TO: **Planning Commissioners**

FROM: **Jack Dodge, Community Development Manager**

MEETING DATE: **February 24, 2015**

SUBJECT: **Revisions to Chapter 3 – Natural Environment, Comprehensive Plan**

ATTACHMENTS:
1. **Draft Revision to Chapter 3 – Comprehensive Plan**
2. **Lower White River Biodiversity Management Area (BMA) Stewardship Plan**
3. **Bioblitz Pacific - 2007**

Previous Planning Commission Review Date:

Summary:

Background

In January 2014 the City received a grant from the Dept. of Commerce for updates to the City's Comprehensive Plan. The contract called out for revisions to the following Chapters of the Comprehensive Plan.

- Chapter 3 – Natural Environment
- Chapter 8 – Transportation
- Chapter 10 – Capital Facilities

The grant also required a major overhaul to the City's "Critical Areas" regulations. Due to a variety of factors (staff shortages, administrative issues), no work on the Comprehensive Plan updates commenced until earlier this year. As a result, the City requested a revision to the "Scope of Work" that would require only the following updates.

- Chapter 3 – Natural Environment
- Chapter 8 – Transportation
- A revised "Critical Areas/Wetlands" map

This was due to mandatory deadlines to met State Environmental review requirements and Dept. of Commerce review requirements. Draft revisions must be submitted to the Dept. of Commerce by March 31, 2015. This requires a tight review schedule by the Planning Commission for proposed updates to the Comprehensive Plan.

Summary of Changes to the Natural Environment Chapter

Chapter 3 – Natural Environment contains the following revisions.

- The Chapter has been reformatted to a single column format
- Removes Goal NE-2.
- Provides additional discussion points for a variety of policies.

- Deletes Policy NE-8.3.
- Adds a new Policy NE-7.5 regarding volcanic hazard evacuation routes.
- Adds new Goals and Policies relating to biodiversity.
- Provides background regarding the Lower White River Biodiversity Management Area (BMA).

Recommended Action:

1. Begin initial discussion of the revisions to the Natural Environment
2. Continue discussion to the March 10, 2015 Special Meeting

Recommended Motion:

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.

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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-~~2~~1.~~1~~2:
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-~~2.2~~ 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-~~2.3~~ 1.4:
Encourage the use of a variety of technologies that minimize environmental degradation and protect public health.

Permeable Pavers - Photo by Collen Owen

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.

Policy NE-~~2.4~~ 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-~~2.5~~1.6:
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-~~2.6~~1.7:
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-~~3~~2: Enhance the natural environment in the community.

POLICIES

Policy NE-~~3~~2.1:
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-~~3~~22:
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-~~3~~2.3:
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-~~3~~2.4:
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-~~3~~2.5:
Encourage private open space preservation in the City.

Discussion: The encouragement of open space preservation could be achieved though 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-~~4~~3: Encourage measures that improve surface water management.

POLICIES

Policy NE-~~4~~3.1:
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-~~4~~3.2:
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-~~4~~3.3:
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).

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Policy NE-~~4~~3.4:
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.

Hillside Erosion

WETLANDS PROTECTION

GOAL NE ~~5~~4: Provide for the protection of wetlands.

POLICIES

Policy NE-~~5~~4.1:
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-~~5~~4.2:
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-~~5~~4.3:
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.

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Policy NE-~~5~~4.4:
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 ~~6~~5: Protect fish and wildlife habitat and native vegetation.

POLICIES

Policy NE-~~6~~5.1:
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-~~6~~5.2:
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

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Policy NE-~~6~~5.3:
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-~~6~~5.4:
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-~~6~~5.5:
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-~~6~~5.6:
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-~~6~~5.7:
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 ~~7~~6: Preserve and enhance water quality.

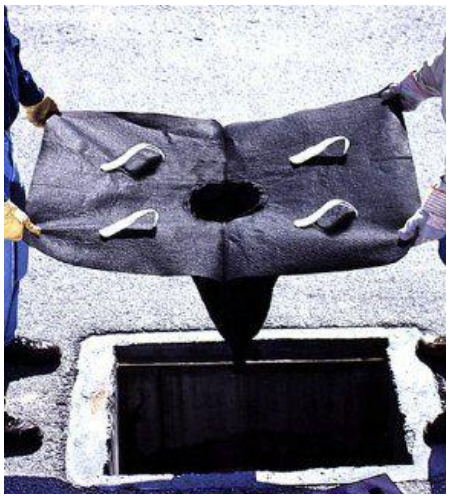
POLICIES

Policy NE-~~7~~6.1:
Prevent pollution of both surface and groundwater resources.

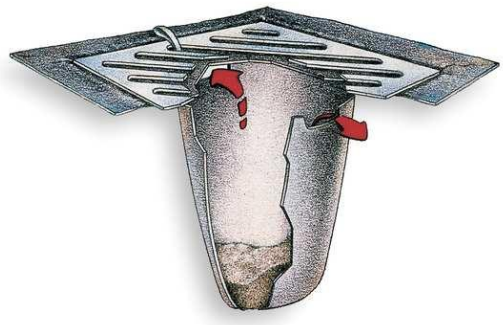
Discussion: Whether it is located in streams, wetlands, or underground sources of water supply, clean water is one of Pacific's important characteristics. The City can protect surface and groundwater resources through some of the following methods:

- 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.



Catch Basin Insert



Catch Basin Insert

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

Policy NE-~~7~~6.2:
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-~~7~~6.3:
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-~~7~~6.4:
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 Wildife 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 ~~8~~7: Reduce potential hazards associated with earthquakes, ~~and~~ steep slopes and volcanic hazards.

POLICIES

Policy NE-~~8~~7.1:
~~The City~~ ~~r~~Require~~s~~ 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-~~8~~7.2:
Regulate land clearing and other significant removal of vegetation on steep slopes in identified landslide hazard~~s~~ 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-~~8~~7.~~4~~3:
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-~~8~~7.~~5~~4:
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 ~~9~~8: Protect and improve local and regional air quality by reducing or eliminating sources of air pollution.

POLICIES

Policy NE-~~9~~8.1:
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-~~9~~8.2:
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-~~9~~8.3:
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-~~9~~8.4:
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 ~~10~~9: Minimize excessive noise and light emitted from commercial and industrial land uses, and new construction.

POLICIES

Policy NE-~~10~~9.1:
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.

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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.

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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.

3.3 Water

3.3.1 Surface Water

White River

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.

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). 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.

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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.

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.

Landslide - West Valley Highway South

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.

Nisqually Quake Damage

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 ~~v~~ Volcanic ~~h~~ Hazards map (Map) 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).

Flood Hazard Area - White River Estates

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). 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 is 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 avert~~s 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)."

Wetland - White River Floodplain

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 t~~ 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 indentified 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 nonregulatary 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

Bald Eagle

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- 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 "biobiltz" 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.

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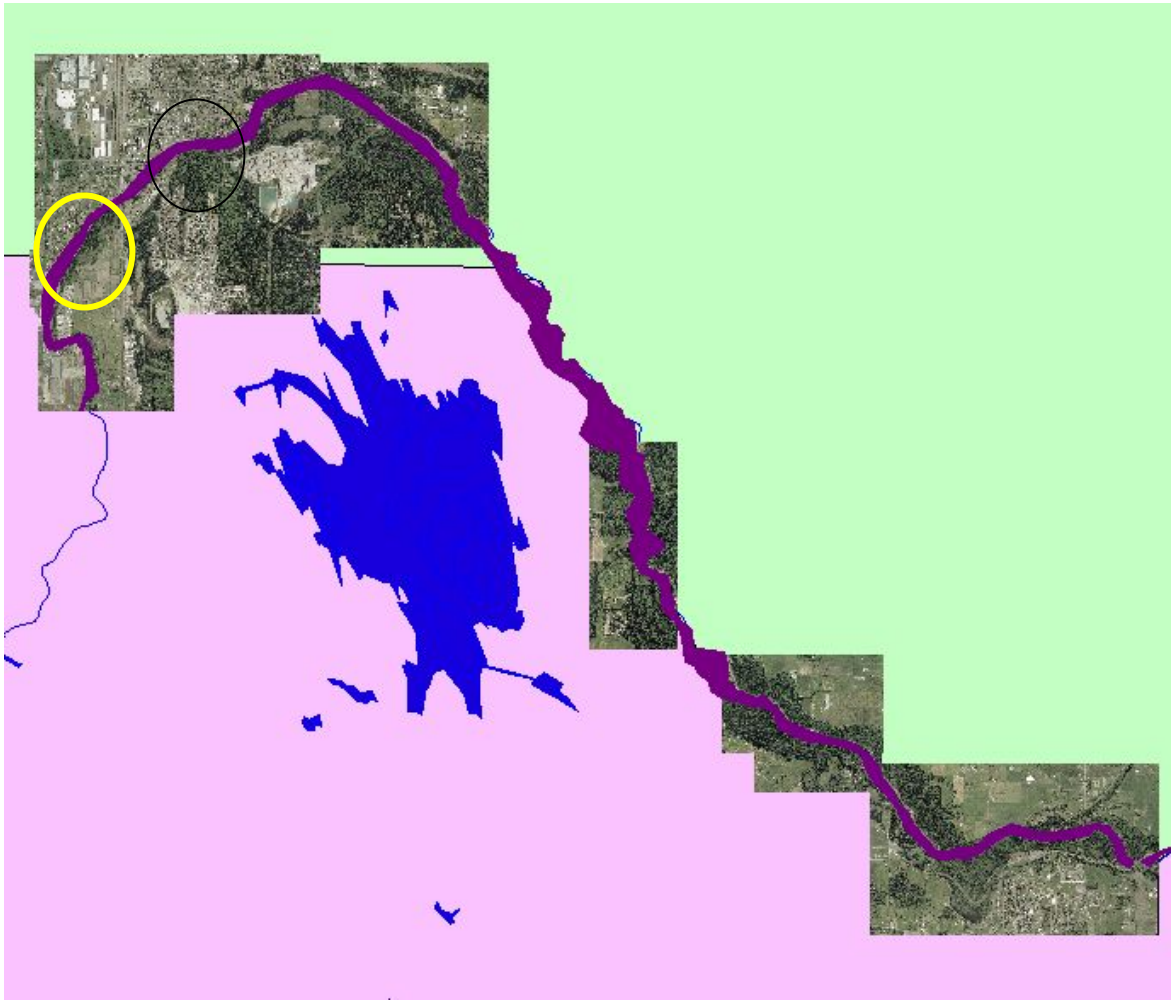
Pierce County Biodiversity Network
Lower White River 2007 Bioblitz
at Selected Sites - Pacific

A Work in Progress of the

Pierce County Biodiversity Alliance (PCBA)

(Pierce County Planning and Land Services, University of Washington, Washington Department of Fish and Wildlife, MetroParks Tacoma, Puyallup River Watershed Council)



What is Biodiversity Planning?

Biodiversity planning is a method used to identify land areas that provide for a biologically diverse representation of species. This planning method considers long-term ecosystem health and establishes a goal of maintaining adequate habitat to ensure the continued viability of a diversity of species within an ecoregion.

Lower White River BioBlitz
June 3-4, 2006 and April 21, 2007

What is a BioBlitz? A rapid biological inventory of the plant and animal diversity found in a designated area during a 24-hour time frame.

Purpose

• To continue the implementation of conservation planning for the Biodiversity Network with landowners and experts to build enthusiasm around biodiversity preservation through open discussion and exploration with experts.
• To assess the quality of habitat and confirm species predicted within the Lower White River BMA.

Who was involved?
2006: Over 100 experts from natural resource agencies, universities, museums, Tahoma and Seattle Audubon, individuals with expertise on specific taxa, such as beetles, bats etc., volunteers, and landowners participated. The bioblitz was funded by a grant from the Washington Biodiversity Council.
2007: Twenty-five experts and volunteers spent 12 hours blitzing 3 sites: Auburn Wilderness Park, City of Pacific Park, and Pierce/King County Water Resources property. The bioblitz was funded by a grant from the Environmental Protection Agency.

The Results

	June 2006	Earth Day April 2007
Volunteers Cost	100 $17,300	40 $2,129 (not including mileage
Area Sampled	1,593 acres	50 acres
Length of bioblitz	24 hours	12 hours
Taxa Teams		
Birds	3 teams	1 team
Amphibians/Reptiles	3 teams	
Mammals Trackers - Mammals	3 teams	1 team 3 teams
Plants	3 teams	2 teams
Invertebrates		
Aquatic	1 team	
Mollusks	2 teams	
Butterflies/Moths	2 teams	
Beetles	2 teams	1 team
Spiders	1 team	

2006 & 2007 Bioblitz Comparison

	2006	2007
Birds	81	40
Mammals	25	17
Amphibians	7	0
Reptiles	3	2
Fish	5	0
Invertebrates	207	12
Plants Note: 2006 totals were adjusted after the final report was issued.	230	196

City of Pacific
City Park
King & Pierce County Properties

	2006	2007
Birds	46	27
Mammals	19	14
Amphibians	0	0
Reptiles	0	2
Fish	0	0
Invertebrates	0	0
Plants	75	142
Non-native	36	61
Trees	13	21
Shrubs	9	26
Grass/forbs	53	95

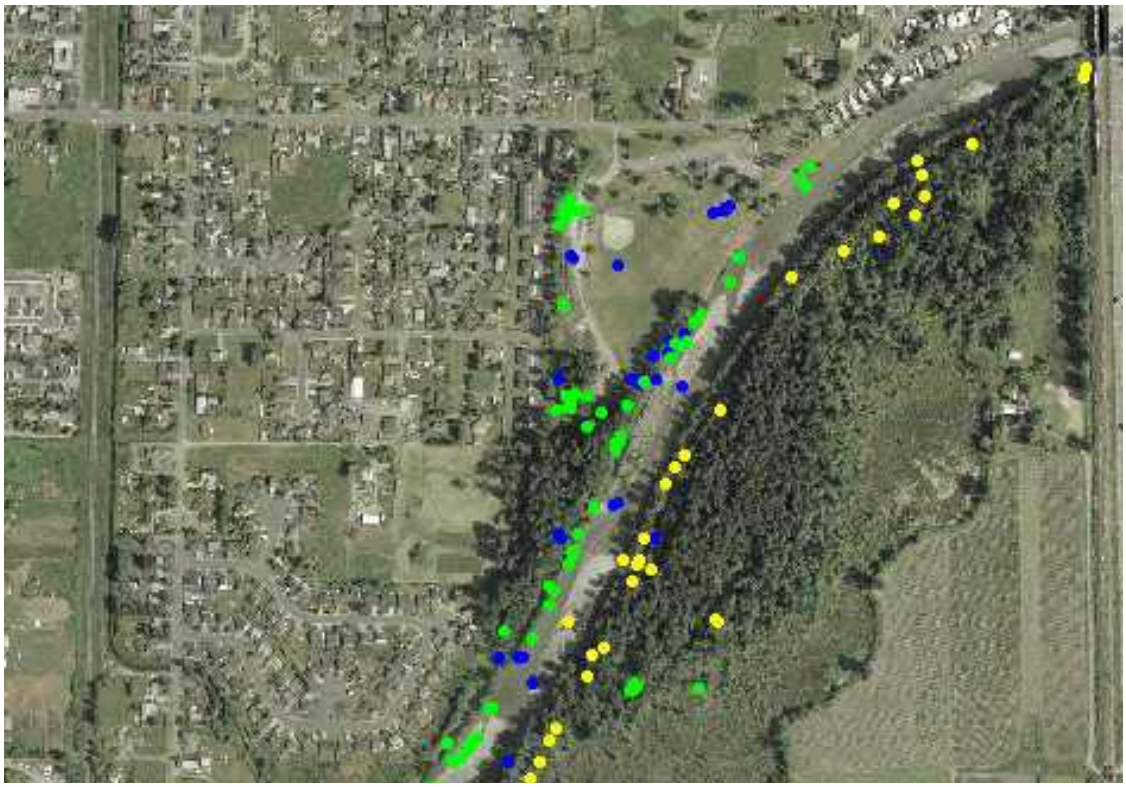
City of Pacific and Vicinity 2006

Bioblitz data were reported at the locations marked below:

Mammals – yellow

Birds – blue

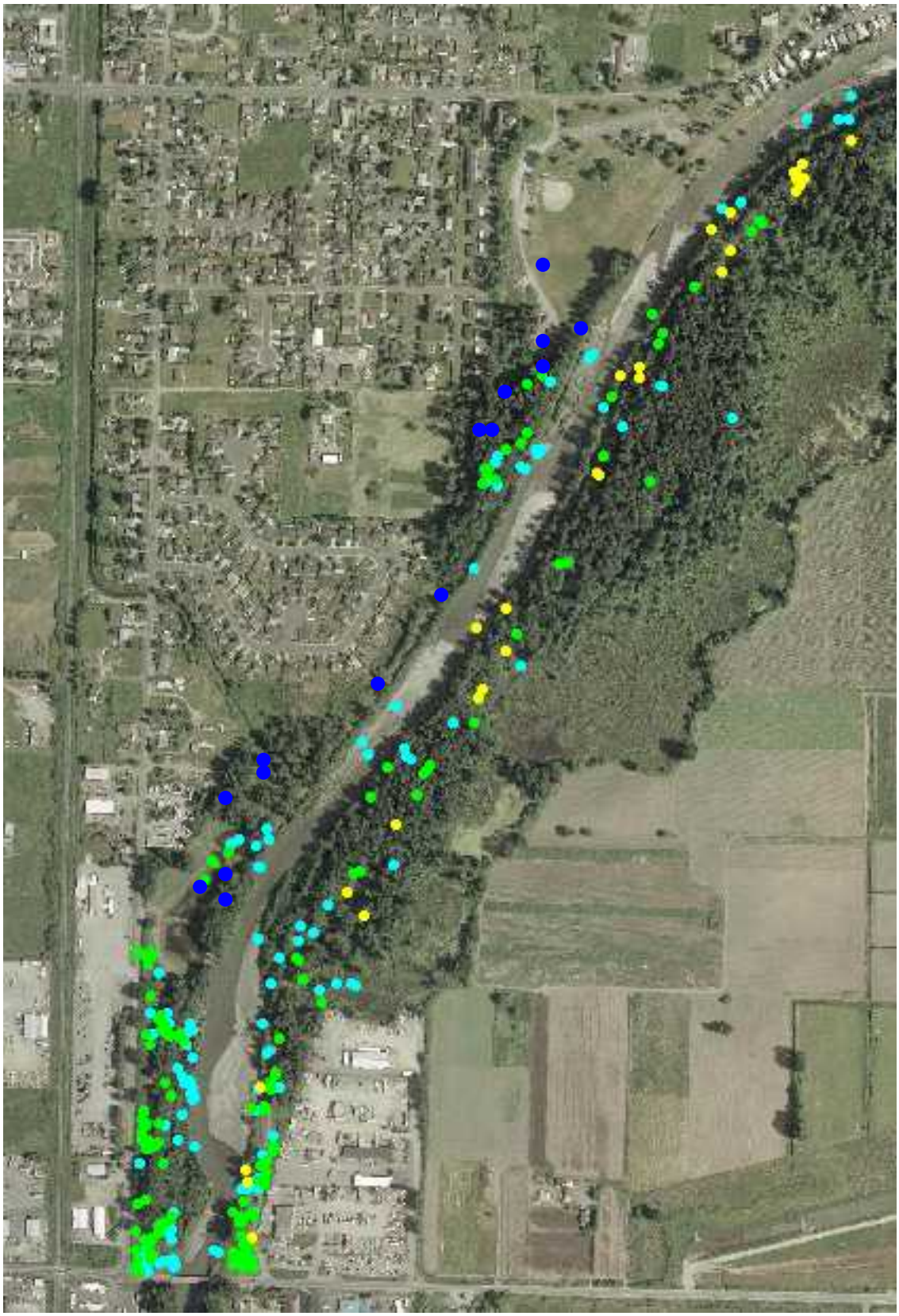
Plants - green



Pierce County Water Programs 2006

City of Pacific and Vicinity 2007

Bioblitz data were reported at the locations marked below:
Mammals – yellow … Mammal Trackers – light blue
Birds – blue
Plants - green



Lower White River Biodiversity Management Area (BMA) Stewardship Plan

Pierce County Biodiversity Alliance

PCBA

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Lynn Helbrecht, Executive Coordinator

Pierce County Conservation District
Dave Seabrook, Board of Directors

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Lucinda Wingard, Founding member

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Introduction

Biodiversity planning is a method used to identify land areas that provide for a biologically diverse representation of species. This planning method considers long-term ecosystem health and establishes a goal of maintaining adequate habitat to ensure the continued viability of a diversity of species within an ecoregion. Forest, riparian, and wetland habitats provide a full suite of ecosystem services vital to human health and livelihood besides a diversity of species.

Currently fish and wildlife planning methods consist of migratory routes and point locations of species of concern. What is missing is connecting the routes and points together that provide the necessary habitat to sustain all species, not just the rare and endangered ones.

The benefits of biodiversity planning:

- 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

Pierce County's biodiversity planning efforts resulted in a Biodiversity Network consisting of 16 Biodiversity Management Areas (BMA). The BMA's are the "best of the best" within Pierce County. The Network is included in Pierce County's Comprehensive Plan Open Space Maps for fish and wildlife. Residents in each BMA automatically qualify for tax incentives.

In 2005 the Crescent Valley BMA was selected by the Pierce County Biodiversity Alliance (PCBA) as the pilot to implement long-term stewardship within the Network. As a result of a year-long effort working with the citizens, the Crescent Valley Stewardship Plan was developed and a community group formed, Crescent Valley Alliance (CVA) to undertake the action items identified in their plan.

The Lower White River Stewardship Plan was developed using Crescent Valley Stewardship Plan as a template. However, the Crescent Valley BMA falls within unincorporated Pierce County, while the Lower White River BMA lies between unincorporated King and Pierce County, Muckleshoot Tribe, and the cities of Auburn, Buckley, Pacific, and Sumner. Therefore this Plan, although designed as a non-regulatory document for local citizens, has been written to provide a thorough detailed report of what citizens <u>and</u> jurisdictions will need to do to protect, maintain and restore biodiversity over time.

Jurisdictions should be cognizant of the fact that much of the details and terminology may be familiar to them, but the goal of this Stewardship Plan is to be also used by the local citizens.. Furthermore, if each of the Stewardship Plans follows the same template, they can easily be merged into volumes representing the overall stewardship goals for the entire Biodiversity Network.

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Frequently Used Acronyms

APD – Agriculture Production District
BMA – Biodiversity Management Area
BWH – Backyard Wildlife Habitat
CLC – Cascade Land Conservancy
CVA – Crescent Valley Alliance
CWH – Community Wildlife Habitat
FLWR – Friends of the Lower White River
GIS – Geographic Information System
NWF – National Wildlife Federation
PCBA – Pierce County Biodiversity Alliance
PCCD – Pierce County Conservation District
PHS – Priority Habitats of Species
PSAT – Puget Sound Action Team
PWU – Pierce County Public Works and Utilities
RM – River Mile
SMA – Shoreline Master Act
SMP – Pierce County Shoreline Master Program
SMR – Pierce County Shoreline Management Regulations
SYH – Schoolyard Habitats
TNC – The Nature Conservancy
TPCHD – Tacoma Pierce County Health Department
URS – URS Consulting
WDFW – Washington Department of Fish and Wildlife
WSU – Washington State University – Pierce County Cooperative Extension Office

Chapter I - Background

Creation of a Biodiversity Plan for Pierce County

The Washington Growth Management Act requires each of the state's 39 counties and their cities to address open space and environmentally sensitive areas in their comprehensive plans. Pierce County's open space planning process includes land areas with the greatest fish and wildlife biological diversity or "biodiversity". The planning method used to identify these biodiversity areas is called "GAP analysis."

GAP analysis is a process of identifying core habitat areas that contain the highest level of species richness and representation remaining across the landscape. The GAP analysis methodology uses the mapping technologies of satellite imagery and the Geographical Information System (GIS) to create a current vegetation map. From that, distribution of wildlife species is derived and areas of high biodiversity are identified. The map is refined or "ground-truthed" with any and all known plant community and wildlife occurrences from WDFW's Priority Habitats and Species and Streamnet databases, the Department of Natural Resources' Heritage and Sensitive Plant Species databases, county natural resource inventories, and local expert biological opinion. This process identified core habitat areas that, along with a surrounding ¼ mile buffer area, provided the framework for the creation of biodiversity management areas (BMAs). BMAs were then connected, often along watercourses, and the resulting coverage became the Biodiversity Network. This information was subsequently incorporated into Pierce County's Comprehensive Plan Open Space Corridors Map.

In January 2000, the first Biodiversity Plan for Pierce County was published[1]. The habitat types represented in the Pierce County Biodiversity Network include lowland riparian areas and wetlands, deciduous hardwoods, oak savannahs and prairies, deciduous old-growth forests, and alpine peaks and meadows. Many of these habitats contain imperiled species including Chinook Salmon, Western Gray Squirrel, Bald Eagle, Spotted Owl, Grizzly Bear, Gray Wolf, and Western Pond Turtle. In addition, the Pierce County GAP analysis was conducted using watershed boundaries, rather than jurisdictional boundaries; therefore the Pierce County Biodiversity Network extends into the adjacent counties of King, Kitsap, Thurston, Lewis and Yakima.

In 2003, Pierce County began a finer-level assessment of lands within the Biodiversity Network to provide a groundtruthing of the original network. This assessment included detailed review of each BMA and connecting corridors through the use of recent orthophotography and site visits conducted by a WDFW biologist. The predicted species lists were also updated to add all predicted species including butterflies, introduced species, and known salmonid presence. The result of this assessment was unilateral removal of the ¼ mile buffer placed around the core habitat polygons, re-alignment of all the connecting corridors along watercourses, and a decision to refine the boundaries of each of biologically rich areas to ensure property lines were not bisected and habitats necessary for the long-term survival of the species based on local watersheds were included. The final revised Biodiversity Network identifies 16 biologically rich areas and connecting corridors that cover 267,784 acres of land (see Figure 1 – County's Revised BMA network) and 41 percent of the salmonid-bearing streams (see Figure 2 – Salmonids). In 2004, the County Council adopted the Pierce County Biodiversity Network Assessment Report[2], and modified the County's Comprehensive Plan Open Space Corridors Map to reflect this revised data set.

