biodiversity of the Lower White River BMA. Without this coordination, potentially conflicting policies or regulations may result that could impact the biodiversity of the Lower White River BMA.

3. EXISTING CONDITIONS

Pacific is known to have the following critical or sensitive, areas: landslide hazard areas, erosion hazard areas, seismic hazard areas, flood hazard areas, steep slopes, streams, wetlands, and critical wildlife habitats including the “Lower White River Biodiversity Management Area”. Many of these features have been identified and mapped, but mapping to date is known to be incomplete.

Features that meet sensitive area definitions are regulated as Critical Areas. Ordinance No. 1187 established Pacific Municipal Code (PMC) Title 23, “Critical Areas Management” in 1992. Ordinance No. 1505 amended sections of this title as part of a Development Regulations update in 2001. Additional amendments to Title 23 were made under Ordinance 1557 in 2004 and Ordinance 1639 in 2006. Further review of the Critical Areas Regulations under Title 23 will be necessary to determine additional amendments necessary to conform with current State and Federal requirements for Critical Area protection. The Comprehensive Plan Update will guide further revisions in accordance with federal, state, and King County and Pierce County Countywide Policies, where applicable.

3.1 Geographical Context

The City of Pacific is located in both south central King County and north central Pierce County. It is primarily a lowlands area of the White River Valley, but also includes a portion of the Jovita Heights uplands on the west. With the incorporation of the City of Edgewood to the southwest in early 1996, and the City of Sumner’s northern annexation to Pacific’s southeast King County line in 2002, the City of Pacific became surrounded by other incorporated cities. The City of Sumner is located to the south and east, Edgewood to the west, Algona to the north, and Auburn to the northeast and east.

Jovita Heights is an area of approximately 218 acres abutting the City of Pacific’s western edge in unincorporated King County. It is an urban growth area (UGA) for the City. A land sliver of about 6.6 acres between West Valley Highway and SR 167 is the City’s western Pierce County UGA. Another isolated portion of unincorporated Pierce County, consisting of less than 30 acres, abuts Pacific on the east from the King County Line to just above Stewart Road. It meets the northwestern boundary of Sumner in the middle on the left bank of the White/Stuck River channel. These comprise the City of Pacific’s UGAs.

3.2 Topography and Geology

3.2.1 Topography

Most of Pacific lies in the valley of the White/Stuck River. The majority of the City is relatively flat to gently rolling. Steep slopes in excess of 30% rise to in the west and to the east of Pacific. The valley extends the length of the City from north to south. The White/Stuck River flows through the northeast corner of Pacific in King County, heading south along the City's eastern border into Pierce County. The valley floor of the City is relatively low, with an average elevation of approximately 70 feet above sea level.

3.2.2 Geology

Soils

The load-bearing capacity of soil, the hydric properties, erosion potential, and characteristics with respect to shrink-swell potential all play a significant role in the development of land. In particular, the hydric properties indicate the existence of wetlands, and signal the potential for other environmental concerns.

A composite soil map based on a 1973 King County Soil Survey and 1939 Pierce County Soil Survey, updated in 2000, also indicates some topographical features. The map is included at the back of this element ([See Map 1](#)).

3.3 Water

3.3.1 Surface Water



Rivers and other surface waters are important resources. The quality of water is crucial to the entire river habitat. Reduction in water quality will not only degrade the environmental and scenic value of the river, but may also threaten the ground water that is the source of potable water for residents of the Pacific planning area.

The White River originates on Mount Rainier and flows generally west along the King-Pierce County line through Buckley and Auburn, before turning southwest to become the White/Stuck River in Pacific. Further south in

Sumner the White/Stuck empties into the Puyallup River. The surface water and river habitat quality are generally good. However, provisions for new development must protect against contamination and soil erosion, and prevent processes that would strip crucial wildlife habitat or change the flow of the river in ways which damage the viability of the ecological system.

The City also contains streams/creeks that are tributary to the White River. These streams and shown on Map 2. Following is a Table providing the Department of Natural Resources stream typing of the creeks.

<u>DNR Stream Type</u>	<u>Streams of This Type in Pacific</u>
<u>Type S (subject to Shorelines Management Act)</u>	<u>• White/Stuck River</u>
<u>Type F (fish-bearing other than S)</u>	<u>• Jovita Creek</u> <u>• Milwaukee Ditch south of 5th Ave. S.W.</u>
<u>Type Np (nonfish, perennial)</u>	<u>• Milwaukee Ditch, middle portion</u> <u>• Boeing Ditch</u>
<u>Type Ns (nonfish, seasonal)</u>	<u>• Milwaukee Ditch east of Tacoma Blvd.</u>

3.3.2 Groundwater

Precipitation is dispersed in three ways. Some of the water enters the surface runoff through a system of ditches and streams. Some of it is intercepted by plant life or is bound up by molecular soil activity. The rest percolates down to recharge water bearing soil layers and is either intercepted by wells, or is discharged to the surface again through springs, seeps, and streams. From there, it reenters the atmosphere by evapotranspiration, then condenses and eventually precipitates as rain to complete the hydrologic cycle.

