

SECTION 11

**YAKIMA RIVER SUB-BASIN
SHORELINE INVENTORY AND ANALYSIS
DISK #5**

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YAKIMA SUB-BASIN CONTEXT SUMMARY

Portions of the following text have been primarily taken, in whole or in part, from the following reports: Golder (2004); Haring (2001;2000).

The Yakima River originates at the outlet of Lake Keechelus near the crest of the Cascade Mountains and flows 214 miles in a generally southwesterly direction to its confluence with the Columbia River. With its tributaries, the Yakima River drains approximately 6150 square miles (4 million acres). Within Yakima County, the Yakima River flows through three valleys: Selah Valley, Moxee Valley, and Yakima Valley.

Selah Valley

The Selah Valley is situated in a synclinal valley between the Umptanum anticline to the north and the Yakima Ridge anticline to the south. Wenas Creek, the only major tributary to the Yakima River within the Selah Valley, enters on the right bank at the upper end of the valley.

Confinement of the floodplain with the Selah Valley began in 1886 with construction of the Northern Pacific Railroad. Settlement intensified as the irrigation potential of floodplain lands was realized. A mix of floodplain farming and domestic stock-grazing dominated land use during the latter part of the 1800s. In 1902, the Cascade lumber mill began log drives from the upper Yakima River basin. Log drives necessitated the construction of a concrete dam at the upper end of the valley. The dam not only precluded the upstream migration (through the fall of 1905) of salmon, but, along with its associated structures, simplified the river's complex structure.

Between 1916 and 1964, the City of Selah continued to grow and fruit-processing facilities expanded along the railway corridor. The location of the Northern Pacific line near the western boundary of the floodplain, in combination with road construction along the eastern margin, reduced the floodplain area. Continued development in the floodplain area by gravel-mining operations and a golf course further restricted the floodplain area available to the river. The river was confined to a single channel by the construction of Interstate-82 and an extensive network of flood revetments constructed to protect floodplain gravel-mining operations.

Currently, the Yakima River has surficial access to only 31 percent of its historic floodplain within the Selah Valley. Of the active floodplain habitat present in 1927, 65 percent has been lost.

Moxee Valley

The Moxee Valley is situated in a deep synclinal valley between the Yakima Ridge anticline to the north and the Ahtanum Ridge-Rattlesnake Hills anticline to the south. The Naches River, the Yakima River's largest tributary, enters on the right bank at the upper end of the valley and Wide Hollow Creek and Ahtanum Creek enter on the right bank at the lower end of the valley.

Settlers were quick (by 1860) to exploit the combination of rich, fine-textured, alluvial soils, the proximity of an abundant source of water flowing through multiple side-channels, and the extensive riparian gallery present across the breadth of the floodplain. As demand for irrigation

water increased, the construction of irrigation ditches began. By 1901, the diversion structures of irrigation companies had become familiar features on the riverine landscape. By 1933, construction of large storage reservoirs, mainstem diversions, and water-delivery systems had altered the flood pulse of the Yakima River.

Constructed in late 1884, the route of the Northern Pacific Railroad was situated on a terrace west of the Yakima River and, therefore, had little impact on surficial connectivity of the floodplain within the Moxee Valley. More importantly, the railroad intensified settlement and land use across the valley. The City of Yakima emerged as the primary agricultural-industrial center in the Yakima Basin. The growth of the city was dependant upon an expanding infrastructure that required a source of gravel for construction projects. Consequently, parts of the Moxee Valley floodplain was mined. From 1916 through 1964, the construction of rudimentary flood revetments, state and county road systems, and irrigation infrastructure decreased the area of the Moxee Valley floodplain subject to surficial fluvial processes.

From 1965 to present, land use intensified on disconnected areas of the Moxee Valley floodplain. Urban, suburban, and industrial uses increasingly displaced agriculture. The transportation system continued to develop and became firmly connected across the floodplain. Construction of Interstate-82 added to the degree of floodplain confinement, primarily through its roadbed, bridge revetments, and by encouraging further development within the disconnected floodplain areas, which, in turn, encouraged the construction of further revetments.

Currently, the Yakima River has surficial access to only 40 percent of its historic floodplain within the Moxee Valley. Of the active floodplain habitat present in 1927, 28 percent has been lost.

Yakima Valley

The Yakima Valley occupies a long (16 miles) and broad synclinal valley between the Ahtanum Ridge-Rattlesnake Hills anticline to the north and the Toppenish Ridge anticline to the south. The floodplain is the largest in the Yakima River basin. Toppenish Creek and Satus Creek enter on the right bank in the lower portion of the valley.

The floodplain of the Yakima Valley is distinctive from those upstream, having been inundated by backwaters of the series of Missoula Floods. Over a period of several thousand years, the floodplain was repeatedly blanketed with silt-laden deposits. Since the last of these floods, the Yakima River and its tributaries have re-worked the flood deposits, creating a nearly-level floodplain.

The gentle-sloping landscape, mantled with a mix of silty flood-deposits and wind-blown loess and interlaced with a myriad of fluvial channels, provided early settlers with ideal conditions for developing a vibrant agricultural economy. In 1884, construction of the Northern Pacific Railroad created the first major constriction of the Yakima Valley floodplain. Settlement within the valley was focused along this transportation corridor.

In the early 1900s, water diverted from the upper portion of the valley was being delivered to areas beyond the floodplain extent. Irrigation systems, unprecedented in scale throughout the

western United States, were built. Existing side-stream channels played an important role in determining the location of diversion points, conveyance routes, and drains across the floodplain.

From 1916 through 1964, small portions of the floodplain were disconnected by road and revetment construction. These structures spread internally from the Northern Pacific Railroad bed and expedited settlement within these areas. The continuing construction of irrigation ditches and drains crosscut side-channel networks and reorganized how water flowed through and across the floodplain.

The development of effective flood revetments, an expanding county road system, the construction of Interstate-82 east of the Yakima River, increasing agricultural land use, gravel-mining operations, and the reduction of peak flow events by the construction of upstream reservoirs have all contributed to the reduction of floodplain area affected by surficial fluvial processes.

Currently, the Yakima River has surficial access to only 15 percent of its historic floodplain within the Yakima Valley. Of the active floodplain habitat present in 1927, 7% has been lost.

The mainstem of the Yakima River between Union Gap and Satus Creek, generally, forms the eastern boundary of the Yakama Reservation.

Surface water uses include domestic water supply, irrigation, frost protection, stock watering, fish propagation, and recreation and beautification. Diversions from the Yakima River are mainly associated with irrigation uses.

Sewerage inputs from the cities of Selah, Yakima, Union Gap, Zillah, Granger, and Grandview, and irrigation return flows affect water quality throughout this reach.

SALMON HABITAT

Channel Condition

The lower portion of the Yakima River within Yakima County (RM 76-83) includes side channels, backwater areas, and diverse habitat types. Satus and Toppenish creeks are the two major tributaries in this reach, with significant inflow from groundwater and irrigation return drains. The mid- and upper-Yakima Valley portion is considered one of the most structurally complex and diverse sections of the Yakima River.

Floodplain reaches that appear to be crucial to the long-term survival and recovery of salmon in the Yakima Basin have been evaluated and ranked based on natural habitat heterogeneity, productivity, current and historic use by anadromous salmonids, and restoration potential. Within Yakima County, the mainstem Yakima reaches identified for conservation actions, listed in order of priority are:

Selah Valley: This floodplain reach is substantially modified by gravel mining, but exhibits a robust upwelling zone at Selah Gap that probably could be rehabilitated by normative flows if

gravel mining ceased. The Taylor Ditch is an old, 4 to 5 mile-long, right-bank side channel that has been converted to irrigation delivery. The channel is currently screened at the upper end, but salmonids are known to occur in the channel. Taylor Ditch offers good potential to provide side-channel habitat in this, otherwise, heavily-altered reach.

Moxee Valley: This floodplain reach has extensive floodplain urbanization, encroachment, and revetment. The lower ~3 miles exhibits extensive upwelling, with a fair amount of interconnected floodplain habitat.

Yakima Valley: From Union Gap to Satus Creek, what remains of the floodplain is in good condition, with an extensive cottonwood riparian forest. However, this reach is influenced by Wapato Dam, Sunnyside Dam, and other upstream diversions and irrigation return-flows through numerous drains. In addition, floodplain function is impaired by an old levee that was built prior to construction of the highway, and riparian vegetation through much of the reach is composed of Russian olive and purple loosestrife. The floodplain habitats are most complex from the Wapato Bridge downstream to the upper end of the meander zone (near the mouth of Satus Creek).

Riparian

Through the Selah Valley and into the upper-Moxee Valley, riparian condition is severely degraded where the riparian zone has been overgrazed and where the river has been channelized. There is minimal riparian buffer in the urbanized areas of the Selah and Moxee valleys.

There are several reaches of the Yakima River, upstream of Satus Creek that have dense stands of mature cottonwoods, which are considered to provide good riparian function. However, close inspection of these mature cottonwood stands indicates they are missing characteristics of healthy cottonwood galleries. Age classes in the existing galleries are primarily limited to only older cottonwoods, with little recruitment of younger age-classes. Natural cottonwood regeneration would occur in the spring as seed is scattered on gravel bars that are inundated during spring runoff. As the natural hydrograph drops, cottonwood seedling would be able to root and grow on the bars. Alteration of the natural hydrograph in the Yakima River for irrigation delivery has eliminated most of the natural cottonwood reproduction potential. In most years, the peak of spring runoff is significantly reduced, as the water is stored in the major reservoirs for irrigation releases through the summer. The irrigation releases result in high flows in late-spring/summer that keep the gravel bars inundated, precluding natural cottonwood regeneration. In addition, unrestricted livestock grazing in some areas has eliminated localized potential for cottonwood regeneration. Consequently, although some areas currently have good riparian function, future conditions are likely to deteriorate unless normative flows are re-established to encourage natural cottonwood regeneration.

Riparian condition is brushy downstream of Granger.

Large Woody Debris

Large woody debris is sparse to non-existent on the mainstem.

Substrate

With changes in gradient are the expected changes in stream substrate, which ranges from cobbles and gravels in the uppermost reaches to sands and silts in the lower reaches.

Water Quality

The Washington State Department of Ecology has rated the Yakima River through Yakima County as having Class A (Quality) standards. In comparison, the American, Bumping, and upper-Yakima rivers were rated as Class AA (Exceptional).

Disturbance

Historically, the alluvial portions of the lower-Yakima River supported all life stages of summer chinook, fall chinook, summer steelhead, and coho, as well as the juvenile life stages of spring chinook. One of the most dramatic alterations to the aquatic ecosystem has been the loss of habitat complexity, including connectivity between off-channel and mainstem habitat, which directly relates to the ability of the ecosystem to support salmonid populations. Flood-control dikes and levees, and railroad and highway construction have disrupted the lateral connectivity between wetted areas that occurred historically. This deprivation of lateral connectivity has resulted in loss of habitat, reduced vertical connectivity, loss of, or changes in, nutrient flux, and reduction in the tempering effect of groundwater on stream temperature. Development on low-lying floodplains adjacent to the Yakima River is reducing historic floodplain water-storage areas, thus accelerating movement of water out to the watershed, potentially reducing the availability of water in the early irrigation season and, therefore, creating greater dependency upon water storage.

Selah Valley: This reach has been severely degraded. Much of the reach is now confined between poorly constructed levees protecting the gravel-mining operation and various developed properties. Streambanks have collapsed, the width to depth ratio is large, and large woody debris is extremely scarce. Stream velocities, associated with management of the river for irrigation purposes, within the Yakima Canyon and Selah valley portion of the Yakima River during spring and summer are much higher than desired for steelhead rearing, especially during the emergence period of June and July. Roza Pool, behind Roza Dam, located upstream of the Yakima County – Kittitas County line and operated by the Bureau of Reclamation, is periodically lowered in order to maintain the screens. This activity results in the release of large quantities of silt which degrades the quality of spawning gravels immediately downstream (Yakima Subbasin Plan, 2004).

Moxee Valley: Through this reach, the river is very confined, bordered by the City of Yakima on its right bank and the community of Terrace Heights and pasture land on its left bank. Rip-rapped dikes parallel the river along both banks through most of this reach, and all of the side-channels that once flowed through the City of Yakima have been filled. Large woody debris is scarce in this reach. Wood recruitment has been reduced by alteration of the upstream riparian zone. Wood retention is inhibited by the modified channel geometry that concentrates flow into a narrow cross-section. Stream velocities in this reach during the spring and summer are much higher than desired for steelhead rearing (USFWS 1989, CBSP 1990, WDFW 1998), especially during the emergence period of June and July. Cobble and large gravel substrates are abundant (WDFW 1998). A small section of the river in the upper-Moxee Valley contains many side-

channels, islands, and backwater areas. A number of large and potentially productive springbrooks in the lower end of this river segment have been isolated. Hatchery-reared coho salmon spawn here and in Wide Hollow Creek (Dunnigan 2001), as do steelhead (Hockersmith et al. 1995). Sporadic observations indicate that juvenile spring chinook and rainbow/steelhead rear in the slower areas. Unfortunately, these areas also support two significant predators, Northern pikeminnow and smallmouth bass (YN, unpublished data; Erik Anderson, WDFW, personal communication, 1999), as well as redbreast shiners, a known competitor for space and food (Patten and Thompson 1970) (Yakima Subbasin Plan, 2004).

Yakima Valley: The reach of the Yakima River has the broadest floodplain within the Yakima River basin as a whole. The current extent of the floodplain is just a fraction of its historic area (Snyder and Stanford 2001). However, much of this reach is still characterized by intact floodplains, cottonwood gallery forests, and extensive riparian wetlands. To a large degree, it is still a very complex and productive portion of the basin. Occasionally, high September temperatures in the lowermost reaches delay the entry of steelhead spawners, and low flows below Sunnyside Dam in drought years might delay migrating spring chinook. Conditions in the Yakima River are generally good enough to enable fall chinook adults to access the lower 1.5 miles of Marion Drain. The drain below the tainter gates at the Highway 97 crossing is broad and shallow and the fringe of Russian olives and brush along the banks provide little cover for migrating adult salmon. It appears as though adult fall chinook are reluctant to enter the lower drain until, fortuitously, the tainter gates are abruptly opened in mid-October at the end of irrigation season. The water impounded above the tainter gate is suddenly discharged, increasing depth and dramatically increasing the turbidity of the water entering the Yakima. Seiler (1992) found that fall chinook movement commenced immediately after the gates were opened, and was minimal both before the opening and after the impounded water had drained away. The predominant substrate in Marion Drain is small gravel, with a high proportion of silt and other fine material. The impact of this sediment on incubating fall chinook eggs in the drain is much less than it would be in the mainstem, because redds are cleaned during spawning and are not “re-silted” by winter floods (the drain receives only ground water after irrigation season) (Yakima Subbasin Plan, 2004).

YAKIMA RIVER SUB-BASIN REACH DESCRIPTIONS

The Yakima River SMP jurisdiction is divided into thirteen distinct reaches. Reach delineation was made based on gradient, landforms, and land use (Fig. Y5; Table Y1). **Reach 1** comprises the lower 6.9 miles of Yakima River within the boundaries of Yakima County, from the Yakima – Benton County line. This reach flows through the terminal portion of the lower-Yakima Valley. Slightly more than half of the lands along this reach remain vacant, with the remainder being dominated by irrigated agriculture. The Yakima River, through this reach, exhibits a single channel and a highly linear form. **Reach 2** is a 13.2-mile segment of the Yakima River that flows through the lower-Yakima Valley. Approximately two-thirds of the lands along this reach remain vacant, with the remainder being dominated by irrigated agriculture. Through this reach, the river exhibits a single channel and a highly meandering form. **Reach 3** is an 11.0-mile segment of the Yakima River that flows through the lower-Yakima Valley. Approximately two-thirds of the lands along reach remain vacant, with the remainder being dominated by irrigated agriculture. Through this reach, the river primarily exhibits a single channel (with two areas of channel bifurcation) and a highly meandering form. **Reach 4** is a 1.4-mile segment of the Yakima River as it flows past the City of Granger. Approximately half of the lands along this reach are under irrigated agriculture, with remainder primarily vacant. Residential and transportation infrastructure development are noted aspects of land use within this reach. Through this reach, the river primarily exhibits a single channel and a highly linear form. **Reach 5** is a 6.2-mile segment of the Yakima River that flows through the mid-Yakima Valley. Over half of the lands along this reach remain vacant; with the remainder dominated by irrigated agriculture. Through this reach, the river flows alternately as a single channel and as a bifurcated channel and is highly meandering throughout most of this reach. **Reach 6** is a 2.3-mile segment of the Yakima River that flows past the City of Zillah. Three-fifths of the lands along this reach remain vacant, and the remainder is dominated by irrigated agriculture. Transportation infrastructure is a noted aspect of land use within this reach. Through this reach, the river exhibits a single channel and a meandering form. **Reach 7** is a 15.1-mile segment of the Yakima River that flows through the upper-Yakima Valley. Approximately half of the lands along this reach are under irrigated agriculture, with remainder primarily vacant. Residential and transportation infrastructure development are noted aspects of land use within this reach. Through this reach, the river flows alternately as a single channel and as a bifurcated channel and exhibits a highly meandering form throughout most of this reach. **Reach 8** is a 1.8-mile segment of the Yakima River as it flows through the water-cut notch of Union Gap. This reach is highly confined by both geologic structure and infrastructure development. Four-fifths of the lands along this reach remain vacant, with the remainder being dominated by transportation infrastructure development. Through this reach, the river flows primarily as a bifurcated channel and exhibits a slight degree of sinuosity. **Reach 9** is a 4.3-mile segment of the Yakima River that flows through the lower-Moxee Valley. Three-fourths of the lands along this reach remain vacant. This reach is highly confined by levees. Residential, transportation infrastructure, and gravel-mining development are noted aspects of land use within this reach. Through this reach, the river flows alternately as a single, bifurcated, and braided channel and exhibits a highly meandering form throughout most of this reach. **Reach 10** is a 3.2-mile segment of the Yakima River that flows through the upper-Moxee Valley. This reach is highly confined by levees. Through this reach, the river flows alternately as a single channel and as a bifurcated channel and exhibits a sinuous form. **Reach 11** is a 3.3-mile segment of the Yakima River as it flows through

the water-cut notch of Selah Gap. This reach is highly confined by both geologic structure and infrastructure development. Seven-tenths of the lands along this reach remain vacant, with the remainder being dominated by transportation infrastructure development. Through this reach, the river flows primarily as a single channel and exhibits a slight degree of sinuosity. **Reach 12** is a 4.2-mile segment of the Yakima River as it flows through the lower-Selah Valley.