[1] Pierce County GAP Application Pilot Project: A Biodiversity Plan for Pierce County, Washington, January 2000.
[2] Pierce County Biodiversity Network Assessment, August 2004.

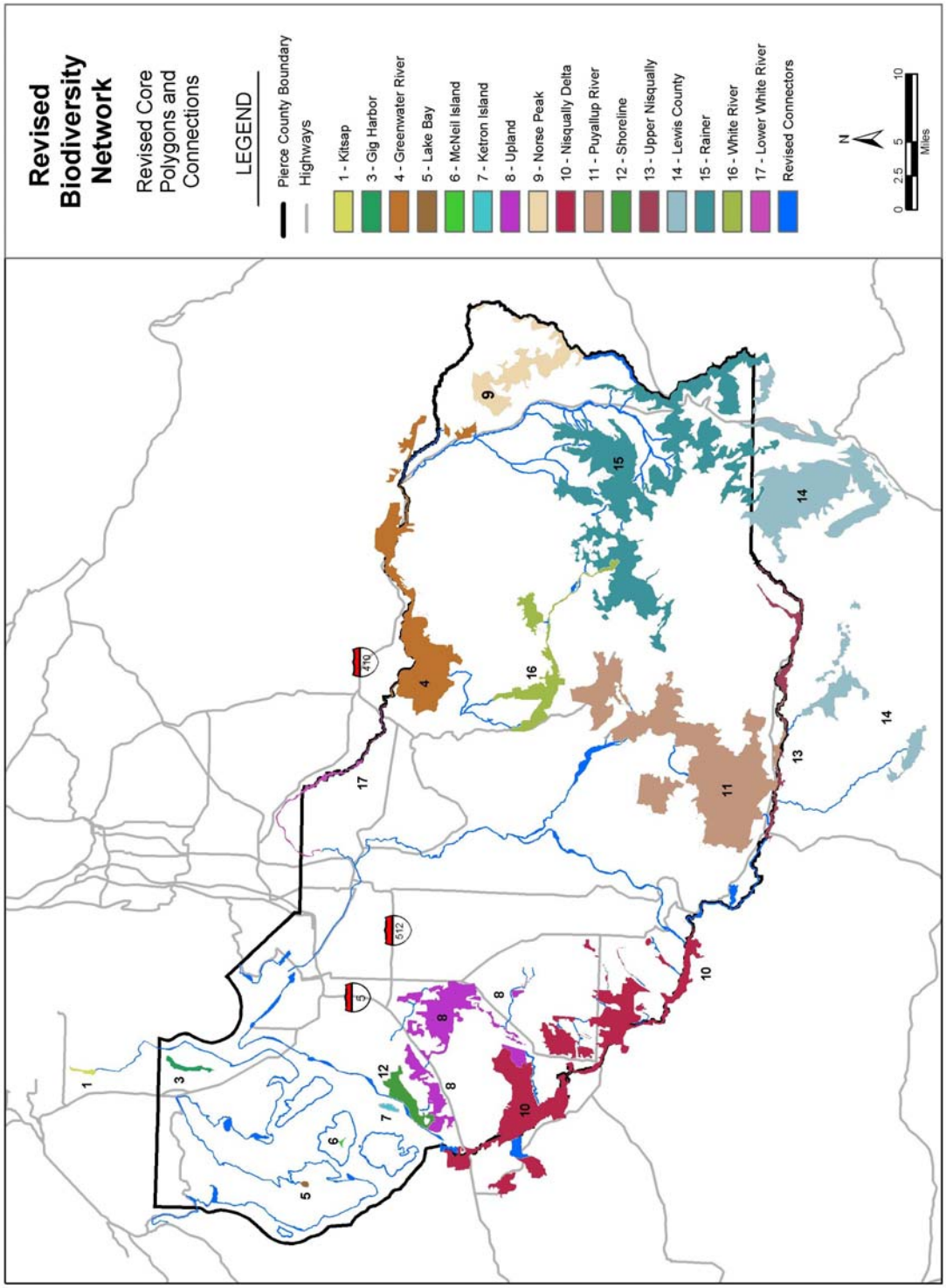

Figure 1. Revised BMA network

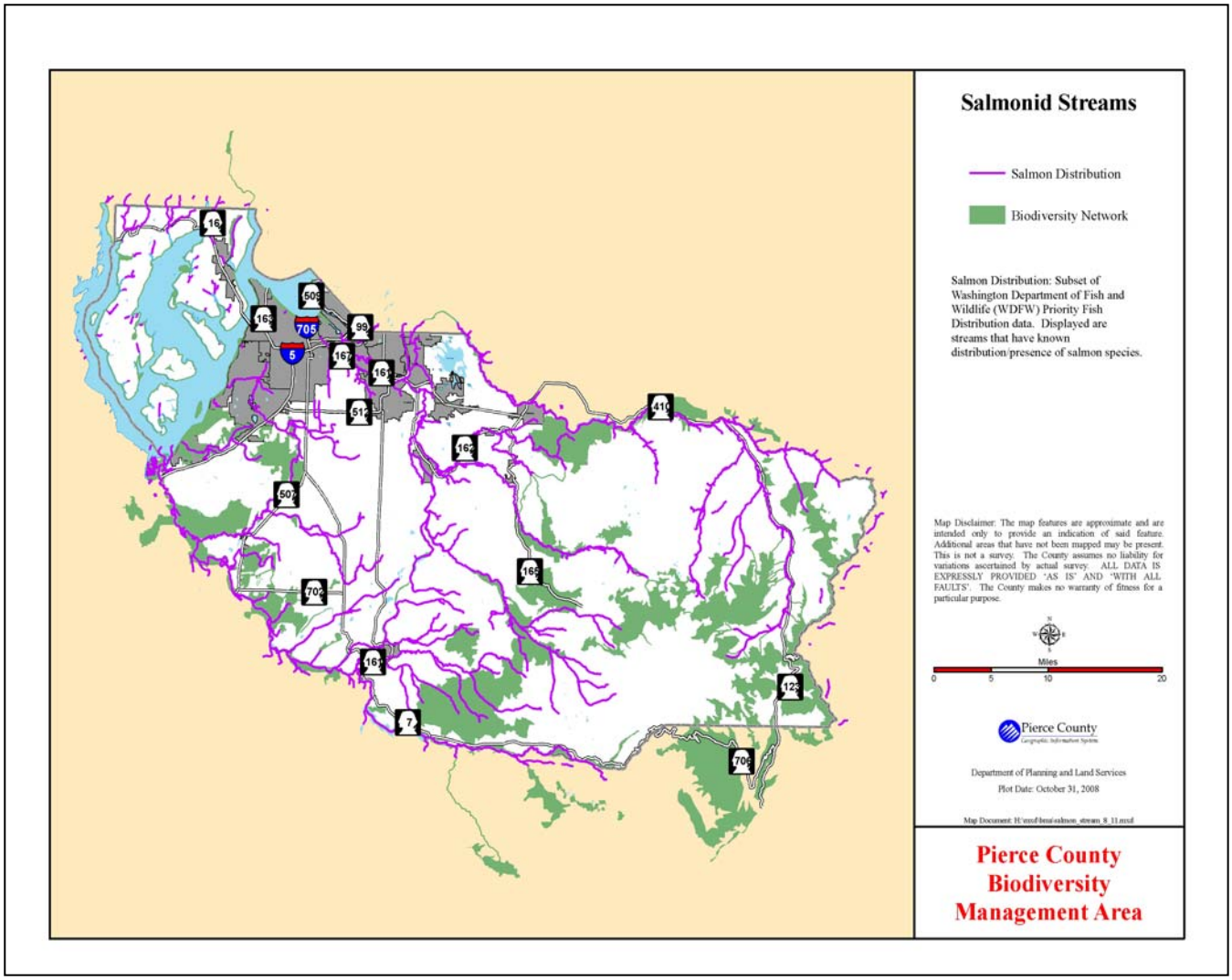

Figure 2. Salmonid presence

Implementation Strategies for the Biodiversity Network at a County and City Level

Since adoption of the first Pierce County Biodiversity Plan, the County has been using this biodiversity information in relation to land use planning in a variety of ways. The Biodiversity Network coverage has been integrated into the County's Comprehensive Plan Open Space Corridors map. This map has been considered in many community planning processes and within those plans has served as the basis for the creation of lower density zones and the establishment of habitat conservation based design standards, such as **low impact** development techniques and minimum native vegetation retention. In addition, Pierce County regulations have been changed to recognize lands within the Biodiversity Network as a high priority for various incentive programs such as the Conservation Futures Program and Current Use Assessment Program.

Because the Biodiversity Network was created using watershed rather than political boundaries, King, King, Kitsap, Mason, Thurston, Lewis, and Yakima counties are being notified of the Network and of opportunities to work together for the protection of biodiversity. To date, King and Pierce County Executives have signed a declaration authorizing cooperation on significant, shared boundary natural resources, including the Lower White River. King County Water and Land Resources Division has provided information inserted within this report and at the end as a separate chapter.

This multi-pronged implementation strategy is putting emphasis on proactive conservation of multiple species, rather than on reactive restoration of individual threatened or endangered species. This approach helps guide county and city planners in directing more intense development away from identified bio-rich lands and can also guide private and public land conservation purchases or easements and restoration actions.

However, while some progress has been made at a countywide planning level, landscape scale planning documents often fail to implement on-the-ground land use actions that serve to promote long-term conservation in "bio-rich" areas. Thus, the ultimate strategy for implementation is to work directly within each BMA to conduct detailed inventories of the predicted species and habitat; re-evaluate the BMA boundaries at a local watershed scale making sure not to bisect property lines or missing critical features not obvious at the countywide scale the BMA was created; meet with local jurisdictions and property owners to ascertain potential stresses to the system and sources of stress (collectively referred to as "threats") and identify a set of conservation strategies to abate these threats; and develop a set of prioritized actions to reduce or eliminate threats and restore habitat areas that will be implemented by a community group or individual landowners over time.

Pierce County Biodiversity Alliance

In order to accomplish the preservation of biodiversity within Pierce County's Biodiversity Network, a group of dedicated individuals has formed an alliance (referred to as the Pierce County Biodiversity Alliance). The Pierce County Biodiversity Alliance (PCBA) is comprised of a unique set of stakeholders, representing governmental, academic and non-profit agencies, who are interested in preserving the long-term biodiversity of Pierce County. Alliance members include Pierce County government; University of Washington - Cooperative Fish and Wildlife Unit; *NatureMapping* Program; NatureMapping Foundation; Washington Department of Fish and Wildlife; Metro Parks Tacoma; Tahoma Audubon Society; Friends of Pierce County; Pierce County Conservation District; Point Defiance Zoological Society; U.S.G.S. – National GAP Program, University of Puget Sound, National Wildlife Federation, Puyallup River Watershed Council; and The Cascade Land Conservancy. And the PCBA is continuing to expand and partner with others who are also interested in protecting biodiversity within the Pierce County

Biodiversity Network, including neighboring cities/counties that fall within the Network.

The main emphasis of the PCBA is non-regulatory in nature and instead focuses on public outreach to property owners within the Pierce County Biodiversity Network, providing education and incentive programs to maintain the habitats and biological diversity. The PCBA goal is to establish biological surveys and monitoring programs and facilitate the development of locally derived habitat conservation plans that will provide detailed information on habitat quality and species presence/viability, identification of threats, threat abatement strategies including restoration opportunities, and priorities for conservation and land acquisition for each BMA. And during this process, create a cohesive community group that can work together towards long-term implementation of conservation strategies.

This endeavor advocates responsible land use and success will be achieved when each BMA and connecting corridor retains ecological function given the community's land-use objectives as outlined in their adopted County or City Comprehensive Plan or in their community plan. Any Biodiversity Stewardship Plans adopted by Pierce County are considered a supporting plan to the Comprehensive Plan.

Project Description and Public Participation

The Lower White River BMA is a Puget Sound lowland environment that includes the local jurisdictions Buckley, Auburn, Pacific, and Sumner on the Pierce-King county border. The White River joins the Puyallup River in Sumner, and flows into Puget Sound at Commencement Bay in Tacoma. The BMA covers 1,593.27 acres/2.49 square miles of which 941.39 acres/1.47 square miles are within Pierce County. Ten miles of the Lower White River[3] (River Miles [RM] 14 to 24) are within the BMA. The river supports several documented salmonid species including Chinook (Federally Threatened, State Candidate), Chum, Coho, Pink, and Steelhead. In particular, the White River Spring Chinook population is considered a priority population in Puget Sound.

On April 29th 2006 a public tour of three sites within the Lower White River (see Figure 3) was hosted by the Puyallup River Watershed Council to begin publicizing the biological importance of the Lower White River. In June 2006, the PCBA conducted an intensive 24-hour species verification survey (referred to as a "bioblitz") and community outreach efforts on private lands within the Lower White River BMA. Three sets of teams covered three areas: Buckley, lands east of the Muckleshoot tribal lands, and Auburn/Pacific. The Washington Biodiversity Council[4] selected the PCBA's work beginning in the Lower White River BMA as one of their two pilot projects and provided funding for the bioblitz. An EPA grant funded the April, 2007 12-hour bioblitz in 3 areas in Auburn and Pacific not adequately sampled in 2006: City of Pacific's Riverside Park, City of Auburn's Game Farm, and Pierce County Water Program's property. Many of the volunteers that were trained for the first bioblitz held in 2005 in the Crescent Valley BMA were the leaders for the 2006 Lower White River bioblitz. These volunteers were trained at a *NatureMapping* workshop on data collection protocols[5]. Additional *NatureMapping* workshops in 2007 were conducted in preparation for the 2007 bioblitz.There were direct mailings to all property owners within the BMA for each of the three above mentioned events (see Figures 3-5) and follow-up telephone contacts. The events also received media coverage through the Tacoma News Tribune, Auburn Reporter,

[3] The sections of the Lower White River that did not qualify as a BMA were designated as a connecting corridor.

[4] The Washington Biodiversity Council's website http://washington.biodiversity.council.gov

[5] The *NatureMapping* Program trains teachers and individual citizens to conduct wildlife and habitat assessments, using standardized protocols and methodology, for integration into a statewide biological survey. All information is transmitted to a central database repository, located at the University of Washington, where it can be used by the public to make local policy and planning decisions regarding how resources may be managed. Website: http://depts.washington.edu/natmap

Courier-Herald, and a Rainier Cable broadcast on the local government channel. Beginning in the afternoon of June 2, 2006 bioblitz participants, lead by a Department of Fish and Wildlife staff biologist, utilized the *NatureMapping* Program's NatureTracker data collection and global positioning software to precisely identify where birds, mammals, amphibians, reptiles, insects, aquatic insects, and plants were found and accurately document what species was identified. The Marion Grange on Old Buckley Hwy served as science central headquarters in 2006 and the Auburn Game Farm was science central in 2007. [Five private landowners allowed access to their private property in 2006.] A total of 80 volunteers including taxonomic experts, 5 high school students, and 10 landowners in 2006 and 39 volunteers in 2007 observed 84% of the predicted bird species, 88% of the predicted amphibians, 52% of the predicted mammals, 60% of the predicted reptiles, 5 fish species, 207 invertebrate samples, and 276 plant species.

The information gathered from the field surveys established a benchmark of current species located within the Lower White River BMA and will also contribute to long-term monitoring activity. Species observations recorded during this monitoring will be used to evaluate whether biodiversity conservation strategies are having positive and successful results. Landowners may also use this information when enrolling in Pierce County's Current Use Assessment tax incentive program or making application for a land acquisition using Conservation Futures funding.

The Puyallup River Watershed Council and Pierce County Biodiversity Alliance (PCBA) invite you to learn from the experts about the dynamics of the Lower White River Corridor watershed. Come view the White River as it meanders through hardwood forests home to eagle, osprey, and bear. View elk wintering grounds, amphibian breeding ponds, and more. Learn how responsible land use decisions can combat the threats to biodiversity and retain ecological function while achieving a community's land use objectives. Learn about opportunities for volunteer tax-reduction programs.

1. Site 1: Auburn Game Farm Park – Encompasses ~72 acres of park and open space along the White River, the park is a unique mix of untapped wildlands within an urbanized environment. After an introduction to biodiversity by Michelle Tirhi, state wildlife biologist and PCBA member, we'll search for many species of birds, fish and wildlife. Aaron Nix, Environmental Protection Mgr with the City of Auburn, will discuss Auburn's comprehensive environmental plan and explain his role in helping keep these types of places special in Auburn.

2. Site 2: River Trail Walks – Don Johnson, a private landowner in the Lower White River, will lead a wildlife walk down the river trail where we will seek out beaver, elk beds, and other elk sign. Michelle Tirhi will talk about the upcoming BioBlitz on June 2nd and 3rd where landowners can become biologists for the day participating in frog trapping to eagle nest counts.

Site 3: Wetlands Complex – This is an area where red-legged frogs and wetland dependent birds, especially several species of flycatchers nest. Tony Fuchs, staff biologist from Puget Sound Energy (PSE), will discuss the dynamics of the wetland complex, including the water regime, beaver modifications, and habitats. Chip Nevins, Conservation Director for Cascade Land Conservancy, will talk about plans to acquire a 10 mile stretch (~3,000 acres) of undeveloped PSE-owned land straddling both sides of the White River to preserve it for future generations.

Vans depart from Auburn Game Farm Wilderness Park
Saturday, April 29th 1-4 PM
RSVP required to reserve your seat on the van
Phone 253-863-1860 or ltburgess3@msn.com

Figure 3. Mailing Notice for April 29th Preview Tour in Lower White River BMA

Dear Lower White River Resident:

As a resident of the Lower White River, you know that it's a special place filled with natural beauty and wildlife. This area was recently recognized as a unique place that sustains healthy populations of fish, mammals, birds, reptiles, and amphibians. Pierce County Biodiversity Alliance (PCBA) needs **YOUR** help to better understand the wildlife that lives in the Lower White River watershed.

As a land owner in the Lower White River, you may qualify for a property-tax reduction while you help Washington wildlife. By granting access for a one-day wildlife inventory in the Lower White River watershed, you could become eligible for your county's open-space tax-reduction program. If wildlife were found on your property, a wildlife assessment would increase your tax break and add points to your application. Join Fish and Wildlife biologists and volunteers for a day of fun as they create wildlife assessments of the area.

Pierce County Biodiversity Alliance, in cooperation with the University of Washington, Washington Department of Fish and Wildlife, Metro Parks Tacoma, Puyallup River Watershed Council, Friends of Pierce County, Pierce County Conservation District, Point Defiance Zoological Society, U.S.G.S. National GAP Program, and National Wildlife Federation, will be conducting a wildlife inventory known as a "**Bioblitz" from 3:00 p.m. Friday, June 2nd through 3:00 p.m. Saturday, June 3rd.** We are asking you and other property owners for your participation to help make this event a success.

Please note: This inventory is intended for scientific information gathering purposes only and landowners participating in the Bioblitz are under no further obligation or restriction to land-use on their property. The inventory will involve a visual tally of observed wildlife and every effort will be made to avoid impacting any natural or man-made features on the property. Everyone participating in this event is insured, so there is no liability to property owners. Landowners are encouraged but not required to accompany biologists during the inventory.

To participate in the **Bioblitz** of the Lower White River, or if you have questions, please complete the attached form or respond to Michelle Tirhi by email at tirhimjt@dfw.wa.gov or by telephone at 253-813-8906.

Michelle Tirhi
Pierce County Biodiversity Alliance
25644 44th Ave. S.
Kent, WA 98032

Figure 4. Mailing Notice for June 2006 Bioblitz Event in Lower White River BMA

Greetings:

Please join the Pierce County Biodiversity Alliance for BioBlitz 2007: Lower White River – Part 2. Many of you participated in last year's BioBlitz. It was a very fun event and quite successful in terms of wildlife and habitat inventory. An overview is provided at: http://depts.washington.edu/natmap/pierce_county.html.

Formally designated the Lower White River Biodiversity Management Area (BMA), this region is an incredible mix of habitat. Dominated by riparian hardwood, the habitat also includes abundant wetlands, flood channels, seeps, and grasslands. Because of the size of the survey area, there is a need for several BioBlitz events.

This year's BioBlitz will focus on filling in the gaps from last year's event. We will be surveying sites that are more urban, but still important to the wildlife that live there. Additionally, we will be targeting several species that we believe should be found in the BMA but were not recorded during last year's survey. The BioBlitz will occur on Saturday, April 21 from 6:00am to 6:00pm. Team leads will do some additional surveys before and after. Taxa that will be surveyed include: mammal, bird, amphibian, reptile, invertebrate, fish, and plant.

Also this year, in conjunction with the survey work, we will host a special event commemorating Earth Day which will highlight the biological diversity of the Lower White River area. We will be inviting the public and members of the media to Science Central for the latter part of the day to heighten their awareness of the natural world and offer ways to help support biodiversity in their own backyard.

So, the 2007 BioBlitz has three objectives. First, to continue to validate the species predicted to inhabit the area based on modeling conducted as part of our larger Pierce County Biodiversity Network Project. Second, to engage community members in discovering the biological richness of the region. Third, to have a great field day for all participants in one of Western Washington's most scenic areas.

This is an intensive event and our team participants work hard documenting as many species as possible against the clock. The members of the Pierce County Biodiversity Alliance and Puyallup River Watershed Council thank you in advance for your assistance. What a great way to do something meaningful for Earth Day! Please indicate your interest by filling out the attached Participation form and sending it to me as soon as possible. Please contact me if you need additional information. Thank you!

Michele Cardinaux
BioBlitz 2007 Coordinator
1919 S. Tyler Street
Tacoma, WA 98405
(253) 591-6439
michele@tacomaparks.com

Pierce County Biodiversity Alliance (PCBA)

Dedicated to conserving the biodiversity of Pierce County, Washington

Figure 5. Mailing Notice for April 2007 Bioblitz Event in Lower White River BMA

A community meeting was held in November 8, 2006 to present the results of the June bioblitz to the residents in the Lower White River BMA and solicit their help developing long-term biodiversity

conservation strategies for this area. The PCBA led a total of four community meetings over four months using the same approach to develop community stewardship plans. However, bad weather and flooding reduced public attendance. Those that did attend were personnel representing multiple jurisdictions within the BMA and didn't need to be educated about conservation planning and terminology. It was decided that the meetings should be postponed until a draft plan was developed and presented to the jurisdictions. The meeting agendas and meeting summaries are attached as Appendix 1.

Implementation of the Lower White River BMA Stewardship Plan

The Lower White River BMA Stewardship planning process includes the development of implementation measures to conserve biodiversity within each jurisdiction included in the BMA. These measures include actions such as property owner enrollment in county tax reduction incentive programs (Current Use Assessment - Public Benefits Rating System) or permanent dedication or purchase of properties as open space (Conservation Futures Program); restoration of native vegetation in areas of degraded habitat (Landowner Incentive Programs, Washington Department of Fish and Wildlife's and National Wildlife Federation's Backyard Wildlife Sanctuary Programs, Pierce County Conservation District's Stream Team); and education on acceptable riparian/wetland land management. Because local jurisdictions may have additional implementation measures that can be applied to their local communities, Chapter VII lists these measures. Chapter VII also customizes proposed action steps for community review.

It should be noted that the Lower White River is not a separate "entity", but part of the Biodiversity Network continuum between the White River BMA, and the Puget Sound via the Puyallup River. The cities of Sumner and Buckley fall within the Lower White River BMA and along the connectors. Therefore, their stewardship efforts extend into the Network.

As stated above, the PCBA's goal is to create a cohesive network of community groups that can work together towards long-term implementation of conservation strategies outlined in the Stewardship Plan. One group that has formed is the Friends of the Lower White River (FLWR) that will be pursuing funding opportunities to complete action items. To that end the FLWR adopted the following Mission Statement:

> *Our mission is to protect the biodiversity and health of the Lower White River Basin and its communities through education; supporting scientific research; fostering citizen participation in government; and by buying, and holding in trust for the public good, critical areas, aquatic and riparian wildlife habitats, and other lands of ecological significance.*

One easy to implement action within the stewardship plan is the certification of individual backyard wildlife habitats individually through the Washington Department of Fish and Wildlife and/or the National Wildlife Federation, or as a community certification with the National Wildlife Federation. The Crescent Valley Alliance was formed by local citizens that helped create their Biodiversity Stewardship Plan as part of the PCBA's Gig Harbor/Crescent Valley BMA implementation pilot project. The Alliance listed the creation of 50 certified backyard habitats as one of their short-term stewardship action plans and as a community became registered for the National Wildlife Federation's Community Habitat Program in 2008.

National Wildlife Federation - Community Wildlife Habitat Program Certification

National Wildlife Federation's (NWF) community education programs empower homeowners, students, community leaders and businesses to preserve, restore and create sustainable landscapes that support a multitude of wildlife and native plants in their backyards, workplaces, places of learning and other community spaces. NWF supports these efforts through training, print and online resources and recognition through a formal certification process. To certify a habitat through NWF, individuals must provide local wildlife with four basic elements: food, water, cover and places for wildlife to raise their young. To date there are 2,325 certified Backyard Wildlife Habitat (BWH) sites, 50 Schoolyard Habitats (SYH) sites and two certified Community Wildlife Habitats (CWH) in Washington State.