Groundwater is surface water that has filtered down through the soil to saturate permeable subsurface layers of gravel, sand, or porous rock. An integral component of this cycle, groundwater is also the entire source of the potable water supply for residents of the Pacific planning area. The source of supply for Pacific's groundwater is the thick White River fan, with its apex near Auburn, consisting of deposits of pebble-cobble gravel and sand. This thick fan is fed directly from the River and has a gravel aquifer in between to act as an infiltration medium. The City's aquifer recharge is potentially influenced by any processes in the White River watershed that might affect water quality downstream.

Critical Aquifer Recharge Area: As defined by PMC 23.08.020.10.030, this is “means an area with a critical recharging effect on aquifers used for potable water, as discussed in WAC 365-190-080(2). Within such areas, pollutants seeping into the ground are likely to contaminate the water supply”. It is critical that this potable water source be protected from point-source contamination such as that from including but not limited to, landfills, lagoons, dumps sites, storm water retention/detention ponds, chemical spills, septic tanks, and injection wells (Map 3). The aquifer must likewise be protected from non point-source contaminants such as agricultural and residential pesticides.

Rainfall and topography have an impact on groundwater quantity and rate of flow. Man-made developments also impact groundwater, by cultivating land, removing vegetation, or compacting soil. Groundwater impacts such as hazardous waste and pollutants are detrimental to the groundwater supply, and affect its quality for years.

Impervious area is a measure of the percentage of area covered by roofs, streets, sidewalks, driveways, etc. Any future development will increase these impervious areas. Increased impervious area can result in decreased groundwater recharge. Even lawn areas allow only a fraction of the groundwater infiltration permitted by natural forest cover. Since a larger percentage of the precipitation volume is going directly to runoff, there is less available surface water for soil moisture replenishment and groundwater storage.

The Growth Management Act (GMA) requires that cities and counties identify and regulate these “areas with a critical recharging effect on aquifers used for potable water.” Land uses and densities in these areas can affect the quality of the groundwater. Aquifer recharge areas exist throughout the City. Studies have not been conducted to determine the exact locations of critical recharge areas.

The City contains many observed springs and seeps along the hillsides to the east, west, and southwest from the upland plateaus, which attests to one or more water-bearing zones above the valley floor.

The City's ~~1998~~ 2010 Water System Plan included the consideration of wellhead protection, susceptibility (potential for groundwater recharge), and wellhead vulnerability (relationship between recharge potential and overlying contaminating land uses). ~~A 2002 amendment of the Water Plan to facilitate the assumption of the Webstone Water District has been approved by the Washington State Department of Health (DOH). The Water Plan is summarized in the Capital Facilities chapter of this Comprehensive Plan.~~

3.4 Climate

The climate of the Puget Sound Region is considered a typical maritime climate. The City of Pacific experiences cold, damp winters, cool damp spring and fall seasons, and moderately warm summers. The average precipitation is 39 inches annually, with the majority of the rain falling during the winter and spring months. The average annual temperature for the area is 51 degrees Fahrenheit. The local weather patterns and the relatively long growing season are ideal for vegetative growth.

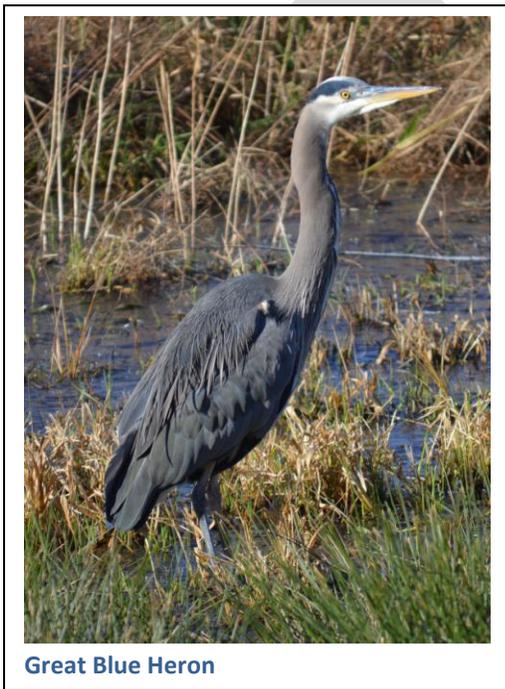
3.5 Vegetation, Fish, and Wildlife

3.5.1 Vegetation

Undisturbed riparian and wetlands-oriented vegetative canopy typically includes Western Red Cedar, Western Hemlock, Red Alder, Black Cottonwood, Big-leaf Maple, and species of Willow. Where this canopy has been disturbed, Reed Canary grass tends to dominate. These same canopy elements are present along the wooded slopes where the many seeps, springs, and surface rills provide sufficient moisture. Douglas fir tends to dominate the drier portions of these hillsides. The vegetative canopy is an essential component of the diverse biological network crucial to the survival of wildlife species.