Approximately one-fourth of the lands along this reach remain vacant, one-third is under irrigated agriculture, and the remainder is dominated by gravel-mining development. Residential development is a noted aspect of land use within this reach. Through this reach, the river primarily flows as a single channel and exhibits a moderate amount of sinuosity throughout.

Reach 13 is a 3.8-mile segment of the Yakima River it flows out of the confines of the Yakima Canyon and through the upper-Selah Valley. Seven-tenths of the lands along this reach remain vacant, with the remainder dominated by transportation infrastructure. Residential and agricultural developments are noted aspects of land use within this reach. Through this reach, the river flows as a single channel and exhibits a highly linear form.

REACH 1

General Description

Reach 1 comprises the lower 6.9 miles of Yakima River within the boundaries of Yakima County. The average gradient of this reach is 0.01% (0.7 ft/mi.). Reach 1 is dominated by the steeply ascending flanks of the Horse Heaven Hills to the south and the gently inclined toe-slopes of the Rattlesnake Hills to the north.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf*)

Geology/Landform (Table Y2)

Reach 1 generally, is located against to flanks of the loess-covered, basalt Horse Heaven Hills, which lie to the south, and by extensive deposits of Missoula Flood deposits to the north (Washington State Department of Natural Resources [WDNR], 2000). Throughout this reach, the surficial geology is one of alluvium.

Two areas of geologic hazards are noted in Reach 1, which, combined, cover 2.4% of the SMP jurisdiction (Yakima County, 2003c). The hazard areas are both rated intermediate risk due to the potential for rock fall or creep from oversteepened slopes. One area is quite small and is located entirely within the SMP jurisdiction, the other consists of an 8000 foot-long area (commencing 6300 feet from the lower end of the reach) that either directly abuts or encroaches within the SMP jurisdiction. Approximately 74% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 1 is dominated by alluvial deposits (53.2%). There are a wide variety of soils within the SMP jurisdiction, but cobbly and very silt loams are predominant (USDA Natural Resources Conservation Service [NRCS], 2003). Within this reach, 15.0% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate, runoff is classed as slow and the hazard of erosion is slight.

Stream Type/Channel Form

Channel form throughout Reach 1 is currently classified as pool-riffle. The river is confined to a single channel throughout and exhibits extremely limited sinuosity, with its course structurally controlled by basalt bluffs either abutting or in close proximity to the channel.

It is unlikely that the channel form of this reach was historically very more complex. Though now confined to a single channel, it was once clearly more migratory. This is a transport reach in which energy is confined and maintained. Over 91% of the SMP jurisdiction of Reach 1 is underlain by likely shallow deposits of alluvium. Though currently confined in many places, there exists the opportunity for flood waters to spread, alternately eroding and depositing materials. As a result, this reach has a potential for increased channel complexity through point, mid-channel, and side-channel bar deposition.

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and greater floodplain underlain by alluvium and given the confined nature of the floodplain, the hyporheic zone is not expected to be extremely widespread. The nature of both the deposits and increasing confinement within this reach suggest hyporheic flow mainly in the form of upwelling. Further evidence of groundwater/surface water interconnection can be found in a review of aerial photographs and topographic maps in the form of a flooded gravel pit and a small pond adjacent to the river.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation is 54.8% (WDFW, 2004b). The riparian gallery is extremely sparse and, where present, is restricted to a very narrow strip along the river banks. Very little riparian vegetation overhangs the river.

Wetlands (Table Y5)

Wetlands occupy 47.0% of the SMP jurisdiction today (United States Fish and Wildlife Service [USFWS], 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 3.8 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (Washington State Department of Fish and Wildlife [WDFW], 2004c). Fall chinook, spring chinook, coho salmon, and summer steelhead are present through the greater portion of Reach 1, and this reach is potentially occupied by bull trout. The greater portion of this reach is used by fall chinook for spawning and, along with spring chinook, for rearing habitat. In general, the greater portion of Reach 1 is also utilized by a variety of introduced species (8) and native species (6), including rainbow trout.

Avian (Table Y7)

GAP analysis data indicates that 28.9% of Reach 1 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat (including osprey), Great Basin Canada goose nesting and brooding habitat, great blue heron habitat and rookery, and provides a critical waterfowl wintering area (WDFW, 2004b). The associated uplands provide habitat for upland gamebirds such as California quail.

Terrestrial (Tables Y5 and Y7)

There are no Wildlife Heritage locations noted within the SMP jurisdiction of this reach (WDFW, 2003). The entire riparian zone is listed as priority habitat (WDFW, 2004b). GAP analysis data indicates that all of Reach 1 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 1, 52.7% remain vacant, 41.5% are in agricultural production, 2.3% is under residential development, and 0.5% is occupied by transportation development (Yakima County, 2004a). Approximately 0.5% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Fish and Wildlife and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 12.2% and 0.1%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 0.4 mile of SMP jurisdiction land in this reach (Yakima County, n.d.a). There is one bridge crossing within the SMP jurisdiction (Washington State Department of Transportation [WDOT], 2004).

Revetments (Table Y10)

There are no revetments found within the SMP jurisdiction of Reach 1 (Central Washington University [CWU], 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 1 is predominantly agriculture (88.0%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned light industrial (6.4%), remote/extremely limited (4.1%), and valley rural (1.1%). Approximately 89.5% of the reach is designated as rural by the current SMP, with the other 10.1% designated as conservancy.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 1 on file with the Washington State Historic Preservation Office (Washington State Historic Preservation Office [WSHPO], 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

Two DOE sites/facilities are found in the SMP jurisdiction of Reach 1: a crop preparation service (minor industrial), and a sand and gravel operation (general permit industrial) (Washington State

Department of Ecology [WDOE], 1998). There is one 303(d)-listed stream segment (total length – 1.2 mile) in Reach 1: at the City of Grandview excursions for fecal coliform.

ECOLOGICAL FUNCTIONS SUMMARY

Reach 1 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|--|--|----------------------|--|
| Steep slopes: 2.4% High soil permeability: 7.4% 100-Year Floodplain: 74% | Wetlands: 47% Undeveloped: 52.7% Priority habitats: 1 Species of concern: 2 Anadromous habitat: 6.9 mi Total fish species: 19 | Public land: 12.3% | Principal land use: Vacant/natural >10% Imperviousness: 0.9% Roads: 0.4 mi Bridge Crossings: 1 DOE sites/facilities: 2 |

Ecological functions along Reach 1 are principally impaired by agricultural and residential development, which covers 43.8% of the jurisdiction. These land uses, in addition to the 0.4 miles of roads, account for the majority of the estimated 0.9% of the reach that is greater than 10% impervious. In addition, 1 bridge crossing occurs along the reach. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. Two DOE sites/facilities are also found in the SMP jurisdiction and there is a 1.2 mile 303(d)-listed stream segment. Riparian vegetation, which is listed as a priority habitat and is a buffer for nonpoint pollution, covers approximately 54.8% of the reach, though tends to be sparse and restricted to a very narrow strip along the river banks, with very little riparian vegetation overhanging the river. Much of the reach is presently undeveloped (52.7%), while 47% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend’s big-eared bat and the burrowing owl, as well aquatic habitat for 19 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
- 2) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Existing riparian buffer on agricultural land protecting a recognized anadromous spawning or rearing habitat in an area. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls, and reduced application of pollutants.
- 2) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 3) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 4) Rationale: Existing riparian buffer on agricultural land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls, and reduced application of pollutants.

REACH 2

General Description

Reach 2 is a 13.2-mile segment of the Yakima River that extends from RM 59 (approximately 0.7 mile below the Mabton-Sunnyside Road Bridge to RM 70.2 (approximately 0.5 mile southwest of the junction of South Emerald Road and Murray Road). The average gradient of this reach is 0.02% (0.9 ft/mi.). Reach 2 is a largely unconfined reach with the gentle slopes of the Horse Heaven Hills to the south.

ABIOTIC -See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf*)

Geology/Landform (Table Y2)

Reach 2 is located within extensive Missoula Flood deposits to both the north and south (WDNR, 2000). Throughout this reach, the surficial geology is one of alluvium.

Two areas of geologic hazards are noted in Reach 2, which, combined, cover 0.1% of the SMP jurisdiction (Yakima County, 2003c). One area (0.1%) is rated high risk due to the potential for stream undercutting of banks immediately adjacent to the river. Approximately 98.4% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 2 is dominated by alluvial deposits (81.2%). There are a wide variety of soils within the SMP jurisdiction, but a mix of cobbly and very stony silt loams and silty to sandy loams are predominant (NRCS, 2003). Within this reach, 54.1% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate and slow, runoff is classed as primarily slow and the hazard of erosion is rated as primarily slight (NRCS, 2003).

Stream Type/Channel Form

Channel form throughout Reach 2 is currently classified as pool-riffle. Within this reach, the river flows as a single channel through a broad and loosely confined (by Northern Pacific Railroad bed on southwest) valley floor. The stream is highly meandering throughout most of this reach and the floodplain exhibits numerous oxbow lakes in varying stages of in-filling, sloughs, and meander scars.

It is highly unlikely that the channel form of this reach was once much more complex historically. This is a graded reach in which stream energy and sediment load is balanced. Reduction in both flow velocity and volume through lateral movement (channel migration) and percolation into the alluvial substrate resulted in a depositional environment. Over 98% of the SMP jurisdiction of Reach 2 is underlain by, likely deep, deposits of alluvium. The river remains generally unconfined throughout this reach, and there exists ample opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials,

albeit not throughout as great a spatial extent as historically. As a result, this reach has retained a high degree of channel complexity.

Approximately 6.8% of the reach has been identified as having a high potential for being in the channel migration zone, with another 17.9% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, and oxbow lakes throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 15.4% to 90.8% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is extremely limited, being non-existent in the lower portion of this reach and both patchy and removed from the river banks throughout the remainder.

Wetlands (Table Y5)

Wetlands occupy 60.2% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 373.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Fall chinook, spring chinook, coho, and summer steelhead are present through the greater portion of Reach 2, and this reach is potentially occupied by bull trout. The greater portion of this reach is used by fall chinook for spawning and, along with spring chinook, for rearing habitat. In general, the greater portion of Reach 2 (81%) is also utilized by a variety of introduced species (6) and native species (6), including rainbow trout.

Avian (Table Y7)

GAP analysis data indicates that 22.2% of Reach 2 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat (including osprey), Great Basin Canada goose nesting and brooding habitat, great blue heron habitat and rookery, and provides a critical waterfowl wintering area (WDFW, 2004b). The SMP jurisdiction of this reach encompasses four wildlife heritage locations: all four are associated with great blue heron colonies and/or rookeries.

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 2 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is listed as priority habitat (WDFW, 2004b). This reach provides habitat for resident mule deer and elk.

**CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map
(*Yakima_Cultural_Modifications.pmf*)**

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 2, 73.1% remain vacant, 26.6% are in agricultural production, and 0.3% is occupied by transportation development (Yakima County, 2004a). Approximately 0.3% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Fish and Wildlife and Yakama Nation are the public owners of land within the SMP jurisdiction, holding title to 57.5% and 36.2%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 1.3 miles of SMP jurisdiction land in this reach (Yakima County, n.d.a). There is one bridge crossing within the SMP jurisdiction (WDOT, 2004).

Revetments (Table Y10)

There are no revetments found within the SMP jurisdiction of Reach 2 (CWU, 2002).

**CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map
(*yakima_cultural_jurisdictional.pmf*)**

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 2 is predominantly remote/extremely limited (60.3%) and tribal (33.5%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned agriculture (6.2%), and valley rural (0.1%). Approximately 79.6% of the reach is designated as conservancy by the current SMP, with the other 20.4% designated as rural.

Cultural Resources (Table Y11)

There are two archeological site form records of cultural sites with in the SMP jurisdiction of Reach 2 on file with the Washington State Historic Preservation Office: a housepit and a lithic scatter (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

One DOE site/facility is found in the SMP jurisdiction of Reach 2: a sewerage system (minor municipal – Mabton) (WDOE, 1998). There are three 303(d)-listed stream segments in Reach 2 totaling 2.2 miles in length: at RM 59.8 excursions for fecal coliform and temperature; at RM 61 (Sulphur Creek Wasteway) excursions for 4,4¹-DDE and 4,4¹-DDD (both DDT metabolites), temperature, and Dieldrin (insecticide); and at RM 72 excursions for silver, arsenic, and mercury (however, these findings are inconsistent with later sampling).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 2 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|--|--|--|---|
| High soil permeability: 2.6% 100-Year Floodplain: 98.4% | Wetlands: 60.2% Undeveloped: 73.1% Riparian cover: 15.4% Priority habitats: 2 Species of concern: 2 Wildlife Heritage Locations: 4 Anadromous habitat: 13.2 mi Total fish species: 17 | Public land: 93.7% Boat launches: 3 | Principal land use: Vacant/natural >10% Imperviousness: 0.3% Roads: 1.3 Bridge Crossings: 1 DOE sites/facilities: 1 |

Ecological functions along Reach 2 are principally impaired by agricultural development, which covers 26.6% of the jurisdiction. These land uses, in addition to the 1.3 miles of roads, account for the majority of the estimated 0.3% of the reach that is greater than 10% impervious. In addition, 1 bridge crossing occurs along the reach. Upland vegetation has been removed and replaced with crops and buildings, which can promote increased runoff and nonpoint source pollution. One DOE site/facility is also found in the SMP jurisdiction and there are three 303(d)-listed stream segments totaling 2.2 miles. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 15.4% of the reach, The riparian gallery is extremely limited, being non-existent in the lower portion of this reach and both patchy and removed from the river banks throughout the remainder. Much of the reach is presently undeveloped (73.1%), while 60.2% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend’s big-eared bat and the burrowing owl, as well as two priority habitats for riparian zones and great blue herons, four wildlife heritage locations for great blue herons, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 2) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
- 3) Rationale: great blue heron Priority Species habitat in riparian zone. Suggested Action: Protect great blue heron rookery.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Marginal riparian buffer on agricultural land along anadromous rearing of spawning area. Work with private landowner to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduced application of pollutants
- 2) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 3) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 4) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 5) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.

REACH 3

General Description

Reach 3 is an 11.0-mile segment of the Yakima River that extends from RM 70.2 (approximately 0.5 mile southwest of the junction of South Emerald Road and Murray Road) to RM 82, south of the City of Granger (0.4 mile below the Marion Drain outfall). The average gradient of this reach is 0.06% (3 ft/mi.). Reach 3 is unconfined to the south and becomes increasingly confined, upstream, by Snipes Mountain to the north.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf*)

Geology/Landform (Table Y2)

Reach 3 is located within extensive Missoula Flood deposits to both the north and south, but is increasingly confined by a basalt ridge in the upper portion of the reach (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium.

Three areas of geologic hazards are noted in Reach 3, which, combined, cover 0.8% of the SMP jurisdiction (Yakima County, 2003c). One area (0.3%) is rated high risk due to the potential for stream undercutting of banks immediately adjacent to the river; and the other (0.5%) contains suspected geologic hazards for which preliminary data indicates a potential hazard (likely due to over-steepened slopes or landslides), but for which detailed geologic mapping of this last area is lacking. Approximately 96% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 3 is dominated by alluvial deposits (88.6%). There are a wide variety of soils within the SMP jurisdiction, but silty and sandy loams are predominant (NRCS, 2003). Within this reach, 23.9% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate, runoff is generally classed as slow (NRCS, 2003). The hazard of erosion is generally rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 3 is currently classified as pool-riffle. Within this reach, the river flows primarily as a single channel, although it does exhibit two locations of bifurcation around large, mid-channel bars. The floodplain is somewhat restricted (by Northern Pacific Railroad bed on southwest), but generally has access the majority of its historic floodplain. The stream is highly meandering throughout most of this reach and the floodplain exhibits numerous oxbow lakes in varying stages of in-filling, sloughs, and meander scars.

It is highly unlikely that the channel form of this reach was once much more complex historically. This is a graded reach in which stream energy and sediment load is balanced. Reduction in both flow velocity and volume through lateral movement (channel migration) and percolation into the alluvial substrate resulted in a depositional environment. Over 96% of the SMP jurisdiction of Reach 3 is underlain by likely deep deposits of alluvium. The river remains

generally unconfined throughout this reach, and there exists ample opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials, albeit not throughout as great a spatial extent as historically. As a result, this reach has retained a high degree of channel complexity.