The Community Wildlife Habitat program is critical to NWF's work in the Puget Sound as it takes the basic elements of the BWH program from the individual backyard to multiple locations throughout a community. Once a community is engaged and interested in taking action to promote healthy habitat, they form a habitat team and, with guidance from NWF staff, set achievable goals that reflect the size and needs of the community; at which point they become formally registered as a Community Wildlife Habitat site. The CWH certification system is points-based and each community earns a certain amount of points that fall within five categories (Registration, Habitat Certification, Education, Community Projects and Administrative Goals).

On average, communities spend three to five years completing their certification goals during which time a certain number of residences, schools and businesses become certified backyard, schoolyard and workplace habitats. Community groups also design and implement an array of locally relevant, habitat-related projects within their communities. Projects include (but are not limited to): stream cleanups, invasive plant removal and native habitat restoration, plant and wildlife rescue, after-school ecology programs, the creation of educational outreach materials and community-sponsored events such as the Tukwila Backyard Wildlife Fair and the Lake Forest Park Dig It! Green Fair. Currently Tukwila and Camano Island are certified and the communities of Alki, Lake Forest Park, Bellingham and Anacortes are registered and working toward their certification goals.

The Crescent Valley Alliance founding members have certified backyard habitats. Their efforts to convince more residents within the BMA to certify their yards and join their efforts as a registered Community Wildlife Habitat site have three key components. The first is on an emotional level:

> *"It causes us to hold ourselves accountable for what we do, and it's created a very emotional, meaningful connection to our land. There is a sense of accomplishment and a feeling that we have done something good for the world and for our kids." ...And that, Lucinda Wingard says, is worth the effort.*

The second component is educational. Residents within the BMA signing up for backyard habitat certification through the Crescent Valley Alliance are learning the Biodiversity Stewardship Plan and how they can play a role as stewards. The third component is financial. BMA residents learn about the financial incentives available to them. Some residents have received up to 25% reduction on their property taxes.

Chapter II - Lower White River BMA Overview

General Description of Lower White River BMA

The Lower White River BMA is located along the White River west of the Greenwater River BMA and is approximately 1,593 acres in size. This BMA is located within the Puget Trough ecoregion[6] (Region 7) and the Puget Sound Douglas-fir vegetation zone (Zone 31). The primary driver habitat for this BMA is riparian habitat (code 533) dominated by hardwood trees and small shrubs. The entire BMA is located within the Puyallup-White River Watershed WRIA 10 (Watershed Resource Inventory Area). Figure 6 depicts the BMA boundary overlain on ortho-photography mapping of the surrounding area.

Figure 6. Lower White River BMA

The White River demarcates King County's southern geo-political boundary. Multiple jurisdictions are present in the BMA in King County including the cities of Auburn, Pacific, and Enumclaw and the Muckleshoot Indian Tribe. King County owns some lands within those other jurisdictions. Additionally, the portion of the BMA that stretches from the Muckleshoot Reservation east to the terminus of the Lower White River BMA is all unincorporated King County. The actual area covered by the BMA that lies within the jurisdiction of unincorporated King County is very limited

[6] Washington Gap Analysis Project Volume 1 – Landcover of Washington State defines ecoregions as contiguous geographic areas of similar climate and geologic history and vegetation zones as areas in which moisture, temperature, and other environmental parameters combine to create conditions that favor similar vegetation communities. 1997.

The White River Basin Plan Characterization Report[7] contains the following general description of the physical and biological characteristics of the watershed basin, which also provides a good representation of the Lower White River, as follows:

> The *White River Basin is divided into 10 sub-basins. The Lower White Sub-basin was established based on the transition from the Cascade foothills to the Puget Sound Lowlands. This sub-basin drains 52 square miles of the plateau formed by the Osceola mudflow and landforms associated with the last glacial advance in the region. The White River flows for 22.5 miles in the sub-basin, dropping in altitude from 620 to 39 feet at the confluence with the Puyallup River. Flooding in the Lower White River Basin is a natural phenomenon that has been mitigated by means of engineered structures (dams and levees). The river flows unconstrained until it reaches Mud Mountain Dam at RM 29.6. The dam, which began operation in 1948, is operated by the U.S. Corps of Engineers to control flooding in the lower Puyallup floodplain. (The Corps of Engineers co-located the Mud Mountain Dam fish passage facility which is a trap and haul program at the Puget Sound Energy (PSE) Diversion Dam. This facility consists of a fish trap, fish ladder and truck transfer facility to load and haul upstream migrants. The transfer process involves trucking the fish to a release point 10 miles upstream and 4 miles above Mud Mountain dam.)*
>
> *Pierce County maintains a system of flood control levees along the White River. According to the 2005 Capital Improvement Program (CIP), prepared by Surface Water Management, only 6 percent (1,840 of 29,209 linear feet of levee) on the White River levee system currently provides 100-year flood protection. There are 4,551 acres in 100-year flood zone and an additional 459 acres in the 500-year flood zone. Specific areas with flooding issues include the Red Creek area just downstream of the dam, Muckleshoot Tribe fish hatchery, Buckley Meadows subdivision, Sumner golf course, residences near the intersection of 8th Street and 138th Avenue East and the Sumner sewage treatment plant.*
>
> *Before 1906, the White River flowed north from Auburn to join the Green River and ultimately discharged into Seattle's Elliott Bay. In 1906, a debris jam blocked the channel of the White River and diverted all the floodwaters away from King County down the Stuck River and south into the Puyallup River. The debris dam was replaced by a permanent diversion wall located at the game farm park in Auburn.*
>
> *Stream flow in the White River is affected by the Lake Tapps diversion near Buckley. Diverted water is stored in Lake Tapps and eventually returned to the White River via the Deiringer Canal. Lake Tapps was built to create storage for the PSE White River hydroelectric project, which came on line in 1912 and suspended operations in January 2004. Approximately 2.5 miles of earthen dikes and embankments were built around four small natural lakes to create the current Lake Tapps. The dikes are maintained to control flooding. A diversion dam on the White River at RM 24.3 is used to fill the lake. Flooding in November 2006 damaged the structure and spawning salmon had difficulty using the adjacent fish ladder in the fall of 2007. Spawning salmon are trapped at the fish ladder and trucked approximately 5 miles upstream of Mud Mountain Dam.*

Significant native riparian vegetation exists within the Lower White River riparian corridor despite continued development encroaching from western Pierce and King Counties. The river running through Sumner, Pacific, and Auburn has been channelized in many locations. The cities of Sumner, Auburn, and

7 "Draft White River Basin Plan" Pierce County Public Works and Utilities Department – Surface Water Management Division, September, 2007.

Buckley are partially located within the floodplain of the river. The floodplain width is variable, ranging from less than 100 to 1,000 feet. The bankfull width e.g. maximum width the stream attains and is typically marked by a change in vegetation or other geological features) ranges from 80 to 500 feet, but the bankfull depth is more consistent and averages 5.5 feet throughout the river. Flood control levees on the White River extend upstream to RM 11.5 but are maintained only to RM 9.4. Segments of the White River have been identified by the Puyallup Tribe as Critical Fishery Rivers and Streams (Pierce County Critical Areas- Type F1: Title 18E40.060B), mandating 150-foot buffers.

When the boundary lines were drawn around the Lower White River BMA, the current river channel was included, but much of the riparian area (including the floodplain) was not. However, that was an oversight due to scale of the original GAP polygons, and the BMA should be changed to include riparian areas, including at a minimum, the entire floodplain.

From an ecological standpoint, the river cannot be separated from its floodplain. These areas are tightly interconnected, and these connections contribute to biodiversity. The floodplain contains substantial physical diversity, including a mosaic of semi-aquatic habitats, complex micro-topography, and patchy concentrations of moisture and nutrients. The physical diversity of the floodplain is supported by riverine processes such as periodic flooding, channel migration, and sediment deposition. Similarly, the floodplain contributes to the diversity of the river by providing wood and sediment to the channel. These are the raw materials for building instream habitats, and for creating new floodplains. The physical diversity that results from these interactions supports high levels of species diversity in the river, as well as in the floodplain. For example, where the river is rich with wood from the floodplain, the channels are split into multiple threads with abundant cover, pools, edges, and gravels that support diverse communities of fish and insects. Where the floodplain is connected to the river, there is abundant habitat for raptors, songbirds, shorebirds, and waterfowl, as well as small and large mammals and reptiles and amphibians. Floodplains also support high levels of plant diversity, owing to the variable patterns of moisture and resources, and wide distribution of protected refuges. In addition, riparian areas contribute substantially to biodiversity by providing habitat for plants and animals that are not commonly found in uplands.

The Lower White River BMA is narrow and in fact does not fully occupy the extent of the historic floodplain in which it lies. That portion of the BMA in unincorporated King County is even smaller and more limited. All of that area is either active river channel or adjacent riparian forest. King County maintains levees and revetments along the lower White River within the cities of Pacific and Auburn. The river through these reaches is channelized and disconnected from its historic floodplain.

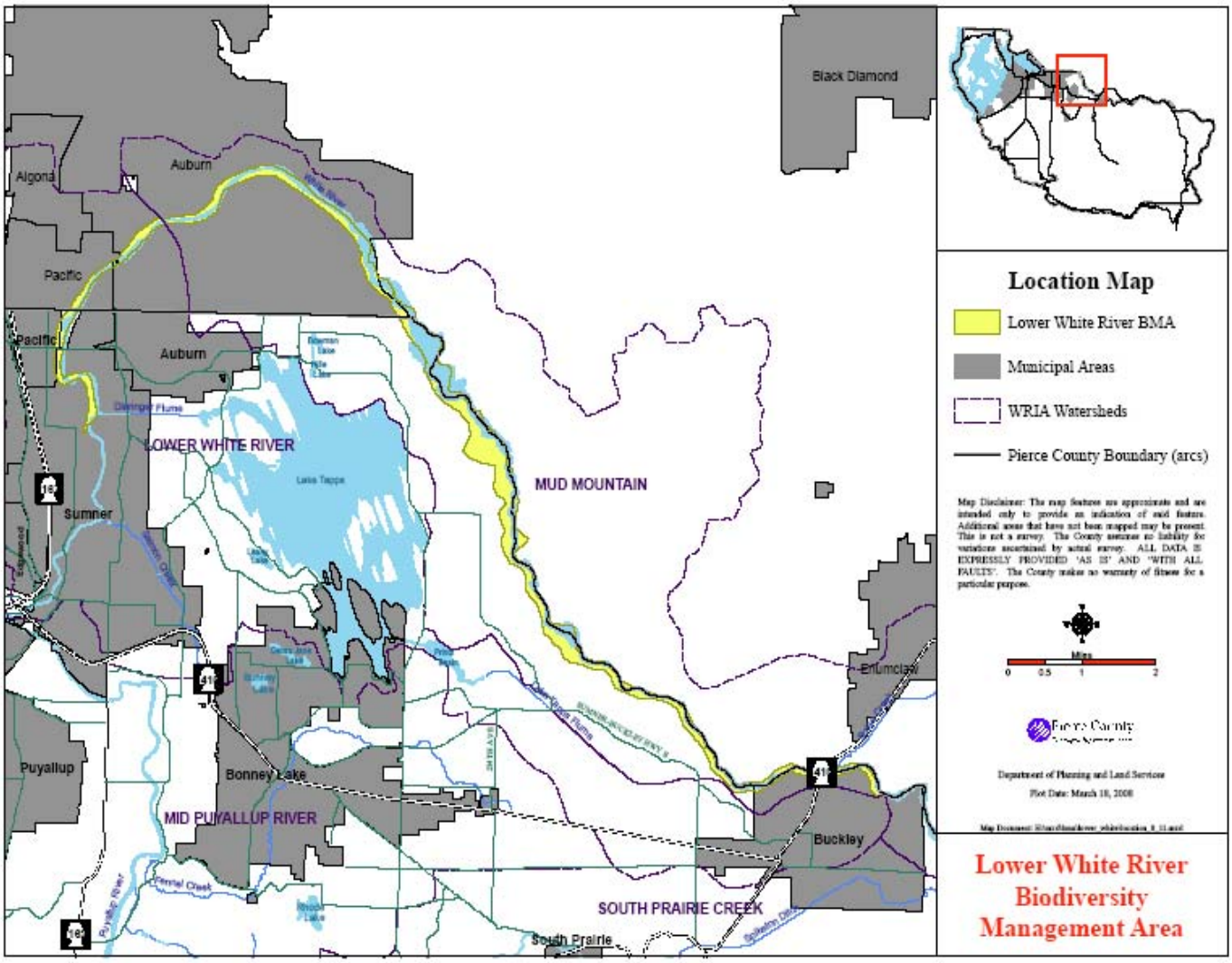

Figure 7. Lower White River BMA Location Map

Current land use is a combination of resource use, residential, civic, vacant, and limited industrial and commercial land use around Sumner, Pacific, and Buckley. In King County, land use is mostly agriculture, tribal lands, and residential around Pacific and Auburn.

Fish and Wildlife Resources

<u>Predicted Wildlife Species (F = federal, S = state, T = threatened, M = monitor, C = candidate, Co = of concern)</u>

The Pierce County Biodiversity Assessment provides a detailed list of predicted species for each of the 16 biodiversity management areas in the biodiversity network. The Painted Turtle is the only trigger species identified for this BMA. There are 6 predicted species listed as at-risk, 16 state or federal listed species and 18 PHS species. The predicted listed species include the Red-Legged Frog (FCo), Western Toad (FCo, SC), Bald Eagle (FT, ST), Great Blue Heron (SM), Green Heron (SM), Olive-sided Flycatcher

(FCo), Osprey (SM), Turkey Vulture (SM), Vaux's Swift (SC), Willow Flycatcher (FCo), Fisher (FCo, SE), Long-eared Myotis (FCo, SM), Long-legged Myotis (FCo, SM), Pacific Water Shrew (SM), Townsend's Big-eared Bat (FCo, SC), and Yuma Myotis (FCo). A total of 6 amphibians, 85 birds, 46 mammals, and 5 reptiles were predicted (see Table 1 – Predicted and Confirmed Wildlife and Fish Species).

The Lower White River supports three salmonid species that are listed as threatened under the Endangered Species Act: Puget Sound Chinook, Puget Sound steelhead, and Coastal-Puget Sound bull trout. The Lower White River is particularly important to Chinook recovery because it is the only population of spring Chinook in south Puget Sound. The Lower White River also supports pink, chum, coho, and sockeye[8] salmon, as well as cutthroat trout. The mouth of Boise Creek falls within the BMA on the King County side. Boise Creek supports Chinook, coho, and pink salmon, steelhead, bull trout, and cutthroat trout.

Gustafson, R.G., T.C. Wainwright, G.A. Winans, F.W. Waknitz, L.T. Parker, and R.S. Waples. 1997. Status review of sockeye salmon from Washington and Oregon. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-33, 282 pp. http://www.nwfsc.noaa.gov/publications/techmemos/tm33/tm33.html#toc

TABLE 1 - PREDICTED AND CONFIRMED WILDLIFE AND FISH SPECIES FOR THE LOWER WHITE RIVER BMA

PREDICTED SPECIES Note: Species observed but not predicted are italicized	Bioblitz 2006 Survey	Bioblitz 2007 Survey
AMPHIBIANS		
Bullfrog[7,8]	X	
Ensatina	X	
Long-toed salamander	X	
Northwestern salamander	X	
Pacific treefrog (Chorus frog)	X	
Red-legged frog [3]	X	
Roughskin newt	X	
Western toad [3,6]	X	
BIRDS		
American bittern [2]		
American coot		
American crow	X	X
American dipper		
American goldfinch	X	
American kestrel	X	
American robin	X	X
Bald eagle [3,4,6]	X	X
Band-tailed pigeon [4]	X	
Bank swallow	X	
Barn swallow	X	
Barred owl[8]	X	
Belted kingfisher	X	X
Bewick's wren	X	X
Black-capped chickadee	X	X
Black-headed grosbeak	X	
Black-throated gray warbler	X	
Blue-winged teal		
Brewer's blackbird	X	
Brown creeper[8]	X	X
Brown-headed cowbird	X	
Bushtit	X	
California quail		
Canada goose	X	X
Cedar waxwing	X	X
Chestnut-backed chickadee[8]	X	X
Cinnamon teal		
Cliff swallow	X	
Common barn-owl	X	

PREDICTED SPECIES Note: Species observed but not predicted are italicized	Bioblitz 2006 Survey	Bioblitz 2007 Survey
BIRDS (Cont'd)		
Common merganser	X	X
Common nighthawk	X	
Common raven	X	
Common snipe		
Common yellowthroat	X	
Cooper's hawk [2]	X	
Dark-eyed junco[8]	X	X
Downy woodpecker	X	X
European starling[7]	X	
Evening grosbeak	X	
Gadwall		
Glaucous-winged gull[8]		X
Golden-crowned kinglet[8]	X	
Great blue heron [3,4,6]	X	X
Great horned owl		
Green heron (Green-backed) [3]	X	X
Green-winged teal		
Hairy woodpecker[8]	X	
Hooded merganser [4]		
House finch	X	
House sparrow[7]	X	
House wren		
Hutton's vireo	X	
Killdeer	X	
Lazuli bunting	X	
Macgillivray's warbler	X	
Mallard	X	X
Marsh wren	X	
Mourning dove[8]	X	
Northern flicker	X	X
Northern harrier		
Northern oriole		
Northern rough-winged swallow	X	
Northern shoveler		
Olive-sided flycatcher [3]	X	
Osprey [3]		X
Pacific slope flycatcher (Western)	X	
Pied-billed grebe [4]		
Pileated woodpecker[6,8]	X	X

TABLE 1 - PREDICTED AND CONFIRMED WILDLIFE AND FISH SPECIES

PREDICTED SPECIES Note: Species observed but not predicted are italicized	Bioblitz 2006 Survey	Bioblitz 2007 Survey
BIRDS (Cont'd)		
Pine siskin[8]	X	
Purple finch	X	
Red-breasted nuthatch[8]	X	X
Red-breasted sapsucker	X	X
Red-eyed vireo	X	
Red-tailed hawk	X	X
Red-winged blackbird	X	X
Rock dove	X	
Ruddy duck		
Ruffed grouse		
Rufous hummingbird	X	X
Savannah sparrow	X	X
Song sparrow	X	X
Sora		
Spotted sandpiper [4]	X	
Spotted towhee (Rufous-sided)	X	X
Steller's jay	X	
Swainson's thrush	X	
Townsend's warbler[8]		X
Tree swallow	X	X
Turkey vulture[3]	X	X
Vaux's swift [3,4,6]	X	
Violet-green swallow	X	X
Warbling vireo	X	
Western meadowlark	X	
Western screech-owl		X
Western tanager[8]	X	
Western wood-pewee	X	
White-crowned sparrow	X	X
Willow flycatcher [3]	X	X
Wilson's warbler	X	
Winter wren[8]	X	X
Wood duck [4]	X	
Yellow warbler[2]	X	X
Yellow-rumped warbler[8]	X	X

PREDICTED SPECIES Note: Species observed but not predicted are italicized	Bioblitz 2006 Survey	Bioblitz 2007 Survey
MAMMALS		
Beaver	X	X
Big brown bat [4]	X	
Black bear		
Black rat[7]		
Black-tailed deer [4]	X	X
Bobcat	X	
California myotis [4]	X	
Coast mole		X
Coyote	X	X
Creeping vole		
Deer mouse	X	X
Douglas squirrel	X	
Dusky (Montane) shrew		
Eastern cottontail[7]	X	X
Eastern gray squirrel[7]	X	X
Elk[8]	X	
Ermine		
Fisher [2,3,4]		
Hoary bat	X	
Little brown myotis [4]	X	
Long-eared myotis [3,4]		
Long-legged myotis [3,4]		
Long-tailed (Forest) deer mouse	X	
Long-tailed vole		
Long-tailed weasel	X	
Mink [4]		X
Mole spp.	X	
Mountain beaver	X	
Mountain lion [7]	X	
Muskrat	X	X
Northern flying squirrel		
Norway rat[7]	X	X
Nutria[7]	X	
Pacific jumping mouse	X	
Pacific water shrew [3]		
Porcupine		

TABLE 1 - PREDICTED AND CONFIRMED WILDLIFE AND FISH SPECIES

PREDICTED SPECIES Note: Species observed but not predicted are italicized	Bioblitz 2006 Survey	Bioblitz 2007 Survey
MAMMALS (Cont'd)		
Raccoon	X	X
Red fox		
River otter	X	X
Shrew-mole		
Shrew spp.	X	
Silver-haired bat [2]		
Southern red-backed vole		
Spotted skunk		
Striped skunk		
Townsend's big-eared bat [2,3,4]		
Townsend's chipmunk[8]	X	
Townsend's mole		X
Townsend's vole	X	
Vagrant shrew		
Virginia opossum[7]	X	X
Vole spp.	X	
Yuma myotis [3,4]	X	
REPTILES		
Common garter snake [1]	X	X
Northwestern garter snake	X	
Northern alligator lizard	X	X
Painted turtle		
Rubber boa		
Western terrestrial garter snake	X	
FISH		
Prickly sculpin	X	
Sculpin spp.	X	
Speckled dace	X	
Western brook lamprey	X	

Footnote:

(1) - Trigger Species - Species that needed additional mapped land cover units to ensure representation within the network

(2) - At-Risk - Washington Gap Analysis Project (WAGAP) selected species considered to be most as risk of continued or future population declines due to human activities

(3) - Listed (State or Federal) - Species listed as State endangered, threatened, sensitive, candidate or monitor, as well as species listed or proposed for listing by the U.S. Fish and Wildlife Service

(4) - PHS - a species defined as priority under the WDFW Priority Habitats and Species (PHS) Program

(5) - Included based on species significance under the WDFW PHS/Heritage database, although not predicted to occur

(6) - Included in the Washington Comprehensive Wildlife Conservation Strategy list

(7) - Current supporting location data

(8) - Washington Comprehensive Wildlife Conservation Strategy (2005) species recommended for monitoring

Confirmed Fish and Wildlife Species and Habitats

The WDFW Heritage data indicates point locations within the BMA for the following species: Bald Eagle (FT, ST), Great Blue Heron (SM), Vaux's Swift (SC), and Western Brook Lamprey (FCo). The WDFW PHS data designates this area as priority habitat for fish resources and small waterfowl. The Pierce County fish presence maps identify several anadromous fish species within the rivers and stream systems in this BMA including Chinook (FT, SC), chum, coho, pink, and steelhead.

The King County Wildlife Habitat Network, mapped in the County's Comprehensive Plan, runs through the BMA. The Wildlife Habitat Network is protected in the King County Critical Areas Ordinance as a Wildlife Habitat Conservation Area (WHCA). Other WHCA's include the nest and designated buffer areas around the nest of certain species, including bald eagle, osprey, red-tailed hawk, and great blue heron. A bald eagle nest was confirmed in 2002 near the hatchery, though it has not been verified more recently. It is likely osprey and red-tailed hawks are nesting in the area, and great blue herons may be nesting or at the least use the river as forage habitat. The lack of species sightings is because there are few to no roads leading to this area and no development thus far, and as such there have been no sightings of King County species of local importance. (Enumclaw-Buckley Rd. SE crosses the river towards the eastern end of the BMA; otherwise no other public roads are within the BMA in this area).

During the bioblitz event of June 2006, a variety of species were identified and confirmed within the Lower White River BMA within Pierce County (see Table 1 – Predicted and Confirmed Wildlife and Fish Species). Confirmed terrestrial vertebrate species in the Lower White River BMA include 8 amphibian species, 80 bird species, 30 mammal species, and 4 reptile species. Additional species from each group were confirmed during the follow-up bioblitz in June, 2007. A confirmed cougar sighting was reported by the Muckleshoot Tribal biologist within the BMA, although he was not involved in the bioblitz. (See Figure 8 - Fish and Wildlife Resources Map.)