3.5.2 Fish and Wildlife

Fish and Wildlife Habitat Areas are those lands identified as being of critical importance to the maintenance of fish, wildlife, and plant species, including areas where endangered, threatened, and sensitive species have a primary association (such as Chinook Salmon and Bull Trout); habitats and species of local importance; naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat; waters of the State (White/Stuck River); lakes, ponds, streams, and rivers with natural fish stock and planted with game fish by a governmental, tribal entity, or private organization; and state natural area preserves and natural resource conservation areas.



Great Blue Heron

The process of urbanization and redevelopment results in the conversion of wildlife habitat to other uses. The loss of certain types of habitat has been significant in Puget Sound, resulting in adverse effects on the health of certain species. These types of habitat are referred to as “critical wildlife habitats.” Critical wildlife habitats include lands important for the protection, management, or public enjoyment of certain wildlife species. These include habitats for species designated by state or federal agencies as endangered, threatened, sensitive, candidate, or priority species.

Other critical natural resources include anadromous fish (those that migrate from the ocean to spawn) habitat; waterfowl and raptor nests; heron rookeries; and habitats of local importance that are identified and designated through a wildlife conservation plan.

The principle Fish and Wildlife Habitat areas within the Pacific planning area are the White/Stuck River floodplain and its associated stream reaches and riverine wetlands, the Milwaukee Ditch, Trout Lake and its associated wetlands, and the steep wooded slopes that form the east and west walls of the valley floor. The White River riparian corridor supports diverse populations of insects, fish, birds, waterfowl, and fur bearing wildlife. Primary fish populations include Chinook, Coho, and Chum salmon, as well as Steelhead, Dolly Varden, and Cutthroat Trout.



Spawned-out Salmon - White River

Under the federal Endangered Species Act (ESA), Chinook Salmon and Bull Trout have been listed as threatened species, and Coho Salmon are a candidate for listing. Salmon runs throughout the Puget Sound and the Northwest are critically depressed. All local governments that border the Puget Sound or that contains streams flowing to the Sound are affected by federal fisheries management. To help restore healthy salmon runs, local governments and the State government must

work proactively to address salmon habitat protection and restoration. Issues of storm water run-off, and associated erosion, sedimentation, and pollution, are affected by the ESA.

The Washington Department of Fish and Wildlife (WDFW) has developed the Priority Habitats and Species (PHS) program to help guide growth in a manner that will preserve the best and most important habitats and provide for the life requirements of fish and wildlife. Priority species are fish and wildlife species that require protective measures and/or management guidelines to ensure their perpetuation. Priority habitats are habitat types with unique or significant value to many species. The WDFW has documented the locations of priority habitats and species within the City. These PHS areas include wetlands, natural open space, habitat for a priority bird species, and the point location of priority bird species sightings. PHS areas are considered critical wildlife habitats.

Trout Lake and its associated wetlands are bounded by an established single-family residential neighborhood. As well as being primary habitat for the typical community of urban lake wildlife, it is annually stocked with fisheries game fish, and it supports populations of native game fish such as bass, perch, and catfish.



Raccoon Tracks Along Milwaukee Ditch

The somewhat less significant wetlands throughout the planning area that are isolated from the waters of the river and lake systems typically support a subsection of these populations by providing crucial habitat for breeding, maturing, watering and feeding, and migrating.

3.6 Air Quality

Air quality is measured by the concentration of chemical compounds and particulate matter in the air outside of buildings. Air that contains carbon monoxide, ozone, and particulate matter can degrade the health of humans, animals, and plants. Human health risks from poor air quality range in severity from

headaches and dizziness to cancer, respiratory disease, and other serious illnesses, to premature death. Potential ecological impacts include damage to trees and other types of vegetation. Quality of life concerns include degradation of visibility and deposit of soot and other particulate matter on homes and other property.

3.7 Critical Areas

The Growth Management Act (GMA) requires that critical areas be designated and that each jurisdiction adopt development regulations to protect these areas.

3.7.1 Geologically Hazardous Areas

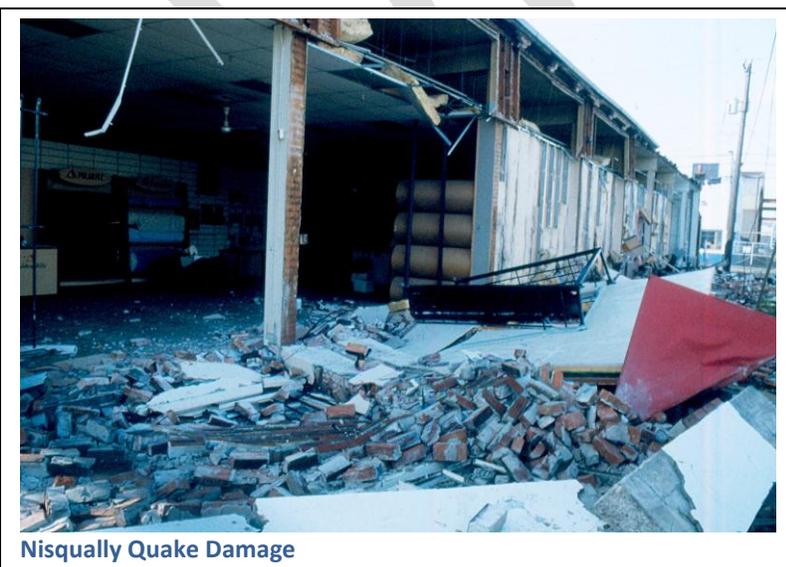
Generally, these areas can be considered to be areas in which there is a possibility that a certain type of potentially destructive geologic activity will take place. Human activity influences, and sometimes accelerates these processes. Development on or adjacent to severe slopes with high erosion hazard may have a negative impact on slope stability.

