

CITY OF FIFE

SHORELINE INVENTORY

PREPARED FOR:

CITY OF FIFE
COMMUNITY DEVELOPMENT DEPARTMENT
FIFE CITY HALL
5411 - 23RD ST. E
FIFE, WA 98424

SUBMITTED TO:

AHBL, INC
2215 NORTH 30TH, SUITE 300
TACOMA, WA 98403

PREPARED BY:

GRETTE ASSOCIATES, LLC
2111 NORTH 30TH
TACOMA, WASHINGTON 98403
(253) 573-9300

151 SOUTH WORTHEN, SUITE 101
WENATCHEE, WASHINGTON 98801
(509) 633-6300

OCTOBER 2004



TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Study Area Boundary	1
1.2	Methodology	1
1.3	Report organization	1
1.4	Study Segments	2
2	LAND USE AND ALTERED CONDITIONS	3
2.1	Historic Land Use and Watershed Conditions	3
2.2	Existing Shoreline Designation	5
2.3	Existing Land Use	5
2.4	Zoning Designations	7
2.5	Parks , Open Space, and Public Access	8
2.6	Impervious Surface	9
2.7	Filled Areas	10
2.8	Roads and Bridges	10
2.8.1	Roads	10
2.8.2	Bridges	10
2.9	Flood Control Structures	11
2.10	Docks, Piers, and Overwater Structures	11
2.11	Storm Water and Sewer Outfalls	11
2.12	Other Utilities	12
2.13	Culverts	12
3	BIOLOGICAL RESOURCES AND CRITICAL AREAS	13
3.1	Wetlands	13
3.2	Aquifers	15
3.3	Fish and Wildlife Habitat Conservation Areas	15
3.4	Geologically Hazardous Areas	17
3.5	Frequently Flooded Areas	18
4	SALMONID USE AND HABITAT	20
4.1	Salmonid Use	20
4.2	Habitat Conditions	20
4.2.1	Framework for Habitat Evaluation	21
4.2.2	Baseline Habitat Conditions for City Shorelines	21
5	CONDITIONS AND OPPORTUNITIES BY INVENTORY SEGMENT	29
5.1	Segment P1	29
5.2	Segment P2	30
5.3	Segment P3	31
5.4	Segment H1	32
5.5	Segment H2	34
5.6	Segment H3	35
6	RECOMMENDATIONS	37

6.1	Recommendations to Protect and/or Contribute to Restoration of Properly Functioning Conditions.....	37
6.2	Recommendations to Address Data Gaps.....	37
7	BIBLIOGRAPHY	39

TABLES

Table 1. Study Segments.....2
Table 2. Existing land use in the City of Fife including the UGA.....4
Table 3. Existing Land Use Observations by Fife Shoreline Segment7
Table 4. Current Zoning by Fife Shoreline Segment8
Table 5. Wetlands Within or Partially Within Fife Shoreline Segments15
Table 6. Documented Priority Habitats and Species within Fife Shoreline Segments17
Table 7. Frequently flooded (100-year flood zone) areas by shoreline segment.19
Table 8. Status of Salmonid Species in the Puyallup River and Hylebos Creek20
Table 9. Water quality impairments on the Puyallup River in the City of Fife.23

FIGURES

- Figure 1. Shoreline Jurisdiction Areas
- Figure 2. Study Segments
- Figure 3. Existing Land Use
- Figure 4. Existing Zoning
- Figure 5. Storm Water and Sewer Outfall Exhibit
- Figure 6. Critical Areas
- Figure 7. Restoration Sites

*Note that for each figure there are three views:
City overview, Hylebos Creek shoreline, and Puyallup River shoreline.*

APPENDICES

- Appendix A. Additional information sources
- Appendix B. Shoreline Aerial Photo Atlas

1 INTRODUCTION

This report is intended to provide baseline information on the existing conditions within the City of Fife's shoreline jurisdiction to provide a basis for the update of the City's Shoreline Master Program (SMP). It includes information on existing environmental conditions and land use practices, as well as current proposals for restoration activities and recommendations for other actions such as conservation and restoration.

1.1 STUDY AREA BOUNDARY

Two water bodies within the City of Fife ("City") are regulated under the State Shoreline Management Act (SMA). The Puyallup River is listed as such under the Washington Administrative Code (WAC 173-18-310). Hylebos Creek is not on this list, but does meet the flow requirements for SMA regulation in the City and in neighboring City of Milton.

This study focuses on these water bodies inside the City's Urban Growth Area (UGA), including associated wetlands and the shore lands within 200 feet upland of the Puyallup River and Hylebos Creek. Consistent with the Shoreline Management Act, the edge of the water body is defined as the ordinary high water mark (OHWM) and shore lands within 200 feet upland of the OHWM (Figure 1).

1.2 METHODOLOGY

Information and data from a number of sources were reviewed as part of this inventory (Bibliography [Section 7]; Appendix A). The City of Fife provided a number of GIS layers, paper maps used for planning and critical areas review, recent digital ortho-photos, and applicable reports from its library. Pierce County GIS data sets, including wetlands and flood maps, were critical sources of digital data. Information was requested from Washington Department of Fish and Wildlife (WDFW) on Priority Habitats and Species, including endangered species, and Washington Department of Natural Resources (DNR) on native ecosystems and rare species. Department of Ecology water quality data also were reviewed. Federal data sources included the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory, US Geological Survey (USGS) stream flow data, and the US Department of Agriculture Natural Resources Conservation Service (USDA NRCS) soils data. A literature review of reports and papers applicable to the shoreline inventory also was conducted, and individuals from non-agency organizations (not-for-profits, tribes) likely to have relevant information were contacted.

1.3 REPORT ORGANIZATION

Information on conditions within the City shoreline area gathered during the inventory are reported in three main sections in this document. Land use and altered conditions are presented in context of current land use and change relative to historic conditions (Section 2). Biological resources and critical areas, as defined by the Washington State Growth Management Act (RCW 36.70A), are addressed in Section 3. Salmon use, and habitat in particular, are addressed in Section 4 using a framework based on the NFMS pathways and indicators analysis (NFMS 1996) that integrate a number of physical and biological habitat parameters. Conditions are summarized by shoreline study segment (see next section), and

opportunities for improved function and/or habitat restoration are identified in Section 5. Finally, in Section 6, recommendations are made for City-wide protection and restoration of functioning shorelines, and also for addressing data gaps identified during the inventory.

1.4 STUDY SEGMENTS

Both the Puyallup and the Hylebos were divided into a number of lineal segments according to land use (e.g., zoning, existing and planned future land use) and environmental characteristics (e.g., significant wetlands, undeveloped habitat) (Table 1, Figure 2). Where possible, study segments were defined according to the City of Fife street system (e.g., from 4th Street East to 12th Street East along the Hylebos). One case in which this was not possible is Puyallup segment 2, which is comprised of remnant oxbows of the River that now are a very large, wetland complex with a hydrologic connection to the River (“Oxbow wetland”, see Section 3.1). Additionally, a smaller wetland area with no hydrologic connection, but within the 100-year flood plain (“Frank Albert Road wetland”, see Section 3.1) was analyzed. This segment includes both wetland complexes, as well as the hydrologic connection to the Oxbow wetland which is approximately 625 feet in length.

This inventory refers to left and right stream banks. This refers to bank orientation when facing upstream.

Table 1. Study Segments

Location	Segment	Description	Approximate Length (ft)	River Mile
Puyallup	P1	I-5 Bridge (North City Limit) upstream to the hydrological connection to the Oxbow wetland upstream of 54 th Ave	13,150	2.4-4.9
Puyallup	P2	Oxbow wetland, hydrological connection to Oxbow wetland, Frank Albert Road wetland	n/a, removed from shoreline	4.9
Puyallup	P3	Upstream edge of the hydrological connection to the Oxbow wetland to Freeman Rd	9,840	4.9-6.8
Hylebos	H1	Fife City limit (north, co-terminus of 57 th and 55 th Ave E) upstream to 4 th St E; right bank only	1,650	0.3-0.6
Hylebos	H2	4 th St E upstream to 12 th St E; both banks	3,335	0.6-1.3
Hylebos	H3	12 th St E upstream to 70th; both banks, includes stretch of shoreline not in the shoreline jurisdiction at Pacific Highway (unincorporated Pierce County)	4,380	1.3-2.1

2 LAND USE AND ALTERED CONDITIONS

The City of Fife is located in the Puyallup River floodplain near the head of Commencement Bay in north Pierce County. The land was historically used by the Puyallup Indian Tribe and was included in its Reservation Lands under 1856 amendments to the Medicine Creek Treaty. Just over a century later, in 1957, the City of Fife was incorporated and has been expanded periodically since that time. The City's present corporate limits and urban growth area are shown in Figure 1.

The City is located on the north side of the Puyallup River. There are two smaller independent tributaries to the Bay flowing through the City: Hylebos Creek and Wapato Creek. Wapato Creek does not meet minimum flow requirements for a shoreline of the state and is therefore not addressed in this inventory.

2.1 HISTORIC LAND USE AND WATERSHED CONDITIONS

Historically, the area north of Interstate 5 was emergent tidal marsh land, while the area south was a combination of freshwater wetlands and uplands. During the late 1800s much of the area was used for agriculture, requiring ditching and draining of both tidal and freshwater wetlands. In 1874, the first railroad was constructed across the head of Commencement Bay, waterward of the area that is now Fife, thereby initiating the conversion of the Bay's tideflats to a highly urbanized seaport. This conversion, in combination with flood control efforts made in the wake of the 1906 diversion of the White River into the Puyallup (made permanent by the Corps in 1914), resulted in channel hardening at the mouths of both the Puyallup and the Hylebos. Levees were constructed along much of the lower Puyallup, including the reach that defines the south edge of the City.

During the early and mid 20th century, agriculture continued to be a primary land use in the area that is now Fife. However as the Port of Tacoma facilities expanded during the mid and late part of the century, land use began to shift toward industry and commercial uses. These have included regionally significant trade and commerce, and also commercial uses that benefit from visibility on the Interstate 5 corridor.

The City's Comprehensive Plan (1996) recognizes the ultimate conversion of agricultural lands to other urban uses by designating them with traditional urban designations (e.g., residential, commercial, industrial, etc.). Existing land use records from the Pierce County Assessor-Treasurer are presented in Table 2 (Figure 3). As of the 2000 Census there were 4,784 residents of Fife.

Table 2. Existing land use in the City of Fife including the UGA.

Land Use Category	Acres	Percent of Gross Area
Commercial	881	26
Residential, single family	448	13
Residential, multi family	103	3
Agriculture	378	11
Industrial	216	6.5
Civic	114	3
Park/open	111	3
Utilities	49	1.5
Unknown	69	2
Office	29	1
Right of Way	15	.5
Vacant	977	29
Gross Area	3410	100

¹ Percentages may not total 100 percent due to rounding during GIS

In addition to the diversion of the White River noted above, the Puyallup River watershed been significantly modified from its historic condition. This includes the construction of hydroelectric dam(s), logging of forest lands and the construction of logging roads, significant development in the lower basin, extensive agricultural practices in the floodplain, and a major flood control effort that has resulted in straightening and channel hardening of much of river below approximately river mile 28 to the mouth at Commencement Bay, including the installation of a complex system of levees, revetments, and dikes on both sides of the River.