Approximately 46.1% of the reach has been identified as having a high potential for being in the channel migration zone, with another 38.7% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, and oxbow lakes throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is one area of hardwood (alder, ash, and maple) noted in the upper portion of the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 36.3% to 93.6% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is sparse along this reach and, where present, is both patchy and removed from the river banks.

Wetlands (Table Y5)

Wetlands occupy 64.1% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 331.6 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Fall chinook, spring chinook, coho, and summer steelhead are present through the greater portion of Reach 3, and this reach is potentially occupied by bull trout. The greater portion of this reach is used by fall chinook for spawning and, along with spring chinook, for rearing habitat. In general, the greater portion of Reach 3 (78%) is also utilized by a variety of introduced species (6) and native species (6), including rainbow trout.

Avian (Table Y7)

GAP analysis data indicates that 4.8% of Reach 3 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat, great blue heron habitat and rookery, and provides moderate-quality waterfowl wintering area (WDFW, 2004b). The SMP jurisdiction of this reach encompasses eight Wildlife Heritage locations: seven are associated with great blue heron colonies and/or rookeries, and one location is a bald eagle nest site.

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 3 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is listed as priority habitat (WDFW, 2004b).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 3, 74.4% remain vacant, 23.0% are in agricultural production, 2.3% is under residential development, and 0.2% is occupied by transportation development (Yakima County, 2004a). None of the SMP jurisdiction is greater than 25% impervious. The Yakama Nation, Washington State Department of Fish and Wildlife, and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 69.8%, 1.2%, and 0.1%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 1.0 mile and abandoned railroads occupy 1.0 mile of SMP jurisdiction land in this reach (Yakima County n.d.a, WDOT 1994).

Revetments (Table Y10)

A total of 0.2 miles of revetments (type unknown) are found within the SMP jurisdiction of Reach 3 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 3 is predominantly tribal (78.4%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned agriculture (12.1%), remote/extremely limited (8.7%), valley rural (0.5%), and light industrial (0.2%). Approximately 90.2% of the reach is designated as conservancy by the current SMP, with the other 9.8% designated as rural.

Cultural Resources (Table Y11)

There are two archeological site form records of cultural sites with in the SMP jurisdiction of Reach 3 on file with the Washington State Historic Preservation Office: both are housepits (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

There are no DOE sites/facilities or stream segments found in the SMP jurisdiction of Reach 3 (WDOE, 1998).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 3 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|--|--|----------------------|---|
| High runoff soils: 1.8% High erosion soils: 1.8% High soil permeability: 26.3% 100-Year Floodplain: 96% | Wetlands: 64.1% Undeveloped: 74.4% Riparian cover: 36.3% Priority habitats: 2 Species of concern: 2 Wildlife Heritage Locations: 8 Anadromous habitat: 11 mi Total fish species: 17 | Public land: 71.1% | Principal land use: Vacant/natural >10% Imperviousness: 0.1% Roads: 1 mi Revetments: 0.2 mi |

Ecological functions along Reach 3 are principally impaired by agricultural and residential development, which covers 25.3% of the jurisdiction. These land uses, in addition to the 1 mile of roads, account for the majority of the estimated 0.1% of the reach that is greater than 10% impervious. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 0.2 miles of revetments within the jurisdiction. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 36.3% of the reach, The riparian gallery is sparse along this reach and, where present, is both patchy and removed from the river banks. Much of the reach is presently undeveloped (74.4%), while 64.1% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend's big-eared bat and the burrowing owl, as well as two priority habitats for riparian zones and great blue herons, eight wildlife heritage locations, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
- 2) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 3) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian.
- 4) Rationale: great blue heron Priority Species habitat in riparian zone. Suggested Action: Protect great blue heron rookery.
- 5) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 6) Rationale: great blue heron Priority Species habitat in riparian zone. Suggested Action: Protect great blue heron rookery.
- 7) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 2) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 3) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 4) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a

larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.

- 5) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain
- 6) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications
- 7) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural adjacent to an area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.

REACH 4

General Description

Reach 4 is a 1.4-mile segment of the Yakima River that extends from RM 82, south of the City of Granger (0.4 mile below the Marion Drain outfall) to RM 83.4, north of Granger (at the south end of Blaine Road). The average gradient of this reach is 0.1% (5.5 ft/mi.). Reach 4 is confined by Snipes Mountain to the east and by the eastern end of Toppenish Ridge to the west.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf*)

Geology/Landform (Table Y2)

Reach 4 is located within extensive Missoula Flood deposits to the north and extensive alluvial deposits to the south (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium.

One area of geologic hazard is noted in Reach 5, which covers 0.3% of the SMP jurisdiction (Yakima County, 2003c). This area is rated high risk due to the potential for stream undercutting of banks immediately adjacent to the river. Approximately 81.6% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 4 is dominated by alluvial deposits (95.7%). There is a wide variety of soils within the SMP jurisdiction, but a mix of stony loams and silty and sandy loams are predominant (NRCS, 2003). Within this reach, 16.0% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate, runoff is classed as slow (NRCS, 2003). The hazard of erosion is rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 4 is currently classified as pool-riffle. Within this reach, the river flows primarily as a single channel. The floodplain is highly restricted by structures on the southwest (Northern Pacific Railroad bed, road beds), and by excavated irrigation drains. The river, currently, is highly linear throughout this short reach, however, the floodplain exhibits an oxbow lake that has been disconnected from the main channel through construction of irrigation drains.

It is highly likely that the channel form of this reach was once more complex. This is a graded reach in which stream energy and sediment load is balanced. Reduction in both flow velocity and volume through lateral movement (channel migration) and percolation into the alluvial substrate resulted in a depositional environment. Over 99% of the SMP jurisdiction of Reach 4 is underlain by, likely deep, deposits of alluvium. The river is generally confined throughout this reach, and there exists little opportunity for flood waters to spread or for channel locations to

shift resulting in this reach currently behaving more as a transport reach. With engineering, this reach would likely exhibit a much higher degree of channel complexity.

Approximately 24.7% of the reach has been identified as having a high potential for being in the channel migration zone, with another 49.1% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, oxbow lakes, and flooded gravel pits throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is one area of hardwood (alder, ash, and maple) noted in the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 37.6% to 66.4% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery remains, more-or-less, intact along the east bank of this reach, although it is restricted to a narrow strip in places, except in the lower 1400 feet of the reach where it has been lost due to agricultural activities.

Wetlands (Table Y5)

Wetlands occupy 17.9% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 0.3 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Fall chinook, spring chinook, coho, and summer steelhead are present through varying portions of Reach 4, and this reach is potentially occupied by bull trout. Portions of this reach is used by fall chinook for spawning and rearing (0.4 miles), while the entire reach is used by spring chinook for rearing habitat. In general, the greater portion of Reach 4 is also utilized by a variety of introduced species (6) and native species (6), including rainbow trout. The SMP jurisdiction of this reach also encompasses one aquatic Wildlife Heritage location associated with the presence of mountain sucker (WDFW, 2003).

Avian (Table Y7)

GAP analysis data indicates that 36.1% of Reach 4 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat, and provides moderate-quality waterfowl wintering area (WDFW, 2004b).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 4 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is listed as priority habitat (WDFW, 2004b).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 4, 37.6% remain vacant, 52.1% are in agricultural production, 5.0% is under residential development, 1.0% is industrial, and 3.3% is occupied by transportation development (Yakima County, 2004a). 4.0% of the SMP jurisdiction is greater than 25% impervious. The Yakama Nation and Washington State Department of Fish and Wildlife are the public owners of land within the SMP jurisdiction, holding title to 66.8% and 0.1%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 1.2 miles of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

There are no revetments found within the SMP jurisdiction of Reach 4 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 4 is predominantly tribal (78.8%) and light industrial (13.9%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned remote/extremely limited (7.3%). Approximately 66.8% of the reach is designated as rural by the current SMP, with the other 11.9-21.3% being designated as urban and conservancy respectively.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 4 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

Two DOE sites/facilities are found in the SMP jurisdiction of Reach 4: a sewerage system (minor municipal – Granger) and a hazardous waste generator (Granger School District) (WDOE, 1998). There is one 303(d)-listed stream segment (total length – 1.2 miles) in Reach 4: at RM 83 (Granger Drain) excursions for DDT, 4,4¹-DDE and 4,4¹-DDD (both DDT metabolites), Dieldrin (insecticide), and Endosulfan (pesticide).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 4 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---|---|----------------------|--|
| High erosion soils: 0.4% High soil permeability: 40.8% 100-Year Floodplain: 81.6% | Wetlands: 17.9% Undeveloped: 37.6% Riparian cover: 37.6% Priority habitats: 1 Species of concern: 2 Natural Heritage points: 1 Anadromous habitat: 1.4 mi Total fish species: 17 | Public land: 66.9% | Principal land use: Agriculture >10% Imperviousness: 4.6% Roads: 1.2 mi Bridge Crossings: 1 DOE sites/facilities: 2 |

Ecological functions along Reach 4 are principally impaired by agricultural and residential development, which covers 57.1% of the jurisdiction. These land uses, in addition to the 1.2 miles of roads, account for the majority of the estimated 4.6% of the reach that is greater than 10% impervious. In addition, 1 bridge crossing occurs along the reach. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. Two DOE sites/facilities are also found in the SMP jurisdiction and one 303(d)-listed stream segment, 1.2 miles in length. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 37.6% of the reach, though tends to be largely restricted to a narrow corridor along the stream banks, sparse in most areas, and non-existent in several segments. Much of the reach is presently undeveloped (37.6%), while 17.9% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend’s big-eared bat and the burrowing owl, as well as a natural heritage location for mountain suckers, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Wetlands and riparian buffer on private property. Suggested action: Work with landowner to protect wetlands and riparian buffer.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 2) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 3) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in a residential/urban area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and provide education regarding erosion and runoff control, and reduced application of pollutants.

REACH 5

General Description

Reach 5 is a 6.2-mile segment of the Yakima River that extends from north of Granger (at the south end of Blaine Road) to the south end of the City of Zillah. The average gradient of this reach is 0.1% (7 ft/mi.). Reach 5 is unconfined to the south and west for several miles and abuts the gentle toe-slope of the Rattlesnake Hills to the north and east.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf*)

Geology/Landform (Table Y2)

Reach 5 is located within extensive Missoula Flood deposits to the north and east and extensive alluvial deposits to the south and west (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium.

Two areas of geologic hazards are noted in Reach 5, which, combined, cover 0.5% of the SMP jurisdiction (Yakima County, 2003c). One area (0.5%) contains suspected geologic hazards for which preliminary data indicates a potential hazard (likely due to over-steepened slopes or landslides), but for which detailed geologic mapping of this last area is lacking. Approximately 96.9% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 5 is dominated by alluvial deposits (96.5%). There are a wide variety of soils within the SMP jurisdiction, but silt loams are predominant (NRCS, 2003). Within this reach, 12.7% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate and very rapid, runoff is generally classed as slow (NRCS, 2003). The hazard of erosion is rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 5 is currently classified as pool-riffle. Within this reach, the river flows alternately as a single channel and as a bifurcated channel. The floodplain is greatly restricted by the roadbed of Interstate 84 to the northeast and by numerous road beds, the Northern Pacific Railroad bed (and roadbed of U.S. Route-97 beyond on the southwest) such that, currently, the river has access to only a small portion of its historic floodplain. The river is highly meandering throughout most of this reach and the floodplain exhibits numerous oxbow lakes in varying stages of in-filling, sloughs, and meander scars.

It is likely that the channel form of this reach was once somewhat more complex. This is a graded reach in which stream energy and sediment load is balanced. Reduction in both flow velocity and volume through lateral movement (channel migration) and percolation into the alluvial substrate resulted in a depositional environment. Over 96% of the SMP jurisdiction of Reach 5 is underlain by likely deep deposits of alluvium. Although confined throughout this reach, and there still exists some opportunity for flood waters to spread, shifting channel

locations and alternately eroding and depositing materials, albeit not throughout as great a spatial extent as historically. As a result, this reach has retained a high degree of channel complexity.

Approximately 29.6% of the reach has been identified as having a high potential for being in the channel migration zone, with another 19.6% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, oxbow lakes, and flooded gravel pits throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is an extensive area of hardwood (alder, ash, and maple) noted in the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 31.3% to 54.3% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery throughout this reach is highly fragmented.

Wetlands (Table Y5)

Wetlands occupy 27.5% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 38.6 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Spring chinook, coho, and summer steelhead are present through varying portions of Reach 5, and this reach is potentially occupied by bull trout. Information on utilization of this reach for spawning was unavailable; however, spring chinook utilize the reach for rearing habitat. Reach 5 is also utilized by a variety of introduced species (6) and native species (6), including rainbow trout. The SMP jurisdiction of this reach encompasses three aquatic Wildlife Heritage locations associate with the presence of mountain sucker, leopard dace, and Umatilla dace (WDFW, 2003).

Avian (Table Y7)

GAP analysis data indicates that 42.8% of Reach 5 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). The SMP jurisdiction of this reach also encompasses three Wildlife Heritage locations: all are associated with great blue heron colonies and/or rookeries (WDFW, 2003).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 5 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is listed as priority habitat (WDFW, 2004b).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 5, 54.7% remain vacant, 44.1% are in agricultural production, 0.7% is under residential development, and 0.4% is occupied by transportation development (Yakima County, 2004a). 0.3% of the SMP jurisdiction is greater than 25% impervious. The Yakama Nation and Washington State Department of Fish and Wildlife are the public owners of land within the SMP jurisdiction, holding title to 83.5% and 0.6%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 1.3 miles, active railroads 1.3 miles, and abandoned railroad 0.6 mile of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

A total of 0.7 miles of revetments (dike) are found within the SMP jurisdiction of Reach 5 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 5 is predominantly tribal (80.0%) and agriculture (13.6%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned valley rural (3.3%), remote/extremely limited (2.7%), and light industrial (0.3%). Approximately 90.5% of the reach is designated as rural by the current SMP, with the other 0.3-9.3% designated as urban and conservancy respectively.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 5 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

Three DOE sites/facilities are found in the SMP jurisdiction of Reach 5: a cattle feedlot (minor industrial), a state cleanup site, and a crop preparation/refrigerator warehouse facility (hazardous chemical report – underground storage tank) (WDOE, 1998). There are no 303(d)-listed stream segments in Reach 5.

ECOLOGICAL FUNCTIONS SUMMARY

Reach 5 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---|---|--------------------|--|
| High erosion soils: 0.1% High soil permeability: 34.3% 100-Year Floodplain: 96.9% | Wetlands: 27.5% Undeveloped: 54.7% Riparian cover: 31.3% Priority habitats: 1 Species of concern: 2 Natural Heritage points: 2 Anadromous habitat: 6.2 mi Total fish species: 16 | Public land: 84.1% | Principal land use: Vacant/natural >10% Imperviousness: 0.6% Roads: 1.3 mi Revetments: 0.7 mi DOE sites/facilities: 3 |

Ecological functions along Reach 5 are principally impaired by agricultural and residential development, which covers 44.8% of the jurisdiction. These land uses, in addition to the 1.3 miles of roads and 1.9 miles of active and abandoned railroad, account for the majority of the estimated 0.6% of the reach that is greater than 10% impervious. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 0.7 miles of revetments within the jurisdiction. Three DOE sites/facilities are also found in the SMP jurisdiction, though there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 31.3% of the reach, The riparian gallery remains fairly intact along the east bank of this reach, although it is restricted to a narrow strip in places, with portions lost due to agricultural activities. Much of the reach is presently undeveloped (54.7%), while 27.5% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend’s big-eared bat and the burrowing owl, as well as two natural heritage points for great blue herons, and aquatic habitat for 16 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer.
- 2) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
- 3) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff control and reduction of chemical applications.
- 2) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 3) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 4) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain
- 5) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.

REACH 6

General Description

Reach 6 is a 2.3-mile segment of the Yakima River that extends from the south end of the City of Zillah to the north end of the City of Zillah (Zillah-Toppenish Road Bridge). The average gradient of this reach is 0.08% (4 ft/mi.). Reach 6 is unconfined to the south and west for several miles and abuts the gentle toe-slope of the Rattlesnake Hills to the north and east.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf*)

Geology/Landform (Table Y2)

Reach 6 is located within extensive alluvial and terraced-alluvial deposits to the south and west and a narrow zone of Missoula Flood deposits that grades into bluffs composed of basalt flows and sedimentary rocks (Ellensburg Formation) to the north and east (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium.

One area of geologic hazard is noted in Reach 6, which covers 0.5% of the SMP jurisdiction (Yakima County, 2003c). This area is rated high risk due to the potential for flash flooding issuing from side canyons. Approximately 96.5% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 6 is dominated by (98.6%) by alluvial deposits. There are a wide variety of soils within the SMP jurisdiction, but silt loams are predominant (NRCS, 2003). Within this reach, 23.6% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate and rapid, runoff is classed as slow (NRCS, 2003). The hazard of erosion is rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 6 is currently classified as pool-riffle. Within this reach, the river flows as a single channel. The floodplain is greatly restricted by the roadbed of Interstate 84 to the northeast and by numerous road beds, the Northern Pacific Railroad bed (and roadbed of U.S. Route-97 beyond on the southwest) such that, currently, the river has access to only a small portion of its historic floodplain. The river is meandering throughout this short reach and the floodplain exhibits a slough.