Erosion Hazard Areas: Erosion hazard areas are identified by the Soil Conservation Service as having "severe rill or inter-rill erosion hazard."



Erosion is a natural process where rain, running water, and wind loosen and transport soil from one location to another. Of these natural forces, erosion by rain and running water is by far the most common within the Puget Sound region. The susceptibility of any soil type to erosion depends upon the physical and chemical characteristics of the soil, its protective vegetative cover, slope length and gradient, the

intensity of rainfall, and the velocity of water runoff. The City contains areas that are prone to erosion activity. Steep slope areas and areas cleared of vegetation are the most susceptible.



Landslide Hazard Areas: Landslide hazard areas are those which are potentially subject to landslides because of a combination of geologic, topographic, and hydrologic factors.

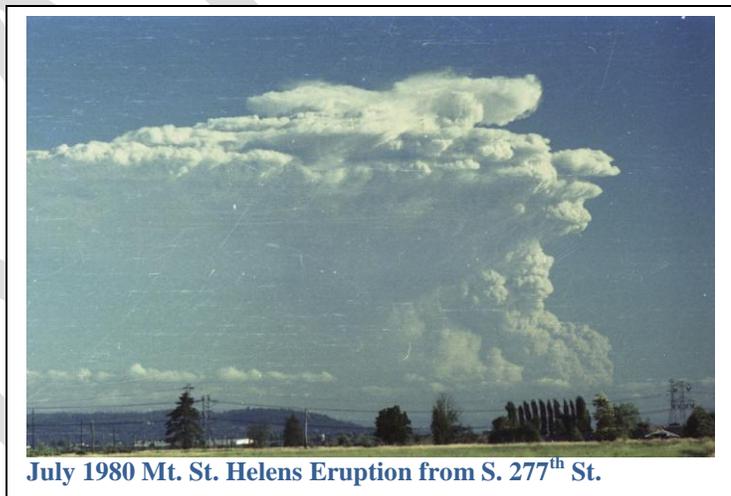
Seismic Hazard Areas: Seismic hazard areas are those which are subject to severe risk of damage as a result of earthquake-induced ground

shaking, slope failure, settlement, and soil liquefaction. These conditions occur in areas underlain by soils with low cohesion and density, usually in association with a shallow groundwater table. When shaken by an earthquake, certain soils lose their ability to support a load. Some soils will actually flow like a fluid; this process is called liquefaction. Loss of soil strength can also result in failure of the ground surface and damage to structures supported in or on the soil. Loose, water-saturated materials are the most susceptible to ground failure due to earthquakes. The primary areas of seismic hazards within the City of Pacific are those along steep slopes, within valley bottoms, atop alluvial fans, and some areas of filled/graded land.

Seismic events in the Puget trough are generally the result of a sudden shift of rock mass within the earth's surface as the Juan de Fuca plate moves downward along the North American plate. The three most recent destructive earthquakes in the region were in 1949, 1965, and 2001. The 1949 quake was centered near Olympia and registered 7.1 on the Richter scale. The 1965 quake was centered near Seattle and registered 6.5. The 2001 [Nisqually](#) quake was centered northeast of Olympia, and registered 6.8.

Minor and major seismic events are considered inevitable throughout the Puget Sound basin. The timing and epicenter of such events cannot be predicted. However, the record of past events, the presence of river bottom soils subject to liquefaction and amplification, and the presence of glacial till soils in steep slope areas that are subject to landslides, indicate significant seismic hazard.

Volcanic Hazard Areas: Volcanic hazard areas are those subject to pyroclastic (ash fall) flows, lava flows, mud flows ([lahars](#)), or related flooding resulting from volcanic activity. The most current USGS [Volcanic Hazards map \(Map 4\)](#) indicates the Pacific area is at a Case 2 Inundation Level (Debris Flow and Debris Avalanche Zone) - 100 to 500 year frequency, and at somewhat greater risk of flooding resulting from such an event. [Pacific has one of the highest percentages of population and assets in the Mt. Rainier lahar zone \(USGS – Community Exposure to Lahar Hazards from Mt. Rainier, Washington – Scientific Investigations Report 2009-5211\).](#) Since the prevailing winds tend to blow eastward, ~~the area~~ [Pacific](#) is at minimal risk from pyroclastic events.



Steep Slopes: Most of the Pacific planning area is river valley bottomland and is relatively flat. However, the terrain rises from 50' elevation above sea level on the valley floor to over 300' on the city's western plateau. The City of Pacific has defined critical slopes as those 30% or greater averaged over distance per King County's Critical Areas Ordinance. The slopes of these valley walls by these criteria are generally greater than 30% and are shown on the Critical Areas Map at the end of this chapter.