The Hylebos Creek watershed is also highly modified as a result of rapid growth in south King County, Federal Way, Milton, as well as northeast Tacoma and Pierce County. Kerwin (1999) characterized the Hylebos Creek basin as “one of the most heavily urbanized watersheds in the State”. The conversion of lowland forests to highly developed urban area has resulted in a significantly flashier creek with overall lower flows and seriously degraded water quality.

The City has a limited series of historic aerial photos that are more than twenty years old. There is a single image of the City with limits taken in 1984 (print, color, 1:4,800), images of different parts within the City from 1978 that include some of the Puyallup River and all of Hylebos Creek within the City (print, black and white, 1:4,800), and some undated images taken as a single series including some of the Puyallup River (print, black and white, 1:2,400). The undated series pre-dates 1978.

These aerial photos clearly demonstrate the development of commercial, industrial, and residential areas in the City. Even in 1984, there remained large tracts of agriculture in areas that have since been developed. However, changes in shoreline areas have been significantly lower in magnitude that those along the Interstate 5 corridor. In some cases, access has been restricted since the beginning of the photographic record. The north end of Levee Road was at one time open to all vehicle traffic, and there were two active roads, Berens and Ferguson Roads, where road beds still exist.

The same is true on Hylebos Creek, where there was greater vehicular access and activity on the left bank between 4th and 8th Streets East from an old gravel mine, and included clearing within the shoreline area. With the exception of some commercial and industrial development (e.g., near Frank Albert Road East and 70th Avenue East on the Puyallup River, and near Pacific Highway on the Hylebos), shoreline land use has either remained relatively constant or been reduced according to the photographic record.

2.2 EXISTING SHORELINE DESIGNATION

The City's existing Shoreline Master Program was adopted in 1974. It includes the following shoreline designations based on Ecology's guidelines at that time:

- 1) Natural Environment: to preserve and restore those shorelines relatively free of human influence.
- 2) Conservancy Environment: to protect, conserve, and manage existing natural resources and valuable historic and cultural areas.
- 3) Rural Environment: to protect agricultural land from urban expansion.
- 4) Urban Environment: to insure optimum utilization of shorelines within urbanized areas.

The only shoreline that was originally designated under this plan was the Puyallup shoreline. The entire reach was designated as Urban Environment. No portion of the Hylebos was designated under that plan.

2.3 EXISTING LAND USE

Existing land use designations in both the City and its UGA are presented in Table 2 (based on 2004 Pierce County Assessor-Treasurer data, Figure 3). Developable vacant land comprises a considerable portion of the area within the City and its UGA. Commercial and industrial uses are also common in the City and UGA. Although official maps maintained by the City of Fife and the Pierce County Assessor-Treasurer appear to illustrate an abundance of developable land within the City's corporate limits, vested and approved projects occupy a considerable acreage of what currently is identified to be vacant or in agricultural use.

For instance, along the Oxbow Wetland are at least two approved preliminary plats which when constructed will result in the introduction of as many as 950 dwelling units in the immediate vicinity of that shoreline. In addition, there are vested projects along 70th Avenue East. WSDOT is engaged in ongoing acquisition of properties between 70th Avenue East and Freeman Road for right-of-way for the future connection of State Route 167 with Interstate 5 and State Route 509.

Existing land use practices on these shorelines were observed using aerial photos, field visits, and review of Pierce County Assessor-Treasurer data. On the Puyallup River, waterward of Levee Road, the entire shoreline is comprised of the Puyallup River Levee, which is not developable. There are some areas of trees or shrubby vegetation, but not enough to

characterize it as forested. Shoreline jurisdiction extends landward of the levee, and includes Levee Road and a narrow strip of adjacent land. Downstream of Frank Albert Road, Levee Road is closed to public access between the old rights-of-way for Berens and Ferguson Road. Most of the shore lands downstream of Frank Albert Road are vacant and have been cleared or otherwise used for agriculture. There are scattered residences with access from the road whose property extend into the shoreline jurisdiction. Upstream of Frank Albert Road to 70th Avenue East most of the land has been cleared and much of it is currently in agriculture. At 56th Avenue East there is a small group of houses with frontage on Levee Road whose properties extend into the shoreline jurisdiction. Land use in the area immediately adjacent to 70th Avenue East includes commercial (dumpster storage) and medium-density residential (mobile homes and single family). The remainder of the Puyallup River shoreline along Levee Road is being farmed although land use applications are on file with the City of Fife that may result in the conversion of these lands to urban-density residential uses.

Approximately one-quarter mile southeast of 54th Avenue East is the hydrological connection between the Puyallup River and the Oxbow Wetland. Because of this connection, the wetland is included in the shoreline jurisdiction. The Puyallup Tribe of Indians has a considerable interest in biological and cultural integrity of the Oxbow Wetland. Most of the area adjacent to the wetland was cleared and used for agriculture in the recent past. As noted above, preliminary plans have been approved for residential development in this area.

Along the Hylebos, most of the land is developed as single family residential dwelling units or is vacant, undeveloped land. A wetland mitigation area (Milgard Nature Area) is on the right bank between 4th and 8th Streets East in an area that is in industrial use. The left bank of the Hylebos, across from the Milgard site, contains an undeveloped forested hillside adjacent to the City water well facility on 62nd Avenue East and is in residential use. There is a small area on the south side of Pacific Highway within the shoreline jurisdiction that is designated for multiple uses (high-density residential, commercial) and has scattered homes.

Table 3. Existing Land Use Observations by Fife Shoreline Segment

Inventory Segment	Bank	Existing Land Use	Approximate Percent Coverage ¹
P1	Left	Vacant	70
		Residential, single family	9
		Residential, multi family	2
		Agriculture	8
		Commercial	7
		Utilities	4
P2	Left	Vacant	72
		Agriculture	23
		Residential, single family	3
		Right of way	2
P3	Left	Residential, single family	31
		Residential, multi family	6
		Park/open space	26
		Vacant	22
		Utilities	8
		Agriculture	7
H1	Right	Residential, single family	97
		Residential, multi family	2
		Vacant	1
		Right of way	1
H2	Right	Residential, single family	43
		Park/open space	39
		Utilities	10
		Vacant	8
	Left	Vacant	65
		Utilities	31
H3	Right	Vacant	40
		Residential, single family	29
		Commercial	21
		Park/open space	10
	Left	Vacant	58
		Residential, single family	48

¹ Percentages may not total 100 percent due to rounding during GIS

2.4 ZONING DESIGNATIONS

The City’s most current Zoning Map (2004) includes 10 zoning designations (Figure 4). Five of the designations are residential, three are commercial, one is business park, and one is industrial. Several of the higher density residential designations encourage mixed use projects that include both residential and commercial land uses.

As depicted on the Zoning Map, much of the areas adjacent to Interstate 5 and Pacific Highway are zoned for industrial or commercial uses. Residential uses tend to be

concentrated south of 20th Street East and along the upstream half of the Puyallup River east of Frank Albert Road East.

Within the shoreline jurisdiction, most of shoreline is zoned as one of four residential classes: Small Lot Single Family, Single Family Residential, Neighborhood Residential, or Medium Density Residential. This is particularly true on Hylebos Creek. The downstream shoreline on the Puyallup River is zoned industrial, as are small areas downstream of 70th Avenue East, around the Frank Albert Wetland, and Hylebos Creek shoreline at the Milgard Nature Area. There are also two areas of Community Commercial zoning on the Puyallup River, and one small area of Regional Commercial on Hylebos Creek at Pacific Highway.

Table 4. Current Zoning by Fife Shoreline Segment

Inventory Segment	Bank	Zoning	Approximate Percent Coverage
P1	Left	Industrial	81
		Community commercial	13
		Neighborhood residential	6
P2	Left	Regional residential	51
		Residential, medium density	17
		Industrial	26
		Community commercial	6
P3	Left	Medium density residential	60
		Industrial	11
		Community commercial	29
H1	Right	Small lot residential	100
H2	Right	Small lot residential	53
		Industrial	47
	Left	Single family residential	100
H3	Right	Small lot residential	60
		Regional commercial	40
	Left	Single family residential	93
		Regional commercial	7

2.5 PARKS , OPEN SPACE, AND PUBLIC ACCESS

A variety of park and open space uses are currently under design or construction throughout the City of Fife. Along Levee Road, a multi-use, regional trail is planned to be constructed during the widening of the road. The trail is proposed with a design that would accommodate both pedestrians and cyclists.

A water access system may be developed for hand-carry or car-top boating activities. The water trails may provide access to salt and freshwater bodies that are not readily accessible or suitable for power boats or other larger water craft.

Where possible, water trailheads may be located to coincide with and use other trail corridors, resource conservancies, and other park and recreational facility services including parking lots, restrooms, and utilities.

The vision for the water trails located within the Puyallup River shorelines jurisdiction is:

- Increase and promote public access to the area's significant fresh water resources, particularly for car-top boating enthusiasts;
- Provide access to scenic natural areas and features of interest that can not be accessed from other trail systems;
- Accommodate boating enthusiasts of all skill levels, and
- Allow extended boating duration including overnight trips.

The Fife School District has constructed a new public school that will contain ball fields adjacent to the Oxbow Wetland. It is anticipated that construction of the school's recreation facilities will be complete in 2005.

Over the last ten years, there has been a concentrated effort by conservancy organizations, private individuals, corporate entities, and the City of Fife to protect portions of the Hylebos Creek shoreline with easements or other legal instruments. These actions have resulted in procuring, in perpetuity, a significant portion of the shoreline as passive open space.

Most of the Puyallup River shoreline waterward of the levee is accessible to the public, although the Pierce County River Improvement District does not actively encourage public use of the area. Landward of the levee most property is privately owned. Most of the Hylebos Creek shoreline is privately owned. The City is planning to provide access to the undeveloped property across Hylebos Creek from the Milgard Nature Area, and perhaps the Milgard area as well.

2.6 IMPERVIOUS SURFACE

There are currently no maps of any type that accurately show impervious surface areas within the City of Fife. It is anticipated that comparatively more of the Puyallup River shoreline area is comprised of impervious surface area than the Hylebos Creek shoreline, due to the presence of the levee (impervious where concrete facing is intact), Levee Road, and other roads, driveways, or developments. In contrast, Hylebos Creek has fewer roads in the shoreline area, most of which cross, rather than run parallel to, the shoreline. Land uses along Hylebos Creek are primarily residential or vacant in nature, and thereby do not greatly increase the impervious surface areas within the shoreline area. Exceptions to this are the first segment of Hylebos Creek, where residences, driveways, and some areas of the road are within the shoreline area, and the most upstream part of the third segment where development around Pacific Highway and the 70th Avenue East overpass result in large expanses of impervious surfaces.

2.7 FILLED AREAS

The entire Puyallup River shoreline has been subject to fill practices as part of the levee installation, and the construction of Levee Road. Straightening the channel connecting the Oxbow with the Puyallup River also is believed to have required the use of fill.

Road construction also required the placement of fill in many areas along Hylebos Creek. Non-levee bank stabilization and fixing of the channel location likely also required the placement of fill in Hylebos Creek shoreline areas.