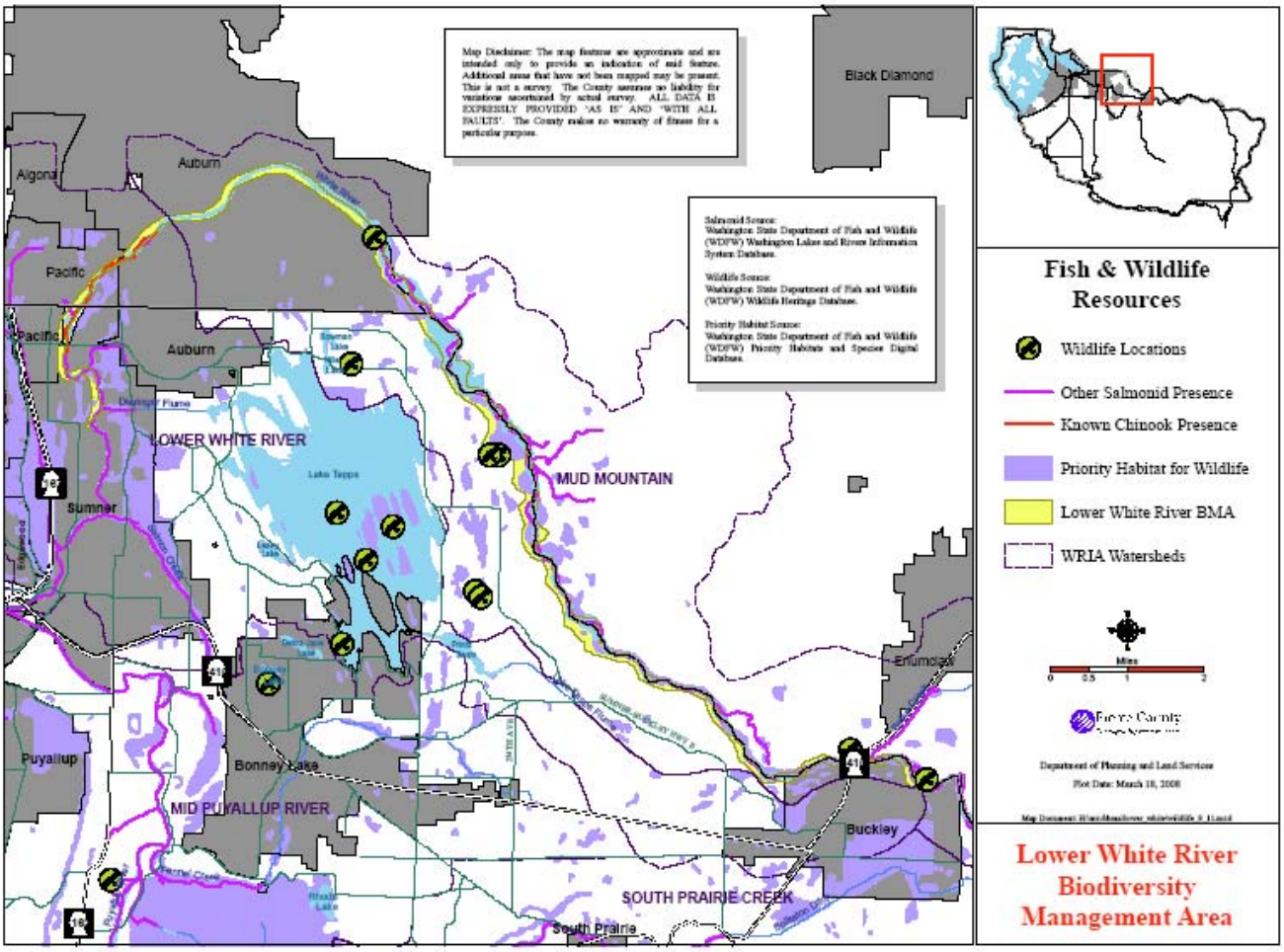

Figure 8. Fish and Wildlife Resources Map

The White River is identified as riparian habitat according to WDFW Priority Habitat and Species Program, and also medium quality riparian salmon habitat. Fall Chinook salmon (FT, SC), Spring Chinook salmon, Coho salmon, Fall Chum salmon, Pink salmon, Sockeye salmon, Bull trout (FT, SC), and Winter Steelhead (FT) fish species have been verified and/or known to occur in the stretch of the White River contained within the LWR BMA[9]. In addition, the draft White River Basin Plan[6] includes anadromous runs of Steelhead and coastal Cutthroat trout. Resident coastal Cutthroat trout and Bull trout also are present. Fall-run Chinook, Chum, and Pink salmon spawning occurs primarily below the diversion dam; Steelhead trout and spring-run Chinook salmon primarily spawn above Mud Mountain Dam, outside of the BMA. Coho salmon and coastal Cutthroat trout spawn and rear primarily in tributary streams throughout the basin. Bull trout spawning occurs only in snowmelt-fed tributaries in the upper

[9] Salmon and Steelhead Habitat Inventory and Assessment Program, http://wdfw.wa.gov/hab/sshiap/)

White River Basin above Mud Mountain Dam. The Muckleshoot Indian Tribe operates the White River Hatchery and the Puyallup Tribe operates 4 spring Chinook acclimation ponds located in the upper White River basin.

Confirmed Invertebrate Species

There are 27 confirmed butterfly species[10] within the Lower White River BMA. The following four butterflies are state-listed: Hydaspe Fritillary (SM), Juba Skipper (SM), Purplish Copper (SM), and Sonora Skipper (SM). The remaining butterfly species include: Anise Swallowtail. Cabbage White, Clodius Parnassian, Echo Blue, Large Wood Nymph, Lorquin's Admiral, Monarch, Mustard White, Mylitta Crescent, Orange Sulphur, Pale Tiger Swallowtail, Pine White, Red Admiral, Ringlet, Sara Orange Tip, Satyr Anglewing, Silvery Blue, Two Banded Checkered Skipper, Western Brown Elfin, Western Meadow Fritillary, Western Tailed Blue, Western Tiger Swallowtail, and Woodland Skipper.

The health of an aquatic ecosystem depends on the health of all its biological components, not just commercially or culturally important species such as salmon. Fish species are supported by the phytoplankton, zooplankton, insects, plants, bacteria, and fungi also inhabiting the waterway.

Benthic (bottom dwelling) invertebrates are effective indicators of the health of watercourses and watersheds. The term "benthic invertebrates" include animals such as aquatic insects (mayflies and stoneflies), snails, clams, crayfish, and aquatic worms. These species represent a diversity of morphological, ecological, and behavioral adaptations to surrounding natural environments (i.e. they have co-evolved with their surrounding ecosystems to preferred locations)[11]. Many factors can affect the types of benthic invertebrates in a system including riparian conditions, thermal regimes, discharge patterns, light penetration, channel gradients, sediment conditions, water, sediment chemistry, and channel stability which is linked to the quantity and size of large woody debris (LWD). Each location along the watercourse continuum will contain a variety of habitats, such as riffles, pools, sloughs, bars, and backwaters, which differ in respect to substrate type and stability, current velocity, and water depth. Each location in the watercourse has a range of natural conditions that, when coupled with environmental requirements of the invertebrate species, determine whether a given organism can live in a particular habitat at a particular point.

These patterns of species distribution are affected by actions that alter the landscape (e.g. wild fires, logging, earthquakes, agriculture, volcanic eruptions, and urbanization), modify hydrologic conditions (changes in evapotranspiration and runoff or construction of reservoirs and irrigation diversions), modify habitats (snagging operations, channel dredging, sedimentation, hurricanes), or add chemicals that are toxic or that elevate nutrient or organic loads. Organisms vary in their tolerance of degradation caused by human actions; some require clean, clear water while others occupy a wide range of conditions (i.e. generally tolerant of the effects caused by human alterations) [12]. As the natural environment is altered by human activities, changes start to occur in the type of benthic invertebrate species that inhabit a waterway Those less tolerant to human alterations begin to disappear and others that are more tolerant appear more abundantly or replace other species altogether. In an effort to understand the health of a particular waterway (e.g. creek, stream, river) benthic invertebrate samples are collected at various intervals along

[10] Washington State Butterfly Atlas

[11] Cuffney, T.F., Gurtz, M.E., and Meador, M.R., 1993, Methods for collecting benthic invertebrate samples as part of the National Water-Quality Assessment Program: U.S. Geological Survey Open-File Report 93-406, 66 p.

[12] "Restoring Life in Running Waters," James R. Karr and Ellen W. Chu, 1998 and "Biological Assessment: Using Biology to Measure the Health of Watersheds," James R. Karr.

the reach to assess the quality of the system. Species are typically categorized in groups including:

- Group 1 - those organisms which are generally pollution intolerant and signify excellent-good water quality including riffle beetle, stonefly, caddisfly, mayfly, and snail;
- Group 2 – those organisms that exist in a wide range of water quality conditions including cranefly, dragonfly, crayfish, sowbug, filtering caddisfly, blackfly, scud, and dobsonfly; and
- Group 3 – those organisms that are generally tolerant of pollution and whose presence generally indicates fair-poor water quality conditions including midge, pouch snail and aquatic worm.

During the bioblitz event of June 2006, 98 terrestrial and 16 benthic invertebrate species were recorded. Eleven of the terrestrial invertebrates were non-native. Ten more terrestrial species were identified in the April 2007 bioblitz (See Table 2). The benthic sample size was too small to assess the overall water quality of the Lower White River. However, it was also found to support at least some taxa that are relatively intolerant to pollution. This indicates that general water quality in the river is relatively good.

TABLE 2 - CONFIRMED TERRESTRIAL AND AQUATIC INVERTEBRATES FOR THE LOWER WHITE RIVER BMA

	Order	Family	Genus/Species	Common
Ants	Hymenoptera	Formicidae	*sp. 1*	Moss Ant
Bees	Hymenoptera	Apidae	*Bombus sp.*	
Beetles	Coleoptera	Carabidae	*Carabus nemoralis*	Carabid Beetle
Beetles	Coleoptera	Carabidae	*Cicindela oregano*	Tiger Beetle
Beetles	Coleoptera	Carabidae	*Harpalini sp.*	Black Ground Beetle
Beetles	Coleoptera	Carabidae	*Nubius sp.*	
Beetles	Coleoptera	Carabidae	*Scaphinopus sp.*	Small Slug Killer
Beetles	Coleoptera	Chrysomelidae	*Altica ambiens*	Alder Flea Beetle
Beetles	Coleoptera		*Cicindela depressula*	Ground Beetle
Beetles	Coleoptera		*Scaphinotus angusticollis*	Ground Beetle
Beetles	Coleoptera		*Cychrus tuberculatus*	Ground Beetle
Beetles	Coleoptera		*Nebria piperi*	Ground Beetle
Beetles	Coleoptera		*Nebria eschscholtsii*	Ground Beetle
Beetles	Coleoptera		*Nebria gyenhali*	Ground Beetle
Beetles	Coleoptera		*Nebria crassicornis*	Ground Beetle
Beetles	Coleoptera		*Diplous aterrimus*	Ground Beetle
Beetles	Coleoptera		*Loricara decimpucatata*	Ground Beetle
Beetles	Coleoptera		*Harpalus carbonatus*	Ground Beetle
Beetles	Coleoptera		*Harpalus seclusus*	Ground Beetle
Beetles	Coleoptera		*Harpalus affinis*	Ground Beetle
Beetles	Coleoptera		*Pterostichis algidus*	Ground Beetle
Beetles	Coleoptera		*Pterostichus creniculus*	Ground Beetle
Beetles	Coleoptera		*Pterostichus herculeanus*	Ground Beetle
Beetles	Coleoptera		*Bembidion platinoides*	Ground Beetle
Beetles	Coleoptera		*Acupalpus*	Ground Beetle
Beetles	Coleoptera		*Trechus obtusus*	Ground Beetle
Beetles	Coleoptera		*Tachys*	Ground Beetle
Beetles	Staphylidae	Osoriinae		Rove Beetle
Butterflies/Moths	Lepidoptera	Arctiidae	*Tyria jacobaeae*	Cinnabar Moth
Caddisflies	Trichoptera	Brachycentusidae	*Brachycentridae*	
Caddisflies	Trichoptera		*Rhyacophila*	Caddisfly
Caddisflies	Trichoptera		*Lepidostoma*	
Centipede	Myriopoda	Lithobiidae	*sp. 1*	Centipede
Crustacean	Crustacea	Ligiidae	*Ligidium gracile*	Isopod
Dragonflies	Odonata	Libellulidae	*Libellula forensis*	Eight Spotted Skimmer
Flies	Diptera	Chironomidae	*Chironomidae*	
Flies	Diptera	Simuliidae	*Simuliidae*	
Flies	Diptera	Tipulidae	*Tipula*	
Flies	Diptera		*Chelifera*	
Leafhoppers	Hemiptera			Tree Hopper
Mayflies	Ephemeroptera	Baetidae	*Baetis tricaudatus*	
Mayflies	Ephemeroptera	Heptageniidae	*Cinygmula*	
Mayflies	Ephemeroptera		*Ephemerellidae*	
Mayflies	Ephemeroptera		*Ameletus*	
Mayflies	Ephemeroptera		*Caudatella hystrix*	
Mayflies	Ephemeroptera		*Epeorus longimanus*	

TABLE 2 - CONFIRMED TERRESTRIAL AND AQUATIC INVERTEBRATES FOR THE LOWER WHITE RIVER BMA

	Order	Family	Genus/Species	Common
Millipedes	Diplopoda	Parajulidae	*sp. 1*	Millipede
Millipedes	Diplopoda	Parajulidae	*sp. 2*	Millipede
Mollusks	Gastropoda	Arionidae	*Arion ater*	European Black Slug
Mollusks	Gastropoda	Pupillidae		Minute snail
Mollusks	Gastropoda	Sminthuridae	*sp. 1*	Snail
Sawflies	Hymenoptera			Wood Sawfly
Snails & Slugs	Gastropoda	Agriolimacidae	*Deroceras reticulaturm*	Grey Field Slug
Snails & Slugs	Gastropoda	Arionidae	*Ariolimax columbianus*	Pacific Banana Slug
Snails & Slugs	Gastropoda	Arionidae	*Arion intermedius*	Hedgehog Arion
Snails & Slugs	Gastropoda	Arionidae	*Arion rufus*	Chocolate Arion
Snails & Slugs	Gastropoda	Arionidae	*Arion subfuscus*	
Snails & Slugs	Gastropoda	Arionidae	*Prophysaon vanattae*	Scarletback Tailchropper
Snails & Slugs	Gastropoda	Bradybaenidae	*Monadenia fidelis*	Pacific Sideband
Snails & Slugs	Gastropoda	Corychiidae	*Carychium occidentale*	Western Thorn
Snails & Slugs	Gastropoda	Daubebariidae	*Oxychilus alliarius*	Garlic Glass-snail
Snails & Slugs	Gastropoda	Euconulidae	*Euconulus fulvus*	Brown Hive
Snails & Slugs	Gastropoda	Gastrodontidae	*Striatura pugentensis*	Northwest Striate
Snails & Slugs	Gastropoda	Haplotrematidae	*Ancotrema sportella*	Beaded Lancetooth
Snails & Slugs	Gastropoda	Haplotrematidae	*Haplotrtema vancouverense*	Robust Lancetooth
Snails & Slugs	Gastropoda	Helicidae	*Cepaea nemoralis*	Grow Snail
Snails & Slugs	Gastropoda	Helicidae	*Cornu aspersum*	Grown Garden Snail
Snails & Slugs	Gastropoda	Limacidae	*Limax maximus*	Giant Garden Slug
Snails & Slugs	Gastropoda	Polygyridae	*Allogona townsendiana*	Oregon Forest Snail
Snails & Slugs	Gastropoda	Polygyridae	*Cryptomastix devia*	Puget Oregonian
Snails & Slugs	Gastropoda	Polygyridae	*Cryptomastix germana*	Pygmy Oregonian
Snails & Slugs	Gastropoda	Polygyridae	*Vespericola columbianus*	Northwest Hesperian
Snails & Slugs	Gastropoda	Pristilomatidae	*Pristiloma stearnsii*	Striate Tightcoil
Snails & Slugs	Gastropoda	Vertiginidae	*Columella edentula*	Toothless Column
Snakeflies	Raphidioptera		*sp. 1*	Snakefly
Spiders	Araneae	Agelenidae	*Agelenopsis sp. 1*	Funnel web spiders
Spiders	Araneae	Agelenidae	*Calymmaria sp. 1*	Funnel web spiders
Spiders	Araneae	Agelenidae	*Cicurina pusilla*	Funnel web spiders
Spiders	Araneae	Agelenidae	*Cicurina sp. 1*	Funnel web spiders
Spiders	Araneae	Agelenidae	*Cryphoeca exlineae*	Funnel web spiders
Spiders	Araneae	Agelenidae	*Cybaeus sp.*	Funnel web spiders
Spiders	Araneae	Amaurobiidae	*Callobius pictus*	Spider
Spiders	Araneae	Amaurobiidae	*Callobius sp. 1*	Spider
Spiders	Araneae	Araneidae	*Araneus sp. 1*	
Spiders	Araneae	Araneidae	*Cyclosa conica*	
Spiders	Araneae	Clubionidae	*Clubiona sp. 1*	
Spiders	Araneae	Clubionidae	*Phruotimpus borealis*	
Spiders	Araneae	Dictynidae	*Dictyna sp. 1*	Spider
Spiders	Araneae	Gnaphosidae	*Zelotes fratris*	Ground spiders
Spiders	Araneae	Hahniidae	*Hahnia cinerea*	Dwarf sheet spider
Spiders	Opiliones	Ischyropsalididae	*Hesperonemastoma modestum*	Harvestmen
Spiders	Opiliones	Ischyropsalididae	*Sabacon occidentalis*	Harvestmen

TABLE 2 - CONFIRMED TERRESTRIAL AND AQUATIC INVERTEBRATES FOR THE LOWER WHITE RIVER BMA				
	Order	**Family**	**Genus/Species**	**Common**
Spiders	Araneae	Linyphiidae	*Ceratinella sp. 1*	Sheeweb weavers
Spiders	Araneae	Linyphiidae	*Entelecara acuminata*	Sheeweb weavers
Spiders	Araneae	Linyphiidae	*Lepthyphantes zibus*	Sheeweb weavers
Spiders	Araneae	Linyphiidae	*Neriene litigiosa*	Sheeweb weavers
Spiders	Araneae	Linyphiidae	*Wubana pacifica*	Sheeweb weavers
Spiders	Araneae	Lycosiadae	*Pardosa dosuncata*	Wolf spiders
Spiders	Araneae	Lycosiadae	*Pardosa vancouveri*	Wolf spiders
Spiders	Araneae	Lycosiadae	*Tarentula kochii*	Wolf spiders
Spiders	Opiliones	Phalangiidae	*Leptobunus sp. 1*	Harvestmen
Spiders	Opiliones	Phalangiidae	*Paraplatybunus triangularis*	Harvestmen
Spiders	Araneae	Salticidae	*Calticus scenicus*	
Spiders	Araneae	Salticidae	*Evarcha proszynskii*	
Spiders	Araneae	Salticidae	*Neon reticulatus*	
Spiders	Araneae	Salticidae	*Phanias albeolus*	Jumping spiders
Spiders	Araneae	Tetragnathidae	*Metellina curtisi*	
Spiders	Araneae	Tetragnathidae	*Tetragnatha laboriosa*	
Spiders	Araneae	Theridiidae	*Enoplognatha ovata*	
Spiders	Araneae	Theridiidae	*Theridion bimaculatum*	
Spiders	Araneae	Theridiidae	*Theridion sexpunctatum*	
Spiders	Araneae	Theridiidae	*Theridion simile*	
Spiders	Araneae	Theridiidae	*Theridion tinctum*	
Spiders	Araneae	Theridiidae	*Theridion varians*	
Spiders	Araneae	Thomisidae	*Misumena vatia*	Crab spiders
Spiders	Araneae	Thomisidae	*Ozyptila pacifica*	Crab spiders
Spiders	Araneae	Thomisidae	*Philodromus dispar*	Crab spiders
Spiders	Araneae	Thomisidae	*Philodromus josemitensis*	Crab spiders
Spiders	Araneae	Thomisidae	*Xysticus pretiosus*	Crab spiders
Stoneflies	Plecoptera	Chloroperlidae	*Sweltsa*	
True bugs	Hemiptera			True bug
True bugs	Heteroptera	Miridae		Plant bug
Worms	Oligochaeta		*sp. 1*	
Worms	Oligochaeta			Earth worms

Confirmed Plant Species

During the bioblitz event of June 2006 plant specialists collected a variety of native and introduced plant species within the Lower White River BMA. A complete listing of native plants is detailed in Table 3. Table 4 provides a list of introduced plant species.

TABLE 3 - 2006, 2007 LOWER WHITE RIVER BIOBLITZ PLANT INVENTORY		
Common name	**Scientific name**	**Plant family**
Big-leaf maple	*Acer macrophyllum*	Aceraceae
Vine maple	*Acer circinatum*	Aceraceae
American waterplantain	*Alisma plantago-aquatica*	Alismataceae
Cow parsnip	*Heracleum lanatum*	Apiaceae
Sweet cicely	*Osmorhiza chilensis*	Apiaceae
Water parsley	*Oenanthe sarmentosa*	Apiaceae
Western sweet-cicely	*Osmorhiza occidentalis*	Apiaceae
Devil's club	*Oplopanax horridum*	Araliaceae
Wild ginger	*Asarum caudatum*	Aristolochiaceae
Coltsfoot	*Petasites frigidus*	Asteraceae
Composite sp.	*Composite sp.*	Asteraceae
Douglas' sagewort	*Artemesia douglasiana*	Asteraceae
Hawksbeard sp.	*Crepis sp.*	Asteraceae
Pearly everlasting	*Anaphalis margaritacea*	Asteraceae
Suksdorf's sagewort	*Artemesia suksdorfii*	Asteraceae
White-flowered hawkweed	*Hieracium albiflorum*	Asteraceae
Yarrow	*Achillea millifolium*	Asteraceae
Cascade Oregongrape	*Berberis nervosa*	Berberidaceae
Tall Oregongrape	*Berberis aquifolium*	Berberidaceae
Vanilla leaf	*Achlys triphylla*	Berberidaceae
Hazelnut	*Corylus cornuta*	Betulaceae
Red alder	*Alnus rubra*	Betulaceae
Forget-me-not	*Myosotis sylvatica*	Boraginaceae
Small-flowered forget-me-not	*Myosotis laxa*	Boraginaceae
American wintercress	*Barbarea orthoceras*	Brassicaceae
Bittercress	*Cardamine sp.*	Brassicaceae
Field pepperweed	*Lepidium campestre*	Brassicaceae
Little Western bittercress	*Cardamine hirsuta*	Brassicaceae
Spring beauty	*Cardamine pulcherrima*	Brassicaceae
Spring whitlow-grass	*Draba verna*	Brassicaceae
Butterflybush	*Buddleja davidsonii*	Buddlejaceae
Different-leaved water-starwort	*Callitriche heterophylla*	Callitrichaceae
Pond water-starwort	*Callitriche stagnalis*	Callitrichaceae
Common snowberry	*Symphoricarpos albus*	Caprifoliaceae
Creeping snowberry	*Symphoricarpos mollis*	Caprifoliaceae
Orange honeysuckle	*Lonicera ciliosa*	Caprifoliaceae
Red elderberry	*Sambucus racemosa*	Caprifoliaceae
Twinberry	*Lonicera involucrata*	Caprifoliaceae
Twinflower	*Linnaea borealis*	Caprifoliaceae
Crisped starwort	*Stellaria crispa*	Caryophyllaceae
Munchkin chickweed	*Moenchia erecta (Kozloff)*	Caryophyllaceae
Northern starwort	*Stellaria calycantha*	Caryophyllaceae
Pacific dogwood	*Cornus nuttallii*	Cornaceae
Red-osier dogwood	*Cornus stolonifera*	Cornaceae
Pacific stonecrop	*Sedum divergens*	Crassulaceae
Spearleaf stonecrop	*Sedum lanceolatum*	Crassulaceae
Western red cedar	*Thuja plicata*	Cupressaceae
Dewey's sedge	*Carex deweyana*	Cyperaceae
Henderson's sedge	*Carex hendersonii*	Cyperaceae

TABLE 3 - 2006, 2007 LOWER WHITE RIVER BIOBLITZ PLANT INVENTORY		
Common name	**Scientific name**	**Plant family**
Sawbeak sedge	*Carex stipata*	Cyperaceae
Sedge	*Carex sp.*	Cyperaceae
Slough sedge	*Carex obnupta*	Cyperaceae
Small-flowered bulrush	*Scirpus microcarpus*	Cyperaceae
Woolgrass	*Scirpus cyperinus*	Cyperaceae
Common horsetail	*Equisetum arvense*	Equisetaceae
Giant horsetail	*Equisetum telmateia*	Equisetaceae
Scouring rush	*Equisetum hyemale*	Equisetaceae
Water horsetail	*Equisetum fluviatile*	Equisetaceae
Bearberry	*Arctostaphylos uva-ursi*	Ericaceae
Pacific madrone	*Arbutus menziesii*	Ericaceae
Pink wintergreen	*Pyrola asarifolia*	Ericaceae
Red huckleberry	*Vaccinium parvifolium*	Ericaceae
Salal	*Gaultheria shallon*	Ericaceae
Single-flowered indian pipe	*Monotropa uniflora*	Ericaceae
American vetch	*Vicia americana*	Fabaceae
Clover	*Trifolium sp.*	Fabaceae
Miniature lotus	*Lotus micranthus*	Fabaceae
Tiny vetch	*Vicia tetrasperma*	Fabaceae
Two-color lupine	*Lupinus bicolor*	Fabaceae
Vetch sp.	*Vicia sp.*	Fabaceae
Black oak	*Quercus sp.*	Fagaceae
Bleeding heart	*Dicentra formosa*	Fumariaceae
Western corydalis	*Corydalis scouleri*	Fumariaceae
Coast black gooseberry	*Ribes divaricatum*	Grossulariaceae
Gummy gooseberry	*Ribes lobbii*	Grossulariaceae
Prickly currant	*Ribes lacustre*	Grossulariaceae
Red-flowered currant	*Ribes sanguinium*	Grossulariaceae
Mock-orange	*Philadelphus lewisii*	Hydrangeaceae
Pacific waterleaf	*Hydrophyllum tenuipes*	Hydrophyllaceae
Small-flowered nemophila	*Nemophila parviflora*	Hydrophyllaceae
Daggerleaf rush	*Juncus ensifolius*	Juncaceae
Field woodrush	*Luzula campestris*	Juncaceae
Rush sp.	*Juncus sp.*	Juncaceae
Slender rush	*Juncus tenuis*	Juncaceae
Small-flowered woodrush	*Luzula parviflora*	Juncaceae
Soft rush	*Juncus effusus*	Juncaceae
Cooley's hedge-nettle	*Stachys cooleyae*	Lamiaceae
Hedge nettle	*Stachys sp.*	Lamiaceae
Self-heal	*Prunella vulgaris*	Lamiaceae
Great duckweed	*Spirodela polyrhiza*	Lemnaceae
Water lentil	*Lemna minor*	Lemnaceae
Clasping-leaved twisted-stalk	*Streptopus amplexifolius*	Liliaceae
False lily-of-the-valley	*Maianthemum dilatatum*	Liliaceae
False Solomon's seal	*Smilacina racemosa*	Liliaceae
Hooker fairy-bell	*Disporum hookeri*	Liliaceae
Star-flowered Solomon's seal	*Smilacina stellata*	Liliaceae