Because of the adverse effect on local runoff and drainage profiles, development should not be located in areas with 8% or steeper grades without erosion control and geotechnical studies to assure mitigation. Development on these slopes would result in increased runoff volumes and rates, would tend to cause erosion, would divert runoff to unsuitable locations, and could drastically alter the area's aquifer recharge processes. These slopes should also generally be considered to be at some risk of landslide during seismic or volcanic events.

Because of its valley bottom location, the major hazards in Pacific are from earthquakes and excessive flooding. During a major earthquake, the unconsolidated alluvial soils of the river valley may liquefy, causing extensive structural damage. These water-saturated soils amplify the shock waves from an earthquake and tend to lose their structural strength.

Aquifer Recharge Areas: These occur where the prevailing geologic conditions allow infiltration rates which create a high potential for contamination of groundwater resources or contribute significantly to the replenishment of ground water.

Flood Hazard Areas: Flood Hazard Areas are lands within a floodplain which are subject to a one percent or greater chance of flooding in any given year. The floodplain consists of two components, the floodway and the flood fringe.

The floodway is that portion of the floodplain which is subject to inundation by deep and fast moving waters. Development within the floodway is prohibited since these waters have the potential to displace structures. The flood fringe is that portion of the floodplain outside the floodway which is subject to inundation by relatively slow moving waters, generally known as the base flood or 100-year flood (one percent chance per year).

The flood fringe includes land areas reserved for conveyance and discharge of the base flood without cumulatively increasing the water surface elevation by more than one foot and which may provide needed temporary storage capacity for flood waters. The White/Stuck River flood fringe is Pacific's principle aquifer recharge area.



The basis for establishing the areas of special hazard is a 1980 report by the Federal Insurance Administration entitled “The Flood Insurance Study for the City of Pacific” and accompanying Flood Insurance Rate Maps (FIRM), which are periodically updated ([Map 5](#)). [This map is subject to revision due to the rising riverbed of the White River.](#)

Mud Mountain Dam is an earth- and rock-fill dam on the White River six miles southeast of Enumclaw. It was built in 1949 and modified in 1990 to provide flood control for the White and Lower Puyallup River Valleys. The two towers at the dam were replaced in 1994 by a single tower designed to withstand severe earthquakes. The Howard A. Hanson Dam, built on the Green River in 1961, also helps control flooding in the area.

The King and Pierce County River Improvement agencies own much of the property within the White/Stuck River floodplain and maintain the levee system along the river through the planning area. [King County is now in the process to relocate the levees on the left bank of the White River in Pacific to create additional flood storage capacity. Existing levees will be removed and relocated further east of](#)

their present location. The purpose of the relocation is to allowed the river channel to migrate more naturally, create flood storage capacity and to help alleviate potential flooding of structures on the right bank of the White River. In the near future, the county will be relocating the levees on the right bank of the White River which will also increase flood storage capacity. The City has adopted FEMA flood regulations to further control and averts ~~most severe~~ flooding activity.

Wetlands: Wetlands are defined by the U.S. Army Corps of Engineers as areas "that under normal circumstances have hydrophytic vegetation, hydric soils, and have periodic or permanent inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soils (wetland hydrology)."



The Growth Management Act defines wetlands as "...areas that are inundated or saturated by surface water or ground water 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. Wetlands do not include those artificial wetlands intentionally created for non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater

treatment facilities, farm ponds, and landscape amenities. However, wetlands may include those artificial wetlands intentionally created from non-wetland areas created to mitigate conversion of wetlands, if permitted by the county or city."

The GMA requires that wetlands regulated under the GMA be delineated in accordance with the Revised Code of Washington (RCW) 90.58.380. RCW 90.58.380 requires that the State "shall adopt a manual for the delineation of wetlands under this chapter that implements and is consistent with the 1987 manual in use on January 1, 1995, by the United States army corps of engineers and the United State environmental protection agency". The State adopted a 1997 manual that was in accordance with the original 1987 Corps of Engineers (COE) manual. This was incorporated under Washington Administrative Code (WAC) 173-22-080. During the past few years the COE has updated and expanded their delineation manual. To ensure consistency between the State manual and COE manual WAC 173-22-080 was repealed and WAC 197-22-035 revised to state that delineations should be done according to the currently approved federal manual and supplements. requires jurisdictions to use the 1997 Washington State Wetlands Identification and Delineation Manual to delineate wetlands for regulatory purposes. The Washington State Wetlands Rating System (as modified in 2014) is used to evaluate the wetlands.

The U.S. Fish and Wildlife Service have produced a series of maps (National Wetlands Inventory [NWI]), which delineate wetland areas, and ~~and~~ These are shown on the Wetlands Map at the back of this chapter (Map – Critical Areas). It is important to note that the map provides a generalized inventory of wetlands within the planning area and in most cases points to the need for further wetlands delineation studies prior to development. It does not imply that any particular parcel covered by a wetland designation is completely occupied by wetlands or is totally constrained from development.