As noted in Section 2.1, agricultural and industrial development in the Commencement Bay tideflats and surrounding area required a substantial amount of filling, which likely also influenced the amount of fill found in the City's shoreline jurisdiction.

2.8 ROADS AND BRIDGES

2.8.1 Roads

Public and private roads are common features within the City's shoreline jurisdiction. Levee Road runs the length of the Puyallup River segment, although public access to the Road stops halfway between the old Berens and Ferguson Road rights-of-way on what is now mostly Union Pacific Railroad property. Major roads that terminate on the south at Levee Road include Frank Albert Road, 56th Avenue East, 70th Avenue East, and Freeman Road. Levee Road is a major arterial for commuters on the left (north) bank of the river.

There is no equivalent roadway running adjacent to Hylebos Creek. The largest roadway in the Hylebos Creek shoreline jurisdiction is Pacific Highway. However, only a small section of roadway in the upstream portion of segment H3 is within the shoreline jurisdiction. A major arterial, 70th Avenue East, crosses Hylebos Creek at the north end of its Interstate 5 overpass. Most of the roadway within the Hylebos Creek shoreline area is associated with a series of smaller local roads, including 4th Street East (which terminates at the River on the left (west) bank), 8th Street East, 62nd Avenue East, and 12th Street East.

2.8.2 Bridges

The Puyallup River segment has two bridges: the Burlington Northern-Santa Fe Railroad Bridge immediately south of Interstate 5 at the western edge of the City, and the 66th Avenue/Melroy Bridge. The Melroy Bridge is a major commuter portal to Interstate 5 and Tacoma: it is the only crossing of the Puyallup River between Interstate 5 and the City of Puyallup west of Meridian Avenue.

On Hylebos Creek, there are at least five small residential bridges in segment H1 and another in segment H3 immediately downstream of the 70th Street overpass. In addition, there are roadway crossings at 4th Street East, 8th Street East, 62nd Avenue East, Pacific Highway, and 70th Avenue East. The crossing at 4th Street East is closed to vehicle traffic, and the crossing at 70th Avenue East is a large overpass that also bridges Interstate 5.

2.9 FLOOD CONTROL STRUCTURES

The entire length of the Puyallup segment consists of a double levee installed and maintained for flood and channel migration control. The upper levee has concrete facing for most of the reach with limited vegetation over and above it. The lower levee is vegetated. Much of the inter-levee space has unimproved vehicular access. The levee property is owned by the US Government and the structure is maintained by the Pierce County River Improvement Division.

There are no similar flood control structures along Hylebos Creek in the City, but based on observations made at the road crossings, many areas of the bank have been stabilized at some point in the past. Much of the reach between 4th and 8th Streets East has old timber bulkhead-like structures on both banks, and also old pile extending approximately one foot into the channel on intervals of approximately 15 feet. Immediately upstream at 8th Street East, there is riprap on the lower portion of both banks as well as some timber. Further downstream there is some timber and, on the right bank, ecology block. At 62nd Avenue East, upstream banks have been stabilized in places with timber and riprap. Shoreline stabilization appears to end immediately downstream of the crossing. At 12th Street, there was no visible stabilization up or downstream, but much of the bank is obscured by thick overhanging vegetation. Between Pacific Highway and 70th Avenue East, much of the lower banks (below water level) have been lined with overlapping concrete tiles.

2.10 DOCKS, PIERS, AND OVERWATER STRUCTURES

According to aerial photos, there are very few over water structures (decks) in residential areas along the first segment of Hylebos Creek. There is no public access to this shoreline segment, so field verification of the type and number of these structures was not possible. Outside of this segment, there are no docks, piers, or overwater structures other than bridges within the City's shoreline jurisdiction.

2.11 STORM WATER AND SEWER OUTFALLS

There are two major surface water management ditches within the shorelines jurisdiction of the City (Figure 5). A stormwater ditch occurs within the Oxbow Wetland. This ditch is connected by culverts to a series of ditches extending along 70th Avenue East and 48th Street East which were originally constructed to drain land that was used for agricultural production as recently as the 1990s. The ditch that is located within the Oxbow Wetland drains to the Puyallup River through a culvert that extends under Levee Road at approximately 60th Avenue East. Ditch maintenance is performed by Pierce County Drainage District #21.

Within the Hylebos Creek shorelines jurisdiction, a series of ditches have been dug adjacent to Interstate 5 at 70th Avenue East. There is a box culvert under Interstate 5 that connects the ditches that occur on both sides of the freeway. Ditch maintenance is performed by the Washington State Department of Transportation.

2.12 OTHER UTILITIES

There are four power crossings of both the Puyallup River and Hylebos Creek. In addition, overhead power lines occur within the Levee Road right-of-way, which is located entirely within the Puyallup River shoreline jurisdiction.

There is one natural gas crossing of the Puyallup River. Two City of Milton water main crossings of Hylebos Creek have been built within the City's SMP planning area.

2.13 CULVERTS

The mainstem Puyallup River does not pass through any culverts. The Oxbow Wetland drains through a culvert under Levee Road. That culvert has a flapgate opening that appears rusted and fixed partially open. There also is a culvert under Freeman Road connecting a wetland area at the corner of Freeman and Levee Roads to a larger wetland outside of the City's Fife's urban growth area. On Hylebos Creek, there is a single culvert on the mainstem under the road crossing for 12th Street East.

3 BIOLOGICAL RESOURCES AND CRITICAL AREAS

This section describes critical areas already identified within the City of Fife as defined by the Washington State Growth Management Act (RCW 36.70A), these are: wetlands, aquifer recharge areas, fish and wildlife habitat conservation areas, geologic hazard areas, and frequently flooded areas. For the purpose of shoreline inventory, areas that meet these criteria and are in any part in the 200-foot jurisdiction area are included. Critical areas, especially habitat areas (e.g., wetlands), where the buffer alone is in the shoreline jurisdiction are not included. Critical areas presented below have been mapped where GIS data layers exist.

Recent Shoreline Inventories for other municipalities within the Puyallup River floodplain have included channel migration zones in critical areas. However, although the City is located within the historic floodplain, the total coverage by the levee on the Puyallup and extensive straightening and bank stabilization of the Hylebos preclude significant opportunity for channel migration within the City's shoreline area.

3.1 WETLANDS

A number of sources were reviewed to assess the presence of wetlands within the City's shoreline jurisdiction area. These sources include National Wetlands Inventory (NWI), the Pierce County and City of Fife GIS (Figure 6), WDFW Priority Habitats and Species (PHS) Maps, and WDNR Natural Heritage Program data. Previously inventoried wetlands based on these data sources are presented in Table 8.

Many of the prominent wetlands along the Puyallup River were formed from remnant oxbows after permanent straightening and channel hardening of the river. Smaller, isolated wetlands are common on the floodplain but not necessarily within shorelines jurisdiction. Only two such wetlands are indicated by the Pierce County and City of Fife GIS wetlands data. The main wetland feature within shoreline jurisdiction along the Puyallup is the Oxbow wetland, which is included within shorelines jurisdiction based on its hydrological connection to river by way of a culvert under Levee Road and conveyance ditch extending approximately 625 feet. According to the NWI, this is actually a complex of 7 distinct wetland areas (Table 5).

A smaller wetland, near Frank Albert Road, is located more than 200 feet from the ordinary high water mark of the Puyallup River. However, this wetland is situated within the 100-year flood plain of the river and is therefore within shorelines jurisdiction. According to the NWI, it is a complex of two distinct wetland areas.

A wetland along Freeman Road and adjacent to Levee Road, is hydrologically connected with the Puyallup River by a culvert, but is located outside the City of Fife's corporate limits and urban growth area.

Of the existing wetland inventories, only the Pierce County wetlands GIS layer identifies wetland areas within shoreline jurisdiction on Hylebos Creek. Two wetland polygons (Figure 6B), totaling 2.4 acres, are situated within the shorelines jurisdiction of the Hylebos Creek. These wetlands consist of a larger area on both banks between 4th and 8th Streets East, and a smaller area mostly on the right bank of the middle-third of the reach between 62nd Avenue East and 12th Street East.

On the right bank, the larger wetland area is part of the Milgard Nature Area, an approximately 6-acre mitigation area owned by the Milgard Corporation and managed by the City. With exception of the downstream end of the smaller wetland area, wetlands on the Hylebos within the City shoreline area are owned or managed by the City.

The City has adopted the Washington State Department of Ecology's wetland categories and definitions. Category II and III wetlands that are less than 2,500 square feet and Category IV wetlands that are less than 10,000 square feet are not regulated by the City. Buffer widths for wetlands within the City of Fife are as follows:

- Category I: 150 feet
- Category II: 100 feet
- Category III: 50 feet
- Category IV: 25 feet

According to current inventories (WDNR, Pierce County and City of Fife GIS), none of these wetlands has been assigned a State category. Wetland delineation and assessment activities conducted in support of development activities adjacent to these wetlands, indicate that the Oxbow wetland is a Category I wetland for the majority of its area, but transitions to a Category III wetland near its crossing at 70th Avenue East. The wetlands adjacent to Frank Albert Road appear to be Category II wetlands. Taken as part of the larger Freeman Road wetland, the small wetland area at Freeman Road also would likely be considered a Category II.

Table 5. Wetlands Within or Partially Within Fife Shoreline Segments

Inventory Segment	Inventory	Number	Wetland Type ¹	Common Name (if known)	Total Acreage ²	Approximate Percent Coverage
P1	N/A	0	N/A		0	0
P2	NWI, Pierce Co., City GIS	2 complexes with 2 and 7 wetland areas respectively, per NWI	Per NWI: Forested (1) Aquatic bed (1) Per NWI: Aquatic bed (2) Emergent (1) Shrub scrub (1) Forested (3)	Frank Albert Road Wetland (entire complex) ³ Oxbow Wetland (entire complex)	49.2 (48.8 per NWI)	100
P3	Pierce Co., City GIS	3	Forested (1) Emergent (1) Shrub scrub (1)	Freeman Road wetland (small part) No common names	0.7	1.7
H1	N/A	0	N/A		0	0
H2	Pierce Co., City GIS, other	2 ⁴	Emergent, Forested (1) Forested, Emergent (1)	Milgard Nature Area & Jordan Property No common name	2.4 ⁴	5.3
H3	N/A	0	N/A		0	0
Total :					47.5 ⁴	23.0

¹ Based on field and aerial photo observations unless inventory data is available (and noted).

² Based Pierce County and City of Fife wetlands GIS layer; depicted on Figure 6.

³ Removed from shoreline segment, but included in jurisdiction based on inclusion in the 100-year flood zone on the old Oxbow

⁴ A recent delineation for the City (Adolfson Associates 2003) identified 2.3 acres of wetlands (2 separate areas, both in shoreline area) on the right bank across from the Milgard Area; this information is not available in GIS. These data would result in a greater overall wetland acreage for this segment and overall shoreline area.

3.2 AQUIFERS

Pierce County GIS data identify most areas of the City to be situated within aquifer recharge areas, as depicted on US Environmental Protection Agency and National Well Water Association DRASTIC maps for Pierce County (DRASTIC ratings 180-199). The exception to this is the steeply sloped area and lands below them on the left bank of the Hylebos. As such, the shorelines jurisdiction associated with the entire stretch of the Puyallup River and the right bank of the Hylebos Creek are included as aquifer recharge areas.