It is highly likely that the channel form of this reach was once more complex. Though now confined to a single channel, it was once clearly more migratory and probably exhibited channel bifurcation historically. This is a graded reach in which stream energy and sediment load is balanced. Reduction in both flow velocity and volume through lateral movement (channel migration) and percolation into the alluvial substrate resulted in a depositional environment. Over 99% of the SMP jurisdiction of Reach 6 is underlain by, likely deep, deposits of alluvium. Although confined throughout this reach, and there still exists some opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials, albeit not

throughout as great a spatial extent as historically. As a result, this reach has retained a modicum of channel complexity.

Approximately 29% of the reach has been identified as having a high potential for being in the channel migration zone, with another 16.6% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, oxbow lakes, and flooded gravel pits throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is one large area of hardwood (alder, ash, and maple) noted in the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 52.6% to 85.7% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is found in robust expression throughout the majority of this reach, being absent only on more-recent alluvial deposits and in proximity to gravel-mining operations.

Wetlands (Table Y5)

Wetlands occupy 18.8% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 0.5 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Spring chinook, coho, and summer steelhead are present through most of Reach 6, and this reach is potentially occupied by bull trout. Information on utilization of this reach for spawning was unavailable; however, spring chinook utilize most of the reach for rearing habitat. Most of Reach 6 is also utilized by a variety of introduced species (6) and native species (6), including rainbow trout.

Avian (Table Y7)

GAP analysis data indicates that 5.0% of Reach 6 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). The SMP jurisdiction of this reach also encompasses one avian Wildlife Heritage location associated with a great blue heron rookery (WDFW, 2003).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 6 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is also listed as priority habitat (WDFW, 2004b).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 6, 60.0% remain vacant, 32.8% are in agricultural production, 0.4% is under residential development, and 6.5% is occupied by transportation development (Yakima County, 2004a). 6.5% of the SMP jurisdiction is greater than 25% impervious. The Yakama Nation and Washington State Department of Fish and Wildlife are the public owners of land within the SMP jurisdiction, holding title to 70.6% and 3.2%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 4.1 miles, active railroads 0.2 miles, and abandoned railroad 0.2 mile of SMP jurisdiction land in this reach (Yakima County n.d.a, WDOT 1997,1994). There are two bridge crossings within the SMP jurisdiction (WDOT, 2004).

Revetments (Table Y10)

A total of 1.7 miles of revetments (type unknown) are found within the SMP jurisdiction of Reach 6 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 6 is predominantly tribal (82.0%) and remote/extremely limited (16.1%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned light industrial (0.5%) and valley rural (04%). Currently 100% of the reach is designated as rural by the current SMP.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 6 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

Four DOE sites/facilities are found in the SMP jurisdiction of Reach 6: a crop-preparation service (minor industrial), a sewerage system (minor municipal – Zillah), a vintner (general permit industrial), and a ready-mix concrete/sand and gravel operation (general permit industrial) (WDOE, 1998). There are no 303(d)-listed stream segments in Reach 6.

ECOLOGICAL FUNCTIONS SUMMARY

Reach 6 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---|---|--------------------|--|
| High soil permeability: 22.8% 100-Year Floodplain: 96.5% | Wetlands: 18.8% Undeveloped: 60% Riparian cover: 52.6% Priority habitats: 1 Species of concern: 2 Natural Heritage points: 4 Anadromous habitat: 2.1 mi Total fish species: 16 | Public land: 73.8% | Principal land use: Vacant/natural >10% Imperviousness: 6.5% Roads: 4.1 mi Revetments: 1.7 mi Bridge Crossings: 2 DOE sites/facilities: 4 |

Ecological functions along Reach 6 are principally impaired by agricultural and transportation development, which covers 39.3% of the jurisdiction. These land uses, in addition to the 4.1 miles of roads and 0.4 miles of active and abandoned railroad, account for the majority of the estimated 6.5% of the reach that is greater than 10% impervious. In addition, 2 bridge crossings occur along the reach. Upland vegetation has been removed and replaced with crops and buildings, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 1.7 miles of revetments within the jurisdiction. Four DOE sites/facilities are also found in the SMP jurisdiction, though there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 52.6% of the reach, The riparian gallery is found in robust expression throughout the majority of this reach, being absent only on more-recent alluvial deposits and in proximity to gravel-mining operations. Much of the reach is presently undeveloped (60%), while 18.8% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend’s big-eared bat and the burrowing owl, as well as four natural heritage points, and aquatic habitat for 16 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

- 2) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: 303(d) facilities located in SMP jurisdiction. Suggested Action: Mitigate all 303(d) facilities.

REACH 7

General Description

Reach 7 is a 15.1-mile segment of the Yakima River that extends from RM 91 at the north end of the City of Zillah (Zillah-Toppenish Road Bridge) to RM 106 (southern end of the Union Gap topographic feature). The average gradient of this reach is 0.2% (12 ft/mi.). Reach 7 is unconfined to the south and west for several miles and abuts the toe-slopes (which become increasingly steeper to the north) of the Rattlesnake Hills to the north and east.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Geology/Landform (Table Y2)

Reach 7 is located within extensive alluvial and terraced-alluvial deposits to the south and west and by a narrow zone of alluvial and Missoula Flood deposits to the north and east that grades into bluffs composed of basalt flows and sedimentary rocks (Ellensburg Formation) (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium. Approximately 95.5% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 7 is dominated by alluvial deposits (99.4%). There are a wide variety of soils within the SMP jurisdiction, but silty and sandy loams are predominant (NRCS, 2003). Within this reach, 23.3% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily very rapid to moderate (NRCS, 2003). Runoff is generally classed as slow and the hazard of erosion is rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 7 is currently classed as pool-riffle. Within this reach, the river flows alternately as a single channel and as a bifurcated channel. The floodplain is greatly restricted by the roadbed of Interstate 84 to the northeast and by numerous road beds, the Northern Pacific Railroad bed (and roadbed of U.S. Route-97 beyond on the southwest) such that, currently, the river has access to only a small portion of its historic floodplain. The river is highly meandering throughout most of this reach and the floodplain exhibits numerous oxbow lakes in varying stages of in-filling, sloughs, and meander scars.

It is likely that the channel form of this reach was once somewhat more complex. This is a graded reach in which stream energy and sediment load is balanced. Reduction in both flow velocity and volume through lateral movement (channel migration) and percolation into the alluvial substrate resulted in a depositional environment. Over 99% of the SMP jurisdiction of Reach 7 is underlain by, likely deep, deposits of alluvium. Although confined throughout this reach, and there still exists some opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials, albeit not throughout as great a spatial extent as historically. As a result, this reach has retained a high degree of channel complexity.

Approximately 34.2% of the reach has been identified as having a high potential for being in the channel migration zone, with another 3.9% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, oxbow lakes, and flooded gravel pits throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is an extensive area of hardwood (alder, ash, and maple) noted in the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 35.8% to 56.6% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is generally robust throughout the lower portion of this reach, although it is sparse in segments. In the upper portion of this reach, the riparian gallery becomes confined to a very narrow strip by Interstate-82 to the east and U.S. Route-97 to the west.

Wetlands (Table Y5)

Wetlands occupy 32.0% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 193.7 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed population (WDFW, 2004c). Spring chinook, coho, and summer steelhead are present throughout Reach 7, and this reach is also potentially occupied by bull trout. Information on utilization of this reach for spawning was unavailable, however, spring chinook utilize the reach for rearing habitat. Reach 7 is also utilized by a variety of introduced species (6) and native species (6), including rainbow trout. The SMP jurisdiction of this reach encompasses two aquatic Wildlife Heritage locations associated with the presence of mountain sucker and leopard dace (WDFW, 2003).

Avian (Table Y7)

GAP analysis data indicates that 52.7% of Reach 7 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). The SMP jurisdiction of this reach encompasses nine avian Wildlife Heritage locations: five are associated with osprey nest/pair and four are associated with great blue heron colonies and/or rookeries (WDFW, 2003).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 7 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is listed as priority habitat, with small portions being identified as priority habitat for great blue heron (WDFW, 2004b).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 7, 36.4% remain vacant, 44.9% are in agricultural production, 10.5% is under residential development, and 7.8% is occupied by transportation development (Yakima County, 2004a). 3.6% of the SMP jurisdiction is greater than 25% impervious. The Yakama Nation, Washington State Department of Fish and Wildlife, Washington State Department of Transportation, and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 70.3%, 15.8%, 0.1%, and 0.5%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 37.3 miles, active railroads 0.4 miles, and abandoned railroad 4.5 miles of SMP jurisdiction land in this reach (Yakima County n.d.a, WDOT 1997,1994). There are fifteen bridge crossings within the SMP jurisdiction (WDOT, 2004).

Revetments (Table Y10)

A total of 18.4 miles of revetments (6.0 miles of dike, 12.4 miles type unknown) are found within the SMP jurisdiction of Reach 7 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 7 is predominantly tribal (64.4%) and remote/extremely limited (23.8%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned agriculture (8.9%), rural settlement (1.8%), light and heavy industrial (0.5%), and single family residential (0.5%). Currently 98.6% of the reach is designated as rural by the current SMP, with the other 1.4% designated as conservancy.

Cultural Resources (Table Y11)

Site Form records of cultural sites with in the SMP jurisdiction of Reach 7 on file with the Washington State Historic Preservation Office: a prehistoric village, three housepits, and an historic can dump (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

Three DOE sites/facilities are found in the SMP jurisdiction of Reach 7: a ready-mix concrete/sand and gravel operation (general permit industrial), an underground storage tank, and the Sunnyside Diversion Dam (WDOE, 1998). There are two 303(d)-listed stream segments in Reach 7 (total length – 2.75 miles): at the City of Buena excursions for Dieldrin (insecticide), DDT, and 4,4¹-DDE (DDT metabolite); and at the City of Parker excursions for temperature.

ECOLOGICAL FUNCTIONS SUMMARY

Reach 7 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---|---|--|--|
| High soil runoff: 0.4% High erosion soils: 0.4% High soil permeability: 45.2% 100-Year Floodplain: 95.5% | Wetlands: 32% Undeveloped: 36.4% Riparian cover: 35.8% Priority habitats: 3 Species of concern: 2 Natural Heritage points: 11 Anadromous habitat: 15.1 mi Total fish species: 16 | Public land: 87.4% Boat launches: 2 | Principal land use: Agriculture >10% Imperviousness: 7.6% Roads: 37.3 mi Revetments: 18.4 mi Bridge Crossings: 15 DOE sites/facilities: 3 |

Ecological functions along Reach 7 are principally impaired by agricultural and residential development, which covers 55.4% of the jurisdiction. These land uses, in addition to the 37.3 miles of roads and 4.9 miles of active and abandoned railroad, account for the majority of the estimated 7.6% of the reach that is greater than 10% impervious. In addition, 15 bridge crossings and one passable insufficient flow dam occur along the reach. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 18.4 miles of revetments within the jurisdiction. Three DOE sites/facilities are also found in the SMP jurisdiction and there are two 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 35.8% of the reach. The riparian gallery is generally robust throughout the lower portion of this reach, although it is sparse in segments, and is confined by highways in the upper portion of the reach. Much of the reach is presently undeveloped (36.4%), while 32% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend’s big-eared bat and the burrowing owl, as well as three priority habitats, eleven natural heritage points, and aquatic habitat for 16 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: great blue heron Priority Species habitat in riparian zone. Suggested Action: Protect great blue heron rookery.
- 2) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
- 3) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer.
- 4) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.
- 5) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 2) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
- 3) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff control and reduction of chemical applications.
- 4) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
- 5) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 6) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. In addition, marginal riparian buffer protecting an anadromous spawning or rearing habitat in an industrial area. Suggested Action: Remove levee to expand the active floodplain. Also, work with private landowners to establish a

larger riparian buffer and provide education regarding erosion and runoff controls. Finally, work with private landowner to relocate junkyard.

- 7) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff control and reduction of chemical applications.
- 8) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
- 9) Rationale: Abandoned railroad grade in floodplain restricting floodplain processes. Suggested Action: Remove railroad grade.
- 10) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff control and reduction of chemical applications.
- 11) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff control and reduction of chemical applications.

REACH 8

General Description

Reach 8 is a 1.8-mile segment of the Yakima River that extends from RM 106 (southern end of the Union Gap topographic feature) to RM 107.8 (northern end of the Union Gap topographic feature). The average gradient of this reach is 0.3% (15 ft/mi.). Reach 8 is confined to both the east and west by the steep, water-cut gap between Ahtanum Ridge and the Rattlesnake Hills.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map
(Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf)

Geology/Landform (Table Y2)

Reach 8 is located within the confines of a gap carved through an anticlinal ridge (Union Gap). To both the east and west, the canyon walls are composed of basalt flows (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium.

One area of geologic hazard is noted in Reach 8, which covers 2.6% of the SMP jurisdiction (Yakima County, 2003c). This area is rated high risk due to the potential for rock fall or creep from over-steepened slopes. Approximately 85.6% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 8 is dominated by alluvial deposits (79.4%). There are a wide variety of soils within the SMP jurisdiction, but silty and sandy loams are predominant (NRCS, 2003). Within this reach, 34.3% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily rapid and very rapid (NRCS, 2003). Runoff is generally classed as slow and the hazard of erosion is rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 8 is currently classified as pool-riffle. Upon exiting the confining canyon at the upper end of this reach, the stream flows through a broadening and ever-less confining floodplain that forms the northern extent of the Yakima Valley. However, today, the floodplain is greatly restricted by the roadbed of U.S. Route-97 to the west. The stream exhibits a slight degree of sinuosity within this short reach.

It is highly likely that the channel form of this reach was once more complex. The river is exceedingly confined within the upper portion of this reach by both geologic structure and by emplacement of the Interstate-82 (to east) and U.S. Route-97 (to west) roadbeds. Within the upper portion, this is a transport reach in which the high degree of confinement functions to concentrate and maintain river energy. Within the lower segment, this is a dispersal reach in which energy is dissipated. Reduction in velocity and volume through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. Currently, a major irrigation diversion

accentuates the depositional nature of the lower portion of this reach. Over 91% of the SMP jurisdiction of Reach 8 is underlain by, likely deep, deposits of alluvium (with the exception of the upper portion). Though currently confined in many places, there existed the opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials. As a result, this reach has a potential for increased channel complexity.

Approximately 53.5% of the reach has been identified as having a high potential for being in the channel migration zone (Table Y4).

Hyporheic Flow

Given the geologic structure controlling the river within this reach, the hyporheic flow pattern is expected to be highly diverse. The nature of both the fluvial deposits and increasing confinement within the upper portion of this reach suggest hyporheic flow mainly in the form of upwelling. Alternately, below Union Gap, hyporheic flow is likely in the form of down-welling. Further evidence of groundwater/surface water interconnection can be found in a review of aerial photographs and topographic maps in the form of flooded borrow pits adjacent to the river.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is one large area of hardwood (alder, ash, and maple) noted in the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 37.8% to 79.5% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is robust throughout this reach except in those locations where thoroughfares abut the river banks.

Wetlands (Table Y5)

Wetlands occupy 64.8% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 2.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Spring chinook, coho, and summer steelhead are present throughout Reach 8, and this reach is potentially, and presumed to be, occupied by bull trout. A portion of this reach is used by coho for spawning (0.4 miles), while the entire reach is utilized by spring chinook for rearing habitat. Most of Reach 8 is also utilized by a variety of introduced species (6) and native species (6), including rainbow trout.

Avian (Table Y7)

GAP analysis data indicates that portions of Reach 8 may provide habitat for four species of current concern, including principally the burrowing owl (23.6%), as well as smaller portions for the Ferruginous hawk, sage sparrow, and sage thrasher (18.9% each) (WDFW, 2004a). Approximately 14% of the reach is also listed as priority habitat for bald eagle (WDFW, 2004b).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that portions of Reach 8 may provide habitat for three species of current concern, including principally the Townsend's big-eared bat (100%), as well as smaller portions for the Black-tailed jack rabbit and Townsend's ground squirrel (18.9% each) (WDFW, 2004a). The entire riparian zone is also listed as priority habitat (WDFW, 2004b).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 8, 78.6% remain vacant, 3.4% are in agricultural production, and 18.1% is occupied by transportation development (Yakima County, 2004a). Approximately 0.3% of the SMP jurisdiction is greater than 25% impervious. The Yakama Nation, Washington State Department of Fish and Wildlife, and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 46.7%, 39.0%, and 0.4%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 3.4 miles, active railroads 1.3 miles, and abandoned railroad 0.5 mile of SMP jurisdiction land in this reach (Yakima County n.d.a, WDOT 1997, 1994). There are three bridge crossings within the SMP jurisdiction (WDOT, 2004).

Revetments (Table Y10)

A total of 0.3 miles of revetments (road bed) are found within the SMP jurisdiction of Reach 8 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 8 is predominantly remote/extremely limited (66.2%) and tribal (20.0%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned Suburban Residential (7.7%), agriculture (5.3%), and Mining (0.7%). Approximately 91.6% of the reach is designated as conservancy by the current SMP, with the other 8.4% designated as rural.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 8 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

Two DOE sites/facilities are found in the SMP jurisdiction of Reach 8: a ready-mix concrete/sand and gravel operation (general permit industrial), and the Wapato Diversion Dam (WDOE, 1998). There is one 303(d)-listed stream segment (total length – 1.0 mile) in Reach 8: above Ahtanum Creek near Union Gap excursions for silver, mercury, and fecal coliform.