TABLE 3 - 2006, 2007 LOWER WHITE RIVER BIOBLITZ PLANT INVENTORY		
Common name	**Scientific name**	**Plant family**
White trillium	*Trillium ovatum*	Liliaceae
Oregon ash	*Fraxinus latifolia*	Oleaceae
Privet sp.	*Liquistrium sp.*	Oleaceae
Enchanter's nightshade	*Circaea alpina*	Onagraceae
Evening primrose	*Oenothera biennis*	Onagraceae
Fireweed	*Epilobium angustifolium*	Onagraceae
Rattlesnake-plantain	*Goodyera oblongifolia*	Orchidaceae
Oregon oxalis	*Oxalis oregana*	Oxalidaceae
California poppy	*Eschcholzia californica*	Papaveraceae
2 needle pine	*Pinus sp.*	Pinaceae
Douglas fir	*Pseudotsuga menziesii*	Pinaceae
Grand fir	*Abies grandis*	Pinaceae
Lodgepole pine	*Pinus contorta*	Pinaceae
Sitka spruce	*Picea sitchensis*	Pinaceae
Western hemlock	*Tsuga heterophylla*	Pinaceae
Annual bluegrass	*Poa annua*	Poaceae
Blue wild rye	*Elymus glaucus*	Poaceae
Brome sp.	*Bromus sp.*	Poaceae
Common brome	*Bromus vulgaris*	Poaceae
Hairy brome	*Bromus commutatus*	Poaceae
Mannagrass	*Glyceria sp.*	Poaceae
Nodding trisetum	*Trisetum cernuum*	Poaceae
Northern mannagass	*Glyceria borealis*	Poaceae
Pacific brome	*Bromus pacificus*	Poaceae
Roughstalk bluegrass	*Poa trivialis*	Poaceae
Water foxtail	*Alopecurus geniculatus*	Poaceae
Western fescue	*Festuca occidentalis*	Poaceae
Bracken	*Pteridium aquilinum*	Polypodiaceae
Deer fern	*Blechnum spicant*	Polypodiaceae
Lady fern	*Athyrium filix-femina*	Polypodiaceae
Licorice fern	*Polypodium glycyrrhiza*	Polypodiaceae
Maidenhair fern	*Adiantum pedatum*	Polypodiaceae
Oak fern	*Gymnocarpium dryopteris*	Polypodiaceae
Spreading wood-fern	*Dryopteris austriaca*	Polypodiaceae
Sword fern	*Polystichum munitum*	Polypodiaceae
Candyflower	*Montia siberica*	Portulacaceae
Miner's lettuce	*Montia perfoliata*	Portulacaceae
Water chickweed	*Montia fontana*	Portulacaceae
	Montia parvigez (Kozloff)	Portulacaceae
Broadleaved starflower	*Trientalis latifolia*	Primulaceae
Baneberry	*Actaea rubra*	Ranunculaceae
Little buttercup	*Ranunculus uncinatus*	Ranunculaceae
Cascara	*Rhamnus purshiana*	Rhamnaceae
Baldhip rose	*Rosa gymnocarpa*	Rosaceae
Black hawthorn	*Crataegus douglasii*	Rosaceae

TABLE 3 - 2006, 2007 LOWER WHITE RIVER BIOBLITZ PLANT INVENTORY		
Common name	**Scientific name**	**Plant family**
Blackcap	*Rubus leucodermis*	Rosaceae
Cherry	*Prunus sp.*	Rosaceae
Coastal strawberry	*Fragaria chiloensis*	Rosaceae
Field strawberry	*Fragaria virginiana*	Rosaceae
Goatsbeard	*Aruncus sylvester*	Rosaceae
Hardhack	*Spiraea douglasii*	Rosaceae
Indian plum	*Oemlaria cerasiformus*	Rosaceae
Large-leaved avens	*Geum macrophyllum*	Rosaceae
Nootka rose	*Rosa nutkana*	Rosaceae
Ocean spray	*Holodiscus discolor*	Rosaceae
Ornamental rose	*Rosa sp.*	Rosaceae
Pacific crabapple	*Malus fusca*	Rosaceae
Pacific ninebark	*Physocarpus capitatus*	Rosaceae
Pacific silverweed	*Potentilla pacifica*	Rosaceae
Pear	*Pyrus communis*	Rosaceae
Salmonberry	*Rubus spectabilus*	Rosaceae
Serviceberry	*Amelanchier alnifolia*	Rosaceae
Sour cherry	*Prunus cerasus*	Rosaceae
Thimbleberry	*Rubus parviflorus*	Rosaceae
Western lady's mantle	*Alchemilla occidentalis*	Rosaceae
Western lady's mantle	*Aphanes arvensis*	Rosaceae
Wild blackberry	*Rubus ursinus*	Rosaceae
Wild strawberry	*Fragaria vesca*	Rosaceae
Cleavers	*Galium aparine*	Rubiaceae
Fragrant bedstraw	*Galium triflorum*	Rubiaceae
Black cottonwood	*Populus trichocarpa*	Salicaceae
Hooker's willow	*Salix hookeriana*	Salicaceae
Pacific willow	*Salix lasiandra*	Salicaceae
Quaking aspen	*Populus tremuloides*	Salicaceae
Scouler willow	*Salix scouleriana*	Salicaceae
Sitka willow	*Salix sitchensis*	Salicaceae
Willow	*Salix sp.*	Salicaceae
Fringecup	*Tellima grandiflora*	Saxifragaceae
Leafy miterwort	*Mitella caulescens*	Saxifragaceae
Youth-on-age	*Tolmiea menziesii*	Saxifragaceae
American brooklime	*Veronica americana*	Scrophulariaceae
Purslane speedwell	*Veronica peregrina*	Scrophulariaceae
Thyme-leaf speedwell	*Veronica serpyllifolia*	Scrophulariaceae
Water speedwell	*Veronica anagallis-aquatica*	Scrophulariaceae
Black nightshade	*Solanum nigrum*	Solanaceae
Common cattail	*Typha latifolia*	Typhaceae
Stinging nettle	*Urtica dioica*	Urticaceae
Stream violet	*Viola glabella*	Violaceae

TABLE 4 - 2006, 2007 LOWER WHITE RIVER BIOBLITZ PLANT INVENTORY (* NON-NATIVE/INTRODUCED PLANTS)		
Common name	**Scientific name**	**Plant family**
Sugar maple	*Acer saccharum**	Aceraceae
Daffodil	*Narcissus pseudonarcissus**	Amaryllidaceae
Chervil	*Anthriscus scandicina**	Apiaceae
Poison hemlock	*Conium maculatum**	Apiaceae
English holly	*Ilex aquifolium**	Aquifoliaceae
English ivy	*Hedera helix**	Araliaceae
Bull thistle	*Circium vulgare**	Asteraceae
Canada thistle	*Circium arvense**	Asteraceae
Common burdock	*Arctium minus**	Asteraceae
Common groundsel	*Senecio vulgaris**	Asteraceae
Common tansy	*Tanacetum vulgare**	Asteraceae
Dandelion	*Taraxacum officinale**	Asteraceae
European daisy	*Bellis perennis**	Asteraceae
Field sowthistle	*Sonchus arvensis**	Asteraceae
Hairy cat's-ear	*Hypochaeris radicata**	Asteraceae
Nipplewort	*Lapsana communis**	Asteraceae
Ox-eye daisy	*Chrysanthemum leucanthemum**	Asteraceae
Spotted knapweed	*Centaurea maculosa**	Asteraceae
Tansy ragwort	*Senecio jacobaea**	Asteraceae
Wall lettuce	*Lactuca muralis**	Asteraceae
Common forget-me-not	*Myosotis scorpioides**	Boraginaceae
Yellow & blue forget-me-not	*Myosotis discolor**	Boraginaceae
Common mustard	*Brassica campestris**	Brassicaceae
Hedge mustard	*Sisymbrium officinale**	Brassicaceae
Pepper weed	*Lepidium campestre**	Brassicaceae
Shepherd's purse	*Capsella bursa-pastoris**	Brassicaceae
Teesdalia	*Teesdalia nudicaulis**	Brassicaceae
Thale cress	*Arabidopsis thaliana**	Brassicaceae
Common chickweed	*Stellaria media**	Caryophyllaceae
Mouse-ear chickweed	*Cerastium vulgatum**	Caryophyllaceae
Sticky chickweed	*Cerastium viscosum**	Caryophyllaceae
Field morning-glory	*Convolvulus arvensis**	Convolvulaceae
Teasel	*Dipsacus sylvestris**	Dipsacaceae
Birdsfoot trefoil	*Lotus corniculatus**	Fabaceae
Black medic	*Medicago lupulina**	Fabaceae
Common vetch	*Vicia sativa**	Fabaceae
Cow vetch	*Vicia cracca**	Fabaceae
Everlasting peavine	*Lathyrus latifolius**	Fabaceae
Least hop clover	*Trifolium dubium**	Fabaceae
Red clover	*Trifolium pratense**	Fabaceae
Scot's broom	*Cytisus scoparius**	Fabaceae
Tiny vetch	*Vicia hirsuta**	Fabaceae
White clover	*Trifolium repens**	Fabaceae
White sweet-clover	*Melilotus alba**	Fabaceae
Cut-leaf geranium	*Geranium dissectum**	Geraniaceae
Dovefoot geranium	*Geranium molle**	Geraniaceae
Filaree	*Erodium cicutarium**	Geraniaceae
Stinky Bob	*Geranium robertianum**	Geraniaceae

TABLE 4 - 2006, 2007 LOWER WHITE RIVER BIOBLITZ PLANT INVENTORY (* NON-NATIVE/INTRODUCED PLANTS)		
Common name	**Scientific name**	**Plant family**
Horse chestnut	*Aesculus hippocastaneum**	Hippocastanaceae
Klamath weed	*Hypericum perforatum**	Hypericaceae
Toad rush	*Juncus bufonius**	Juncaceae
Creeping Charlie	*Glecoma hederacea**	Lamiaceae
Red dead-nettle	*Lamium purpureum**	Lamiaceae
Grape hyacinth	*Muscari botryoides**	Liliaceae
Spanish squill	*Hyancinthoides hispanica**	Liliaceae
Hops	*Humulus lupulus**	Moraceae
Watson's willow-herb	*Epilobium cilatum**	Onagraceae
Watson's willow-herb	*Epilobium cilatum watsonii**	Onagraceae
Common plantain	*Plantago major**	Plantaginaceae
English plantain	*Plantago lanceolata**	Plantaginaceae
Barren fescue	*Festuca bromoides**	Poaceae
Bulbous bluegrass	*Poa bulbosa**	Poaceae
Common velvet grass	*Holcus lanatus**	Poaceae
Early hairgrass	*Aira praecox**	Poaceae
English ryegrass	*Lolium perenne**	Poaceae
Fowl bluegrass (meadow grass)	*Poa palustris**	Poaceae
Italian ryegrass	*Lolium multiflorum**	Poaceae
Kentucky bluegrass	*Poa pratensis**	Poaceae
Orchard grass	*Dactylis glomerata**	Poaceae
Quack grass	*Agropyron repens**	Poaceae
Rat-tail fescue	*Festuca myuros**	Poaceae
Reed canarygrass	*Phalaris arundinacea**	Poaceae
Silver hairgrass	*Aira caryophyllea**	Poaceae
Soft brome	*Bromus mollis**	Poaceae
Sweet vernalgrass	*Anthoxanthum odoratum**	Poaceae
Tall fescue	*Festuca arundinacea**	Poaceae
Bohemian knotweed	*Polygonum 1. bohemicum**	Polygonaceae
Broad-leaved dock	*Rumex obtusifolius**	Polygonaceae
Japanese knotweed	*Polygonum cuspidatum**	Polygonaceae
Sheep sorrel	*Rumex acetocella**	Polygonaceae
Sour dock	*Rumex crispus**	Polygonaceae
Creeping buttercup	*Ranunculus repens**	Ranunculaceae
Meadow buttercup	*Ranunculus acris**	Ranunculaceae
English hawthorn	*Crataegus monogyna**	Rosaceae
European mountain-ash	*Sorbus aucuparia**	Rosaceae
Evergreen blackberry	*Rubus laciniatus**	Rosaceae
Himalayan blackberry	*Rubus discolor**	Rosaceae
Japanese rambler rose	*Rosa multiflora**	Rosaceae
Ornamental/cultivated Apple	*Pyrus malus**	Rosaceae
Sweet cherry	*Prunus avium**	Rosaceae
White poplar	*Populus alba**	Salicaceae
Common mullein	*Verbascum thapsus**	Scrophulariaceae
Common speedwell	*Veronica officinalis**	Scrophulariaceae

TABLE 4 - 2006, 2007 LOWER WHITE RIVER BIOBLITZ PLANT INVENTORY (* NON-NATIVE/INTRODUCED PLANTS)		
Common name	**Scientific name**	**Plant family**
Field veronica	*Veronica arvensis**	Scrophulariaceae
Foxglove	*Digatalis purpurea**	Scrophulariaceae
Ivy-leaved speedwell	*Veronica hederifolia**	Scrophulariaceae
Moth mullein	*Verbascum blattaria**	Scrophulariaceae
Bittersweet nightshade	*Solanum dulcamara**	Solanaceae

Demographics, Land Use (e.g. how the land is being utilized) and Growth Potential

It has been recognized that land use and human activities are the primary driver of habitat loss, introduction of exotic species, environmental degradation, and increased runoff and pollutants. These effects are exacerbated in urbanizing landscapes such as Pierce and King Counties where changes are both rapid and permanent. As such, a discussion of the current land use trends within the Lower White River BMA is essential to understanding impacts to the feasibility of retaining biodiversity within this area.

Existing Land Use and Population - Pierce

Currently there are 94 individual properties (tax parcels) located within the Lower White River BMA and according to year 2000 census data approximately 302 people live within the BMA. Land use on the Pierce County side of this BMA is predominately for utilities (Puget Sound Energy - 23%). The rest of the breakdown is parks/open space (9%), industrial (5%), low density single-family residential (3%), natural resources (3%) and commercial (.4%). Approximately 30% of the BMA is vacant land (i.e., no building on the parcel), 18% water bodies, and 8% classified as unknown. The remaining 48% are lands within King County. (See Figure 9 for Existing Land Use Map)

Existing Land Use and Population - King

The properties along the White River in unincorporated King County in and adjacent to the BMA are nearly all owned by Puget Sound Energy and all in riparian/floodplain forest (Table 5). Land use on the King County side of this BMA is predominately low density single-family residential (6%) and parks (5%) with a small amount of industrial (3%). Approximately ½ of the BMA (52%) is vacant land. See Figure 10 for Existing Land Use Map.

Table 5. Land Ownership in the Lower White River BMA within King County's jurisdiction.

Land Owner	**Acres within BMA**
King County	5.4
State of Washington-DNR	2.1
Puget Sound Energy	60.1
Other Private Ownership	15.3
Total	82.9

Table 6 provides a breakdown of existing land use on these parcels by categories such as residential, commercial, industrial, civic, and vacant lands. Note that the figures for King County are for geographic King County, meaning that they are not all in King County government's jurisdiction.

TABLE 6 – EXISTING LAND USES IN THE LOWER WHITE RIVER BMA					
Land Use	**Acreage (Pierce/King)**		**Total Parcels**		**% of the BMA**
Single-Family	19.76	30.18	10	103	3.13%
Mobile Homes	6.70	17.04	6	23	1.49%
Total Residential	**26.46**	**47.22**	**16**	**126**	**4.62%**
Commercial	**3.20**	**-**	**5**	**-**	**0.20%**
Industrial	**41.05**	**26.03**	**14**	**1**	**4.21%**
Communication/Utility	**194.40**	**60.1**	**15**	**2**	**15.97%**
Education (includes schools)	**-**	**7.91**	**-**	**1**	**0.50%**
Public & Quasi-Public Facility (churches)	**-**	**7.73**	**-**	**1**	**0.49%**
Parks, Open Space, Recreation	**74.26**	**34.43**	**9**	**3**	**6.82%**
Natural Resource					
Mining/Quarry/Ore	-	2.84	-	3	0.18%
Forestry	24.91	-	5	-	1.56%
Agriculture	-	0.05	-	1	
Total Natural Resource	**24.91**	**2.89**	**5**	**4**	**1.74%**
Vacant	**252.22**		**30**		**41.05%**
Vacant Single Family		328.75		68	20.63%
Vacant Multi-Family		3.92		4	0.25%
Vacant Commercial		69.10		4	4.34%
Vacant Industrial		0.01		1	
River/Creek/Stream*	**155.07**	**.97**	**12**	**1**	**9.79%**
Unknown/Other jurisdictions	**69.39**	**170.92**	**-**	**-**	**15.09%**
TOTAL LOWER WHITE RIVER AREA	**1,593.27**				**100%**

* Rivers are considered waters of the state and are not put into parcels. The acreage of Water is higher, but these numbers represent the amount of area in the BMA based within legal parcels.

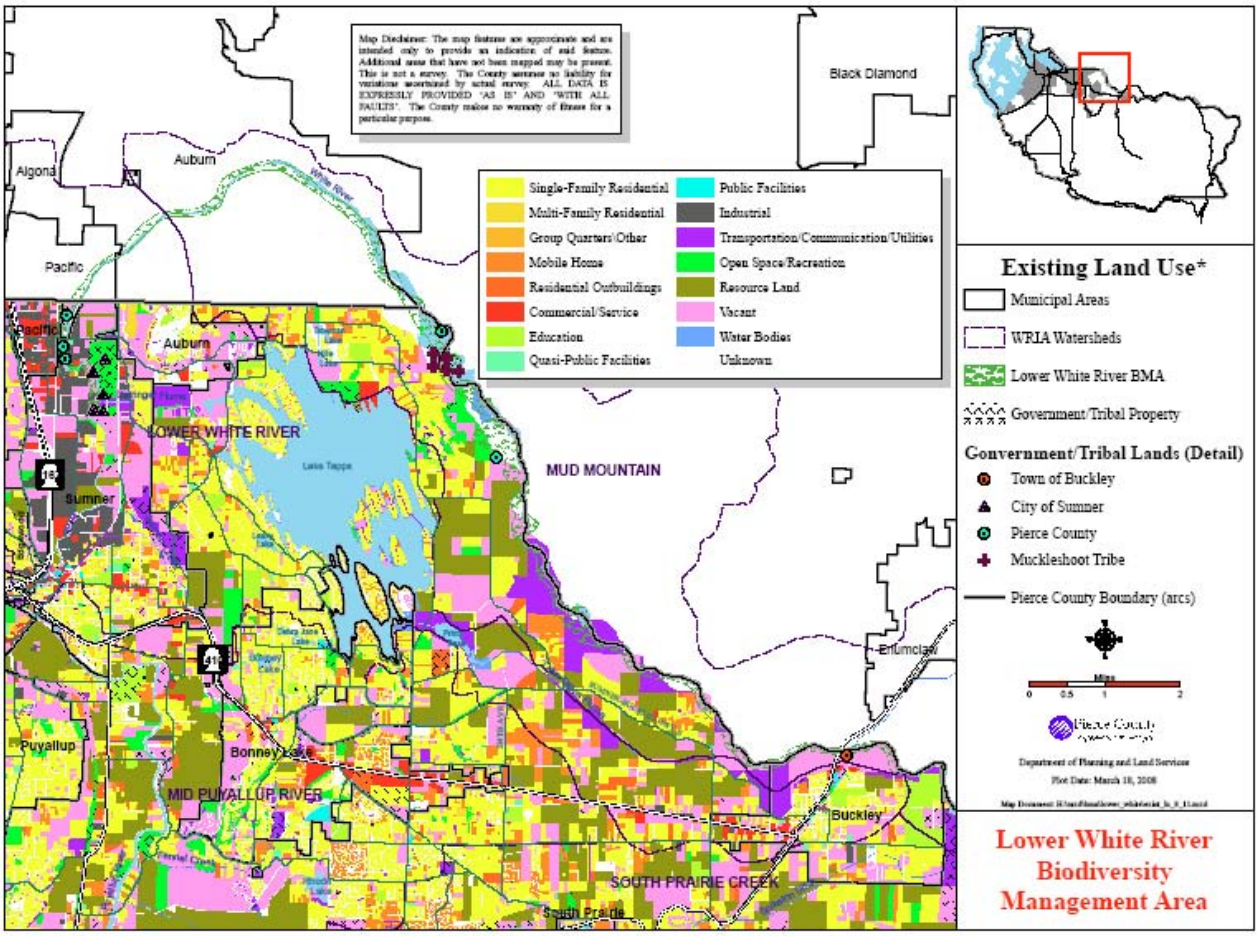

Figure 9 – Existing Land Use Pierce County

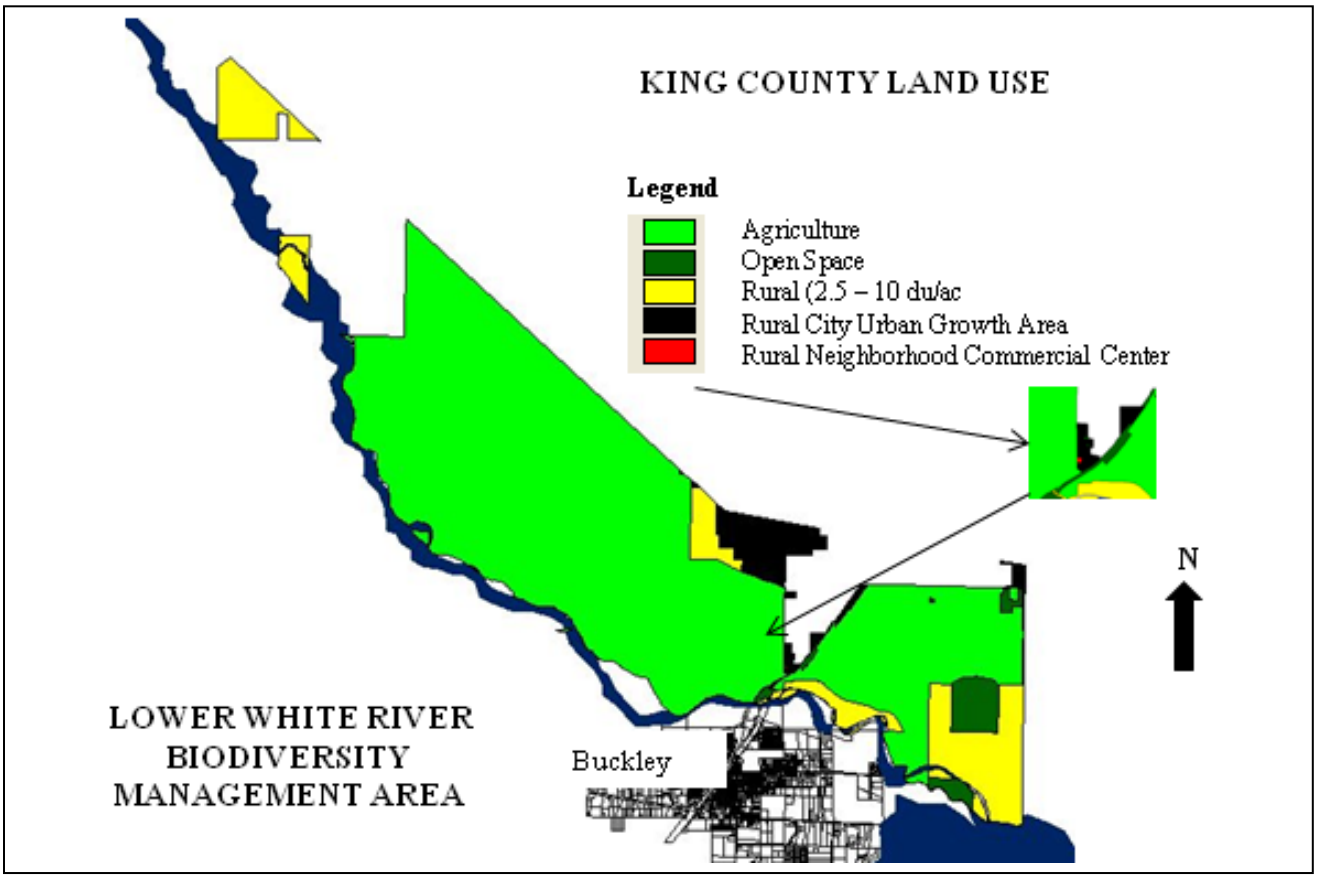

Figure 10 Existing Land Use – King County

There are fifteen properties located within or partially within the BMA that are publicly owned by local, state, and tribal governments. The Muckleshoot Tribe owns five properties containing 66 acres. Pierce County owns approximately 40 acres of land on five parcels of land. The City of Pacific owns 26 acres within their City Park. Buckley owns one property, 0.17 acres in size. The City of Sumner owns six parcels for a total of 9 acres. Table 7 provides a breakdown of publicly owned lands within the Lower White River BMA in Pierce County.

There are twenty-three properties located within or partially within the BMA within geographic King County that are publicly owned (Table 8). Of these, only 3 properties owned by King County totaling approximately 16 acres are within King County's jurisdiction.

<u>Current Zoning and Shoreline Environments</u>

Zoning

On the Pierce County side, very small portions of the Lower White River BMA are located within Pacific (14 acres), Sumner (78 acres), and Buckley (69 acres) and the remaining area is located in unincorporated Pierce County. Within unincorporated Pierce County, the BMA is predominately zoned Rural 10 (R10) and Employment Centers (EC). A small portion of a parcel is zoned Agricultural Resource Land (ARL). (See Figure 11 – Zoning Map) The Rural 10 zone allows for densities of 1 dwelling unit (du) per 10 acres with a bonus density of 2 du/10 acres when 50% of the property is set aside as permanent open space.

Lot sizes within the R10 zone must be a minimum of 1 acre in size. Employment Centers allow a wide variety of industrial uses with some limited commercial uses. The ARL is a resource lands zone that allows densities of 1 du/10 acres with minimum lot sizes of 10 acres. Table 9 provides a breakdown of the zones that apply within the BMA.

Lands in the BMA, as it is currently drawn, in *unincorporated* King County (and outside the Muckleshoot Indian Reservation) are within either the Agriculture Production District (APD) or are in RA-10 zoning (Table 10). The zoning in the APD is A-35: Agricultural, one dwelling unit per 35 acres. The zoning in RA-10 has a 10-acre minimum parcel size, except for smaller parcels that were already established when zoning was established.