3.3 FISH AND WILDLIFE HABITAT CONSERVATION AREAS

Fish and wildlife habitat conservation areas in the City are identified on a paper map available in City Hall. Within the shoreline area, the habitat conservation areas are based on the WDFW PHS inventory. A current (February 2004) query of that database for this area identified four PHS polygons located within the City shoreline jurisdiction (Table 6). Those on the Puyallup are primarily wetland habitat related, while those on the Hylebos are either riparian or steep slopes immediately landward of the riparian fringe. Most of the left bank of the Hylebos is contained within PHS polygons, as is much of the right bank in segment H3.

Additionally, the program identifies salmonid fish runs in both the Puyallup River and Hylebos Creek. Because the City of Fife is so close to the mouth of both water bodies, it is believed that all anadromous fish in these systems pass through reaches in the City shoreline jurisdiction. The PHS system includes records of the following anadromous salmonids in the Puyallup River: spring and fall chinook (*Oncorhynchus tshawytscha*), chum (*O. keta*), coho (*O. kisutch*), pink (*O. gorbuscha*), sockeye (*O. nerka*), and both summer and winter steelhead (*O. mykiss*). The PHS system includes records of resident salmonids on this reach, with dolly varden/bull trout associated with the main river and resident cutthroat (*O. clarki*) in Clear Creek, a tributary to the river on the opposite bank. For Hylebos Creek, the PHS includes coho, chum, searun cutthroat and winter steelhead. Pierce County GIS data as well as data gathered by Friends of the Hylebos (C. Carrell, pers. comm.) also demonstrate chinook presence in Hylebos Creek. The PHS record includes one record of non-salmonid fish species (reticulate sculpin, *Cottus perplexus*) within the shoreline jurisdiction. However, this is not a State Priority species.

Priority avian species in the greater area that would be expected to be present in the Fife shoreline jurisdiction include bald eagle (*Haliaeetus leucocephalus*) and great blue heron (*Ardea herodias*). Great blue herons themselves are not Priority species, but their breeding areas are Priority habitats. There are nesting colonies present within 2 miles of Fife Shorelines, near the head of Clarks Creek. There are no PHS polygons or points for regular habitat use by these species (e.g., feeding territories, nests) within the shoreline jurisdiction, but they are likely to at least use these areas for transit. There is also a single record of western pond turtle (*Clemmys marmorata*) within the City, but not within the Hylebos or Puyallup shoreline areas (Wapato Creek in 1992).

Of the non-salmonid species included in PHS data, only bald eagles are listed under the Federal Endangered Species Act (threatened status); they are also considered threatened by the State. Western pond turtles have State endangered status and are Federal species of concern. WDFW information on this species indicates that it has been nearly extirpated from the Puget Sound lowlands – there are only two records of individual occurrences of these turtles in (Wapato Creek in 1992) or near (Thea Foss waterway in 1987) the City. The remaining non-salmonid species identified on the PHS as potentially falling within the Fife shoreline jurisdiction have neither Federal nor State listing status.

Table 6. Documented Priority Habitats and Species within Fife Shoreline Segments

Inventory Segment	Bank	Species or Habitat Type	Type of Use ¹
P1	N/A	Chinook salmon (spring, fall)	Rearing/migration
		Coho salmon	Rearing/migration
		Chum	Migration
		Pink	Migration
		Sockeye	Migration
		Steelhead (summer, winter)	Migration
		Dolly varden/bull trout	Migration
		Cutthroat (resident)	Presence (based on resident population in Clear Creek, and greater Puyallup Basin)
		Reticulate sculpin	Presence
P2	Left	PHS polygon: Oxbow wetland	Wetland; waterfowl, deer, raptor use
P3	N/A	Same salmonid species as P1	Same salmonid uses as P1
H1	Right	PHS polygon: riparian area	Undeveloped riparian; bird and mammal habitat; also trout and steelhead habitat
	N/A	Chinook salmon	Presence
		Coho salmon	Migration
		Steelhead (winter)	Migration
		Chum salmon	Migration
		Cutthroat (searun)	Presence
H2	Both	PHS polygon: riparian area	Undeveloped riparian; bird and mammal habitat; also trout and steelhead habitat, includes part of Milgard Nature Area
	N/A	Same salmonid species as H1	Same salmonid uses as P1
	Left	PHS polygon: steep slope	Landward of riparian polygon; steep slopes and bluffs, raptor habitat and refugia for birds and mammals
H3	Both	PHS polygon: riparian area	Undeveloped riparian; bird and mammal habitat; also trout and steelhead habitat
All	N/A	Bald eagle, great blue heron	No PHS polygons or points (e.g., feeding territory, nests) in shoreline area, but use of shoreline habitat (presence at minimum) is known

¹ Habitat use for salmonids based on StreamNet database except where presence is used (based on WDFW PHS data or Pierce County GIS data).

3.4 GEOLOGICALLY HAZARDOUS AREAS

The City identifies three types of geologically hazardous areas in its Municipal Code (Chapters 17.11, 17.13): erosion areas, landslide areas, and seismic areas.

The erosion and landslide hazard map was compiled from the USDA NRCS Soil Survey (Zualaf 1977, http://www.or.nrcs.usda.gov/pnw_soil/washington/wa653.html for current maps and tables), and is based on soils with severe erosion potential and severe building site limitations due to slope (Xerochrepts, 45 to 70 slopes). No erosion or landslide hazardous areas are identified on the Puyallup River shoreline. On Hylebos Creek, downstream from

12th Street, much of the left bank and some of the right bank are identified as hazard areas based on these parameters. The hazard areas extend beyond the shoreline jurisdiction on both sides of the Creek (segments H1 and H2), particularly on the left bank where most of the steep slopes above the Creek are included.

The seismic hazard map is based on USGS Water Supply Bulletin No. 22, *Groundwater Occurrence and Stratigraphy of Unconsolidated Deposits, Central Pierce County, Washington*. Within the City, the entire Puyallup valley floor is considered a seismic hazard area because of the presence of alluvium, as is the right bank of Hylebos Creek. The left bank of the Hylebos, between 4th Street East and 62nd Avenue East, is identified as a seismic hazard area from the creek to the toe of the steep slope.

Currently, there are no GIS layers that depict these areas; the City uses paper maps that depict combined erosion and landslide hazard areas, and seismic hazard areas.

3.5 FREQUENTLY FLOODED AREAS

Pierce County GIS data shows frequently flooded areas in the City based on 100-year and 500-year flows (flood zone and flood way, respectively, Figure 6). The 100-year flood zone data is most pertinent to shoreline jurisdiction, as it can be used to designate wetlands greater than 200 feet from the waterbody as regulated shoreline. The levee along the Puyallup River was built for flood control, as well as for permanent channel maintenance. The 100-year flood zone does not extend above the levee, with two exceptions. The Oxbow wetland complex, with its direct connection to the river, is susceptible to flooding around its edges, but in a narrow margin. The Frank Albert Road wetland complex and its margins are part of an isolated area of the flood zone. Likely, this is due to its greater susceptibility to flooding as part of the remnant oxbow.

The Hylebos Creek channel has been permanently fixed in areas, but not as extensively nor with the capacity for flood control as the river. Portions of both banks of the creek lie within the flood zone, although the left bank is largely constrained by steep slopes. Generally, the flood zone is within 50 feet of the creek. Between 4th Street and 8th Street, the flood zone includes the left bank at the downstream end (extending beyond the shoreline jurisdiction) and both sides at the upstream end, including most of the shoreline area on the left bank. Upstream of 12th Street the right bank (extending beyond the shoreline area) is within the flood zone, as is the left bank below the toe of the steep slope. The entire area within shorelines jurisdiction between Pacific Highway and Interstate 5 is also prone to frequent flooding.

Table 7. Frequently flooded (100-year flood zone) areas by shoreline segment.

Inventory Segment	Bank	Flooded Area in Shoreline Jurisdiction (ac)	Total Segment Area (ac)	Percent of Shoreline Area
P1	L	17.7 ac	62.3 ac	28%
P2	L	34.8 ac	48.8 ac	71%
P3	L	10.0 ac	44.8 ac	22%
Puyallup, all	L	62.5 ac	155.9 ac	40%
H1	L	Not City Shoreline		
	R	1.5 ac	7.5 ac	20%
H2	L	3.6 ac	15.2 ac	24%
	R	6.2 ac	15.2 ac	41%
H3	L	3.1 ac	9.0 ac	35%
	R	8.9 ac	10.8 ac	83%
Hylebos, all	Both	23.3 ac	57.2 ac	40%
Total		85.8 ac	213.5 ac	40%

4 SALMONID USE AND HABITAT

4.1 SALMONID USE

Of the ten State Priority species identified in or near the City of Fife shoreline jurisdiction, eight are salmonids (Table 8). Of these, two species have federal threatened status and state candidate status (chinook, bull trout) and one has federal candidate status (coho). Due to the City’s downstream location in the Hylebos and Puyallup basins, all anadromous fish using the Hylebos or Puyallup basins must pass through the City, and become exposed to conditions related to shoreline practices. For this reason, salmonid use and habitat are given particular attention in this inventory.

As presented in Table 6 (Section 3.3), salmonids generally use Hylebos Creek and the Puyallup River in the City for migration and, in the case of chinook and coho in the Puyallup, also for rearing. Chinook and coho life histories also indicate that rearing is likely in the lower reaches of Hylebos Creek, and that chum in both systems may also rear in the lower watershed, particularly in areas of tidal influence (Margolis and Groot 1991). There are no documented spawning areas for any salmonid species in the Fife shoreline jurisdiction.

Table 8. Status of Salmonid Species in the Puyallup River and Hylebos Creek

Species	Waterbody	Federal Status	State Status
Chinook	Puyallup, Hylebos	Threatened	Candidate
Chum	Puyallup, Hylebos	Not listed	Not listed
Coho	Puyallup, Hylebos	Candidate	Not listed
Pink	Puyallup	Not listed	Not listed
Sockeye	Puyallup	Not listed	Not listed
Steelhead	Puyallup, Hylebos	Not listed	Not listed
Cutthroat	Puyallup, Hylebos	Not listed	Not listed
Coastal Bull Trout ¹	Puyallup	Threatened	Candidate

¹ PHS data identifies this run as Dolly Varden/Bull Trout, but WDFW SASI and Pierce County GIS both specifically identify bull trout in this watershed.

4.2 HABITAT CONDITIONS

One of the traits of salmonid life histories is variability, within and among species, in degree and type of freshwater habitat use. For those salmonids moving relatively quickly through the City shoreline areas (pink and sockeye salmon; steelhead, cutthroat and bull trout), water quality conditions may be more important than shoreline habitat. However, for chinook, coho, and chum which are more likely to spend time in City shoreline areas, availability and condition of shoreline habitat is an additional concern. Rather than using a species-specific approach to discuss salmonid habitat City shorelines, the following sections provides a evaluation of river and shoreline conditions based on a series of habitat attributes generally considered to be important for anadromous salmonids.