ECOLOGICAL FUNCTIONS SUMMARY

Reach 8 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---|---|--|--|
| Steep slopes: 2.6% High soil runoff: 0.4% High erosion soils: 0.4% High soil permeability: 68.2% 100-Year Floodplain: 85.6% | Wetlands: 64.8% Undeveloped: 78.6% Riparian cover: 37.8% Priority habitats: 2 Species of concern: 7 Anadromous habitat: 1.8 mi Total fish species: 17 | Public land: 86.1% Boat launches: 1 | Principal land use: Vacant/natural >10% Imperviousness: 26.5% Roads: 3.4 mi Revetments: 0.3 mi Bridge Crossings: 3 DOE sites/facilities: 2 |

Ecological functions along Reach 7 are principally impaired by agricultural and transportation development, which covers 21.5% of the jurisdiction. These land uses, in addition to the 3.4 miles of roads and 1.8 miles of active and abandoned railroad, account for the majority of the estimated 26.5% of the reach that is greater than 10% impervious. In addition, 3 bridge crossings and one passable dam occur along the reach. Upland vegetation has been removed and replaced with crops and buildings, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 0.3 miles of revetments within the jurisdiction. Two DOE sites/facilities are also found in the SMP jurisdiction and one, 1 mile 303(d) listed stream segment. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 37.8% of the reach. The riparian gallery is robust throughout this reach except in those locations where thoroughfares abut the river banks. Much of the reach is presently undeveloped (78.6%), while 64.8% is covered by wetlands. The reach provides habitat for seven species of concern, as well as two priority habitats for bald eagles and riparian zones, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 2) Rationale: bald eagle habitat in riparian zone. Suggested Action: Protect nesting habitat from encroachment.
- 3) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 4) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.

REACH 9

General Description

Reach 9 is a 4.3-mile segment of the Yakima River that extends from RM 107.3 (northern end of the Union Gap topographic feature) to RM 111.6 (east end of Nob Hill Boulevard, southern tip of Sportsmen Park). The average gradient of this reach is 0.25% (14 ft/mi.). Reach 9 is unconfined to the east, but confined to the west by old river terraces and levees.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Geology/Landform (Table Y2)

Reach 9 is located within extensive alluvial and terraced-alluvial deposits to both the east and west (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium.

One area of geologic hazard is noted in Reach 9, which covers 0.4% of the SMP jurisdiction (Yakima County, 2003c). This area is rated high risk due to the potential for rock fall or creep from over-steepened slopes. Approximately 94.4% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 9 is dominated by alluvial deposits (86.7%). There are a wide variety of soils within the SMP jurisdiction, but silty and sandy loams with rock outcrops are predominant (NRCS, 2003). Within this reach, 85.9% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily rapid, runoff is classed as slow (NRCS, 2003). The hazard of erosion is rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 9 is currently classified as pool-riffle. Within this reach, the river flows alternately as a single, bifurcated, and braided channel. The floodplain is somewhat restricted by the roadbed of Interstate 84 to the west, but is only loosely confined to the east such that, currently, the river has access to a substantial portion of its historic floodplain. The river is highly meandering throughout most of this reach and the floodplain exhibits numerous oxbow lakes in varying stages of in-filling, sloughs, and meander scars.

It is highly unlikely that the channel form of this reach was once much more complex historically. This is a graded reach in which stream energy and sediment load is balanced. Reduction in both flow velocity and volume through lateral movement (channel migration) and percolation into the alluvial substrate resulted in a depositional environment. Over 98% of the SMP jurisdiction of Reach 9 is underlain by, likely deep, deposits of alluvium. The river remains generally unconfined throughout this reach, and there exists ample opportunity for flood waters to spread, shifting channel locations and alternately eroding and depositing materials,

albeit not throughout as great a spatial extent as historically. As a result, this reach has retained a high degree of channel complexity.

Approximately 47.3% of the reach has been identified as having a high potential for being in the channel migration zone, with another 28.3% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, oxbow lakes, and flooded gravel pits throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is a very extensive area of hardwood (alder, ash, and maple) noted in the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Y4)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 35.3% to 85.2% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is robust throughout this reach, although it is restricted where thoroughfares abut the river banks. Riparian vegetation is absent from more-recent alluvial deposits, but exhibits multiple age-classes and structure elsewhere.

Wetlands (Table Y5)

Wetlands occupy 59.7% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 178.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Spring chinook, coho, and summer steelhead are present throughout Reach 9, and this reach is presumed to be occupied by bull trout. A portion (0.4 miles) of this reach is used by coho for spawning, while the entire reach is classed as spring chinook rearing habitat. Reach 9 is also utilized by a variety of introduced species (7) and native species (12), including rainbow trout. The SMP jurisdiction of this reach encompasses two

aquatic Wildlife Heritage locations, both associated with the presence of mountain sucker (WDFW, 2003).

Avian (Table Y7)

GAP analysis data indicates that 11.3% of Reach 9 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat (including osprey) and Golden eagle habitat, great blue heron habitat and rookery, and provides moderate quality waterfowl wintering area. The SMP jurisdiction of this reach encompasses two avian Wildlife Heritage locations associated with a great blue heron colony and an osprey nest (WDFW, 2003).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 9 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is listed as priority habitat (WDFW, 2004b). This reach provides big-horn sheep range and habitat for resident mule deer and elk. The mule deer population is noted as being threatened, endangered, or sensitive.

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 9, 75.2% remain vacant, 5.7% is under residential development, 6.1% is occupied by gravel mining operations, and 6.3% is occupied by transportation development (Yakima County, 2004a). Approximately 7.7% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Transportation and Yakima County are the public owners of land within the SMP jurisdiction, holding title to 8.4% and 0.5%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 6.1 miles of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

A total of 5.1 miles of revetments (2.9 miles of dike, 2.2 miles of road bed) are found within the SMP jurisdiction of Reach 9 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 9 is predominantly remote/extremely limited (42.0%), Suburban Residential (27.5%), and light industrial (18.6%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned agriculture (6.9%), Mining (4.5%),

Current Business-District Support (0.2%) and valley rural (0.4%). Approximately 83.7% of the reach is designated as conservancy by the current SMP, with the other 16.3% designated as rural.

Cultural Resources (Table Y11)

There is one archeological site form records of cultural sites with in the SMP jurisdiction of Reach 9 on file with the Washington State Historic Preservation Office: an irrigation canal (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

Two DOE sites/facilities are found in the SMP jurisdiction of Reach 9: both are ready-mix concrete/sand and gravel operations (general permit industrial) (WDOE, 1998). There is one 303(d)-listed stream segment (total length – 2.4 miles) in Reach 9: Moxee (Birchfield) Drain excursions for DDT, Chlorpyrifos (organophosphate pesticide), and fecal coliform.

ECOLOGICAL FUNCTIONS SUMMARY

Reach 9 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---|---|----------------------|---|
| Steep slopes: 0.4% High soil permeability: 74.4% 100-Year Floodplain: 94.4% | Wetlands: 59.7% Undeveloped: 75.2% Riparian cover: 35.3% Priority habitats: 4 Species of concern: 2 Natural Heritage points: 4 Anadromous habitat: 4.3 mi Total fish species: 23 | Public land: 8.9% | Principal land use: Vacant/natural >10% Imperviousness: 23.3% Roads: 6.1 mi Revetments: 5.1 mi DOE sites/facilities: 2 |

Ecological functions along Reach 9 are principally impaired by residential and transportation development as well as gravel mining operations, which covers 18.1% of the jurisdiction. These land uses, in addition to the 6.1 miles of roads, account for the majority of the estimated 23.3% of the reach that is greater than 10% impervious. Upland vegetation has been removed and replaced with mining pits, buildings, and lawns, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 5.1 miles of revetments within the jurisdiction. Two DOE sites/facilities are also found in the SMP jurisdiction and there is one 303(d)-listed stream segment. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 35.3% of the reach. The riparian gallery is robust throughout this reach except in those locations where thoroughfares abut the river banks. Much of the reach is presently undeveloped (75.2%), while 59.7% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend’s big-eared bat and the burrowing owl, as well as four priority habitats, four natural heritage points, and aquatic habitat for 23 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: great blue heron Priority Species habitat in riparian zone. Suggested Action: Protect great blue heron rookery.
- 2) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 3) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 4) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an urban/residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff control and reduction of chemical applications.
- 2) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
- 3) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 4) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 5) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an urban/residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff control and reduction of chemical applications.
- 6) Rationale: Marginal riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Also, a levee, while protecting structures, is restricting floodplain processes Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications. Also, setback levee to new location to expand the active floodplain.

REACH 10

General Description

Reach 10 is a 3.2-mile segment of the Yakima River that extends from RM 111.6 (east end of Nob Hill Boulevard, southern tip of Sportsmen Park) to RM 114.9 (Boise Cascade mill). The average gradient of this reach is 0.4% (20 ft/mi.). Reach 10 is confined to the west by old river terraces and levees and becomes increasingly confined by the flanks of Yakima Ridge and Selah Heights.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Geology/Landform (Table Y2)

Reach 10 is located within extensive alluvial and terraced-alluvial deposits to both the east and west (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium.

There are no areas of geologic hazard noted in Reach 10 (Yakima County, 2003c). Approximately 98.5% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 10 is dominated by alluvial deposits (74.9%). There are a wide variety of soils within the SMP jurisdiction, but silt loams, loams, and rock outcrop are predominant (NRCS, 2003). Within this reach, 67.4% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily rapid, runoff is classed as primarily slow (NRCS, 2003). The hazard of erosion is rated as primarily slight.

Stream Type/Channel Form

Channel form throughout Reach 10 is currently classified as pool-riffle. Within this reach, the river flows alternately as a single channel and as a bifurcated channel. The floodplain is greatly restricted by an extensive system of levees and roadbeds to both the east and west such that, currently, the river has access to only a small portion of its historic floodplain. The river is sinuous throughout most of this reach.

It is highly likely that the channel form of this reach was once more complex. Though now largely confined to a single channel, it was once clearly more migratory. This is a transport reach in which sediments are moved and energy is dissipated. Reduction in both velocity and volume through increased sinuosity, lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. Over 99% of the SMP jurisdiction of Reach 10 is underlain by, likely deep, deposits of alluvium. Though currently confined in most places, there existed the opportunity for flood waters to spread, shifting channel locations and alternately eroding and

depositing materials. As a result, this reach has a great potential for increased channel complexity.

Approximately 66.9% of the reach has been identified as having a high potential for being in the channel migration zone, with another 6.6% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, oxbow lakes, and flooded gravel pits throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is an extensive area of hardwood (alder, ash, and maple) noted in the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 46.4% to 84.1% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is robust in places within the active channel-migration zone, but is largely absent elsewhere. Nowhere is the riparian gallery continuous.

Wetlands (Table Y5)

Wetlands occupy 57.6% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 82.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Spring chinook, coho, and summer steelhead are present throughout Reach 10, and this reach is presumed to be occupied by bull trout. This reach is also used by coho for rearing habitat. Reach 10 is also utilized by a variety of introduced species (6) and native species (5), including rainbow trout. The SMP jurisdiction of this reach encompasses two aquatic Wildlife Heritage locations associated with the presence of mountain sucker and leopard dace (WDFW, 2003).

Avian (Table Y7)

GAP analysis data indicates that 6.6% of Reach 10 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat (including osprey) and provides moderate quality waterfowl wintering area. The SMP jurisdiction of this reach encompasses one avian Wildlife Heritage location associated with a bald eagle communal roost site (WDFW, 2003).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 10 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is listed as priority habitat (WDFW, 2004b). This reach provides big-horn sheep range and habitat for resident mule deer and elk. The mule deer population is noted as being threatened, endangered, or sensitive (WDFW, 2004a).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 10, 75.8% remain vacant, 5.2% is under residential development, 6.0% is occupied by parks, 4.7% is commercial, 1.0% is industrial, and 7.1% is occupied by transportation development (Yakima County, 2004a). Approximately 11.0% of the SMP jurisdiction is greater than 25% impervious. The Washington State Department of Transportation, other State agencies, Yakima County, and irrigation districts are the public owners of land within the SMP jurisdiction, holding title to 8.3%, 20.6%, 7.6%, and 0.1%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 1.5 miles and active railroads occupy 0.5 mile of SMP jurisdiction land in this reach (Yakima County n.d.a, WDOT 1997). There is one bridge crossing within the SMP jurisdiction (WDOT, 2004).

Revetments (Table Y10)

A total of 6.5 miles of revetments (5.6 miles of dike, 0.7 mile of road bed, 0.2 mile of bridge) are found within the SMP jurisdiction of Reach 10 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach is predominantly Suburban Residential (71.0%) and light industrial (27.5%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned Business District Support (1.6%). Currently 41.8% of the reach is

designated as urban by the current SMP, with the other 27.3-31% designated as rural and conservancy, respectively.

Cultural Sites (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 10 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

Four DOE sites/facilities are found in the SMP jurisdiction of Reach 10: an electrical services operation (hazardous chemical report/hazardous chemical generator), a machinery repair service (hazardous waste generator/LUST facility/State cleanup site/underground storage tank), a calf ranch (minor industrial), and a site for which no information was available (WDOE, 1998). There are no 303(d)-listed stream segments in Reach 10.

ECOLOGICAL FUNCTIONS SUMMARY

Reach 10 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---|---|----------------------|---|
| High soil permeability: 66.8% 100-Year Floodplain: 98.5% | Wetlands: 57.6% Undeveloped: 75.8% Riparian cover: 46.4% Priority habitats: 2 Species of concern: 2 Natural Heritage points: 3 Anadromous habitat: 3.2 mi Total fish species: 16 | Public land: 36.9% | Principal land use: Vacant/natural >10% Imperviousness: 24.5% Roads: 1.5 mi Revetments: 6.5 mi Bridge Crossings: 1 DOE sites/facilities: 4 |

Ecological functions along Reach 1 are principally impaired by park and residential development, which covers 11.2% of the jurisdiction. These land uses, in addition to the 1.5 miles of roads and 0.5 miles of active railroad, account for the majority of the estimated 24.5% of the reach that is greater than 10% impervious. In addition, 1 bridge crossing occurs along the reach. Upland vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 6.5 miles of revetments within the jurisdiction. Four DOE sites/facilities are also found in the SMP jurisdiction, though there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 46.4% of the reach. The riparian gallery, while fragmented, is robust in places within the active channel-migration zone, but is largely absent elsewhere. Much of the reach is presently undeveloped (75.8%), while 57.6% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend’s big-eared bat and the burrowing owl, as well as two priority habitats for bald eagles and riparian zones, three natural heritage points, and aquatic habitat for 16 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Existing riparian buffer on privately owned urban land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer.
- 2) Rationale: Existing riparian buffer on privately owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 3) Rationale: Existing riparian buffer on privately owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer.
- 4) Rationale: Existing riparian buffer on privately owned urban land protecting a recognized anadromous spawning habitat. In addition, wetlands on private property. Suggested Action: Work with private landowners to protect riparian buffer and wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain.
- 2) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 3) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 4) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 5) Rationale: Levee, not protecting any visible infrastructure on vacant or natural land, is restricting floodplain processes. Suggested Action: Remove levee to expand the active floodplain..
- 6) Rationale: Marginal riparian buffer protecting an anadromous spawning habitat on public land. In addition, a levee, while protecting structures, is restricting floodplain processes. Suggested Actions: Establish a larger riparian buffer and setback levee to new location to expand the active floodplain.

REACH 11

General Description

Reach 11 is a 3.3-mile segment of the Yakima River that extends from RM 114.9 (Boise Cascade mill) to RM 118 (northern end of Elks Golf Course in Selah). The average gradient of this reach is 0.09% (5 ft/mi.). Reach 11 is confined to both the east and west by the steep, water-cut gap between Yakima Ridge and Selah Heights.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Geology/Landform (Table Y2)

Reach 11 is located within alluvial and terraced-alluvial deposits to the south and west and by basalt bluffs to the north and east (WDNR, 2000). This reach also exhibits a gap carved through an anticlinal ridge (Selah Gap) within which, the canyon walls to both the east and west are composed of basalt flows. Throughout this reach, the surficial geology is predominately one of alluvium.

Areas of geologic hazard are noted in Reach 11, which covers 13.2% of the SMP jurisdiction (Yakima County, 2003c). This area is rated high risk due to the potential for rock fall or creep from over-steepened slopes. Approximately 78.8% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 11 is dominated by alluvial deposits (53.5%). There are a wide variety of soils within the SMP jurisdiction, but rock outcrop and stony loams are predominant (NRCS, 2003). Within this reach, 54.5% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily rapid, runoff is classed as slow (NRCS, 2003). The hazard of erosion is rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 11 is currently classified as pool-riffle. Upon exiting the confining canyon at the upper end of this reach, the stream flows through a broadening and less confining floodplain that forms the northern limit of the Moxee Valley. However, today, the floodplain is greatly restricted by the roadbed of Interstate 82 in the lower portion and by the roadbed of the Burlington Northern Railroad in the upper portion of the reach. The stream exhibits a slight degree of sinuosity within this short reach with the majority of sinuosity being dictated by structural geology.

Within the upper portion, this is a transport reach in which the high degree of confinement functions to concentrate and maintain river energy. Within the lower segment, this is a transport/dispersal reach in which energy is dissipated. Reduction in velocity and volume

through lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. However, the addition of both flow and sediments from the Naches River system further function to create a depositional environment except for those times where flow volumes in this reach become critical, at which point, this reach serves to deliver sediments to lower reaches. Over 87% of the SMP jurisdiction of Reach 11 is underlain by, likely deep, deposits of alluvium (with the exception of the upper portion that is narrowly confined). Though currently confined in many places, historically there existed the opportunity for flood waters to spread, shifting channel locations, braiding channels, and alternately eroding and depositing materials. As a result, this reach has a potential for increased channel complexity.

Approximately 49.6% of the reach has been identified as having a high potential for being in the channel migration zone (Table Y4).