TABLE 7 – LOWER WHITE RIVER BMA PUBLIC LANDS (PIERCE & KING COUNTY)				
Parcel Number	**Total Area**		**Area Within BMA Only**	
	# Parcels	**Acres**	**# Parcels**	**Acres**
Pierce County				
0520022011	1	12.40	1	12.29
0520123001	1	9.70	1	0.11
0420012003	1	25.98	1	25.29
0420013047	1	8.16	1	2.37
4495400422	1	2.52	1	0.42
Total Pierce County	**5**	**58.76**	**5**	**40.48**
City of Buckley				
0620344004	1	0.83	1	0.17
Total City of Buckley	**1**	**0.83**	**1**	**0.17**
City of Sumner				
0420121012	1	1.01	1	0.61
0420014059	1	10.89	1	7.24
0420014058	1	104.86	1	0.05
0420121003	1	5.25	1	0.29
0420121011	1	4.74	1	0.96
0420121010	1	9.84	1	0.06
Total City of Sumner	**6**	**136.59**	**6**	**9.21**
Muckleshoot Tribe				
0520023008	1	39.32	1	36.94
0520023012	1	3.20	1	0.13
0520023010	1	10.37	1	10.01
0520023002	1	16.16	1	6.80
0520024000	1	19.17	1	12.41
Total Muckleshoot Tribe	**5**	**88.22**	**5**	**66.29**
City of Pacific (King)				
3621049077	1	26.40	1	26.40
Total City of Pacific	**1**	**26.40**	**1**	**26.40**
TOTAL	**18**	**310.80**	**18**	**142.55**

Table 8. Lower White River BMA Public Lands within Geographic King County.

Public Agency	**Acres within BMA**
King County	251.3
City of Auburn	210.1
City of Pacific	2.2
United States-BIA	36.9
Grand Total	500.6

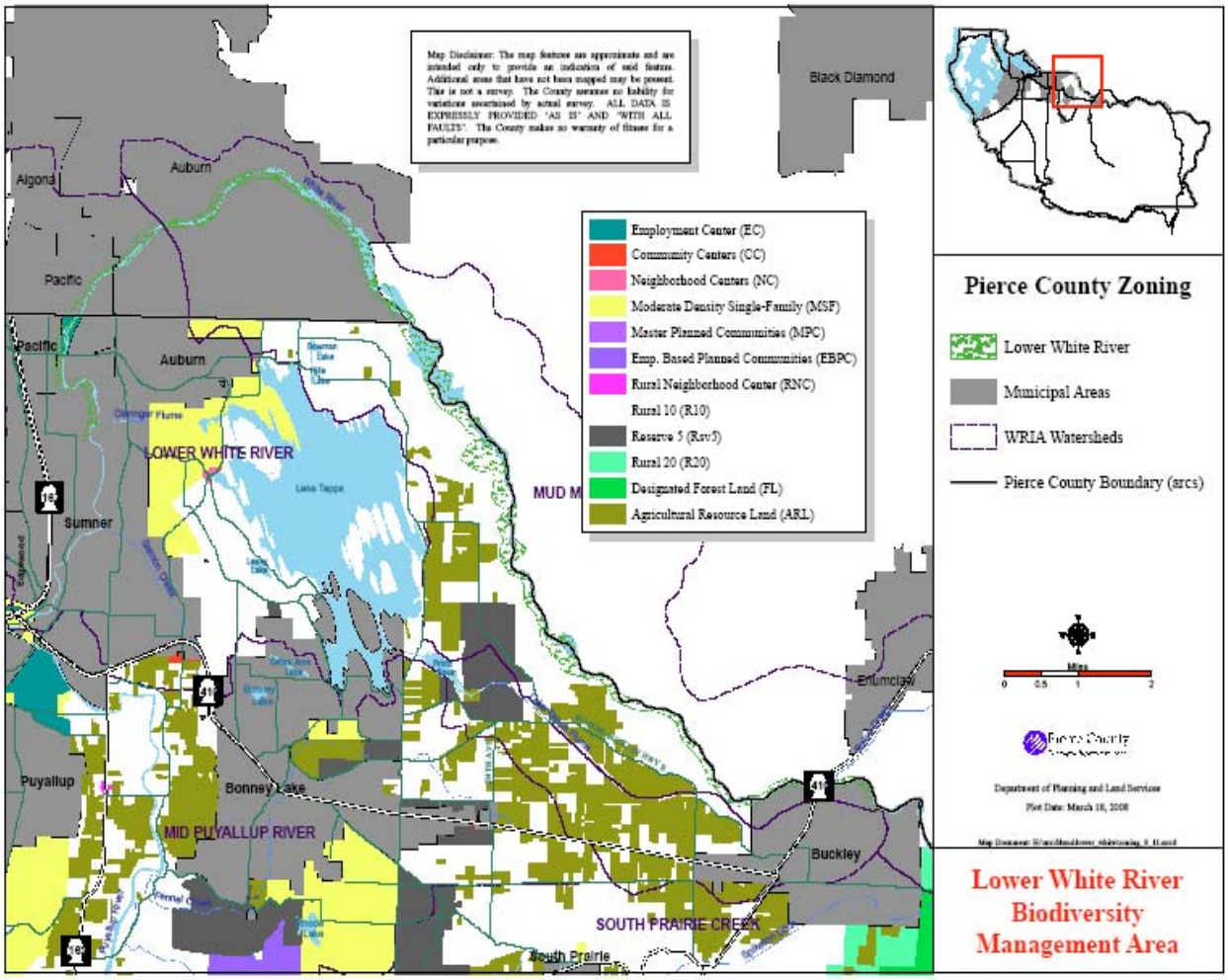

Figure 11. Pierce County Zoning Map

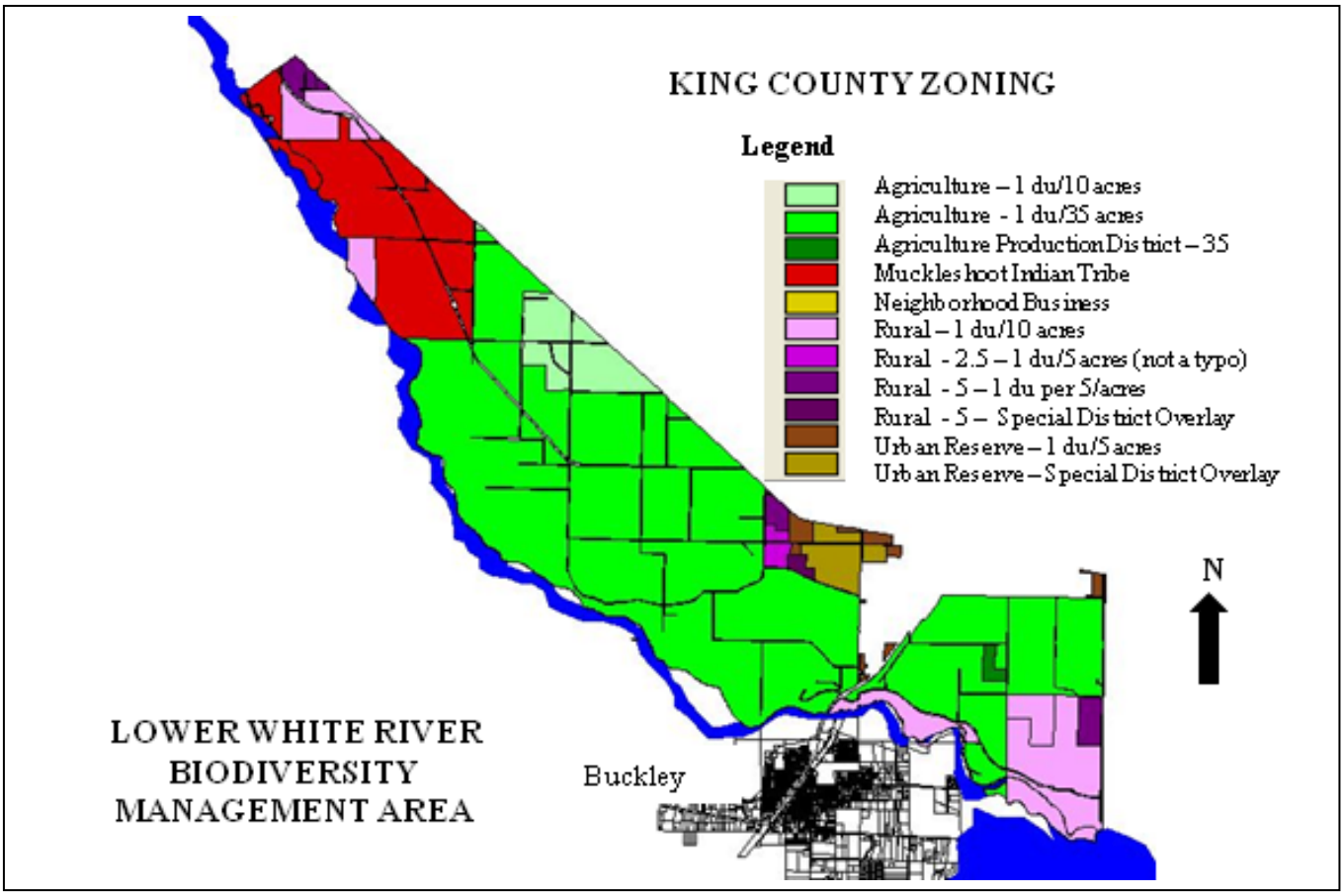

Figure 12. King County Zoning Map

TABLE 9 - PIERCE COUNTY ZONING CLASSIFICATIONS WITHIN THE LOWER WHITE RIVER BMA		
Zones	**Acreage**	**Percent of BMA**
Urban Zones (unincorporated Pierce County)		
EC	33.00	3.51%
Total Urban	**33.00**	**3.51%**
Rural Zones		
R10	747.14	79.37%
Total Rural	**747.14**	**79.37%**
Natural Resource Zones		
ARL	0.04	0.00%
Total Natural Resource	**0.04**	**0.00%**
Total Pierce County Unincorporated	**780.18**	**82.88%**
Pierce County Incorporated		
City of Buckley	69.46	7.38%
City of Pacific	13.80	1.46%
City of Sumner	77.95	8.28%
Total Pierce County Incorporated	**161.21**	**17.12%**
TOTAL PIERCE COUNTY	**941.39**	**100%**

Table 10. Zoning Classifications within the Lower White River BMA in Geographic King County.

Zoning Classification	Acres in BMA
A-35 (Agricultural Production District)	109.57
RA-10 (Rural, 10-acre minimum parcel size)	83.17
MIT (Muckleshoot Reservation; their zoning applies)	175.02
Grand Total	367.76

Shoreline Environments
The Washington State Shoreline Management Act (SMA) provides for the management of water bodies or watercourses identified as "Shorelines of the State." Areas under jurisdiction of the SMA include water courses with a mean annual flow of 20 cubic feet per second (cfs), lakes greater than 20 acres in size and the shorelines of Puget Sound. All lands within 200 feet of the ordinary high water mark, and associated wetlands and floodplains, fall within the jurisdiction of Shorelines of the State. The Pierce County Shoreline Management Program (SMP) and companion Shoreline Management Regulations (SMRs) designate Shorelines of the State into five types of environments including Urban, Residential Rural, Rural, Conservancy, and Natural. These environments are similar to zoning designations allowing different land uses, densities and activities ranging from the most intensive uses (Urban) to very limited uses (Natural).

The White River is considered a Shoreline of the State. The majority of the shorelines within the BMA are classified as Rural, Urban, and Conservancy. The classification of Rural shoreline in Pacific and Buckley, allows for areas which are presently used for intensive agricultural and recreation purposes or for those areas having the potential of supporting intensive agricultural and recreational development. This classification is intended to protect agricultural land from urban expansion, restrict intensive development along undeveloped shorelines, and encourage preservation of open spaces. A small section at the west tip of the BMA in Sumner is classified as Urban. Urban shorelines are areas of high intensity land use including residential, commercial and industrial development. These areas are presently subjected to intensive use pressure as well as those areas planned to accommodate urban expansion. Most of the river from the Muckleshoot tribe south towards Buckley is classified as Conservancy Environment, which allows for low density residential, outdoor recreation and low intensity agricultural and forestry uses. (See Figure 13 -Shorelines Environment Map).

The shoreline in this area within King County is designated as either Natural or Rural shoreline in the current (2004) Shoreline Management Master Program. However, shorelines were re-designated during an update of the program during 2007-2008, and the new Shoreline Master Program designations await King County Council approval. In the Draft Shoreline Master Program (2008), King County shorelines along the White River in this area are designated Resource Shoreline because they are within the Agricultural Production District. A small area outside the APD are designated Conservancy Shoreline. According to the draft code, the Resource shoreline designation is applied to allow for mining and agricultural uses on lands that have been designated under the Growth Management Act as agricultural land of long-term commercial significance or mineral resource lands. The Conservancy designation is applied to protect and conserve the shoreline for ecological, public safety, and recreation, purposes. It includes areas with important ecological processes and functions, valuable historic and cultural features, flood and geological hazards, agricultural and mineral resource lands, and recreational opportunities. Residential areas can be designated as conservancy shorelines. (See Figure 14 – Shorelines Management Map).

Open Space Corridors
Pierce County identifies land areas most desirable for open space purposes (See Figure 15 - Open Space Corridors Map). These areas represent the highest priority for lands for conservation including creeks, wetlands, and fish and wildlife habitat areas. The Lower White River BMA is included within the County's Open Space Corridor map because of its status as a biodiversity management area and because of the White River. Identified open space corridor areas may be used as the basis for application of special zoning that provides for greater environmental protection and less density. For example, Pierce County has applied a Rural Sensitive Resource (RSR) in rural areas (i.e. at least 50% of a parcel must fall within the open space corridor) and a Residential Resource (RR) in urban areas. In addition, extra points under Pierce County's Current Use Assessment and Conservation Futures Programs are awarded to

properties located within the open space corridor. All of these new environmentally sensitive zones were created as a result of the BMA work.

Future Growth Potential

Figure 16 – Potential Development Map indicates the parcels of land located within the Lower White River BMA that have a potential to subdivide and create additional lots. Each of these parcels is represented with an ID number. Table 8 provides a list of these parcels and indicates the parcel acreage, the potential total lots and the potential additional number of lots that may be possible given the Rural 10 zones provision for a maximum of two dwelling units per 10 acres if 50% of the property is set aside as open space. Given the County's provision for rounding up to the next whole number for anything greater than .5 any parcel of land greater than 7.5 acres would be able to subdivide. Of the 37 parcels of land within the Lower White River BMA, there are currently 33 parcels that could be subdivided with no bonus density for a potential total of 275 additional new lots. If landowners used the bonus density, those parcels could be subdivided for a potential total of 308 additional new lots. There could be additional development potential within the incorporated cities given what their zoning is and what the development provisions are for those zones.

Each of these lots could support a new residential home and associated driveways and accessory structures and all run along the river between Auburn and Buckley on the Pierce County side. Of the White River Basin, the Lower White River sub-basin has the highest percentage (14%) of impervious surface with a projected increase to 20% future land use converting open space to residential and commercial uses. This projected increase would be with the potential new lots within the Lower White River BMA.