4.2.1 Framework for Habitat Evaluation

The Habitat Conservation Branch of the National Marine Fisheries Service (NFMS) Environmental and Technical Services Division developed a system for making Endangered Species Act determinations for anadromous salmonids (NFMS 1996). Commonly referred to as the “pathways and indicators” analysis, or the “matrix”, this system was designed to evaluate the effects of an activity on listed salmonids by defining their biological requirements, evaluating the relevant components of their environmental baseline, and determining the effects on them based on some action. While designed to be flexible based on the specific environment and species being evaluated, this system uses six baseline habitat elements important to salmonids (pathways) and defined attributes of each (indicators). For instance, water quality is a pathway with temperature, sediment/turbidity, and chemical contaminants/nutrients as its indicators. The pathways are:

- Water Quality
- Habitat Access
- Habitat Elements
- Channel Condition and Dynamics
- Flow/Hydrology
- Watershed Conditions

Because they were designed to make determinations on a watershed scale, the pathways and indicators defined in this system also provide an excellent framework to evaluate salmonid habitat conditions in stream and river shoreline areas. However, while the following evaluation of baseline conditions and functions for salmonid habitat use the same framework as a pathways and indicators analysis, it does not evaluate an action or group of actions pursuant to making an effects determination. Instead, it uses the pathways and indicators to evaluate the condition of salmonid habitat in the City shoreline areas.

4.2.2 Baseline Habitat Conditions for City Shorelines

Water Quality

Indicators of water quality for anadromous salmonids include temperature, sediment/turbidity, and chemical contaminants/nutrients. Dissolved oxygen, pH, and fecal coliform levels are also important components of water quality. Within the City shoreline area, the major source of available data for water quality is the State Water Quality Assessment, commonly referred to as the “303(d) list”. Technically, the 303(d) list refers to a specific category of water quality (see below). In order to maintain compliance with the Federal Clean Water Act, Ecology evaluates water quality for state fresh and marine water bodies and publishes the information as a list every two to four years. The data also are available spatially through on-line mappers made available on the Ecology website (<http://apps.ecy.wa.gov/wqawa/viewer.htm>). Prior to the current list (2002/4), the next most recent list was prepared in 1998. Ecology prepares the list by integrating data from its assessment activities with data collected by other agencies and organizations. For each parameter tested, applicable areas for each waterbody are assigned one of the following categories:

- **Category 5** Polluted waters with no existing Total Maximum Daily Load (TMDL), submitted to EPA for approval on 2002/4 list.
- **Category 4c** Impaired, already has a TMDL.
- **Category 4b** Impaired, has pollution control plan.
- **Category 4a** Impaired, non-pollutant.
- **Category 3** No data (catch all for parameters not in Categories 5, 4 [all], 2, or 1).
- **Category 2** Waters of concern (not impaired or known to be impaired).
- **Category 1** Meets tested standards.

The assessment for each area of each waterbody is not inclusive for all pollutants. A Category 1 listing for a particular parameter does not necessarily mean that area is clean of all other pollutants.

Based on the most recent Ecology water quality impairments list (Table 9) the Puyallup River reach along the City of Fife shoreline has impairment listings for six water quality parameters. Three of these (copper, lead, fecal coliform) are Category 5 listings and require a pollution control plan (Total Maximum Daily Load or TMDL). The Puyallup River, and the rest of WRIA 10, is scheduled for TMDL scoping by Ecology beginning in 2005. Dissolved oxygen, fecal coliform, and mercury levels also have raised concern in some segments, but not enough to be considered impaired. Areas in this reach met tested standards for a number of metals, as well as pH and temperature (Table 10).

Turbidity and suspended solids are known to be high in the Puyallup River, particularly during low flow periods. In the summer, the turbidity plume during low tide frequently extends far out into Commencement Bay. Glacial meltwater from Mount Rainier and sediment input from land use practices in the greater watershed both have been identified as contributing to this turbidity (Kerwin 1999). There are no turbidity/sediment listings for this reach of the river on the 303(d) list. However, Ecology also publishes information from its river and stream monitoring programming (http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html), which includes monthly data from a station located at Puyallup RM 6.6 (0.4 mile upstream of the City). Ecology uses a water quality index (WQI) to evaluate a number of parameters separate from the State Assessment. Parameter area assigned a rating of good, moderate or poor both by year and by month, and also integrated into overall water quality at the station by month. At this station during 2003, both turbidity and suspended solids were given a rating of poor. Additionally, the WQI rating for total phosphorus also was poor, and fecal coliform (303[d]-listed) rating was poor. According to the WQI, for 2003, overall water quality was determined to be moderate; over the last three years it was generally good during periods of higher flow (fall, winter, spring), and moderate during low flow periods. This associated in part with operations at the Mud Mountain Dam (White River RM 29.6), which retains suspended solids during periods of high base flows when water is impounded above the dam, and releases them with water releases to supplement low base flows.

Table 9. Water quality impairments on the Puyallup River in the City of Fife.

Category	Parameter	No. Listings	Listed prior to 2002/4
5 (303[d])	Copper	2	N
	Lead	1	N
	Fecal coliform	1	Y
4c (polluted, no TMDL required)	-	-	-
4b (polluted, no TMDL required)	-	-	-
4a (polluted, no TMDL required)	-	-	-
2 (waters of concern)	Dissolved oxygen	2	N
	Fecal coliform	1	Y
	Mercury	1	N
1 (meets tested standards)	Chromium	2	N
	Zinc	2	N
	Mercury	1	N
	pH	2	N
	Temperature	2	N
	Lead	1	N
	Ammonia-N	1	N

Within the City, Hylebos Creek has only two records on the State Water Quality Assessment, neither of which are Category 5. The entire reach has been assigned a Category 4c listing based on bio-assessment (based on aquatic invertebrates), and a Category 2 listing based on dissolved oxygen. Neither one of these parameters were on earlier 303(d) lists. Ecology has no current monitoring stations on Hylebos Creek, although there are data from 1983 and 1984 available on its website.

Friends of the Hylebos have an ongoing water monitoring program in the watershed upstream of the City. Generally, temperature, turbidity, and phosphate conditions are acceptable and do not appear to be in decline. Both dissolved oxygen and pH conditions are currently acceptable at most sites, but may be declining. Nitrate conditions are generally either poor and declining, or acceptable but declining over time. The monitoring station closest to the Fife UGA is a site in west Milton. At this station all water quality conditions are acceptable. However, dissolved oxygen, pH, and nitrate conditions may be declining. Both the Friends of the Hylebos and the Department of Ecology are monitoring water quality within the City as part of a planned restoration action across from the Milgard Nature Area (see Sections 4.3, 5.5), but as of yet these data are unavailable for review (C. Carrel, pers. comm.).

Based on the available data, both the Puyallup River and Hylebos Creek have moderate water quality impairments. In terms of salmonid habitat, they are both functioning, but at reduced capacity relative to their historic condition.

Habitat Access

NMFS (1996) defines physical barriers (manmade) as the single indicator of habitat access. In the City of Fife, neither the Puyallup River nor Hylebos Creek has any physical barriers to

anadromous salmonids at base flows. There has been no loss of this function relative to their historic condition.

Habitat Elements

Indicators of habitat elements include substrate, large woody debris (LWD), pool frequency, pool quality, off-channel habitat, and refugia (NMFS 1996). Quantitative reports of these parameters along City shorelines are not available; they are addressed in a larger-scale review of watershed conditions (Kerwin 1999), and also based on field observations and qualitative information available from other sources.

Anadromous salmonids do not spawn in the lower reaches of the Puyallup River or Hylebos Creek reaches, including those in the City of Fife. Therefore, substrate type is somewhat less critical of a habitat element than in areas higher in these watersheds. Kerwin (1999) identified substrate as a limiting factor in both Puyallup River and mainstem Hylebos Creek, based on high levels of fines.

Large woody debris (LWD) has been increasingly identified as an important habitat component for salmonids in river systems. It can be recruited to a stream or river from bank-side vegetation in the immediate area and from upstream sources. The latter is addressed under the greater watershed condition pathway below.

Along the Puyallup shoreline, the river is completely disconnected from vegetation across Levee Road, with the exception of the Oxbow wetland. Vegetation from the levee itself is the only potential source of LWD. However, practices of the US Corps of Engineers (between RM 0 and RM 3) and the Pierce County River Improvement District (upstream of RM 3) generally dictate the removal of trees greater than six inches in diameter at breast height (Kerwin 1999), thereby eliminating the capacity for the shoreline to function as a source for LWD.

Much of shoreline on the Hylebos has been developed and cleared of large woody vegetation up to the Creek banks. However, since there are large reaches where forested habitat extend to the shoreline, including most of the left bank, there is capacity for LWD recruitment. No quantitative data exist on LWD frequency in these two shoreline areas, but based on field observations it is very low in both areas. This is consistent with Kerwin's (1999) assessment that LWD is a limiting factor for salmonids in both the Puyallup and the Hylebos.

The extreme bank hardening and straightening of the Puyallup River has reduced the capacity for habitat function based on pool frequency and quality compared to historic (pre-levee) conditions. This has been identified as a limiting factor for salmonids (Kerwin 1999). Without the hydrodynamics of a meandering, active channel, and with little LWD, only areas where bars or other features (such as bridge pile) create sufficient water movement to counter the main downstream flow can pools occur. The Hylebos Creek channel has also been fixed through much of the Fife shoreline, limiting the capacity for pool formation. Although there is no quantitative information available, it appears that there is relatively greater availability of pools in the Hylebos than in the Puyallup. However, it is still considered to be a limiting factor for salmonids in the mainstem of Hylebos Creek (Kerwin 1999).

Off-channel habitat is almost non-existent in both the Puyallup and the Hylebos within the City, due to the levee (Puyallup) and bank stabilization/straightening (Hylebos). There are two exceptions to this: the Oxbow wetland on the Puyallup and a large stormwater ditch on the Hylebos immediately south of the Pacific Highway crossing.

The Oxbow wetland is connected to the river by a culvert and conveyance ditch. The culvert has a flapgate, which appears to be fixed in a partially open condition due to rust damage. According to the National Wetlands Inventory, this wetland includes at least 8 acres of open water (aquatic bed) habitat within the greater than 45-acre forested, shrub scrub, emergent, and open water complex. This wetland provides highly functioning off-channel habitat, although access is limited due to the flapgate.

On the Hylebos, the only existing off-channel habitat in the City is the stormwater ditch draining into the creek from the south immediately upstream of the Pacific Highway crossing (the "Surprise Lake Drainage"). The ditch is lined with herbaceous vegetation, including reed canary grass, and some large trees. It provides functioning off-channel habitat, but is not high quality. These observations are consistent with previous determinations that off-channel habitat is a limiting factor for salmonids in both the Puyallup and mainstem of the Hylebos (Kerwin 1999).

Taken together, LWD, pools, and off-channel habitat all contribute toward different types of refugia for juvenile salmonids, include refuge from high water velocity in the mainstem and from larger predators. Channel edges also can provide refugia where overhanging vegetation or physical features (bars, complex banks) reduce water velocity or provide cover. Other than the Oxbow wetland, refugia are extremely limited along the Puyallup shoreline (Kerwin 1999). Generally, there are more opportunities for refugia on the Hylebos, but these are also reduced compared to historic conditions.