Hyporheic Flow

Given the geologic structure controlling the river within this reach, the hyporheic flow pattern is expected to be highly diverse. The nature of both the fluvial deposits and increasing confinement within the upper portion of this reach suggest hyporheic flow mainly in the form of upwelling. Alternately, below Union Gap, hyporheic flow is likely in the form of down-welling. Further evidence of groundwater/surface water interconnection can be found in a review of aerial photographs and topographic maps in the form of ponds and flooded borrow pits adjacent to the river.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is primarily non-forest (as designated by ICBEMP), however, there is one small area of hardwood (alder, ash, and maple) noted in the reach. Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 29.6% to 72.8% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is absent from more-recent alluvial deposits and, elsewhere, is generally limited to a narrow corridor along the river banks.

Wetlands (Table Y5)

Wetlands occupy 46.4% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 1.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Spring chinook and summer steelhead are present throughout Reach 11, while coho salmon are present through approximately half of the reach. Reach 11 is also currently occupied by bull trout. A portion of this reach is used by spring chinook and summer steelhead for spawning. The entire reach is utilized by spring chinook for rearing habitat, while summer steelhead use approximately half the reach for rearing as well. Portions of Reach 11 are also utilized by a variety of introduced species (8) and native species (10), including rainbow trout.

Avian (Table Y7)

GAP analysis data indicates that portions of Reach 11 may provide habitat for five species of current concern, including principally the burrowing owl (10.5%), sage thrasher (7.7%), and sage sparrow (6.0%), and as well as smaller portions for the Ferruginous hawk and sage grouse (1.6% each) (WDFW, 2004a). Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat (including osprey), wood duck habitat, great blue heron habitat and rookery, and provides moderate quality waterfowl wintering area (WDFW, 2004b).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that portions of Reach 11 may provide habitat for three species of current concern, including principally the Townsend's big-eared bat (100%), as well as smaller portions for the black-tailed jack rabbit and Townsend's ground squirrel (7.7% each). The entire riparian zone is listed as priority habitat (WDFW, 2004b). This reach provides big-horn sheep range and habitat for resident mule deer and elk. The mule deer population is noted as being threatened, endangered, or sensitive (WDFW, 2004a).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 11, 70.1% remain vacant, 6.0% are parks/recreation, 1.8% is under residential development, 1.3% is under agriculture and 20.9% is occupied by transportation development (Yakima County, 2004a). Roadways occupy 6.5 miles and active railroads occupy 0.9 mile of SMP jurisdiction land in this reach. There are four bridge crossings within the SMP jurisdiction. 26.8% of the SMP jurisdiction is greater than 25% impervious. Yakima County, the Washington State Departments of Fish and Wildlife, Washington Department of Transportation, are the public owners of land within the SMP jurisdiction, holding title to 10.8%, 5.5%, 2.1% respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 6.5 miles and active railroads occupy 0.9 mile of SMP jurisdiction land in this reach (Yakima County, n.d.a). There are four bridge crossings within the SMP jurisdiction (WDOT, 2004).

Revetments (Table Y10)

A total of 3.2 mile of revetments (1.4 miles of road bed, 1.0 mile of bridge, 0.8 mile of dike) are found within the SMP jurisdiction of Reach 11 (CWU, 2002).

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (yakima_cultural_jurisdictional.pmf)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 11 is predominantly remote/extremely limited (38.1%), light industrial (38.1%), and Suburban Residential (23.2%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned Mining (0.6%). Currently 91% of the reach is designated as rural by the current SMP, with the other 1.3 and 7.7% being designated as urban and conservancy, respectively.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 11 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

One DOE site/facility is found in the SMP jurisdiction of Reach 11: a ready-mix concrete/sand and gravel operations (general permit industrial) (WDOE, 1998). There are two 303(d)-listed stream segments (total length – 0.1 mile) in Reach 11, however information on these segments was unavailable.

ECOLOGICAL FUNCTIONS SUMMARY

Reach 11 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|--------------------------|---------------------------|----------------------|--------------------------|
| Steep slopes: 13.2% | Wetlands: 46.4% | Public land: 18.4% | Principal land use: |
| High soil runoff: 9.9% | Undeveloped: 70.1% | Boat launches: 1 | Vacant/natural |
| High erosion soils: 9.9% | Riparian cover: 29.6% | | >10% Imperviousness: |
| High soil permeability: | Priority habitats: 6 | | 30.9% |
| 55% | Species of concern: 8 | | Roads: 6.5 mi |
| 100-Year Floodplain: | Anadromous habitat: 3.3 | | Revetments: 3.2 mi |
| 78.8% | mi | | Bridge Crossings: 4 |
| | Total fish species: 23 | | DOE sites/facilities: 1 |

Ecological functions along Reach 11 are principally impaired by transportation and parks/recreation development, which covers 26.9% of the jurisdiction. These land uses, in addition to the 6.5 miles of roads and 0.9 miles of active railroad, account for the majority of the estimated 30.9% of the reach that is greater than 10% impervious. In addition, 4 bridge crossings occur along the reach. Upland vegetation has been removed and replaced with roads, buildings, and lawns, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 3.2 miles of revetments within the jurisdiction. One DOE site/facility is

also found in the SMP jurisdiction and there are two 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 29.6% of the reach. The riparian gallery is absent from more-recent alluvial deposits and, elsewhere, is generally limited to a narrow corridor along the river banks. Much of the reach is presently undeveloped (70.1%), while 46.4% is covered by wetlands. The reach provides habitat for eight species of concern, as well as six priority habitats and aquatic habitat for 23 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer.
- 2) Rationale: Existing riparian buffer on privately owned land protecting a recognized anadromous spawning and rearing area adjacent to an area with high soil erosion potential. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 3) Rationale: Wetlands found on public land. Suggested Action: Protect wetlands.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 2) Rationale: 303(d) facility located in SMP jurisdiction. Suggested Action: Mitigate 303(d) facility.
- 3) Suggested Action: Investigate possibility of reconnecting gravel pit.
- 4) Suggested Action: Investigate possibility of reconnecting gravel pit.

REACH 12

General Description

Reach 12 is a 4.2-mile segment of the Yakima River that extends from RM 118 (northern end of Elks Golf Course in Selah) to the State Route 823 Bridge. The average gradient of this reach is 0.2% (12 ft/mi.). Reach 12 is largely unconfined to the west, but is confined to the east by the steep flanks of Yakima Ridge and by Interstate 82.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Geology/Landform (Table Y2)

Reach 12 is located within alluvial and terraced-alluvial deposits to both the east and west beyond which lie bluffs composed of sedimentary rocks (Ellensburg Formation) (WDNR, 2000). Throughout this reach, the surficial geology is predominately one of alluvium.

There are no areas of geologic hazard noted in Reach 12 (Yakima County, 2003c). Approximately 96.7% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 12 is dominated by alluvial deposits (76.1%). There is a variety of soils within the SMP jurisdiction, but silt loams are predominant (NRCS, 2003). Within this reach, 74.5% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate, runoff is classed as slow (NRCS, 2003). The hazard of erosion is generally rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 12 is currently classified as pool-riffle. Within this reach, the river flows as a single channel. The floodplain is greatly restricted by the roadbed of Interstate-82 to the east and the roadbed of the Burlington Northern Railroad to the west, such that, currently, the river has access to only a portion of its historic floodplain. The river is moderately sinuous throughout most of this reach.

It is highly likely that the channel form of this reach was once more complex. Though now largely confined to a single channel, it was once clearly more migratory. This is a transport reach in which sediments are moved and energy is dissipated. Reduction in both velocity and volume through increased sinuosity, lateral movement (channel migration), braiding/distributaries (multiple channels), and percolation into the alluvial substrate resulted in a depositional environment. Over 99% of the SMP jurisdiction of Reach 12 is underlain by, likely deep, deposits of alluvium. Though currently confined in most places, there existed the opportunity for flood waters to spread, shifting channel locations, increasing sinuosity, braiding, and alternately eroding and depositing materials. As a result, this reach has a great potential for increased channel complexity.

Approximately 54.2% of the reach has been identified as having a high potential for being in the channel migration zone, with another 1.1% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and much greater floodplain underlain by alluvium, the hyporheic zone is expected to be extremely widespread. The nature of the deposits likely makes hyporheic flow extremely complex. Evidence of ground water/surface water interactions occurring along this reach are evidenced in a review of aerial photographs and topographic maps in the form of numerous springs, rising streams, wetlands, ponds, oxbow lakes, and flooded gravel pits throughout the width and length of the greater floodplain area.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 9.6% to 38.9% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is lacking in places and, elsewhere, is generally restricted to a narrow corridor along the river banks.

Wetlands (Table Y5)

Wetlands occupy 27.6% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 65.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Spring chinook and summer steelhead are present throughout Reach 12, and this reach is currently occupied by bull trout. This reach is used by spring chinook and summer steelhead for spawning and rearing habitat. Reach 12 is also utilized by a variety of introduced species (6) and native species (8), including rainbow trout.

Avian (Table Y7)

GAP analysis data indicates that 59.4% of Reach 12 may provide habitat for one species of current concern, namely the burrowing owl (WDFW, 2004a). Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat (including osprey) and golden eagle habitat, great blue heron habitat and rookery, and provides moderate quality waterfowl wintering area (WDFW, 2004b). The SMP jurisdiction of this reach encompasses two

avian Wildlife Heritage locations associated with a great blue heron rookery and an osprey nest (WDFW, 2003).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that portions of Reach 12 may provide habitat for one species of current concern, namely the Townsend's big-eared bat (WDFW, 2004a). The entire riparian zone is listed as priority habitat (WDFW, 2004b). This reach provides big-horn sheep range and habitat for resident mule deer and elk.

**CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map
(*Yakima_Cultural_Modifications.pmf*)**

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 12, 25.1% remain vacant, 32.2% are in agricultural production, 21.6% is occupied by gravel-mining operations, 12.5% is under government, 5.9% is under residential development, 0.8% is under recreation and 1.8% is occupied by transportation development (Yakima County, 2004a). Approximately 1.6% of the SMP jurisdiction is greater than 25% impervious. There are no publicly-owned lands with the SMP jurisdiction (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 1.0 mile and active railroads occupy 0.5 mile of SMP jurisdiction land in this reach (Yakima County n.d.a, WDOT 1997). There is one bridge crossing within the SMP jurisdiction (WDOT, 2004).

Revetments (Table Y10)

A total of 3.1 miles of revetments (2.1 miles of dike, 0.6 mile of road bed, 0.4 mile of bridge) are found within the SMP jurisdiction of Reach 12 (CWU, 2002).

**CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map
(*yakima_cultural_jurisdictional.pmf*)**

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach is predominantly remote/extremely limited (67.2%) and Mining (23.9%) (Yakima County Zoning, 2004b). Minor portions of the jurisdiction are zoned agriculture (7.2%), light industrial (0.9%), and valley rural (0.5%). Approximately 98.2% of the reach is designated as rural by the current SMP, with the other 1.8% designated as conservancy.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 12 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

There are no DOE sites/facilities or 303(d)-listed stream segments found in the SMP jurisdiction of Reach 12 (WDOE, 1998).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 12 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|-------------------------------|---|---------------|---|
| 100-Year Floodplain: 96.7% | Wetlands: 27.6% Undeveloped: 25.1% Riparian cover: 9.6% Priority habitats: 4 Species of concern: 2 Natural Heritage points: 2 Anadromous habitat: 4.2 mi Total fish species: 17 | | Principal land use: Agriculture >10% Imperviousness: 4.7% Roads: 1 mi Revetments: 3.1 mi Bridge Crossings: 1 |

Ecological functions along Reach 12 are principally impaired by agricultural development and gravel-mining operations, which covers 53.8% of the jurisdiction. These land uses, in addition to the 1 mile of roads and 0.5 miles of active railroad, account for the majority of the estimated 4.7% of the reach that is greater than 10% impervious. In addition, 1 bridge crossing and one diversion dam occur along the reach. Upland vegetation has been removed and replaced with crops, buildings, and mining pits, which can promote increased runoff and nonpoint source pollution. The Yakima River has also been heavily diverted and extensive areas have lost floodplain connectivity, including approximately 3.1 miles of revetments within the jurisdiction. There are no DOE sites/facilities found in the SMP jurisdiction, and there are no 303(d)-listed stream segments. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 9.6% of the reach, generally restricted to a narrow corridor along the river banks and non-existent in several segments. Much of the reach is presently undeveloped (25.1%), while 27.6% is covered by wetlands. The reach provides habitat for two species of concern, the Townsend's big-eared bat and the burrowing owl, as well as four priority habitats, two natural heritage points for ospreys and great blue herons, and aquatic habitat for 17 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Wetlands on private property. Suggested action: Work with landowner to protect wetlands.

- 2) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 3) Rationale: great blue heron Priority Species habitat in riparian zone. Suggested Action: Protect great blue heron rookery from encroachment.
- 4) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer.
- 5) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer.
- 6) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning or rearing habitat. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 7) Rationale: Existing riparian buffer on privately-owned land protecting a recognized anadromous spawning habitat. Suggested Action: Work with private landowners to protect riparian buffer.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 2) Rationale: Marginal riparian buffer, gravel pit and levee restricting floodplain processes. Suggested Actions: Work with private landowner to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications. Also work with private landowner to investigate possibility of removing levee and reconnecting gravel pit.
- 3) Rationale: Levee, while protecting structures, is restricting floodplain processes. Suggested Action: Setback levee to new location to expand the active floodplain.
- 4) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 5) Rationale: Marginal riparian buffer in an agricultural area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.
- 6) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing habitat in a residential area with high soil erosion potential. Suggested Action: Work with private

landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.

- 7) Rationale: Marginal riparian buffer in a residential area. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduction of chemical applications.

REACH 13

General Description

Reach 13 is a 3.8-mile segment of the Yakima River that extends from the State Route 823 Bridge to the Yakima County line. The average gradient of this reach is 0.2% (13 ft/mi.). Reach 13 is narrowly confined to both east and west by the steep canyons created as the river entrenched into Umptanum Ridge.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Geology/Landform (Table Y2)

Reach 13 is located within a narrow band of alluvial and terraced-alluvial deposits to both the east and west beyond which lie basalt bluffs exhibiting mass-wasting and talus deposits (WDNR, 2000). Throughout this reach, the surficial geology is one of alluvium and terraced-alluvial deposits.

Four areas of geologic hazards are noted in Reach 13, which, combined, cover 35.21% of the SMP jurisdiction (Yakima County, 2003c). One area (8.91%) is rated high risk due to the potential for flash flooding issuing from side-canyons and another area (6.9%) is rated high risk due to the potential for landslides; the other two areas are rated Intermediate Risk (4.2%) and high risk (15.2%) due to the potential for rock fall or creep from over-steepened slopes. Approximately 56.4% of the reach is within the 100 year floodplain.

Soils/Soil Properties (Table Y3)

Reach 13 is dominated by alluvial deposits (25.4%). There is a variety of soils within the SMP jurisdiction, but stony loams and silt loams are predominant (NRCS, 2003). Within this reach, 20.5% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily rapid, runoff is classed as slow (NRCS, 2003). The hazard of erosion is rated as slight.

Stream Type/Channel Form

Channel form throughout Reach 13 is currently classified as pool-riffle. Throughout this reach, the river is narrowly confined by geologic structure. Upon exiting the confining canyon, the river flows through a slightly broadening and ever-less confining floodplain that forms the northern limit of the Selah Valley. The stream is quite linear throughout this reach.

It is unlikely that the channel form of this reach was historically ever more complex. Though now confined to a single channel, it was once clearly more migratory. This is a transport reach in which the high degree of confinement serves to concentrate and maintain river energy, facilitating the movement of sediments. Over 61% of the SMP jurisdiction of Reach 13 is underlain by likely shallow deposits of alluvium. Historically, there has not existed the opportunity for flood waters to spread and the high degree of geologic confinement affords little

opportunity for shifting channel locations. As a result, this reach has a little potential for increased channel complexity.

Approximately 1.5% of the reach has been identified as having a high potential for being in the channel migration zone, with another 0.3% having a moderate potential (Table Y4).

Hyporheic Flow

Given the high proportion of the SMP jurisdiction and greater floodplain underlain by alluvium and given the increasingly unconfined nature of the floodplain, the hyporheic zone is not expected to be extremely widespread. The nature of both the deposits and decreasing confinement within this reach suggest hyporheic flow mainly in the form of down-welling. Further evidence of groundwater/surface water interconnection can be found in a review of aerial photographs and topographic maps in the form of a small pond adjacent to the river.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 15.2% to 22.1% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is extremely limited, generally consisting of low-to-medium height shrubs.

Wetlands (Table Y5)

Wetlands occupy 34.8% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 7.0 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

Anadromous fish, once abundant in the Yakima River, are now present in severely suppressed populations (WDFW, 2004c). Spring chinook and summer steelhead are present throughout Reach 13, and this reach is currently occupied by bull trout. This reach is used by spring chinook and summer steelhead for spawning and rearing habitat. Reach 13 is also utilized by a variety of introduced species (5) and native species (11), including rainbow trout.

Avian (Table Y7)

GAP analysis data indicates that portions of Reach 13 may provide habitat for four species of current concern, including principally the burrowing owl (46.8%), as well as smaller portions for the Ferruginous hawk (34.6%), sage thrasher (34.6%), and sage sparrow (12.4%) (WDFW, 2004a).