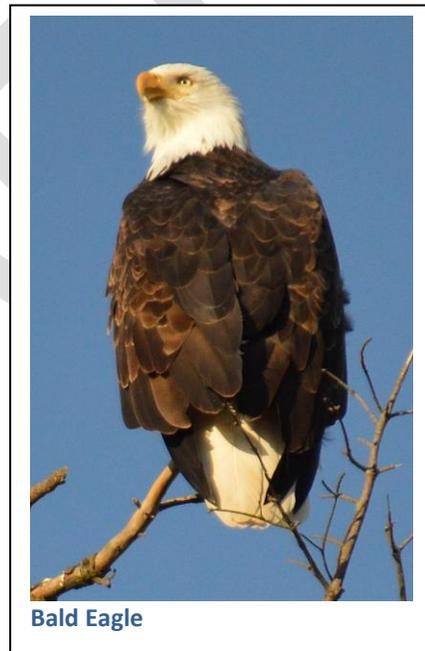
The size and extent of wetlands constantly change under natural climatic and artificial influences, and determinations relative to specific sites must be made individually. In general, wetlands are environmentally sensitive areas and present limitations to construction and other activities such as siting of facilities. Depending on the site and nature of the activity, permits and/or mitigating measures are often required if development is allowed at all.

Some of the wetlands within the City of Pacific have been identified and delineated on the King and Pierce County Comprehensive Drainage Program Maps. In September of 1997, the City conducted additional generalized mapping of potential wetlands to aid in development review. However, other wetlands have not been identified and will be identified during required site specific studies as part of the development review process.

3.8 Lower White River Biodiversity Management Area (BMA)

Pacific is located in the Lower White River Biodiversity Management Area. A Stewardship Plan was created for this area through the cooperation of many local, state, federal, educational and nonprofit organizations. The Lower White River Biodiversity Management Area (BMA) extends from Buckley to Sumner. The Management area is one (1) of 16 BMA's identified in Pierce County. The Pierce County Biodiversity Alliance (PCBA) has been actively involved in the biodiversity planning efforts at the local level since 1997. The Stewardship Plan for the Lower White River Biodiversity Management Area provides a nonregulatory planning tool for biodiversity planning. As stated in the plan, the benefits of biodiversity planning include:

- Protects remaining high-quality land cover important for fish and wildlife
- Implements Growth Management Act requirements for Habitat Conservation Areas
- Provides regional connectivity network for fish and wildlife dispersal and migration
- Establishes proactive approach to help avoid future listings under ESA
- Includes all habitat types not just point specific habitats such as wetlands, streams, endangered species locations



As part of the Stewardship Plan, the PCBA conducted a “bioblitz” identifying birds, mammals, amphibians, reptiles, fish, invertebrates, and plants within the Lower White River Management Area (2006 & 2007). The bioblitz in Pacific revealed a diverse number of plants, animals and birds including bald eagles and green herons.

Conservation of biodiversity is necessary if benefits including important ecosystem services such as clean water, natural flood control, timber production, climate regulation, and pollination currently enjoyed and relied upon by residents of the City are to be available for future generations. Protection of biodiversity in all its forms and across all landscapes is critical to continued prosperity and quality of life in the City. In fisheries, forestry, and agriculture, the value of biodiversity to sustaining long-term productivity has been demonstrated in region after region. With the impending effects of climate change, maintaining

biodiversity will be critical to the resilience of resource-based activities and to many social and ecological systems. The continued increase in the City’s population and the projected effects of climate change make conservation a difficult but urgent task. The protection and restoration of biodiversity and of a full range of supporting habitats is important.

4. FUTURE NEEDS AND ALTERNATIVES

4.1 Vegetation, Fish, and Wildlife

4.1.1 Vegetation

Environmentally based development standards and incentives help protect native vegetation during the development process. For example, these standards could include a requirement that the developer file a vegetation management plan that specifies how vegetation removal will be minimized and where replacement trees will be planted. Incentives should include density bonuses or expedited permit review for housing that protects areas of undisturbed open space, especially when significant vegetation is preserved.

Other tools which can be used to protect vegetation include public education, habitat enhancement assistance, conservation easements, open space designation and property tax reductions, transfer or purchase of development rights, and outright acquisition. The goals and policies contained in this Plan will be used to develop specific regulations, incentives, and programs, to be identified in the Municipal Code.

4.1.2 Fish and Wildlife

Washington Department of Fish and Wildlife (WDFW) management recommendations are intended to assist landowners, users, and managers in conducting land-use activities in a manner that incorporates the needs of fish and wildlife. Management recommendations are developed through a comprehensive review and synthesis of the best scientific information available. The City may review the PHS management recommendations developed by WDFW and adapt these to fit the existing conditions and limitations of our unique environmental conditions. Management guidelines for priority habitats and species may be established in the Pacific Municipal Code.

Additional priority habitats and species may occur in areas not currently known to WDFW biologists or in areas for which comprehensive surveys have not been conducted. PHS data can only confirm that a species or habitat type may be present. This data does not confirm that a species or habitat type is not present. Site-specific surveys may be necessary to rule out the presence of priority species and priority habitats on an individual project site. WDFW has established guidelines, which enable local governments to designate and protect species of local importance. The City will work with WDFW, residents, and other interested parties to identify and protect native wildlife species and habitats from the adverse impacts of current land use and future development.