Overall, the function of the all the above habitat elements appears to be significantly reduced in both the Puyallup and the Hylebos within the City. The Puyallup appears to have the greatest reduction in function, although it does have some off-channel habitat available in the Oxbow wetland. The Hylebos has reduced function for these habitat elements, but with the exception of off-channel habitat, is in generally better condition than the Puyallup. This can be attributed to at least two major factors: (1) the Puyallup levee almost completely disconnects the River from the greater shoreline area, which is not the case on the Hylebos, and (2) the Hylebos also has a relatively lower degree of development than the Puyallup, in part due to its location along the toe of a series of steep banks.

Channel Conditions and Dynamics

In their natural state, most rivers and stream systems change as they migrate across their floodplains. Erosion and deposition from normal channel movement influence sediment and substrate characteristics on scales ranging from very small (i.e., outside bank eroding deposits sand and gravel in the main channel below it) to very large (i.e., fine sediment transport from the high-gradient reaches to low-gradient depositional areas miles away). Occasional large-scale natural disturbances (such as bank failures and land slides) also are important for maintaining properly functioning in-stream conditions. Indicators of channel conditions and

dynamics are width/depth ratio, streambank condition, and floodplain connectivity. The quantitative values assigned to the first two of these indicators for the pathways and indicators analyses are specific to areas higher in the watershed than shorelines in the City (NMFS 1996), but they can still be addressed qualitatively.

There is no quantitative information on stream width/depth ratios for the Puyallup River or Hylebos Creek. Both streams have constrained channels through most of the City, with set channel widths. Depths vary with tides as well as flow. The major functional attribute of this indicator is temperature. Shallow, wide streams are more susceptible to seasonal temperature extremes, particularly during low flow periods (NMFS 1996). As noted in the section on water quality above, temperature extremes currently are not of concern in either stream.

Streambank condition is normally determined by the percentage of naturally stable bank compared to actively eroding bank (NMFS 1996). However, in the case of City shorelines, extensive artificial bank stabilization has made this comparison an inadequate measure of function. Almost the entire Puyallup River shoreline consists of levee, although there is some accretion of sediment over the structure. There is at least one area of levee erosion in the first segment where there is some active erosion. Hylebos Creek also has been artificially stabilized along much of the City shorelines, albeit not as extensively as in the Puyallup River. Areas that are not artificially stabilized (such as downstream of 4th Street) generally are vegetated and not rapidly eroding. The artificial bank stabilization in both streams removes or decreases the potential for dynamic channel migration and recruitment of streambank sediments to the channel.

Artificial bank stabilizing and fixing of channel locations have also removed or severely diminished the floodplain connectivity of these streams. Because of its levee, the Puyallup River will not overrun its banks downstream of Frank Albert Road even under 500-year flood conditions (Figure 6). Most flood waters are constrained to the remnant oxbow in which the Oxbow and Frank Albert Road wetlands are located. The Oxbow wetland is the sole floodplain area with a hydrological connection to the River.

Hylebos Creek is more connected to its floodplain, particularly in the segments H2 and H3 where flooding frequently occurs in much of the shoreline area. However, the channel is still almost completely constrained within a narrow strip of the larger floodplain.

Channel conditions and the potential for dynamic channel behavior (e.g., channel migration or sediment recruitment from channel banks) have been reduced, in some areas dramatically reduced, in City shoreline areas relative to historic conditions. As a result, the potential for these areas to function as salmonid habitat has also been reduced.

Flow and Hydrology Conditions

Timing of peak and/or base flows and drainage network density due to roads are both indicators of flow and hydrology conditions (NMFS 1996). The flow regime in the Puyallup River has been significantly altered compared to historic conditions due to the redirection of the White River into the Puyallup Basin, the operation of the Mud Mountain dam, and the diversion of water into Lake Tapps for hydropower generation. A recent USGS report

indicates that the hydrograph for the lower Puyallup River is strongly influenced by the outflow from the Lake Tapps Diversion (Sumioka 2004). For the protection of fish and wildlife resources, the Department of Ecology has mandated a minimum flow requirement for the lower Puyallup River (RM 6.6 to mouth), ranging between 1000 and 2000 cubic feet per second depending on the season (WAC 173-510-030). According to Kerwin (1999), between 1980 and 1993, this minimum daily flow was not met an average of 35 days annually. There has been no significant change in daily mean, monthly mean (for October), or annual mean streamflow in the River since 1980 (Sumioka 2004).

The flow regime in Hylebos Creek also has been significantly altered compared to historic conditions, but unlike the Puyallup River, the greater concern in Hylebos Creek is extremely high flows due to surface water runoff during storm events (Kerwin 1999). Development in the basin, particularly in the upper watershed, and the hydrological changes associated with it has resulted in an up to three-fold increase in peak flows. This also has implications for low flows, as less water is retained in the system between precipitation events.

The indicator of increased drainage network density due to roads is generally related to logging practices (NFMS 1996), but can also be applied to other roads. Increased runoff from streets and roads within the City is collected in a series of drainage ditches, outfalls for which include sites in the Puyallup River and Hylebos Creek shoreline areas. The increased road density resulting from urbanization and forest management practices within the watershed has affected flows within the City.

Changes in flow regime and basin hydrology for both the Puyallup River and Hylebos Creek have affected the potential for the City shorelines to function as salmonid habitat. Increased peak flow and flow frequency has implications for in-stream conditions for fish (such as water velocity increase without refugia resulting in either decrease in rearing habitat quality or premature forcing of fish out of rearing habitats), and also habitat conditions (e.g., increased potential for erosion and scour), whereas low flows can decrease habitat access and increase potential for temperature extremes. Flow and hydrology conditions in both streams are reduced compared to historic conditions.

Watershed Condition

The City's location near the end of the watershed continuum for both the Puyallup River and Hylebos Creek makes its shorelines susceptible to influence from conditions and practices in the rest of the basin. Basin-wide indicators of watershed condition include road density and location, disturbance history, and riparian reserves (NMFS 1996). As with many of the other indicators, the quantitative measures assigned to them were designed to be applied to upper watershed areas, specifically those in forest practices. However, stream conditions in the City can still be addressed quantitatively. Discussions earlier in this section, as well under historic conditions in Section 2, have already addressed some of these topics, but they are reviewed again below.

The level of development in both watersheds, particularly in the Hylebos basin, has resulted in very high road density as well as other impervious areas (e.g., parking lots, buildings). Development, forestry, and hydrology management (dams, diversions, flood control

measures) all have added to disturbance in large areas of both watersheds. Finally, all three of these factors have contributed to substantial reduction and fragmentation of riparian reserves, thereby reducing potential for LWD recruitment, shade, and habitat complexity along the shoreline. Watershed condition for both streams is compromised, resulting in reduced potential for the City shoreline to function as salmonid habitat.

5 CONDITIONS AND OPPORTUNITIES BY INVENTORY SEGMENT

5.1 SEGMENT P1

Segment P1 is the most downstream City of Fife shoreline segment on the Puyallup River. It is 13,510 feet in length and extends on the left bank from the City limit at RM 2.4 (at the Interstate 5 bridge) at the downstream extent to RM 4.9, the where the Oxbow wetland is connected to the Puyallup River.

Current Land Use

The dominant feature of this segment is the levee, which runs the length of the City shoreline along the Puyallup River. Levee Road runs parallel to the River at the top of the bank for the length of the segment, but it closed to public vehicle access at approximately the halfway point, downstream of Frank Albert Road. Existing land use is mostly vacant, with some residential (single and multi family), commercial, and utilities areas. Much of the vacant land has been used for agricultural at some point in the past, but there are large areas that are completely undeveloped, particularly at the downstream end of the segment. Most of the land downstream of Frank Albert Road is owned by railroad companies and is zoned for industrial uses, and the remaining shoreline is either residential or commercial. Based on this, future land use will likely result in greater shoreline development and greater land use density; although the levee area (waterward of Levee Road) is generally undevelopable and will likely remain the same. The exception to this is the planned development of a recreational trail system, as part of a larger regional system, concurrent with future widening of Levee Road. Ideally, public access points to the Puyallup River for recreational water use also would be integrated into this system.

Critical Areas

The entire segment is part of a greater aquifer recharge and seismic hazard areas. There are no wetlands, 100-year flood zones, or steep slopes. There are also large areas of open space, including undeveloped land and agricultural areas, that likely provide wildlife habitat, at least for birds, deer, and small mammals. However, there are no designated habitat areas according to the PHS inventory. Limited vehicle access in the downstream reach also means that the undeveloped areas are less subject to regular human disturbance than those further upstream.

Priority Habitats and Species

Eight species of salmonids (chinook, chum, coho, pink, sockeye, steelhead, cutthroat, bull trout) use this reach of the Puyallup River for migration. Chinook, coho, and likely chum also spend time rearing there. There are no other records of priority habitats and species within the shoreline area of this segment, but other priority species present in the greater area (e.g., bald eagles) are likely to at least transit through the area.

Salmonid Habitat Limiting Factors

The levee and Levee Road completely disconnect most of the shoreline area from the Puyallup River, and therefore restrict its ability to provide any function for salmonid habitat in

this segment. Other than the vegetation on the levee, which is subject to maintenance practices by the Corps and Pierce County River Improvement District, there is no functioning riparian habitat. Vegetation management on the levee severely restricts the potential for woody debris recruitment from the banks, although overhanging levee vegetation (relatively continuous fringe of willow, alder, and blackberry) does provide some shade and refuge opportunities for fish in the mainstem. Levee vegetation is primarily herbaceous or shrubby, with some small stands of relatively young alder or cottonwood. Water quality is somewhat impaired, with Category 5, 2, and 1 303(d) listings. The channel has been straightened, hardened, and permanently fixed, all of which have contributed to reduced capacity for functioning salmonid habitat. Land use practices in the greater watershed have also negatively affected salmonid habitat by altering hydrology and water quality. Major modifications to basin hydrology (such as dams, diversions, and the re-routing of the White River into the Puyallup Basin) also have had negative implications on salmonid habitat in this segment.

Opportunities for Conservation and Restoration

Many of the conditions in segment P1, particularly those related to salmonid habitat, are due to factors outside the jurisdiction of the City of Fife. These include upstream land use, major alterations in basin hydrology, and placement and maintenance of the levee. However, the City can identify areas for conservation and/or restoration within the shoreline area that would provide some habitat for non-aquatic species. In particular, as the City works with land owners to plan development downstream of Frank Albert Road, areas could be identified for open space corridors that connect upland and shoreline areas. Areas that are forested (such as the area immediately downstream of Freeman Road) are strongly recommended for conservation, and could also be prioritized for connection to the shoreline areas by way of open space corridors. Additionally, where possible the City could collaborate with the Corps and Pierce County River Improvement District to develop vegetation plans for the levee that complement vegetation and open space across Levee Road.

5.2 SEGMENT P2

Segment P2 consists of two wetland complexes, the Frank Albert Road wetland and the Oxbow wetland, plus the hydrologic connection between Oxbow wetland and the Puyallup River, located at RM 4.9. There is no shoreline length associated with this segment, as it has no shoreline frontage. It is 44.4 acres in area.