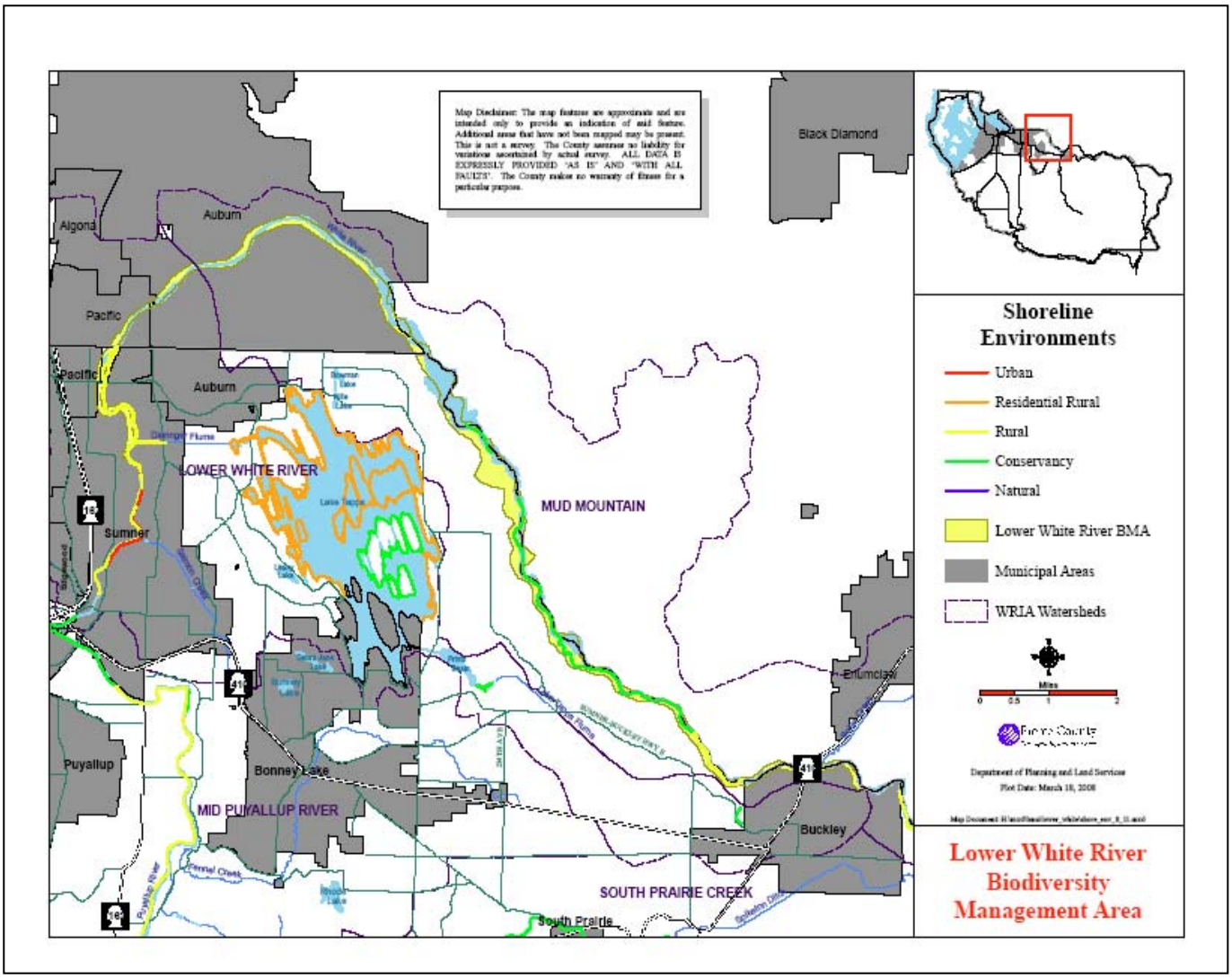

Figure 13. Shoreline Map – Pierce County

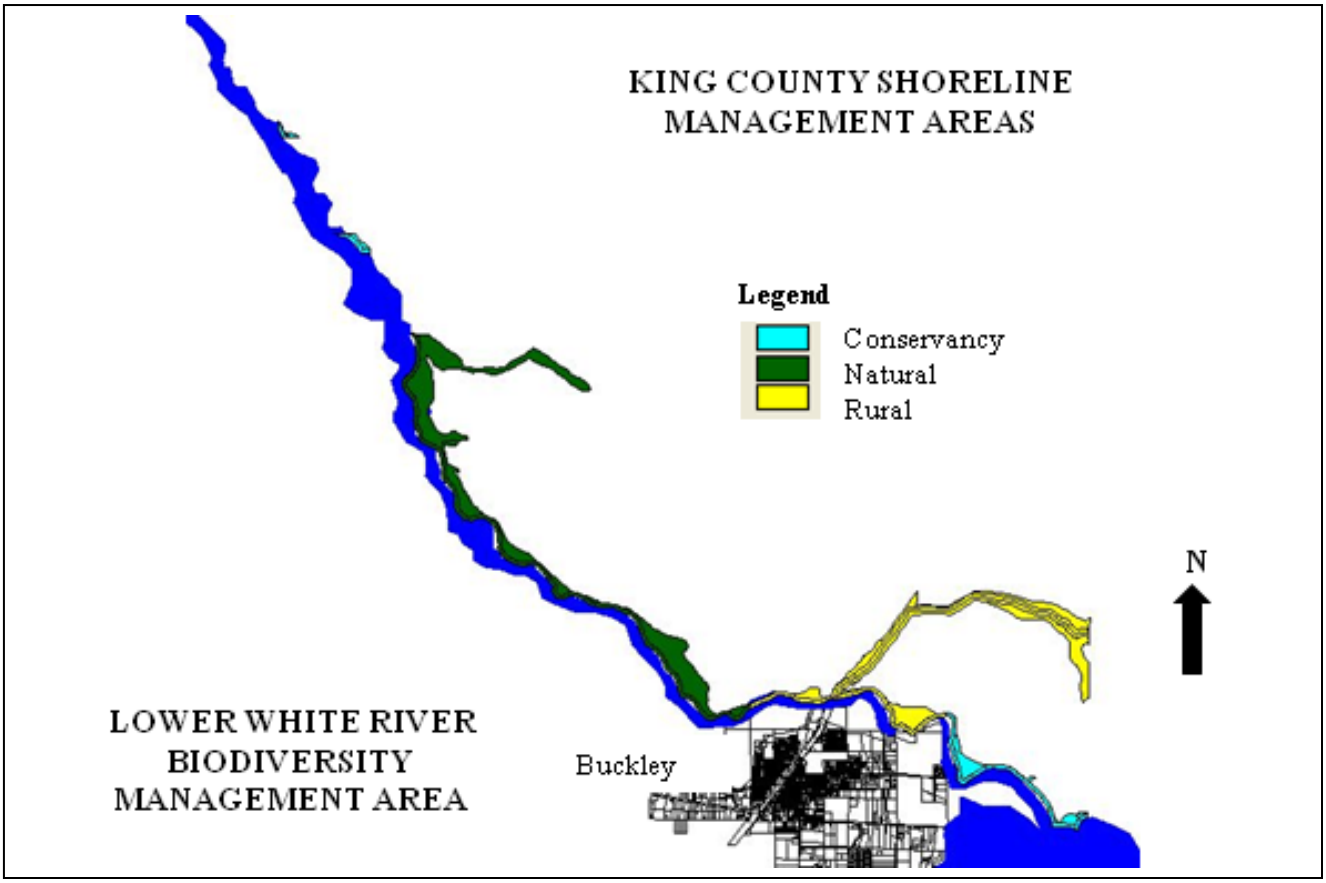

Figure 14. Shoreline Map – King County

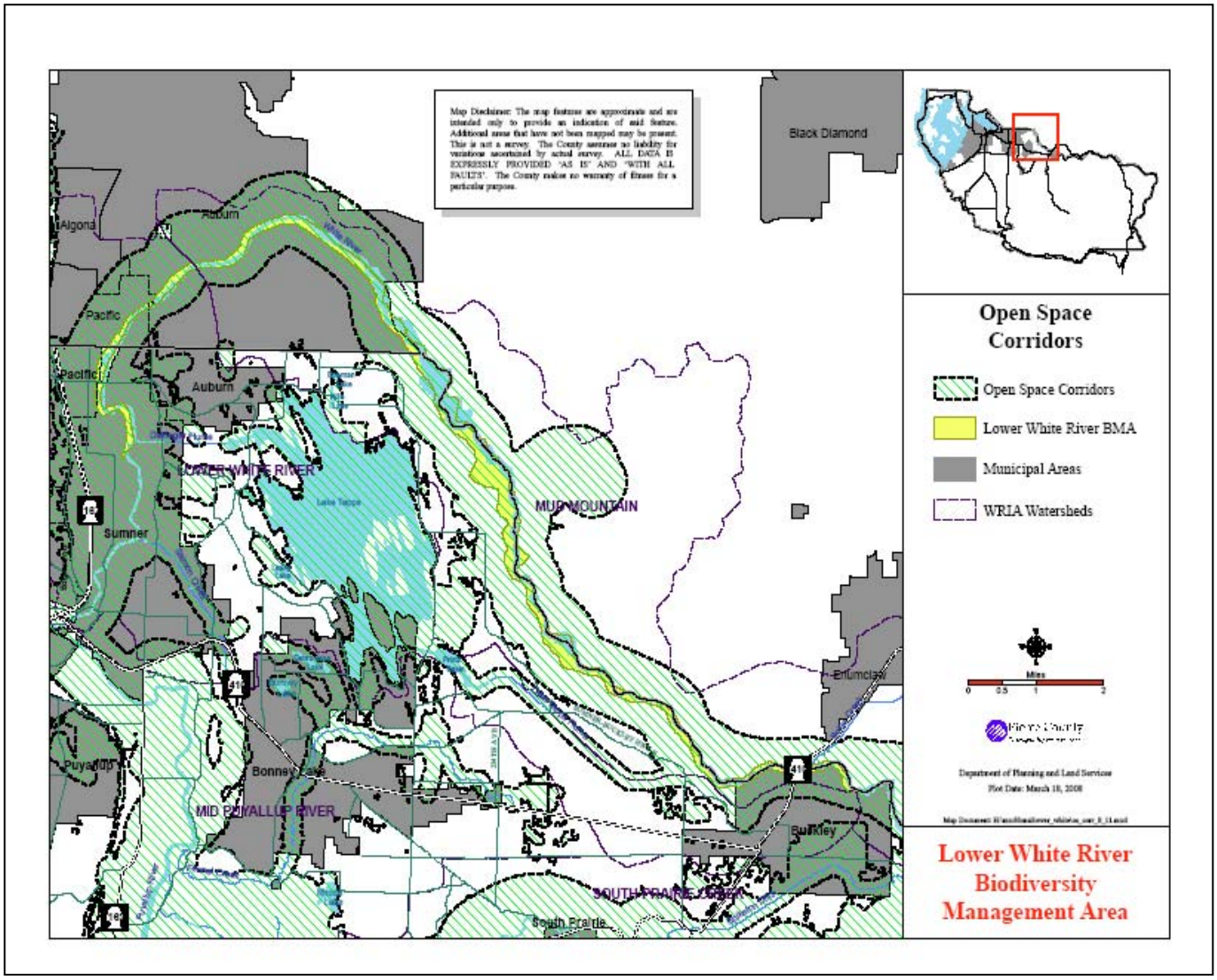

Figure 15. Open Space Corridor Map

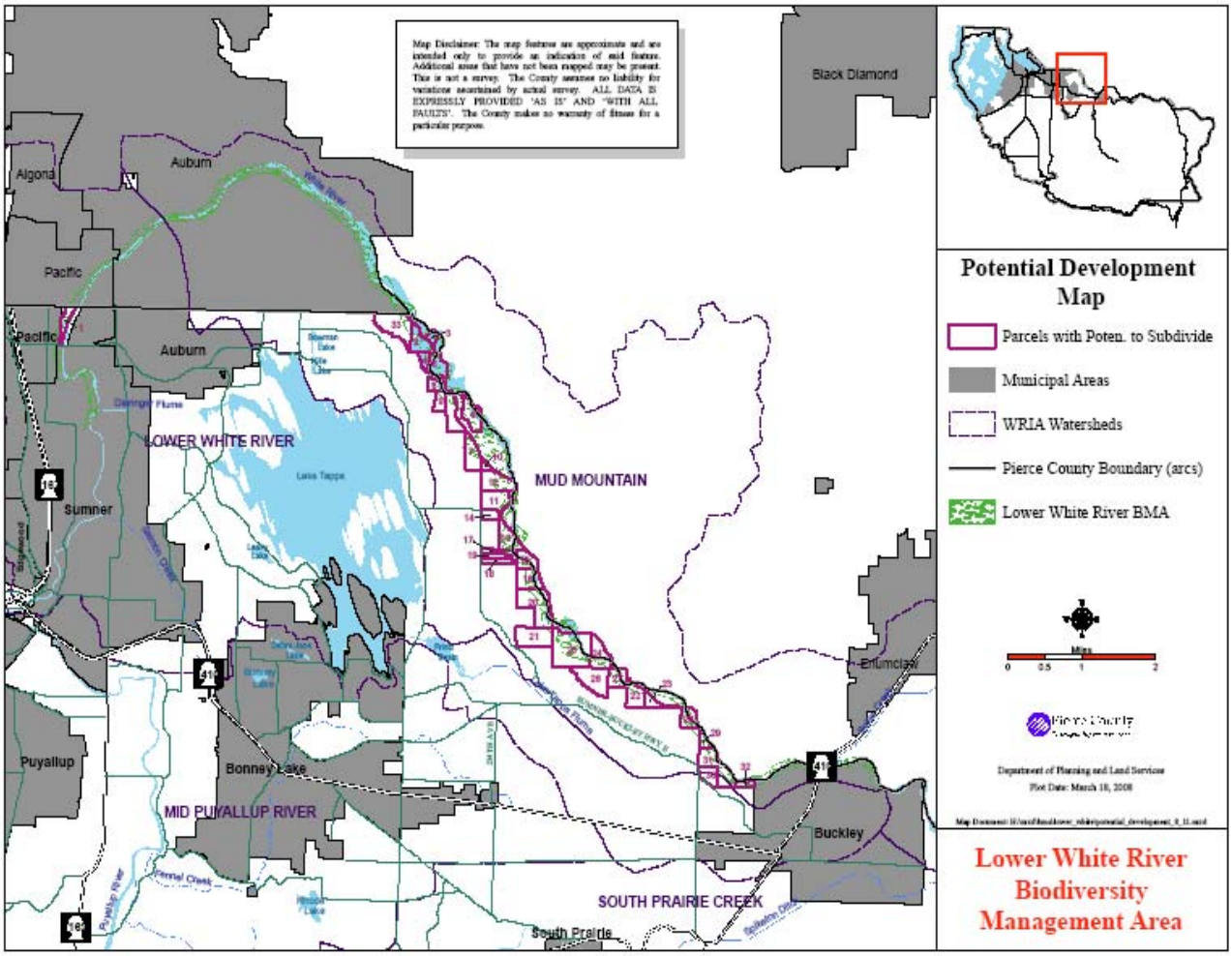

Figure 16. Potential Development Map – Pierce County

TABLE 11 – DEVELOPMENT POTENTIAL WITHIN LOWER WHITE RIVER BMA (PIERCE COUNTY UNINCORPORATED)				
Map ID #	**Parcel #**	**Acreage**	**Potential # of Total Lots[1]**	**Potential # of Additional Lots**
1	0420012003	25.20	5	4
2	0520022001	38.00	7	7
3	0520022011	10.78	2	1
4	0520023002	14.00	2	1
5	0520023007	17.50	3	2
6	0520023008	23.95	4	3
7	0520111000	115.85	23	22
8	0520111001	34.75	6	5
9	0520112012	25.75	5	4
10	0520123001	10.00	2	1
11	0520132000	58.90	11	10
12	0520132002	61.70	12	11
13	0520133000	51.30	10	9
14	0520133004	20.00	4	3
15	0520241000	32.90	6	5
16	0520241001	54.00	10	9
17	0520242021	20.00	4	3
18	0520242022	20.00	4	3
19	0520242023	20.00	4	3
20	0520244000	108.95	21	20
21	0520251001	80.20	16	15
22	0620293000	57.92	11	10
23	0620293001	20.00	4	3
24	0620301000	35.00	7	6
25	0620302000	127.80	25	24
26	0620303001	85.25	17	16
27	0620304000	40.00	8	7
28	0620321001	25.00	5	4
29	0620332000	45.00	9	8
30	0620333001	30.00	6	5
31	0620333002	120.00	24	23
32	0620334000	65.00	13	12
33	7001480280	90.32	18	17
TOTALS		**1,585.02**	**308**	**275**
1 – The number of total lots is based on maximum development potential in cases where the property owner utilizes the bonus density of 2 dwelling units per 10 acres with 50% of the parcel set aside as open space.				

Because of the zoning in this area, only five parcels that intersect the BMA in unincorporated King County (and outside the MIT Reservation) would potentially be able to be subdivided (Table 12).

Table 12. Development Potential within Lower White River BMA (King County Unincorporated).

PIN	Zoning	Present Use	Acres	No. possible lots
1120059001	RA10	Vacant(Single-family)	41.75	4
2420059001	A35	Vacant(Single-family)	71.54	2
1120059002	RA10	Vacant(Single-family)	34.75	3
3520069024	RA10	Farm	35.26	3
2420059002	A35	Vacant(Single-family)	71.64	2

Impacts of Growth and Development on Habitat and Species Presence

Future growth potential on the lands in unincorporated King County is somewhat limited by regulatory protections offered to critical areas present within the BMA. The entire BMA in King County is within a Critical Aquifer Recharge Area (CARA) and a seismic hazard area, and much of it is within an erosion hazard area. Portions of the BMA that are along the valley wall are within the slide hazard area. The BMA is also located within the 100-year floodplain of the White River.

The Lower White River BMA will only remain rich in species diversity if care is given to maintaining large enough habitat areas for species viability and good quality habitat conditions, including corridors for safe movement between primary and seasonal habitats. Stressors to habitat include a variety of factors such as:

- Fragmentation in habitat below the threshold for species viability due to land development, removal of vegetation, and roads
- Actions that change the hydrology within the watershed and specifically within the floodplain which especially affects amphibians, fish species, and wetland plant species
- Species mortality caused by vehicular traffic on roads and predation by non-native animals (cats, dogs, bullfrogs, non-native fish, etc.)
- Conversion of native vegetation to non-native and invasive plant species
- And other human actions that cause species mortality or negatively impact habitat, such as water or air quality changes.

Stressors to the Lower White River BMA are discussed in greater detail in Chapter III. In addition, the fate of the Puget Sound Energy (PSE) properties along the White River (totaling 2,500 acres) will play a critical role for the long-term protection of biodiversity within the Lower White River BMA. Negotiations between PSE and the Cascade Land Conservancy and other parties are ongoing to preserve this land. Most of the PSE properties were inventoried in the 2006 LWR Bioblitz. A report was prepared for the Cascade Land Conservancy identifying which parcels had the greatest potential for long-term conservation.

Chapter III - Conservation Targets and Threats

Overview of Conservation Targets and Threats

At a landscape level, conservation targets (systems) may include ecological systems, ecological communities, species, and other important natural resources. Ecological systems share common ecological processes (e.g. hydrology), environmental features (e.g. soil types), or environmental conditions (e.g. precipitation). Ecological communities have common or co-occurring features such as species or natural vegetation types. Other important factors in determining conservation targets include groundwater recharge, forest reserves, etc.[13]

Each conservation target has key ecological attributes that ensure the proper functioning of that system's occurrence in a landscape over the long-term. Key ecological attributes consist of size, condition (i.e. measure of the composition, structure and biotic interactions that characterize the occurrence), ecological processes (e.g. hydrologic regimes, fire regimes and other natural disturbances) and connectivity of target species to habitats and resources including dispersal or migration routes.

In an ideal situation, intact and properly functioning conservation targets are not significantly stressed. Stresses to a conservation target result in degradation and impairment of key ecological attributes and occur in a variety of ways from human impacts and other natural factors. The source(s) of the problem is what causes the stress to occur. Collectively, stresses and sources of stress are referred to as threats to the system.

In the Lower White River BMA several conservation targets were selected to represent the key ecological functions occurring throughout the area. These conservation targets include

- Lower White River
- Tributaries, wetlands, and oxbows
- Conifer/deciduous mixed forest areas.

Each of these conservation targets provides the systems that collectively create the rich variety of habitats necessary to foster a high level of biodiversity in that BMA. A detailed description of each conservation target and the threats to these systems follows. Conservation strategies to abate these threats are discussed in Chapter IV.

Lower White River

General Description of the Lower White River

The Lower White River riparian corridor is dominated by riparian habitat, with an overstory of hardwood and hardwood/conifer trees. The BMA begins north of Sumner, passes through an area recently restored by Pierce County, and continues northwards through the cities of Pacific and Auburn. Riverfront property just north of Pacific City Park in Auburn (east end of 3rd Ave SE) has resulted in some removal of native

[13] The concept of identification of conservation targets and key ecological attributes, threats (stresses and sources of stress), and threat abatement strategies (referred to here as "conservation strategies" to abate threats) is derived from The Nature Conservancy (TNC) 5-S conservation action planning methodology. However, this method has been adapted to acknowledge the fact that the BMA was already identified utilizing the GAP methodology and as such the conservation targets were selected based on review of the key ecological attributes within the BMA.

riparian vegetation. The dominant hardwood forest along this stretch of the river consists of willows, red alder, black cottonwood, black hawthorn, bigleaf maple, and Pacific dogwood. The BMA then continues through Auburn Game Farm Wilderness Park; an area dominated by native vegetation with a mix of hardwood and conifer trees with western hemlock, western redcedar, and Douglas fir the dominant conifers. Hazelnut, salmonberry, red elderberry, red osier dogwood, and invasive Himalayan and evergreen blackberries are the dominant shrubs. One small section of the White River Trail System, near the riverfront has also had native vegetation removed. Stuck River Drive may also impede movement of some species; however, this is a minor road with little traffic. As the BMA continues eastward through Muckleshoot Indian Reservation and into eastern Pierce County, it continues to be dominated by riparian, deciduous/conifer vegetation in a non-fragmented arrangement (e.g. mostly undeveloped).

Water Quality of White River

Water quality was analyzed at 5 sites in 2005-2006 as part of the White River Basin Plan effort. Two gaging stations, one at Salmon Springs in Sumner and Stream 51 near Bonney Lake collected flow data over the same time frame. Neither the water quality sampling sites or gaging stations were within the LWR BMA. The White River mainstem was surveyed by URS Consultants in the fall of 2004. Reach observations were summarized by reach lengths, physical features and overall aquatic and riparian conditions. Reach observations that fell within or near the LWR BMA are included with the individual jurisdictional breakout in this plan.

The Basin Plan ranked and prioritized stream reaches and selected 73 sites. Riparian integrity is considered high if >70% of the corridor has an intact riparian zone wider than 100 ft, and <10% of the corridor is <35 ft, and there are <3 breaks (road crossings) in the corridor per stream mile. Streams meeting these conditions have greater potential for maintaining natural ecological functions. The Plan indicates that:

- 4% of the White River riparian corridor is in good condition,
- 59% is in fair condition, and
- 37% is in poor condition.

Of the 21 sites sampled within the LWR BMA,

- 5% were in good condition,
- 86% in fair condition, and
- 10% were in poor condition.

The Ecosystems Diagnosis and Treatment (EDT) model rates the quality, quantity, and diversity of habitat along a stream relative to the needs of fish such as Coho or Chinook salmon. The method describes how the fish would rate conditions in a stream based on current scientific understanding of their needs. Aquatic habitat EDT rankings indicated 16% is in good condition, 37% in fair condition, and 47% in poor condition. Within the BMA, 33% of aquatic habitat is in good condition, 43% aquatic habitat is in fair condition, and 24% aquatic habitat is in poor condition.

Development Along the River

Puget Sound Energy and Mud Dam have restricted or prohibited development along the White River, which has contributed to the continued biodiversity of this important riparian corridor and its designation as ecoregionally significant[14].

[14] Flobert, J., M. Goering, G. Wilhere, C. MacDonald, C. Chappell, C. Rumsey, Z. Ferdana, A. Holt, P. Skidmore, T. Horsman, E. Alverson, C. Tanner, M. Bryer, P. Iachetti, A. Harcombe, B. McDonald, T. Cook, M. Summers, D. Rolph. 2004. Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment, Volume One: Report. Prepared by The Nature Conservancy with support from The Nature Conservancy of Canada, Washington Department of Fish and Wildlife, Washington Department of Natural Resources (Natural Heritage and Nearshore Habitat programs), Oregon State Natural Heritage Information Center and the British Columbia Conservation Data Centre.

Tributaries, Wetlands and Oxbows

The Lower White River watershed is a complex hydrologic system with wetlands and multiple tributaries feeding into this wetland/riparian system from the Upper White River. The wetland and riparian systems provide a rich habitat for a variety of fish, reptiles, amphibians, mammals and bird species. Certain wildlife species, such as pond breeding amphibians, are very dependent on the hydrology of an area for their life cycle needs.

Private homes, farms, and light industry are located near the tributaries and the condition of the streams depends to a large extent on how individual developers and owners have treated the riparian corridor, which in most cases has resulted in poor to fair condition.

Wetlands filter excess nutrients, chemicals and sediments from excess runoff. They help keep groundwater clean, store flood waters and provide habitat for aquatic species and wildlife who use the water. Wetlands may dry up in the summer or they may be saturated year round. Wetlands generally support plants adapted to wet areas but are able to tolerate dry spells.

Oxbows, plus buffer zones can be useful and environmentally sound measures of flood control. Other flood control measures may have a detrimental effect on salmon habitat, specifically dikes that impair connections between rivers and their flood plains, which would normally supply large woody debris, fine organic matter and dissolved nutrients to the drainage network. Oxbows retain those characteristics that are important habitat elements, providing refuge and food sources for the riverine community. Re-channeling or braiding of the streams may be necessary to restore oxbows.

King County has allocated Capital Improvement funds for the White River flood damage repair at Stuck River Drive. Both King Floodplain management and Pierce County Surface Water Management have purchased land along the BMA between Pacific and Auburn for the purpose of flood control. Pierce County has analyzed the feasibility of levee setbacks and the White River at 6 locations between RM 2.6 and 5.1.

Riparian habitat or buffer zones along the river can contribute many attributes to the river it abuts. Shade to cool the water, organic and woody debris provides nutrients to river inhabitants. Vegetation roots protect and stabilize the banks, providing shelter and habitat. The riparian zone contributes to a high water table, increased storage capacity and higher late summer stream flows. Lawns, agricultural areas adjacent to the river, non-native vegetation and impervious surfaces contribute none of these things and indeed degrade the quality and quantity of the river itself.

Forest – Conifer/Deciduous Mixed Forest

The Lower White River BMA contains a patchwork of mixed lowland conifer/deciduous forest, punctuated with wetlands, riparian areas, pastures, areas developed for single family residential and commercial uses. Along the adjacent lands the forest cover transitions to a conifer/deciduous forest habitat. The Muckleshoot Tribe and Puget Sound Energy have left much of the forest surrounding the river intact. Forested areas provide connectivity between the different habitat patches and also serve to maintain hydrologic cycles within a watershed. Best available science indicates that 65% forest cover within an urban watershed provides high quality hydrological function for wetland water level fluctuation

and stream hydrology[15]. The Lower White River BMA currently has at least 65% forest cover and more if the riparian areas along the floodplain are included. These forest areas are a necessary component in many terrestrial species lifecycles. Each species has their own unique needs for habitat patch size, which increases for mammals and birds with a sensitivity to patch size. This is very important for pond-breeding amphibians, and native fish species that utilize the stream, wetland, and lake systems in the watershed and BMA. It will be crucial to work with each jurisdiction to maintain or increase forest cover.

[15] Booth, D.B., 2000. Forest Cover, Impervious-Surface Area, and the Mitigation of Urbanization Impacts in King County, Washington, Prepared for King County Water and Land Resources Division.

Threats to Conservation Targets

The main threats that are or may potentially be occurring to conservation targets include:

- Habitat conversion and fragmentation due to development, removal of native vegetation and roads, specifically potential development of the Puget Sound Energy properties.
- Poor water quality caused by residential use of fertilizers, domestic animal waste, septic tank leakage, spraying of herbicides along public roads, and road runoff
- Loss of pools, large woody debris (LWD), and riparian vegetation due to development and channelization of the river.
- Introduction of invasive, exotic, non-native species including plant species, wildlife species (e.g. bullfrogs, Japanese knotweed)
- Fish passage blockage from culverts.
- Wildlife movement blockages from roads, driveways and fencing
- Erosion and damage of riparian habitat from dikes/levees along City's of Buckley, Pacific, and Sumner
- Predation of native species by domestic cats and dogs
- Water fluctuations due to storm drains redirecting water flow into the river and not into wetlands, dikes, and stormwater from development
- Pollution caused by dumping of trash and debris into or near the river
- Non-permitted illegal discharge dumped directly into the river

Chapter IV - Conservation Strategies

Overview of Conservation Strategies

To achieve long-term health of a conservation target, threats must be abated to ensure viable, functioning systems. There are two approaches to lessen the stress and enhance or maintain the viability of the conservation target. The first is to abate the sources that are causing the stresses, under the assumption that the stress will subside if the source is removed. The second is to directly abate the stresses that may persist once the source is removed.

Conservation strategies are developed and implemented to (1) abate the critical sources of stress (i.e., threat abatement); and (2) directly restore altered key attributes of the systems (i.e., restoration). Threat abatement may involve a number of approaches including direct actions (e.g. removal of a culvert blocking a creek) or public education and outreach (e.g. educating property owners on the negative impacts of removing native vegetation that provides habitat). Restoration actions may include replanting native vegetation that is appropriate to the underlying soils and indigenous plant communities that historically thrived in a given location.[16]

In the Lower White River BMA planning process each of the conservation targets described in the previous chapter were reviewed in detail and potential threats identified. During this process Lower White River jurisdictions also identified conservation strategies to ascertain the level or severity of a potential threat, to directly abate known threats, or to identify restoration opportunities where degradation has occurred. Some threats applied to multiple conservation targets and as such the conservation strategies have been grouped under the following categories, which have been stated as a positive outcome:

- Reduce Habitat Conversion and Fragmentation (due to development and human activity)
- Enhance Water Quality
- Decrease Flooding
- Eliminate/Reduce Invasive and Introduced Species
- Remove Fish and Wildlife Movement Blockages
- Control Erosion and Siltation
- Halt/Reduce Predation by Domestic Animals

The discussion below provides recommended conservation strategies for each stress and source of stress to the conservation targets.

[16] TNC 5-S conservation action planning methodology.

Reduce Habitat Conversion and Fragmentation

Source of Stress: Development, Vegetation Removal and Deforestation

Conservation Strategies

1. Adjust the Lower White BMA boundary as evidence presents itself and after review by all jurisdictions, to better represent lands necessary for the long-term persistence of aquatic species, as well as other birds, mammals, amphibians, and reptiles.
   a. Work with all appropriate jurisdictions to adopt the Lower White River BMA Stewardship Plan and companion amendments to the Lower White River BMA boundary.
   b. Integrate the revised Lower White River BMA boundary into the Pierce County Comprehensive Plan Open Space Corridors Map
   c. Foster natural floodplain processes by preserving and creating conveyance areas (levee removal and/or setback) to accommodate flood waters
   d. Apply the Rural Sensitive Resource zoning to the tax parcels located within the revised Open Space Corridors Map at the county level.

2. Utilize Low Impact Development (LID) techniques within the BMA.
   e. Work with the Counties, Pierce and King Conservation Districts and other interested agencies to educate property owners on LID techniques.
   f. Work with the Counties, Cities of Buckley, Auburn, Pacific, and Sumner, and State Agencies to promote the use of LID on public properties.

3. Continue to apply native vegetation retention practices to environmentally sensitive areas within BMA.
   a. During review of development proposals work with the County and local jurisdictions in the design of projects that maintain native vegetation, wetlands, and shorelines and ensure mitigation efforts are appropriate and relevant to the development impacts.
   b. Enforcement of potential violations to existing regulations should receive a higher priority. Work with the County and City Councils to provide adequate staffing resources for this purpose.

4. Provide increased education and outreach to property owners, developers and real estate agents regarding impacts of vegetation removal and fish and wildlife habitat stewardship actions through organized community groups working with the cities and counties.
   a. Provide landscape consultation and on-going workshops (with guest speakers) to homeowners.
   b. Provide homeowners with literature on how to be a shoreline steward
   c. Create realtor packets with materials on shoreline stewardship to be given to new residents of shoreline properties.
   d. Present project at realty offices to get them to pass out realtor packets and educate on unique ecological characteristics of the communities.
   e. Contact developers and alert them about community projects and their role in transforming ideology around selective cutting vs. clear cutting a property
   f. Create homeowner information packets that describe the location and importance of corridors. Include all certified backyard habitats/sanctuaries to help inspire people to get involved.

5. Participate in local land use advisory meetings regarding proposed developments that affect the BMA
   a. Landowners who live within or are interested in a development that is located within jurisdictional boundaries of a city should attend City Planning Commission meetings to provide input into development proposals. Those who live within the jurisdictional boundaries of unincorporated

Pierce or King County should go to the County Planning Commission meetings.

b. Create a phone tree (provide agency numbers of enforcement for community) to contact community members when a proposed development is being reviewed by the City or County.
c. Have group placed on interested parties list for notification by the City or County of any development proposals within or adjacent to the BMA.
d. Advocate for conditions that eliminate or minimize threats to the conservation targets.
e. Work with developers to achieve a "win-win" solution (i.e. utilizing density bonus for open space and where best to locate open space areas in relation to the BMA and adjacent wildlife habitat areas).

6. Consider application of special zoning that provides for greater environmental protection and less density (i.e. the RSR zoning either through a Comprehensive Plan amendment process or adoption of a new Community Plan or the city equivalent -downzoning) to LWR BMA areas that are located in unincorporated rural portions of Pierce and King Counties. Also, consider requiring LID and other environmentally sensitive design techniques within the LWR BMA areas.
   a. Any future updates to the White River Basin Plan should include a review of additional habitat areas for inclusion within the BMA.

7. Work with the counties, cities and developers to locate open space set aside areas in contiguous tracts or within contiguous conservation easements located in such a manner as to promote connectivity and proximity to the conservation targets including:
   a. Identify the best locations for designated open space areas during the development proposal review process.
   b. High priority open space set aside areas are along tributaries and the White River.
   c. New development in forested areas should provide their open space dedications adjacent to the BMA as first priority.
   d. Establish connectivity and habitat zones around wetlands and White River and adjacent forest areas which provide habitat.
   e. Refer to the Washington Department of Fish and Wildlife (WDFW) landscape planning document[17] for guidance to help maintain fish and wildlife habitat including:
      i. Maintain habitat connectivity within the BMA and adjacent habitat areas through corridors and permeable landscape mosaics.
      ii. Proactively address wildlife and road issues by routing traffic through less sensitive wildlife areas, locate development with road placement and traffic intensity issues for wildlife in mind, and provide connectivity linkages across roads that intersect habitat patches or corridors.
      iii. Rectify existing road conditions that cause wildlife mortality at important crossing areas such as in connective corridors, or amphibian crossing locations, through road and wildlife planning approaches.
      iv. Maintain larger habitat areas to support development sensitive species.
      v. Preserve rare landscape elements and associated species and connected areas with critical habitats.
      vi. Retain large contiguous or connected areas that contain priority habitats and species.
      vii. Preserve large habitat areas and sensitive locations through land use planning mechanisms like outright purchase, purchase of development rights, conservation easements, and transfer of development rights.

[17] Schuett-Hames, J.P., J.M. Azerrad, M.J. Tirhi, B. Vadas Jr., C.L. Sato, C.W. May, J.L. Hayes, J.E. Jacobson, J.P. Carleton, and G.F. Wilhere. Draft 2008. Landscape Planning for Washington's Fish and Wildlife: Managing for Biodiversity in Developing Areas. Washington Department of Fish and Wildlife. Olympia, WA.

viii. Maintain natural hydrologic conditions and minimize surface runoff using low-impact site design principles and the retention of natural forest and wetland cover throughout the watershed.
ix. Protect water quality using a combination of innovative treatment BMPs and aggressive, comprehensive source controls.
x. Maintain watershed processes (e.g., delivery and routing of water, sediment, nutrients/toxicants/bacteria, large wood, heat, forest succession, and upland disturbance regimes).
xi. Protect in-stream habitat and natural channel morphological conditions through the control of storm-water inputs and bank-full flows.
xii. Protect the stream-riparian ecosystem corridor, channel migration zone (CMZ), and floodplain.

f. Develop and implement community/school education programs (1) to prevent the introduction of nonnative species such as bullfrogs and fish, and (2) to encourage wildlife friendly, responsible pet ownership.
g. Place open space areas in such a manner as to create a transition area of native plants/vegetation between developed and non-developed areas thus reducing the edge effect.