4.2 Air Quality

One of the basic characteristics of a livable city is clean air. Numerous federal, state, regional, and local agencies enact and enforce legislation to protect air quality. Good air quality in Pacific, and in the region, requires controlling emissions from all sources, including: internal combustion engines; industrial operations; indoor and outdoor burning; and wind-borne particles from land clearing and development. In the Puget Sound region, vehicle emissions are the primary source of air pollution. Local and regional

components must be integrated in a comprehensive strategy designed to improve air quality through transportation system improvements, vehicle emissions reductions, and demand management strategies.

4.3 Critical Areas

Over 90% of the original critical areas in the City of Pacific have been destroyed in over 90 years of urban development. As suggested in the Draft - Model Critical Areas Regulations and Review Procedures by the Office of Community Development, innovative mitigation techniques should be encouraged, such as the creation or enhancement of a larger system of critical areas and open space in preference to the preservation of many individual habitat areas.

See the Parks, Open Space, Recreation, and Trails element for more detailed policies and discussion of critical areas protection and enhancement.

4.3.1 Wetlands

When planning the future of the community, it is important to consider the specialized functions that wetlands perform as part of the natural ecosystem.

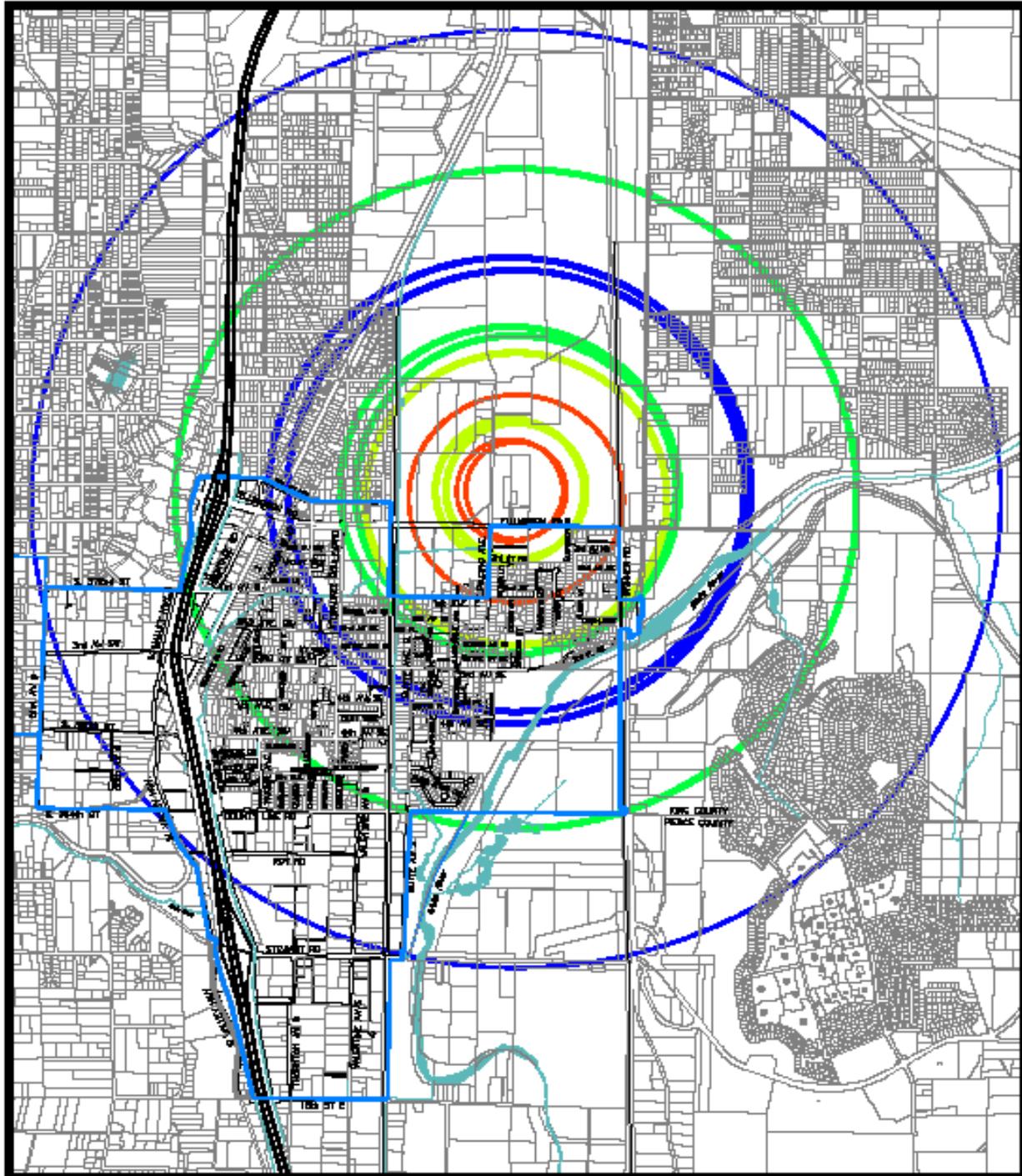
Wetlands receive surface water from surrounding areas and filter pollutants by a combination of physical, chemical, and biological processes. Wetlands also play a significant role in flood control. During flooding, streams overflow their banks and spread out across the floodplain. Wetlands attenuate the peak flows from storm events by storing water during wet periods and discharging the stored water during drier periods.