Portions of this reach also provide for bald eagle wintering habitat (anadromous fish run), raptor nesting habitat (including osprey) and golden eagle habitat, and provides moderate quality waterfowl wintering area (WDFW, 2004b).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 13 may provide habitat for three species of current concern, including principally the Townsend's big-eared bat (100%), as well as smaller portions for the black-tailed jack rabbit (34.6%) and Townsend's ground squirrel (34.3%) (WDFW, 2004a). The entire riparian zone is listed as priority habitat (WDFW, 2004b). This reach provides big-horn sheep range and habitat for resident mule deer and elk.

**CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map
(*Yakima_Cultural_Modifications.pmf*)**

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 13, 72.2% remain vacant, 6.8% are in agricultural production, 5.5% is under residential development, and 14.5% is occupied by transportation development. 0.2% of the SMP jurisdiction is greater than 25% impervious (Yakima County, 2004a). The U.S. Bureau of Land Management, Washington State Department of Fish and Wildlife, irrigation districts, and the Washington State Department of Natural Resources are the public owners of land within the SMP jurisdiction, holding title to 25.3%, 17.7%, 5.2%, and 0.8%, respectively (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 0.2 mile and active railroads occupy 2.6 miles of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

There are no revetments found within the SMP jurisdiction of Reach 13 (CWU, 2002).

**CULTURAL MODIFICATIONS- See Yakima Cultural Jurisdiction Map
(*yakima_cultural_jurisdictional.pmf*)**

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach is almost exclusively remote/extremely limited (98.9%) (Yakima County Zoning, 2004b). The entire reach is designated as conservancy by the current SMP.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 13 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

There are no DOE sites/facilities or 303(d)-listed stream segments found in the SMP jurisdiction of Reach 13 (WDOE, 1998).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 13 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|--|---|------------------|---|
| Steep slopes: 19.4% High soil runoff: 7.9% High erosion soils: 7.9% High soil permeability: 23.7% 100-Year Floodplain: 56.4% | Wetlands: 34.8% Undeveloped: 72.2% Riparian cover: 15.2% Priority habitats: 6 Species of concern: 7 Anadromous habitat: 3.8 mi Total fish species:19 | Public land: 49% | Principal land use: Vacant/natural >10% Imperviousness: 5.6% Roads: 0.2 mi |

Ecological functions along Reach 13 are principally impaired by agricultural, transportation, and residential development, which covers 26.8% of the jurisdiction. These land uses, in addition to the 0.2 miles of roads and 2.6 miles of active railroad, account for the majority of the estimated 5.6% of the reach that is greater than 10% impervious. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 15.2% of the reach. The riparian gallery is extremely limited, generally consisting of low-to-medium height shrubs. Much of the reach is presently undeveloped (72.2%), while 34.8% is covered by wetlands. The reach provides habitat for seven species of concern, as well as six priority habitats and aquatic habitat for 19 fish species, including anadromous fish.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Existing riparian buffer on privately-owned property. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.
- 2) Rationale: Rocky Mountain Elk Priority Species habitat in riparian zone. Suggested Action: Protect Rocky Mountain Elk habitat.
- 3) Rationale: Rocky Mountain Elk, mule deer, black tailed deer, and bighorn sheep habitat in riparian zone. Suggested Action: Protect habitat from encroachment.
- 4) Rationale: Existing riparian buffer on privately-owned property in an area with high soil erosion potential. Suggested Action: Work with private landowners to protect riparian buffer and provide education regarding erosion and runoff controls.

- 5) Rationale: Rocky Mountain Elk, mule deer, black tailed deer, and golden eagle habitat in riparian zone. Suggested Action: Identify and protect habitat from encroachment.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Marginal riparian buffer in a residential area with high soil erosion potential. Suggested Action: Work with private landowners to establish a larger riparian buffer and provide education regarding erosion and runoff controls and reduced chemical applications.
- 2) Rationale: Marginal riparian buffer protecting an anadromous spawning or rearing. Suggested Action: Work with private landowners to establish a larger riparian buffer.

REACH 1a- Byron Ponds

General Description

The geology along this reach consists entirely of basalt flows (WDNR, 2000).

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf* and *Yakima_Soil_Characteristics.pmf*)

Geology/Landform (Table Y2)

The geology along this reach consists entirely of basalt flows (WDNR, 2000).

Soils/Soil Properties (Table Y3)

Reach 1a is dominated by basalt deposits flows (100%). Within this reach, 40.3% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate, runoff is classed as medium (NRCS, 2003). The hazard of erosion is rated as moderate.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

There is no riparian data available for this reach.

Wetlands (Table Y5)

Wetlands occupy 55.6% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 120.3 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

There is no aquatic fish data available for this lake.

Avian (Table Y7)

GAP analysis data indicates that portions of Reach 1a may provide habitat for a species of current concern, the burrowing owl (0.3%) (WDFW, 2004a).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 1a may provide habitat for species of current concern, namely the Townsend's big-eared bat (100%) and the black-tailed jack rabbit (0.3%)(WDFW, 2004a). The entire wetlands zone is listed as priority habitat (WDFW, 2004b).

**CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map
(*Yakima_Cultural_Modifications.pmf*)**

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 1a, 100% remain vacant/natural (Yakima County, 2004a). 0.6% of the SMP jurisdiction is greater than 25% impervious (Yakima County, 2004a). The Washington State Department of Fish and Wildlife is the public owner of land within the SMP jurisdiction, holding title to 100% of the jurisdiction (WDNR, 2003).

Transportation (Table Y10)

Roadways and railroads occupy none of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

There is no revetment data available for this reach.

**CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map
(*yakima_cultural_jurisdictional.pmf*)**

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 1a is almost exclusively remote/extremely limited (100%) (Yakima County Zoning, 2004b). The entire reach is designated as conservancy by the current SMP.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 1a on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

There are no facilities or stream segments found in the SMP jurisdiction of Reach 1a (WDOE, 1998).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 1a Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|------------------|---|-------------------|--|
| | Wetlands: 55.6% Undeveloped: 100% Priority habitats: 1 Species of concern: 3 | Public land: 100% | Principal land use: Vacant/natural >10% Imperviousness: 0.6% |

Ecological functions along Reach 1a are principally unimpaired by development. An estimated 3.7% of the reach is greater than 10% impervious. Presently, the entirety of the reach is undeveloped (100%), while 55.6% is covered by wetlands. The reach provides habitat for three species of concern, as well as one priority habitat for wetlands.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 1) Rationale: Marginal natural vegetation buffer. Suggested Action: Establish a larger natural vegetation buffer.

REACH 1b- Byron Ponds

General Description

The geology along this reach consists entirely of basalt flows (WDNR, 2000).

ABIOTIC- See **Yakima Physical Map and Yakima Physical (Soil Characteristics) Map** (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Soils/Soil Properties (Table Y3)

Reach 1b is dominated by basalt flows (100%). Within this reach, 0.3% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate, runoff is classed as medium and the hazard of erosion is rated as moderate (NRCS, 2003).

BIOTIC- See **Yakima Biological Map** (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

There is no riparian data available for this reach.

Wetlands (Table Y5)

Wetlands occupy 43.5% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 132.2 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

There is no aquatic fish data available for this lake.

Avian (Table Y7)

GAP analysis data indicates that portions of Reach 1b may provide habitat for a species of current concern, principally the burrowing owl (11.3%) (WDFW, 2004a).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that Reach 1b may provide habitat for species of current concern, namely the Townsend's big-eared bat (100%) and the black-tailed jack rabbit (11.4%) (WDFW, 2004a). The entire wetland zone is listed as priority habitat (WDFW, 2004b).

**CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map
(*Yakima_Cultural_Modifications.pmf*)**

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 1b 100% is classified as vacant/natural (Yakima County, 2004a). Washington Department of Fish and Wildlife is public owner of land within the SMP jurisdiction, holding title to 100% (WDNR, 2003).

Transportation (Table Y10)

Roadways and railroads occupy none of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

There is no revetment data available for this reach.

**CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map
(*yakima_cultural_jurisdictional.pmf*)**

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach is exclusively remote/extremely limited (100%) (Yakima County Zoning, 2004b). The entire reach is designated as conservancy by the current SMP.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 1b on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

There is 1 DOE site/facility and no 303(d) stream segments found in the SMP jurisdiction of Reach 13 (WDOE, 1998).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 1b Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---------------------------------|---|----------------------|--|
| High soil permeability: 0.8% | Wetlands: 43.5% Undeveloped:100 % Priority habitats: 1 Species of concern: 3 | Public land: 100% | Principal land use: Vacant/natural DOE sites/facilities: 1 |

Ecological functions along Reach 1b are principally unimpaired by development. There is one DOE site/facility found in the SMP jurisdiction, though there are no 303(d)-listed stream segments and there is also one dam within this reach. Presently, the entirety of the reach is undeveloped (100%), while 43.5% is covered by wetlands. The reach provides habitat for three species of concern, as well as one priority habitat for wetlands.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Wetlands are present. Suggested action: Work to protect wetlands along shoreline.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 2) Rationale: Marginal natural vegetation buffer. Suggested Action: Establish a larger natural vegetation buffer.

REACH 2a- Oleys Lake

General Description

The geology along this reach consists entirely of alluvium (WDNR, 2000).

ABIOTIC- See **Yakima Physical Map and Yakima Physical (Soil Characteristics) Map** (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Soils/Soil Properties (Table Y3)

Reach 2a is dominated by alluvial deposits (100%). Within this reach, 12.7% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily moderate, runoff is classed as very slow (NRCS, 2003). The hazard of erosion is rated as slight.

BIOTIC- See **Yakima Biological Map** (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

There is no riparian data available for this reach.

Wetlands (Table Y5)

Wetlands occupy 80% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 10.5 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

There is no aquatic fish data available for this lake.

Avian (Table Y7)

GAP analysis data indicates that portions of Reach 2a may provide habitat for a species of current concern, the burrowing owl (100%)(WDFW, 2004a).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 2a may provide habitat for species of current concern, namely the Townsend's big-eared bat (100%) and the black-tailed jack rabbit (100%) (WDFW, 2004a, 1997).

**CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map
(*Yakima_Cultural_Modifications.pmf*)**

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 2a 82.3% is classified as vacant/natural, 12.6% is single family residential, and 5.1% is agriculture (Yakima County, 2004a).

Transportation (Table Y10)

Roadways and railroads occupy none of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

There are is no revetment data available for this reach.

**CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map
(*yakima_cultural_jurisdictional.pmf*)**

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 2a is 99.9% rural transitional and 0.1% is agriculture (Yakima County Zoning, 2004b). The entire reach is designated as conservancy by the current SMP.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 2a on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

There are no facilities or stream segments found in the SMP jurisdiction of Reach 2a (WDOE, 1998).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 2a Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|----------------------------------|--|----------------------|---------------------------------------|
| High soil permeability: 18.6% | Wetlands: 80% Undeveloped: 82.3% Species of concern: 3 | | Principal land use: Vacant/natural |

Ecological functions along Reach 2a are principally impaired by agricultural and residential development, which covers 17.7% of the jurisdiction. Upland vegetation has been removed and replaced with crops, buildings and lawns, which can promote increased runoff and nonpoint source pollution. There are no DOE sites/facilities found in the SMP jurisdiction, and there are no 303(d)-listed stream segments. Much of the reach is presently undeveloped (82.3%), while 80% is covered by wetlands. The reach provides habitat for three species of concern.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 2) Rationale: Wetlands are present. Suggested action: Work to protect wetlands along shoreline.

REACH 7a- Unnamed Lake (CB-E-300)

General Description

The geology along this reach consists entirely of alluvium (WDNR, 2000).

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf and Yakima_Soil_Characteristics.pmf*)

Soils/Soil Properties (Table Y3)

Reach 7a is dominated by alluvial deposits (100%). Within this reach, none of the soils are aquic, (Yakima County, n.d.c). Soil permeability is primarily moderately rapid, runoff is classed as very slow and the hazard of erosion is rated as slight (NRCS, 2003).

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

Estimates of the SMP jurisdiction area covered by riparian vegetation range from 9.1% to 39.8% (WDFW, 2004b and Yakima County, 2003b). The riparian gallery is extremely limited, generally consisting of low-to-medium height shrubs.

Wetlands (Table Y5)

Wetlands occupy 17.3% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development. An additional 2.5 acres of wetland may be classified as associated wetlands within the final SMP jurisdiction, either intersecting the draft SMP jurisdiction boundary directly or being located in the 100-year floodplain.

Wildlife

Aquatic (Table Y6)

There is no aquatic fish data available for this lake.

Avian (Table Y7)

GAP analysis data indicates that portions of Reach 7a may provide habitat for a species of current concern, principally the burrowing owl (100%) (WDFW, 2004a).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 7a may provide habitat for species of current concern, the Townsend's big-eared bat (100%) and the black-tailed jack rabbit (WDFW, 2004a).

**CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map
(*Yakima_Cultural_Modifications.pmf*)**

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 7a, 54.9% remain vacant, 1.6% is in agricultural production, 31.2% is under residential development, and 9.8% is occupied by transportation development. 0.4% of the SMP jurisdiction is greater than 25% impervious (Yakima County, 2004a). The Washington State Department of Fish and Wildlife is the public owner of land within the SMP jurisdiction, holding title to 26.2% (WDNR, 2003).

Transportation (Table Y10)

Roadways and railroads occupy none of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

There are no revetment data available for this reach.

**CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map
(*yakima_cultural_jurisdictional.pmf*)**

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 7a is mostly valley rural (78.1%) (Yakima County Zoning, 2004b). The entire reach is designated as rural by the current SMP.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 13 on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

There are no facilities or stream segments found in the SMP jurisdiction of Reach 13 (WDOE, 1998).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 7a Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|------------------|--|--------------------|--|
| | Wetlands: 17.3% Undeveloped: 54.9% Riparian cover: 9.1% Priority habitats: 1 Species of concern: 3 Wildlife Heritage point: 1 | Public land: 26.2% | Principal land use: Vacant/natural >10% Imperviousness: 3.2% |

Ecological functions along Reach 7a are principally impaired by transportation and residential development, which covers 41% of the jurisdiction. These land uses, account for the majority of the estimated 3.2% of the reach that is greater than 10% impervious. Upland vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Riparian vegetation, which is both a priority habitat and buffer for nonpoint pollution, covers approximately 9.1% of the reach. Much of the reach is presently undeveloped (54.9%), while 17.3% is covered by wetlands. The reach provides habitat for three species of concern and a natural heritage location for common loons.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 3) Rationale: Wetlands are present. Suggested action: Work to protect wetlands along shoreline.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 3) Rationale: Marginal natural vegetation buffer adjacent to agricultural area. Suggested Action: Establish a larger natural vegetation buffer adjacent to agricultural area.
- 4) Rationale: Marginal natural vegetation buffer adjacent to residential area. Suggested Action: Establish a larger natural vegetation buffer adjacent to residential area.

REACH 12a- Big Elton Pond

General Description

The geology along this reach primarily consists of alluvium (73%) (WDNR, 2000). Approximately 41.7% of the reach is within the 100 year floodplain.

ABIOTIC- See Yakima Physical Map and Yakima Physical (Soil Characteristics) Map (*Yakima_Physical.pmf* and *Yakima_Soil_Characteristics.pmf*)

Soils/Soil Properties (Table Y3)

Reach 12a is dominated by alluvial deposits (73%). Within this reach, 89.8% of the soils are aquic, a direct reflection of stream and hyporheic flow across and through much of the floodplain (Yakima County, n.d.c). Soil permeability is primarily rapid, runoff is classed as slow (NRCS, 2003). The hazard of erosion is rated as moderate.

BIOTIC- See Yakima Biological Map (*yakima_biological.pmf*)

Natural Vegetation

Upland

Historic vegetation is non-forest (as designated by ICBEMP). Potential natural vegetation is primarily sagebrush-steppe.

Riparian (Table Y5)

There is no riparian data available for this reach.

Wetlands (Table Y5)

Wetlands occupy 8.7% of the SMP jurisdiction today (USFWS, 2003). It is likely that numerous wetlands have been lost as a result of historic agricultural and more recent urban development.

Wildlife

Aquatic (Table Y6)

There is no aquatic fish data available for this lake.

Avian (Table Y7)

GAP analysis data indicates that portions of Reach 12a may provide habitat for a species of current concern, principally the burrowing owl (27.7%) (WDFW, 2004a).

Terrestrial (Tables Y5 and Y7)

GAP analysis data indicates that all of Reach 12a may provide habitat for one species of current concern, namely the Townsend's big-eared bat (100%) and the black-tailed jack rabbit (27.7%) (WDFW, 2004a).

CULTURAL MODIFICATIONS- See Yakima Cultural Modifications Map (*Yakima_Cultural_Modifications.pmf*)

Land Use (Table Y8)

Of the SMP jurisdiction lands along Reach 12a, 52.5% is government, 34.1 is under transportation development, 13% is under residential development and 0.4% is under agriculture. 46.6% of the SMP jurisdiction is greater than 25% impervious (Yakima County, 2004a). The Washington Department of Transportation is the public owner of land within the SMP jurisdiction, holding title to 52.5% (WDNR, 2003).

Transportation (Table Y10)

Roadways occupy 0.7 mile and active railroads occupy none of SMP jurisdiction land in this reach (Yakima County, n.d.a).

Revetments (Table Y10)

There are is no revetment data available for this reach.

CULTURAL JURISDICTIONS- See Yakima Cultural Jurisdiction Map (*yakima_cultural_jurisdictional.pmf*)

Zoning (Table Y9)

Current zoning within the SMP jurisdiction of Reach 12a is mostly valley rural (99.6%) and with some areas of mining (0.4%) (Yakima County Zoning, 2004b). The entire reach is designated as rural by the current SMP.