Current Land Use

Existing land use as presented in Section 2.3, based on parcel-level resolution, indicates that segment P2 is largely vacant land with some agriculture, and very small areas of residential and right of way. However, the wetland areas themselves are largely undisturbed. Zoning indicates that most of the Oxbow wetland will be bordered by neighborhood residential or high density residential areas, with some industrial areas on the southeast margin. The area around Frank Albert Road wetland is zoned for industrial and community commercial uses. Potential exists for recreational access in the wetlands and buffer areas in the form of trails and interpretive areas in compliance with the City's critical areas ordinance.

Critical Areas

Segment P2 is entirely comprised of critical areas, based on wetlands, aquifer recharge and seismic hazard areas, and flood zones. Both wetlands include forested components, which increases their habitat value. The Oxbow wetland in particular is a very large area of undisturbed habitat, which is uncommon in the immediate vicinity.

Priority Habitats and Species

The Frank Albert Road wetland has no hydrologic connection to the Puyallup River and therefore no potential for salmonid access. The Oxbow wetland does have potential for access, but salmonid presence has not been documented in the wetland. Both wetlands are included as polygons on the PHS inventory. Frank Albert Road wetland has no hydrologic connection to the Puyallup River and therefore is not accessible to salmonids.

Both wetlands are listed as polygons in the PHS inventory, with multiple attributes including (for both):

- Wetlands (broadleaf shrub, shrub scrub, emergent, farmed, cottonwood swamps)
- Waterfowl concentrations (regular, regular large)
- Deer and raptor use

Salmonid Habitat Limiting Factors

The Oxbow wetland has potential to provide highly functioning off-channel habitat, which is not common in the lower Puyallup River. However, access appears to be limited.

Opportunities for Conservation and Restoration

It is highly recommended that this entire segment be put into conservation, and that land use in the immediate area be planned to minimize impacts. Areas of the wetlands or their buffers that may have been altered due to past development are recommended for enhancement actions, including invasive species removal and native vegetation planting. The Oxbow wetland represents the greatest potential for the City to enhance salmonid habitat on the Puyallup shoreline. Collaboration with the Pierce County River Improvement District to restore salmonid access to the wetland would provide a large, highly functioning salmonid rearing habitat on a stretch of shoreline that currently has no off-channel habitat and is functioning at a substantially reduced level compared to historic conditions.

5.3 SEGMENT P3

Segment P3 is the most upstream reach in the City on the Puyallup River. It is 9,840 feet in length and extends on the left bank from the hydrologic connection to the Oxbow wetland (RM 4.9) to Freeman Road (RM 6.8).

Current Land Use

As with segment P1, the dominant feature of this segment is the levee. Existing land use is mostly single family residential, parks/open space, and vacant land with small amounts of agriculture, utilities, and multi family residential. The area is zoned for medium density residential, commercial, and industrial uses. This indicates that the shoreline area will become increasingly developed, except for the levee itself. Potential for increased recreational use in this segment is the same as for segment P1.

Critical Areas

Critical areas are similar to those in segment P1. The entire segment is part of a greater aquifer recharge and seismic hazard areas. There are also three small wetlands, totaling 0.7 acre in area. There is a small forested wetland area at the intersection of Freeman Road and Levee Road that is connected to a larger wetland to the east, outside of the City, by way of a culvert under Freeman Road. There is no hydrologic connection from this wetland to the Puyallup River. There are also two other small wetlands near Levee Road, one halfway between 56 Ave and 70th Ave (emergent), and the other at the Melroy Bridge (shrub).

Priority Habitats and Species

Salmonid use in this segment is the same as segment P1. There is also a PHS polygon the wetland at Freeman Road that has been assigned the same PHS attributes as Frank Albert Road and Oxbow wetlands: wetlands, waterfowl concentrations, and deer and raptor use.

Salmonid Habitat Limiting Factors

Salmonid habitat limiting factors are the same as for segment P1. There is severely limited riparian function, no access to off-channel habitat, impaired water quality, and factors related to practices and conditions in the greater watershed.

Opportunities for Conservation and Restoration

As with segment P1, the City does not have jurisdiction over many of the factors influencing salmonid habitat function in this segment. Conservation of upland open space areas, particularly forested areas, is highly recommended, as is conservation and enhancement of wetland areas. Collaboration with the Pierce County River Improvement District to develop vegetation and habitat enhancement plans that complement each other on both sides of Levee Road also is recommended.

5.4 SEGMENT H1

Segment H1 is the most downstream reach of Hylebos Creek in the City. Located between RM 0.3 and 0.6 (4th St E), it is 1,650 feet in length. Only the right bank is in City jurisdiction.

Current Land Use

Existing land use in this segment is almost entirely single family residential, with homeowner property extending to the top of bank. Most of the lots are entirely within the shoreline jurisdiction. The area is designated small lot residential, so land use is unlikely to change much in the future. There is no public access to the Hylebos Creek in this area, and therefore recreational activities are limited to in-water activities. However, Hylebos Creek is generally too shallow and has too many obstructions (road crossings) to be accessible to small boats (e.g., kayaks, canoes). It is anticipated that there will be continue to be no opportunities for public recreation in this segment.

Critical Areas

Segment H1 includes a number of critical areas. The 100-year flood zone extends up into the shoreline area. There are areas of erosion and landslide hazards. The entire segment is part of the greater seismic hazard and aquifer recharge areas. There are no identified habitat conservation areas, or substantial open spaces available for habitat.

Priority Habitats and Species

Five species of salmonids (chinook, chum, coho, steelhead, cutthroat) are present in Hylebos Creek. It is likely that chinook, coho, and chum also spend time rearing there. There are no other PHS records within the shoreline area of this segment, but other priority species present in the greater area (e.g., bald eagles) are likely to at least transit through the area.

Salmonid Habitat Limiting Factors

In general, Hylebos Creek is much more connected to its floodplain than is the Puyallup River in the City of Fife. There is no structure comparable to the levee in this stream. The channel at the upstream extent of segment H1 is not stabilized, but it is likely that banks in front of some of the residences have been stabilized with riprap or other similar material, which is detrimental to instream salmonid habitat. There are no barriers to access in the mainstem of the Creek, but there is no off-channel habitat available for fish. It is apparent from aerial photos that most of the riparian vegetation has been removed along this reach, also reducing habitat function. However, the left bank in this area is (City of Tacoma and unincorporated Pierce County) is forested, and the creek is relatively narrow. Water quality in lower Hylebos Creek is somewhat impaired, with Category 4, 2 303(d) listings. Monitoring by the Friends of the Hylebos also indicate that pH, DO, and nitrates, while acceptable now, may be worsening over time. As with the Puyallup River, land use practices in the greater watershed have also negatively affected salmonid habitat by altering hydrology and water quality.

Opportunities for Conservation and Restoration

Because the entire segment is privately owned and occupied, there are essentially no opportunities for conservation and restoration without homeowner involvement or property acquisition. However, the City could explore developing an educational program to inform homeowners of actions they can take to minimize their impacts in-stream habitat or ways to enhance it with native landscaping and invasive species removal. Non-governmental

organizations (such as Friends of the Hylebos, Citizens for a Healthy Bay) familiar with outreach programs in the watershed would be useful partners in such an effort.

5.5 SEGMENT H2

Segment H2 consists of both banks Hylebos Creek between 4th St East (RM 0.6) and 12th St East (RM 1.3). It is 3,335 feet in length, and both banks are within City jurisdiction.

Current Land Use

Segment H2 has relatively more open space than do any of the other segments within the City. Included in this segment are the Milgard Nature Area, two City well sites, and a great deal of vacant land, including much of the forested hillside on the left bank. Residential development is almost entirely limited to the right bank of Hylebos Creek in this area. The Milgard Nature Area is zoned industrial, but because it is a mitigation area, it is unlikely that land use will change on that site in the future. The remaining area of this segment is designated either single family or zoned small lot residential. On the right bank, there is potential for increased residential development as vacant, formerly agricultural land is converted to residential use. However, the left bank is mostly forested, steep slopes that are on the backside of residential lots on the hill above Hylebos Creek. Under the City's critical areas ordinance, these areas are likely to remain undeveloped. The Milgard Nature Area currently provides the most opportunity for shoreline access and recreation on Hylebos Creek. Although there are no formal trails or interpretive areas, the area is available for bird watching and other low-impact activities. Similar opportunities for access and recreation are anticipated at the Jordan property, the parcel immediately across Hylebos Creek from the Milgard Area, which has been acquired by the City and is planned for restoration (see Figure 7).

Critical Areas

There are a number of critical areas in segment H2. The 100-year flood zone extends up into the shoreline area on both banks. Much of the left bank, with its steep slopes, is an erosion and landslide hazard area. The entire right bank and areas of the left bank are part of the greater seismic hazard and aquifer recharge areas. The Milgard Nature area and Jordan Property have identified wetland areas that, based on aerial photos and field observations, include emergent, shrub-scrub, and forested components. There is an additional wetland area on the left bank upstream from 62nd Avenue East that appears to be primarily emergent vegetation.

Priority Habitats and Species

In addition to the salmonids in Hylebos Creek, the PHS inventory includes two polygons on the left bank in this segment. Immediately adjacent to Hylebos Creek is a polygon extending almost the length of shoreline area that is identified as undeveloped riparian habitat. It provides general habitat for birds and mammals, and limited salmonid habitat. Landward of that polygon, extending north from 12th Street East is identified as urban natural open space comprised of steep slopes and bluffs, providing raptor habitat and bird and mammal refugia.

Salmonid Habitat Limiting Factors

Many of the same limiting factors from segment H1 apply to this segment. However, there is significantly more riparian vegetation and much larger areas of completely undeveloped shoreline in this segment. The channel has been stabilized in a number of places, including a timber bulkhead on both banks between 4th Street East and 8th Street East. There also are areas where the banks are stabilized, particularly the left bank upstream of 62nd Avenue East.

Opportunities for Conservation and Restoration

The Jordan Property, which is the left bank across from the Milgard Nature area, has been acquired by the City and is planned for restoration in partnership with a number of other stakeholders. As currently planned, this restoration action would remove the timber bulkhead and create a great deal of complex off-channel habitat, significantly improving conditions for salmonids in lower Hylebos Creek. There are also conceptual plans for complementary restoration actions in the Milgard Nature Area. Conservation of the remaining undeveloped riparian areas on the left bank is strongly recommended. Additional property acquisition for conservation and restoration actions on the right bank to complement and enhance the riparian areas on the left bank also is recommended where possible, as is shoreline property owner outreach and education regarding actions they can take to minimize impacts and enhance habitat on their property. One opportunity for restoration is the left bank between 8th Street East and 62nd Avenue East, where an undeveloped area dominated by reed canary grass with limited riparian vegetation could be cleared and replanted with native vegetation, or even graded down to create off-channel wetland habitat. Kerwin (1999) identified off-channel habitat as a limiting factor in Hylebos Creek. Off-channel habitat with a riparian community could provide input of nutrients and a forage base for coho salmon (as well as chinook).

Another opportunity for restoration is the left bank immediately downstream of 12th Avenue East, where there is a large amount of debris and invasive vegetation in the shoreline area. These opportunities are typical of those in the City shoreline area on Hylebos Creek in that they would require either significant property owner cooperation or property acquisition. The City also could develop guideline for building setbacks and riparian vegetation requirements for new residential development in this segment.