8. Maintain or restore at least 65% native vegetation throughout the LWR BMA and White River Sub-basin to maintain normal hydrological functions, as well as connectivity for wildlife. This can be done per residence, and can be boosted by keeping some large habitats in natural condition.
   a. Provide educational materials to homeowners in the Puyallup River Watershed, and especially to property owners within the BMA and along the shorelines of the White River, on the importance of retaining native vegetation and forest cover.
   b. Work with developers to identify best locations for native vegetation retention and open space set asides.
   c. Work with property owners to plant, retain, and restore buffers around the White River, tributaries and wetlands.
      i. Organize work parties as an annual or biannual native vegetation planting event. Consider partnering with local Boy Scout or Girl Scout troops, schools, or other environmental or civic organizations for volunteers.
      ii. Target identified restoration areas for native vegetation planting events.
      iii. Pursue grant programs to help fund the purchase of native plant materials or work with local plant nurseries, Pierce and King Conservation Districts, developers or other potential sources to obtain native plant supplies.
   d. Conduct monthly seminars on various components of creating wildlife habitats.

9. Encourage targeting the purchase of land within the Lower White River for wildlife habitat.
   a. Work with property owners located within the BMA to identify parties who are interested in selling their property or a portion of their property for permanent open space, passive recreation, or conservation easement.
   b. Compile a list of willing sellers, property owners or other properties within the BMA that are a high priority for acquisition as permanent open space.
   c. Reduce the threat of habitat conversion and fragmentation (resulting from development and human activity) by purchasing PSE lands or other undeveloped open space areas along the river corridor (King County).
   d. Work with the cities of Buckley, Auburn, Pacific, Sumner and the Cascade Land Conservancy to promote purchase or transfer of development rights for high priority open space properties within the BMA.

e. Submit applications to the Pierce County Conservation Futures Program for acquisition of high priority open space properties.

10. Apply for National Wildlife Federation – Community Habitat Program certification and conduct public education and outreach efforts to property owners to participate in this program and certify their property as backyard wildlife sanctuaries.

Source of Stress: Roads and Driveways

11. Avoid new public and private roads that bisect and fragment the BMA considering the following criteria:
    a. Consider first the expansion of existing roads located outside or on the fringe of the BMA and install wildlife mitigation measures with the road expansion project.
    b. If a new road is the only feasible option, construct the roadway with wildlife mitigation measures.[18]
    c. Avoid new roads that bisect open space set aside areas.
    d. Utilize WDFW's landscape planning document to help plan where roads should go based on fish and wildlife information.

12. Work with the counties and cities to install signage along Lower White River BMA that indicates the motorist is traveling through a "sensitive wildlife area" and that this road is a "wildlife crossing area". Signage should include a caution statement to watch out for and avoid wildlife that may be crossing the road.

13. Seek to identify alternative driveway access points rather than introduce new stream crossings.

Enhance Water Quality

Source of Stress: Application of Fertilizers, Pesticides and Herbicides

Conservation Strategies

1. Evaluate the impacts to White River and its tributaries, and groundwater supplies resulting from the use of fertilizers, pesticides and herbicides on properties within the BMA.
    a. Collect water quality data over a five year time period.
    b. Work with the Tacoma Pierce County Health Department (TPCHD), Pierce County Public Works and Utilities (PWU), Pierce Conservation District (PCD) or a local water steward group to identify testing sites, gain access to monitoring equipment, etc.
    c. Work with to acquire commitment from the TPCHD, PWU or PCD for sampling kits and lab costs to establish water quality information at different reaches along the White River.
    d. Educate property owners within the BMA on the importance of having their well water tested on a regular basis. Utilize this information to determine if any of the well water supplies are contaminated from the use of fertilizers, pesticides or herbicides or other toxins.
    e. Partner with local Boy Scout or Girl Scout troops, schools, or other environmental or civic organizations to conduct monitoring and sampling of local streams and the White River. Consider creation of a booklet produced by students about the water quality monitoring in Lower White

[18] Schuett-Hames, JP. J.M. Azerrad, M.J. Tirhi, B. Vadas Jr., C.L. Sato, C.W. May, J.L.Hayes, J.E. Jacobson, J.P. Carleton, and G.F. Wilhere. Draft 2008. Landscape Planning for Washington's Fish and Wildlife: Managing for Biodiversity in Develop Areas. Washington Department of Fish and Wildlife, Olympia, WA.

River and how the testing results impact the biodiversity in the BMA. Teachers and biologists could work with students to create booklet.

2. Replace the use of chemical fertilizers, pesticides and herbicides with natural, organic and permaculture methods.
   a. Provide increased education and outreach to property owners regarding negative impacts of using non-organic pesticides and fertilizers and demonstrate natural alternatives (such as the use of biological pest control).
   b. Provide this information as one of the community workshop topics or hold a Community Education Day to walk the neighborhood to distribute literature.
   c. Work with PCD, WSU – Pierce County Cooperative Extension Office (WSU) or other sources to identify natural methods now available.

3. Eliminate/discontinue the spraying of herbicides within the public right-of-ways and public owned land within the BMA by working with the County Public Work Utilities Departments to assess spraying regimes.
   a. Property owners can install "no-spray" signs on their properties along public right-of-ways.
   b. Park and road maintenance crews can alter spraying practices within BMA area and should consider utilizing Integrated Pest Management systems as an alternative to the use of chemicals.
   c. Property owners can provide education and outreach to public agencies on why pesticide-free parks are beneficial.

4. Plant, retain, and restore buffers to prevent runoff from reaching the streams and river.
   a. Work with jurisdictions include Washington Department of Natural Resources (DNR) to strengthen reforestation requirements through tighter timelines. Currently DNR applicants have two years to replant after logging.

<u>Source of Stress: Domestic Animal Waste</u>

Conservation Strategies

5. Acquire commitment with county/TPCHD for fecal coliform sampling kits and lab costs.
   a. Collect fecal coliform water quality data for five years through local monitoring group.

6. Implement Pierce County pet waste education program.

7. Clean up after pets and livestock through community composting.
   a. Provide property owners with educational information/materials on why this is so important (i.e. impacts associated with waste)
   b. Work with local nurseries to institute a community compost program.

8. Use fencing to create a buffer between riparian (i.e. the lake, creek and estuary) and wetland areas and livestock pasture areas.
   a. Encourage property owners with livestock to develop farm management plans.
   b. Provide property owners with livestock educational materials on cost-share programs to install fencing between pasture areas and riparian and wetland areas.

<u>Source of Stress: Septic Tanks</u>

Conservation Strategies

10. Work with property owners to test all the septic tanks for possible contamination into the system.
    a. Explore available Pierce County or Tacoma-Pierce County Health Department programs to check septic tanks.
    b. Explore any available incentive programs to help homeowners pay for this.
11. Collect fecal coliform water quality data within water bodies and watercourse for five years.

12. Develop and/or distribute informational packets about septic tanks that go out to all residents.

<u>Source of Stress: Runoff from Roads and Fields</u>

Conservation Strategies

13. Review all local jurisdictions' planning documents to determine if any storm water drains in the BMA area discharge directly into a water body, watercourse or wetland. If this information is not available then work with the County or PCD to conduct an inventory to determine if any such stormwater drains exist. If there are any stormwater drains that discharge directly into a water body, watercourse or wetland then develop a community drain stenciling event to mark these drains to prohibit discharge into them.

14. Plant native vegetation along roads, driveways, roadside ditches, and channels of the tributaries to filter road runoff pollutants.

15. Work with local jurisdictions to apply new road maintenance standards to public right-of-way areas to reduce harmful impact from runoff from roads.

16. Identify culverts and ditches that deposit road runoff directly into a waterbody, watercourse or wetland. If this information is not available then work with the county or PCD to conduct an inventory to determine if any such culverts or ditches exist. If there are any culverts or ditches that discharge directly into a waterbody, watercourse or wetland than work with the local jurisdiction to apply mitigation measures for pre-treatment prior to discharge. Consider applying low impact development techniques for mitigation measures.

17. Remove or move pipes in fields and industrial parks to channel untreated stormwater runoff into detention areas.

<u>Source of Stress: Trash/Garbage</u>

Conservation Strategies

18. Develop a trash pickup campaign along roadways.
    a. Work with local schools, neighborhood associations and local property owners to participate in an Adopt-a-road program to pick up trash and garbage.

19. Organize garbage cleanup days and/or educate property owners on need to keep garbage and pollutants out of habitat areas.
    a. Coordinate with Nonpoint Watershed Committee. This is an action item in the Watershed Plan.

20. Create a watchdog team for development to report garbage dumping. When appropriate utilize the Pierce County Responds Program to report garbage dumping in the area.

a. Coordinate with Nonpoint Watershed Committee. This is an action item in the Watershed Plan.

Eliminate Invasive and Introduced Species

Source of Stress: Introduced Plant Species and Weeds

Conservation Strategies

1. Conduct a detailed inventory of the plants within the BMA to identify the density of invasive species and determine target areas for non-native/invasive plant removal and replanting of native vegetation.

2. Provide educational information to property owners and plant nurseries regarding the impact of local non-native and invasive plant species.
   a. Develop or obtain a booklet of invasive local weeds and mail to local property homeowners. Booklet should include the following information: list of undesirable non-native and/or invasive plant species; methods of removal; native plants that can be used to revegetate; wildlife benefits of native plants; etc.
   b. Contact local nurseries to discuss the impacts of non-native/invasive plant species on habitat areas and the potential to limit or eliminate the sales of non-native or invasive plant species and increase the sales of native plant species.
      i. Explore the possibility for local nurseries to host monthly education community meetings
      ii. Request local nurseries to distribute brochures on the benefits of utilizing native plant species
      iii. Work with local nurseries to host native plant sales in conjunction with BMA events
      iv. Request local nurseries to label invasive plant species

3. Work with local property owners and municipal jurisdictions to remove non-native and invasive plant species within the BMA.
   a. Organize a "Weed Walkabout" workshop for the community.
   b. Organize weed cleanup activities utilizing PCD, schools, Boy Scout troops, or other local volunteers.
   c. Contact Pierce County and the cities' Public Works and Parks Departments about removal of invasive species within the road right-of-way and public properties.

Source of Stress: Introduced Non-Native Wildlife Species

Conservation Strategies

5. Educate the homeowners and pet stores on the damage that is done when they turn loose non-native fish and wildlife species into wetlands, tributaries, and other habitat areas within the BMA.
   a. Include this information as part of lake information packet or fact sheet that should be developed for distribution to area property owners.
   b. Species that should be listed in the information packet include but are not limited to turtles, frogs, and aquarium fish.
   c. Contact local pet stores to discuss the impacts of non-native/invasive fish and wildlife species on habitat areas and the potential to limit or eliminate the sales of non-native fish and wildlife species.
   d. Contact WDFW enforcement if non-native species are being sold.

6. Collect and destroy bullfrog egg masses.
   a. Establish a bullfrog eradication program that lasts a minimum of 3 years, which could be part of a whole wildlife monitoring plan and/or water monitoring program.

7. Fence livestock out of creeks and wetland and their associated buffer areas.
   a. Partner with PCD staff to educate and work with property owners to help develop farm management plans and with funding for fencing to keep livestock out of stream.

   b. Provide educational materials to property owners with livestock on negative impacts associated with unrestricted access to creeks and wetland areas and incentive/grant programs to help defray the cost of fencing.

Remove Fish and Wildlife Movement Blockages

Source of Stress: Culverts

Conservation Strategies

1. Work with King and Pierce County, Cities of Buckley, Auburn, Pacific, and Sumner, PCCD and homeowners to replace existing culverts that are causing fish blockages.

Source of Stress: Roads and Driveways

Conservation Strategies

2. Monitor road kills and develop strategy for better wildlife crossings where most of the kills take place. Employ different strategies for the various species based upon their needs such as:
   a. Amphibians may need crossings under roads.
   b. Mammals need speed limit reduction, better signage, and connective corridors linking areas throughout the watershed with the large forest patch to the east.

3. Work with the County to establish signage along Lower White River roads that indicates this is a "sensitive wildlife area" and to drive with caution.

4. Encourage the development of a booklet for county, developers, park districts to explain the history and conservation efforts of Friends of the Lower White River and other community groups. Put on multiple websites to keep everyone aware of progress.

5. Provide education to landowners regarding the importance of maintaining vegetation corridors along roadways and driveways so that wildlife can have alternative movement corridors.

6. Work with the County, cities and developers to design new roadways within BMA to be wildlife friendly. Roads should not create barriers and should utilize new technologies in ecological road design that incorporates the needs for stormwater treatment, safety and ecology functions (e.g. bioswells).

Source of Stress: Fencing

Conservation Strategies

7. Utilize fencing that does not block wildlife movement from occurring.
   a. Avoid solid board on board fencing in wildlife movement corridors.
   b. Utilize smooth (as opposed to barbed) wire fencing for livestock that minimizes potential for injuring wildlife. An example is New Zealand smooth wire fencing.

Control Erosion and Siltation

Source of Stress: Channelization/Levees

Conservation Strategies

1. Riparian buffers along the King County-maintained levees and revetments are limited in quality, width, and connectivity along the river corridor.
   a. Recommendations to remove and set back levees, restore riparian buffer, and connect the river to its historical floodplain habitat are part of King County's adopted 2006 Flood Hazard Management Plan.

Source of Stress: Development

Conservation Strategies

1. Monitor new construction activities to ensure that erosion control measures are properly installed and functioning from preventing erosion into ditch systems, watercourse, wetland and estuary areas.
   a. Local residents should call Pierce County Planning and Land Services Department with any potential violations of erosion control measures.

Halt Predation by Domestic Animals

Source of Stress: Cats and Dogs Allowed Unconstrained Access to Outdoors

Conservation Strategies

1. Provide educational materials to property owners and residents on keeping domestic pets away from nesting areas and habitat areas during breeding season.
   a. Distribute handouts on keeping cats and dogs indoors (Seattle Audubon has good handouts on this).
   b. Address this issue as part of backyard habitat seminars.

Minimize Water Fluctuation

Source of Stress: Water Fluctuation

Conservation Strategies

1. Work with the counties and cities to maintain buffers around wetlands to reduce major water fluctuation in the seeps, springs, wetlands and creeks feeding into the Lower White River.

2. Work with the counties, cities, DNR, and property owners to maintain or restore ≥65% natural vegetation throughout the Lower White River BMA to maintain normal hydrological functions (including water level fluctuation in wetlands), as well as connectivity for wildlife. This can be done per residence, and can be boosted by keeping some large patches in natural vegetation.
   a. Work with property owners within BMA to leave portions of the property in native vegetated condition. This can be done in conjunction with backyard wildlife sanctuary program.
   b. Organize native planting work parties with local property owners and interested non-profit agencies, schools, Boy Scout troops, Stream Team, etc.

c. Work with property owners that have Forest Practices permits issued by DNR to not allow applicants to log in wetland buffers and increase their less restrictive buffers, restoration and reforestation requirements.

Source of Stress: Low Water Flow

Conservation Strategies

3. Maintaining the water level is a high priority in order for the Lower White River to function as a true river. Work with the Muckleshoot Tribe and other jurisdictions to maintain enough water in the river.

4. Conduct a review of adopted stormwater and watershed plans, or if necessary work with the County and cities to conduct a new analysis, to determine if any storm drains are directing water flow into the White River, tributaries and streams, or wetlands.

5. Work with the counties and cities to redirect any public storm water drains that discharge directly into a water body or water course into a pre-treatment facility that is designed to slowly infiltrate the water back into the aquifer (e.g. Low Impact Development facility).

6. Encourage property owners to leave properties in an open space condition and, as an incentive, enroll their properties in the County's Current Use Assessment Program (Public Benefit Rating System) to reduce taxes.

7. Encourage property owners to conserve water and when possible, reuse water.
   a. Provide educational materials to property owners regarding reuse of grey water and rainwater for watering plants; use of native plant species that require less water; best times for watering vegetation (i.e. not in the heat of the day when large amount of water is lost to evaporation); etc.

8. Work with the Pierce and King County Health Department, the counties' and cities' water departments and compare with planned development to identify where all of the current water sources are and future planned water sources.

Short-Term Actions (1 year)

1. Work with Pierce County Planning and Land Services Department and all other applicable jurisdictions during the year 2011 Comprehensive Plan amendment cycle to:
   a. Adopt the Lower White River BMA Stewardship Plan as a Title 19D document
   b. Amend the Pierce County Comprehensive Plan Open Space Corridors Map and Biodiversity GIS layer to incorporate the revised Lower White BMA boundary as evidence presents itself.
   c. Revise the zoning within all applicable jurisdictions to apply the RSR zoning to tax parcels located within the expanded BMA boundary.

2. Apply for National Wildlife Federation – Community Habitat Program. *(Registered)*
   a. Set participation goals for the 10 landowners in the BMA.
   b. Conduct public education and outreach efforts to property owners to participate in this program and certify their property as backyard wildlife sanctuaries.
   c. Establish a 65% native vegetation and forest cover goal for the entire BMA.

3. Conduct surveys and collect 'best science' information about the Lower White River riparian system.
   a. Encourage members to participate in the *NatureMapping* Program.
   b. Work with school-related and other citizen projects in surveying the area.
   c. Collect latest information on how to keep private property and the riparian system healthy.
   d. Coordinate efforts with other groups.

4. Provide increased education and outreach to property owners, developers and real estate agents regarding impacts of vegetation removal and earth moving. Create and dispense educational materials concerning fish and wildlife habitat stewardship actions.
   a. Maintain signage along Lower White River roads that indicates the motorist is traveling through a "sensitive wildlife area" and that this road is a "wildlife crossing area". Signage should include a caution statement to watch out for and avoid wildlife that may be crossing the road.
   b. Create homeowner information packets that describe the location and importance of corridors. Include all certified backyard habitats/sanctuaries to help inspire people to get involved. Provide homeowners and developers with literature on how to be a shoreline steward.
   c. Create realtor packets with materials on shoreline stewardship and on unique ecological characteristics of community to be given to new residents of shoreline properties.
   d. Provide landscape consultation and on-going workshops (with guest speakers) to homeowners and others.

5. Participate in local land use decisions regarding proposed developments that affect the BMA. Advocate for conditions that eliminate or minimize threats to habitat fragmentation.
   a. Work with Pierce County to include the BMA's are Habitats of Local Importance in Title 18E and develop/provide guidelines as how to regulate relative to proposed/possible development.
   b. Create a phone tree (provide agency numbers of enforcement for community) to contact community members when a proposed development is being reviewed by the County.

c. Have group placed on interested parties list for notification by the County of any development proposals within or adjacent to the BMA.
d. Work with the cities of Buckley, Auburn, Pacific, and Sumner, and developers to help identify the best locations for designated open space areas during the development proposal review process. Try and come up with a "win-win" solution (i.e. utilizing density bonus for open space and where best to locate open space areas in relation to the BMA).

6. Work with King County as they apply for Salmon Recovery Funding Board and other grant(s) to facilitate implementation of high priority restoration actions within the BMA.
   a. Identify properties along the Lower White River to facilitate levee setback and floodplain reconnection projects for King County.

Mid-Term Actions (2-3 years)

1. Organize volunteer work parties. Partner with local Boy or Girl Scout troops, schools, or other environmental or civic organizations for volunteers.
   a. Sponsor annual or biannual native vegetation planting event.
   b. Sponsor invasive species eradication events.
   c. Sponsor volunteer "bioblitz" activities led by professional experts.
   d. Consider a project with the cities' Parks Departments to create a demonstration project, cooperating with Pierce County Conservation District, Master Gardeners, schools, Boy Scout troops, or other local volunteers.

Long-Term Actions (3-5 years)

1. Conduct surveys and collect 'best science' information about the Lower White River riparian system.
   a. Coordinate with the Watershed Planning groups for current data.
   b. Arrange for Stream Team assistance in collection information on water quality and flow for the next five years.
2. Inventory biodiversity around schools and within sections of the White River and monitor changes.
   a. Arrange for *NatureMapping* training through the Tacoma Nature Center for local residents and students for five years.
3. If needed, adjust BMA boundaries and amend the Open Space Map in the Pierce County Comprehensive Plan.

Chapter VI - Conclusions

General Overview
The availability of lowland deciduous, riparian, estuarine and upland coniferous habitats along the Lower White River contributes to this BMAs ecological richness. Most of the at-risk, listed, and/or priority species predicted or confirmed within this BMA have a primary association with water for either all or part of their life cycle. Water quality within the White River, its tributaries, streams, and wetlands should not be compromised as it contributes foremost to the presence of the species predicted within.

Farmlands and pasturelands along Lower White River continue to collect water and could be targeted for wetland restoration sites by willing sellers. In their present state, they may provide breeding locations for amphibians. Sections of Lower White River located on private property, where native vegetation has been removed to the river's edge, should be targeted for habitat restoration. Future land development should not allow removal of native vegetation along the creek within a defined buffer. Culverts along the creeks should be assessed for blockage to fish movement and the community should work with the local jurisdictions and Pierce County to correct these blockages and identify other target areas for restoration and protection. Landowners along these creeks, and within defined buffers of the Lower White River, should be educated on maintaining the integrity of the riparian corridors. Education should focus on vegetation retention and restoration, retaining in-stream flows to White River, and the biological importance of the Lower White River corridor. The Lower White River BMA would benefit by the application of WDFW PHS Riparian Habitat Guidelines on privately owned riparian lands and by enforcing county regulations for development along riparian corridors. WDFW PHS recommendations for salmonids and county critical area ordinance standards should also be applied in consideration of salmonid presence.

The community should coordinate with the Forest Stewardship Council for working forestland owners (minimum of 20 acres) and continue to monitor wildlife species within and adjacent to the BMA. This can be accomplished through participation in the *NatureMapping* Program and Tahoma Audubon birding events.

Certification Through Wildlife Habitat Programs
FLWR, neighborhoods, and the Puyallup River Watershed Council should pursue certification in the NWF-CWH program. FLWR, Puyallup River Watershed Council, and city Parks Departments from Buckley, Auburn, Pacific, and Sumner should also continue to promote property owner participation in the WDFW-BWH program.

Pursuing Conservation Strategies
The conservation strategies outlined in Chapter IV provide a framework for abating threats to the Conservation Targets and conducting restoration of degraded habitat areas. FLWR and other community groups should work towards accomplishing the conservation strategies outlined in this plan.

Funding Options
The National Wildlife Federation Community Habitat Program has provided an initial grant to FLWR to install signage and conduct training. In addition, the NWF also has grant monies available for schools to assist in native vegetation planting and monitoring for Lower White River. FLWR and other community groups should also consider pursuing funding opportunities through state and local agencies, the PCD, and environmental foundations.

Stewardship Plans by Jurisdictions

The Lower White River BMA runs through six jurisdictions; the cities of Buckley, Pacific, Auburn, Sumner, King County, and the Muckleshoot Indian Tribe.

Although the Lower White River BMA has the same conservation targets, the stressors and subsequent conservation strategies, recommendations, and stewardship plans were tailored to individual jurisdictions. The following chapters were developed with input from each jurisdiction, except the Muckleshoot Indian Tribe, who currently has chosen not to participate with the stewardship planning process.

Appendices

Meeting Agendas – Buckley

September, 2009
October, 2009
November, 2009

Kickoff Meeting Agenda for September 21, 2009

Buckley Library

Time	**Topic**	**Discussion Leader**
6:00	Introductions	Linda
6:15	Pierce County Biodiversity Network Overview & questions	Karen/Michelle
7:00	LWR Stewardship Plan and Buckley's chapter	Linda/Karen/Michelle
7:30	Next steps	Linda
7:45	**Community *NatureMapping* Workshop** October 10-11 at Northwest Trek	Karen

Lower White River Biodiversity Management Area
Buckley and Vicinity

Community Workshop #2
Monday, October 12, 2009
6:00 p.m. to 8:00 p.m.
Enumclaw Library

6:00 – 6:10 p.m.	Welcoming comments and review of BMA network
	PCBA slide logo and partners
	Mission to implement and protect bd network
	Picture of network
6:10 – 6:40	Start at terminology - define
	Conservation target and definition
	Threats (stressor) – give bullfrog examples
	Sources of stress - release of exotics (Japanese knotweed)
	Conservation strategy - actions
	Change CVA examples to Buckley
6:40 – 6:50	Break time
6:50 – 7:00	Buckley and vicinity Stewardship Plan overview
	Start with conservation strategies in draft plan
7:00-7:45	Threats to conservation targets (make a slide)
	Read each individual bullet and discuss
7:45 – 8:00	Closing discussion

Next Meeting –November 16, 2009, 6:00 p.m. TBD

Lower White River Biodiversity Management Area
Buckley and Vicinity

Community Workshop #3
Monday, November 16, 2009
6:00 p.m. to 8:00 p.m.
Enumclaw Library

6:00 – 6:05 p.m.	Welcome
6:05 – 7:00	National Wildlife Federation Backyard Habitat
7:00 – 7:45	Segue into biodiversity Review last meeting terminology – questions? Conservation target and definition Threats (stressor) – give bullfrog examples Sources of stress - release of exotics (Japanese knotweed) Conservation strategy - actions Begin Matrix
7:45 – 8:00	Closing discussion

Next Meeting –January 11, 2010, 6:00 p.m. TBD