To maintain water quality, support groundwater, vegetation, and wildlife, it is imperative that wetlands be preserved. Clearing of vegetation, grading, filling and draining, and other activities associated with land development, may decrease the ability of the zone to provide drainage, stabilize stream banks, provide wildlife habitat, and filter pollutants from the water.

MAP 2

STREAMS AND CREEKS

DRAFT

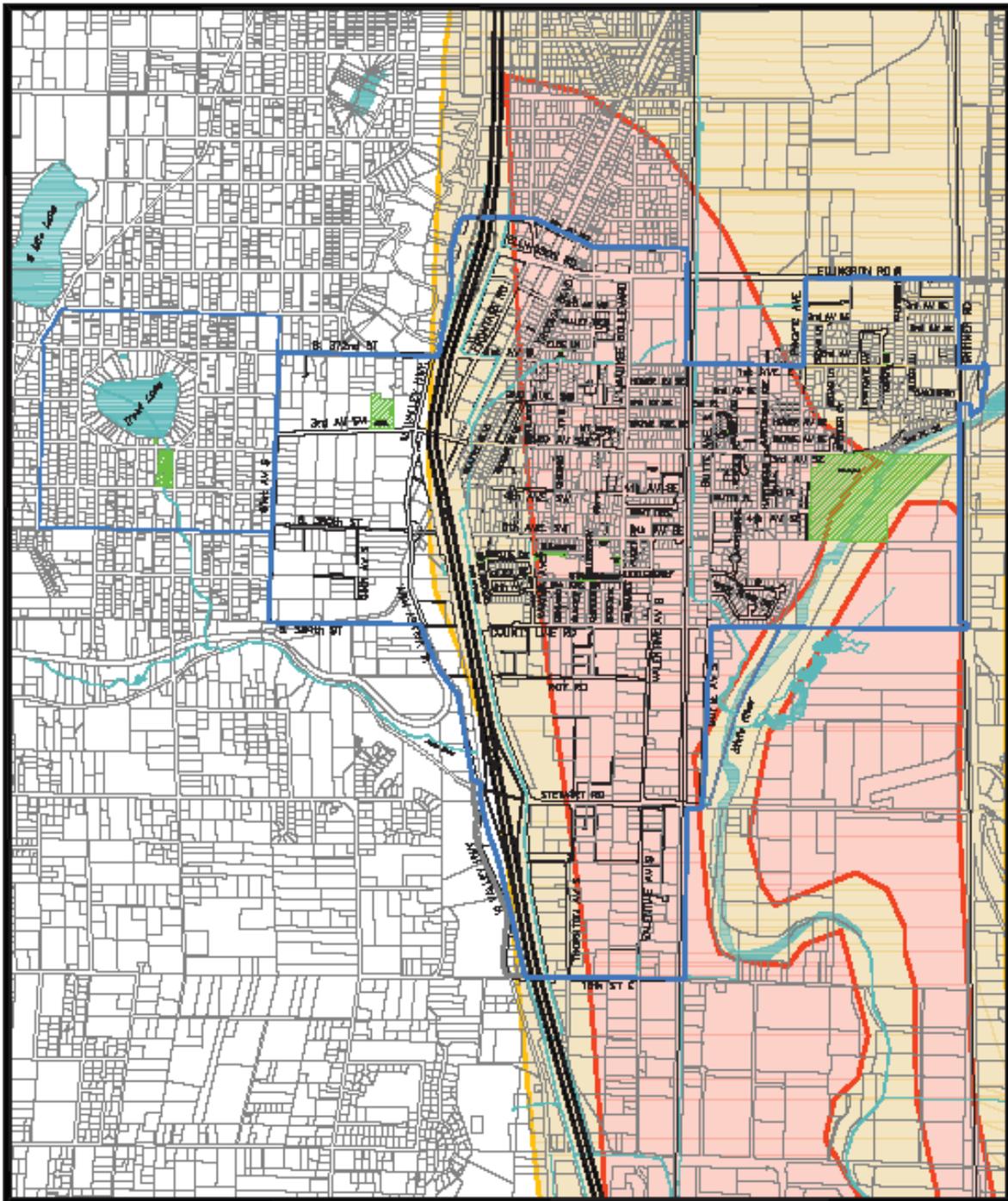


LEGEND

- City Limits
- Urban Growth Area (UGA)
- 6-Month Travel Zone
- 1-Year Travel Zone
- 5-Year Travel Zone
- 10-Year Travel Zone

0 1,500 3,000
Scale in Feet

Figure X.X: City of Pacific Wellhead Protection Area



Scale in Feet

LEGEND

- City Limits
- National Lahar-sized event
generally moderate in size
- Electron Mudflow-sized event
generally large in size

**Figure 3.X: City of Pacific
Lahar Hazard Areas**