5.6 SEGMENT H3

Segment H3 is the most upstream reach of the Hylebos Creek, extending 4,380 feet from the 70th Avenue East (RM 2.1) to 12th Street East (RM 1.3), excepting a small area of unincorporated Pierce County immediately downstream of the Pacific Highway crossing.

Current Land Use

Existing land use in the segment is mostly residential. Vacant land includes undeveloped areas and also parcels currently in agriculture. Upstream of Pacific Highway is commercial use, open space, and a single residential lot. Zoning in this segment indicates that future land use will result in increasing residential areas downstream of Pacific Highway as vacant and agricultural land is developed. The zoning upstream of Pacific Highway is commercial, but future land use and environmental conditions will be dependent upon the final configuration

of the planned State Route 167 extension. Restoration, enhancement, and re-configuration of reaches of Hylebos Creek in this reach and immediately upstream of the City are an important environmental component of this Project. As with Segment H1 there are no existing opportunities for public access and recreation in segment H3.

Critical Areas

There are a number of critical areas in segment H3. The 100-year flood zone extends beyond up into the shoreline area of both banks. The right bank is part of larger aquifer recharge and seismic hazard areas. However, there are no wetlands or erosion and landslide hazard areas in this segment.

Priority Habitats and Species

PHS information for this segment is similar to segment H2, except that the steep slope polygon does not extend upstream into this segment and the riparian habitat polygon ends at the downstream side of Pacific Highway.

Salmonid Habitat Limiting Factors

Many of the same limiting factors from segments H1 and H2 apply to this segment. Riparian vegetation is limited immediately downstream of 12th Street East on both banks, and also in areas of the reach upstream of Pacific Highway. The only off-channel habitat in this segment is a large drainage ditch (Surprise Lake drainage) flowing into Hylebos Creek immediately upstream of Pacific Highway. The channel has been stabilized in a number of areas.

Opportunities for Conservation and Restoration

It is strongly recommended that the City conserve remaining riparian vegetation in this segment. As with segments H1 and H2, opportunities for conservation and restoration are somewhat limited to options involving property owner involvement or property acquisition. Guidelines for building new residential development as vacant land is converted to residential areas could be used to enhance and conserve riparian areas. This is a likely scenario for the undeveloped and agricultural shoreline areas immediately upstream of 12th Avenue East. As this area becomes developed, riparian areas could be conserved and vegetation restored, including removal of the large stand of Japanese knotweed (*Polygonum cuspidatum*) on the left bank and its replacement with native vegetation. The eventual extension of State Route 167 may present the greatest opportunity for habitat restoration and enhancement, as well as the greatest opportunity for partnership and coordination with stakeholders working upstream of the City.

6 RECOMMENDATIONS

6.1 RECOMMENDATIONS TO PROTECT AND/OR CONTRIBUTE TO RESTORATION OF PROPERLY FUNCTIONING CONDITIONS

This Shoreline Inventory documents existing habitat conditions and functions within the Shoreline jurisdiction in the City of Fife. This section includes recommendations for management actions and projects that would protect and restore long-term properly functioning conditions.

- Work with the Corps of Engineers and the Pierce County River Improvement district to investigate means to provide increased shoreline function along the Puyallup River without compromising flood control capacity.
- Conserve wetlands in the shoreline area through buffer maintenance. Consider off-channel habitat creation, enhancement or improvement projects for the Hylebos Creek, wherever possible.
- Carefully consider the impacts of uplands development upslope of shoreline areas, even outside of the shoreline jurisdiction.
- Ensure stormwater facilities and stormwater design provide adequate water treatment before re-introduction to water bodies. Explore new stormwater technologies, including low impact development and water recycling.
- Conserve riparian vegetation within the shoreline areas, wherever possible, especially where there is opportunity for large woody debris (LWD) recruitment into the adjacent streams.
- Inform shoreline property owners about shoreline habitat and the special functions associated with shoreline areas. Promote restoration or re-vegetation of riparian areas through education or incentive programs.
- Work with shoreline property owners on pile removal, removal of hardened banks, and shoreline stabilization using vegetation and removal of remnant crossings.
- Coordinate with local jurisdictions, business, and citizen action groups on large scale habitat creation or restoration projects.

6.2 RECOMMENDATIONS TO ADDRESS DATA GAPS

The City of Fife has shoreline information in several formats; GIS, hard copy maps, photographs and project reports. The review of the City's information has identified both data gaps and data management issues that should be addressed to better inform land use decisions.

- Digitize all existing paper maps for use in GIS, if possible, and update content during digitization.

- Complete an impervious surface analysis for the City, and digitize the results.
- Complete a detailed wetland inventory, both within the shoreline area and in the City at large to improve critical areas management and provide information for comprehensive planning; digitize the results.
- Log wetlands delineations from shoreline permit applications into a central file for reference, and if possible, digitize wetland data.
- Coordinate with other local jurisdictions and interest groups (i.e., Friends of the Hylebos), to share data regarding salmon habitat, distribution and use of both Hylebos Creek and the Puyallup River.

7 BIBLIOGRAPHY

- Carrel, Christopher. 2004. Executive Director, Friends of the Hylebos. Personal communication with M. Haas of Grette Associates via telephone and e-mail on 5 April 2004 and 7 April 2004.
- City of Fife. 1974. Shoreline Management Master Plan. Fife, Washington.
- City of Fife. 1996. City of Fife Comprehensive Plan. Fife, Washington.
- Groot, C., and L. Margolis (*eds.*). 1991. Pacific Salmon Life Histories. UBC Press, Vancouver, British Columbia.
- Kerwin, J. 1999. Salmon Habitat Limiting Factors Report for the Puyallup River Basin (Water Resource Inventory Area 10). Washington Conservation Commission, Olympia, Washington.
- National Marine Fisheries Service (NMFS). 1996. Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. Prepared by Environmental and Technical Services Division, Habitat Conservation Branch.
- Pierce County. 1991. Puyallup river basin comprehensive flood control management plan. Prepared by James M. Montgomery, Consulting Engineers for Pierce County Department of Public Works, Pierce County River Improvement Division. Tacoma, Washington.
- Sumioka, S.S. 2004. Trends in streamflow and comparisons with instream flows in the Lower Puyallup River Basin, Washington. U.S. Geological Survey Scientific Investigations Report 2004-5016.
- US Department of Transportation Federal Highway Administration and Washington Department of Transportation. 2003. SR 167 Puyallup to SR 509 - Tier II (Draft) Environmental Impact Statement. FHWA-WA-EIS-2002-02-D.
- Wissmar, R. C. and P. A. Bisson (*eds.*). 2003. Strategies for restoring river ecosystems: sources of variability and uncertainty in natural and managed systems. American Fisheries Society, Bethesda, Maryland.
- Zulauf, A.S. 1979. Soil Survey of Pierce County Area, Washington. United States Department of Agriculture, Soil Conservation Service in cooperation with Washington State Department of Natural Resources, and Washington State University, Agriculture Research Center. Washington, District of Columbia.

CITY OF FIFE

**SHORELINE INVENTORY
APPENDIX A: INFORMATION SOURCES**

A number of information sources outside of standard, citeable literature were used during the City of Fife Shoreline Inventory. This appendix is intended to provide readers with a list of the type, source, and use of the information in this report.

Name	Description (as needed)	Source	Applicable Section
GIS LAYERS			
aquifer_recharge	Aquifer Recharge Areas based on DRASTIC maps	Pierce County GIS	3
cult_ind	Possible cultural resource locations based on voluntary 1982 inventory	Pierce County GIS	3
fishmarkers	Permanent monuments on roadways adjacent to salmon-bearing waterways	Pierce County GIS	4
floodzone, floodway	FEMA 100 year flood zone, 500 year floodway	Pierce County GIS	3
pchydro, pchydro_lines	Pierce County hydrology based on DNR and PC Tax Parcel data	Pierce County GIS	2
salmon	1999 GAP analysis for salmonid presence (Pierce County, WDFW, Puyallup Tribe)	Pierce County GIS	4
wetlands_blands (F), wetlandsfinln (PC)	Wetlands based on National Wetlands Inventory, Pierce County Buildable Lands Inventory, Pierce County accumulated wetland data	City of Fife, Pierce County	3, 5
culverts	City data layer, does not appear to match field observations	City of Fife GIS	2
landuse, landuse_annex	2003 land use data	City of Fife GIS	2
watersys	2003 water system schematic	City of Fife GIS	2
zoning, zoning_annex	2003 zoning data	City of Fife GIS	2
ON-LINE MAPPERS			
National Wetlands Inventory	Mapper	US Fish and Wildlife Service http://www.nwi.fws.gov	3, 5
WA Digital Coastal Atlas	Including aerial photos, flood zone data, others	WA Department of Ecology http://www.ecy.wa.gov/programs/sea/SMA/atlas_home.html	2, 3, 5

Name	Description (as needed)	Source	Applicable Section
StreamNet	Salmonid presence and use	Pacific States Marine Fisheries Commission http://www.streamnet.org/mapper.html	4
Washington State 303(d) list	Mapper	Washington Department of Ecology http://apps.ecy.wa.gov/wqawa/viewer.htm	4
Pierce County Planning and Land Use Map Your Way	Includes tax assessor data, zoning designations, others	Pierce County Planning and Land Use http://triton.co.pierce.wa.us/MapYourWay/index.cfm	2
Pierce County Soils Survey	Mapper and report text	US Department of Agriculture, Natural Resources Conservation Science http://www.or.nrcs.usda.gov/pnw_soil/washington/wa653.html	3
PAPER MAPS			
Zoning Map	Undated large format maps available at City Hall	City of Fife http://www.cityoffife.org/Depts/Community_Development/zoning.htm	2
Aquifer Recharge Area	Undated large format maps available at City Hall	City of Fife	3
Erosion and Landslide Hazard Areas	Undated large format maps available at City Hall	City of Fife	3
Seismic Hazard Areas	Undated large format maps available at City Hall	City of Fife	3
Habitat Areas	Undated large format maps available at City Hall	City of Fife	3
AERIAL PHOTOS			
Digital Ortho-photos	2003, incomplete shoreline coverage	City of Fife	2, 3, 5
Historic Aerial Photos	Photos from 1984, 1978, undated earlier series; all incomplete shoreline coverage	City of Fife	2
TerraServerUSA	2002 Aerial photos (color)	http://www.terra-server.com	2, 3, 5
OTHER			
Priority Habitats and Species, maps/reports	T20NR03E and T20NR04E, March 5, 2004	WA Department of Fish and Wildlife PHS Office	3, 4, 5
Natural Heritage Program, letter	Letter stating no records in database, March 25, 2004	WA Department of Natural Resources	3, 5

Name	Description (as needed)	Source	Applicable Section
City of Fife Municipal Code	On-line version	Municipal Research and Services Center of Washington http://www.mrsc.org/codes.aspx	3
State Administrative Code and Rules	On-line WAC and RCW	Washington State Legislature http://www.leg.wa.gov/rcw http://www.leg.wa.gov/wac	1, 3
River and Stream Water Quality Monitoring	Water quality data for various time periods, depending on station	WA Department of Ecology http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html	4

CITY OF FIFE

SHORELINE INVENTORY – REVIEW DRAFT
APPENDIX B: PHOTO AND GIS ATLAS