Cultural Resources (Table Y11)

There are no archeological site form records of cultural sites with in the SMP jurisdiction of Reach 12a on file with the Washington State Historic Preservation Office (WSHPO, 2004).

DOE Sites/facilities and 303(d) Listings (Table Y11)

There are no facilities or stream segments found in the SMP jurisdiction of Reach 12a (WDOE, 1998).

ECOLOGICAL FUNCTIONS SUMMARY

Reach 12a Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions | Public Access | Key Modifications |
|---|---|----------------------|---|
| High soil permeability: 91.1% 100-Year Floodplain: 41.7% | Wetlands: 8.7% Priority habitats: 1 Species of concern: 3 | Public land: 52.5% | Principal land use: >10% Imperviousness: 0.4% Roads: 0.7 mi |

Ecological functions along Reach 12a are principally impaired by governmental and transportation development, which covers 86.6% of the jurisdiction. These land uses, account for the majority of the estimated 0.4% of the reach that is greater than 10% impervious. Upland vegetation has been removed and replaced with buildings, which can promote increased runoff and nonpoint source pollution. Approximately 8.7% of the reach is covered by wetlands. The

reach provides habitat for three species of concern, as well as one priority habitat for waterfowl concentrations.

ECOLOGICAL PROTECTION OPPORTUNITIES- See Yakima Opportunities for Protection Map (*Yakima_Opp_Protection.pmf*)

The following list refers to the similarly numbered locations on the digital ecological protection maps for the Yakima River.

- 1) Rationale: Wetlands are present. Suggested action: Work to protect wetlands along shoreline.

ECOLOGICAL RESTORATION OPPORTUNITIES- See Yakima Opportunities for Restoration Map (*Yakima_Opp_Restoration.pmf*)

The following list refers to the similarly numbered locations on the digital ecological restoration maps for the Yakima River.

- 5) Rationale: Marginal natural vegetation buffer adjacent to transportation area. Suggested Action: Establish a larger natural vegetation buffer adjacent to transportation area.

APPENDIX

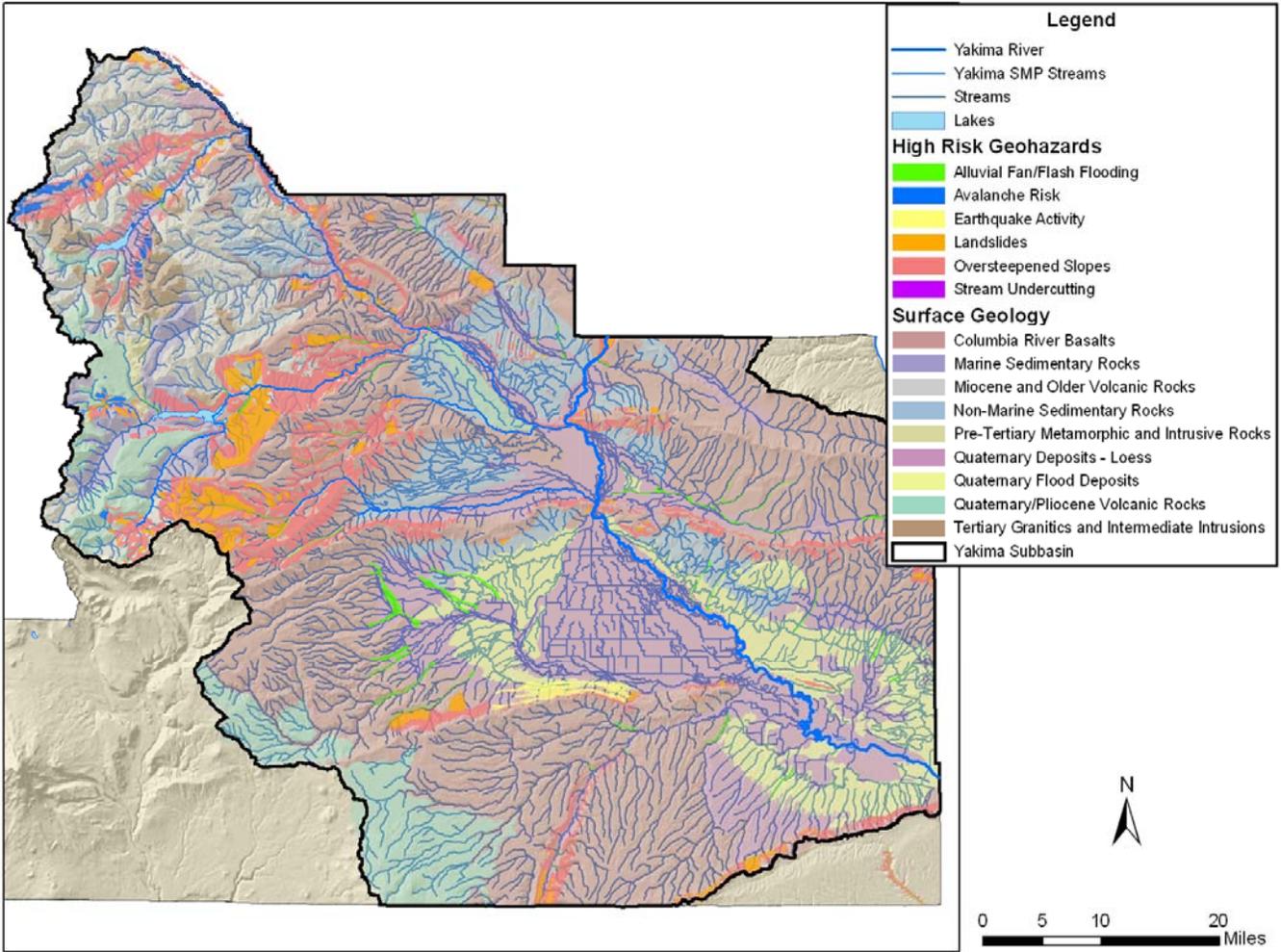


Figure Y1. Geology and Geohazards in Yakima River Basin

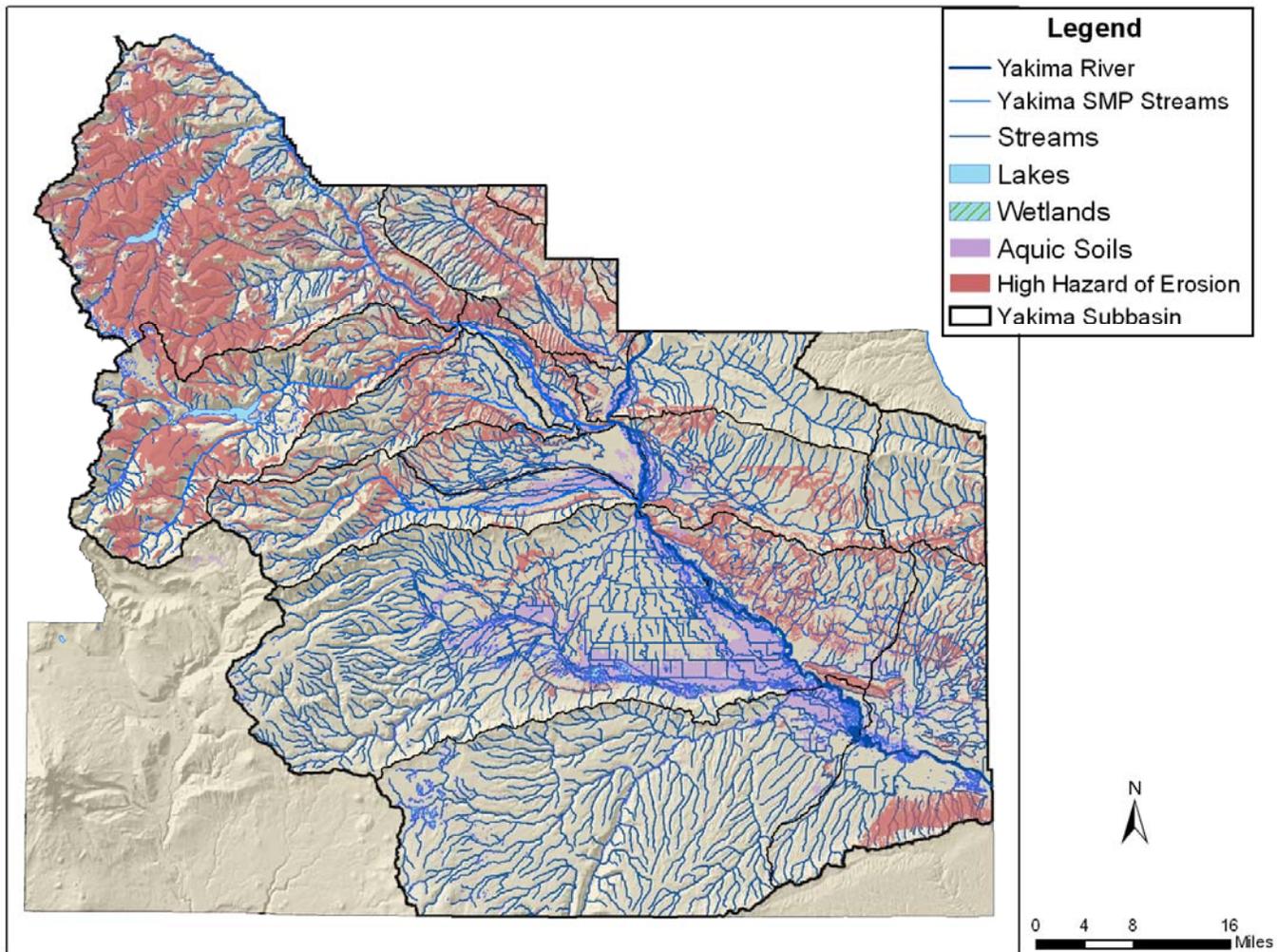


Figure Y2. Wetlands and Soil Characteristics in Yakima River Basin.

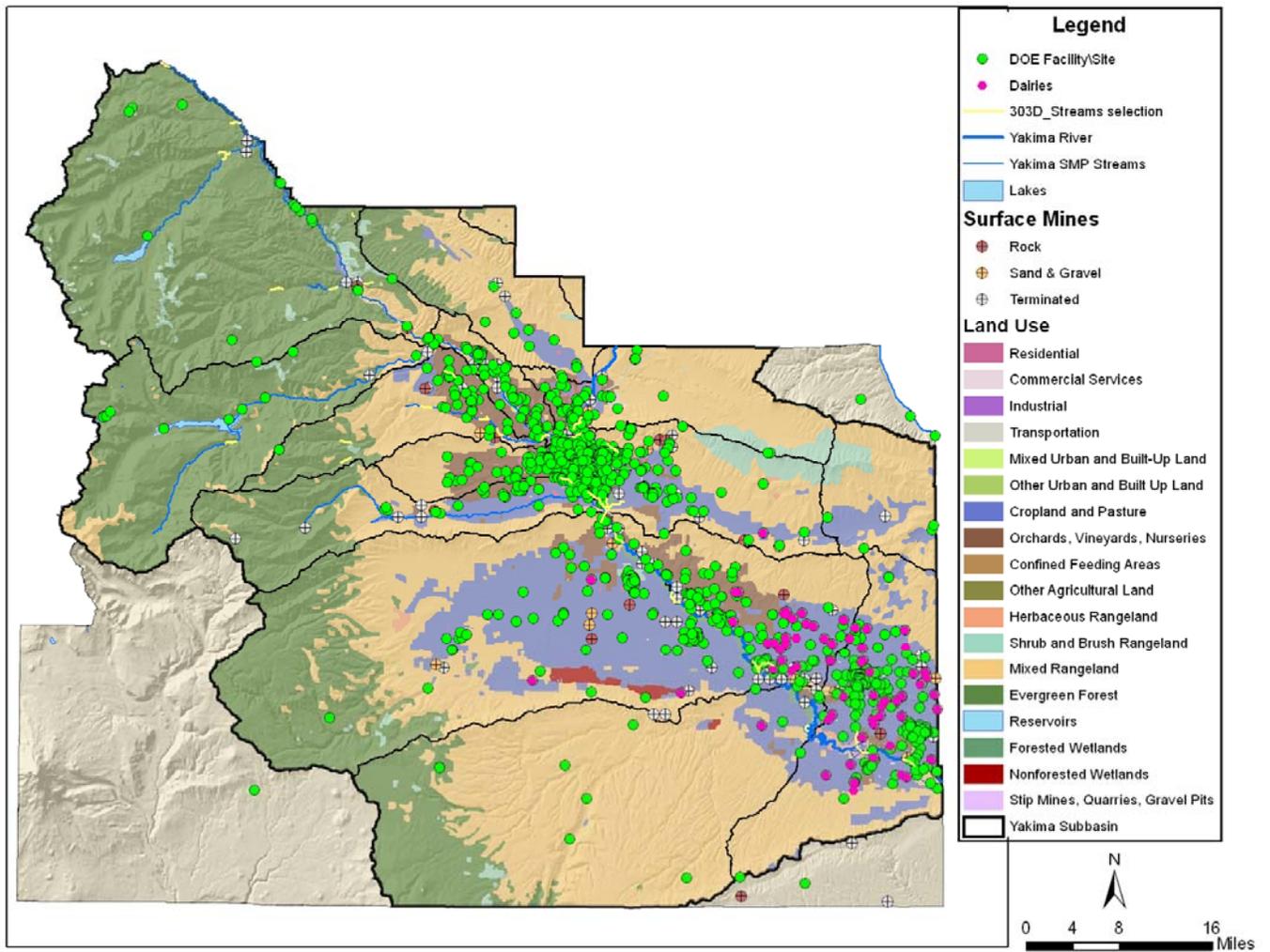


Figure Y3. Cultural Modifications in Yakima River Basin.

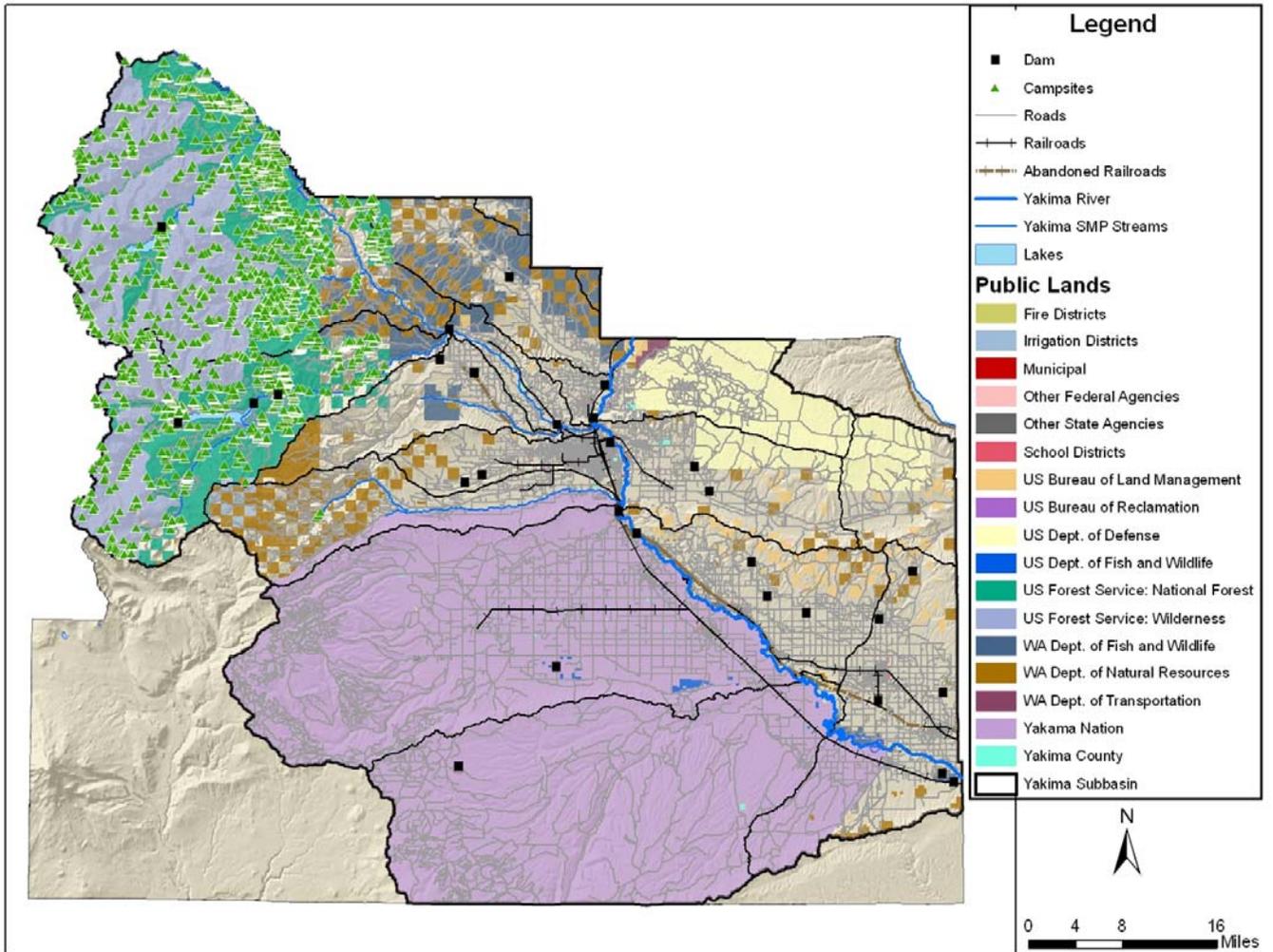


Figure Y4. Public Resources and Access in Yakima River Basin.

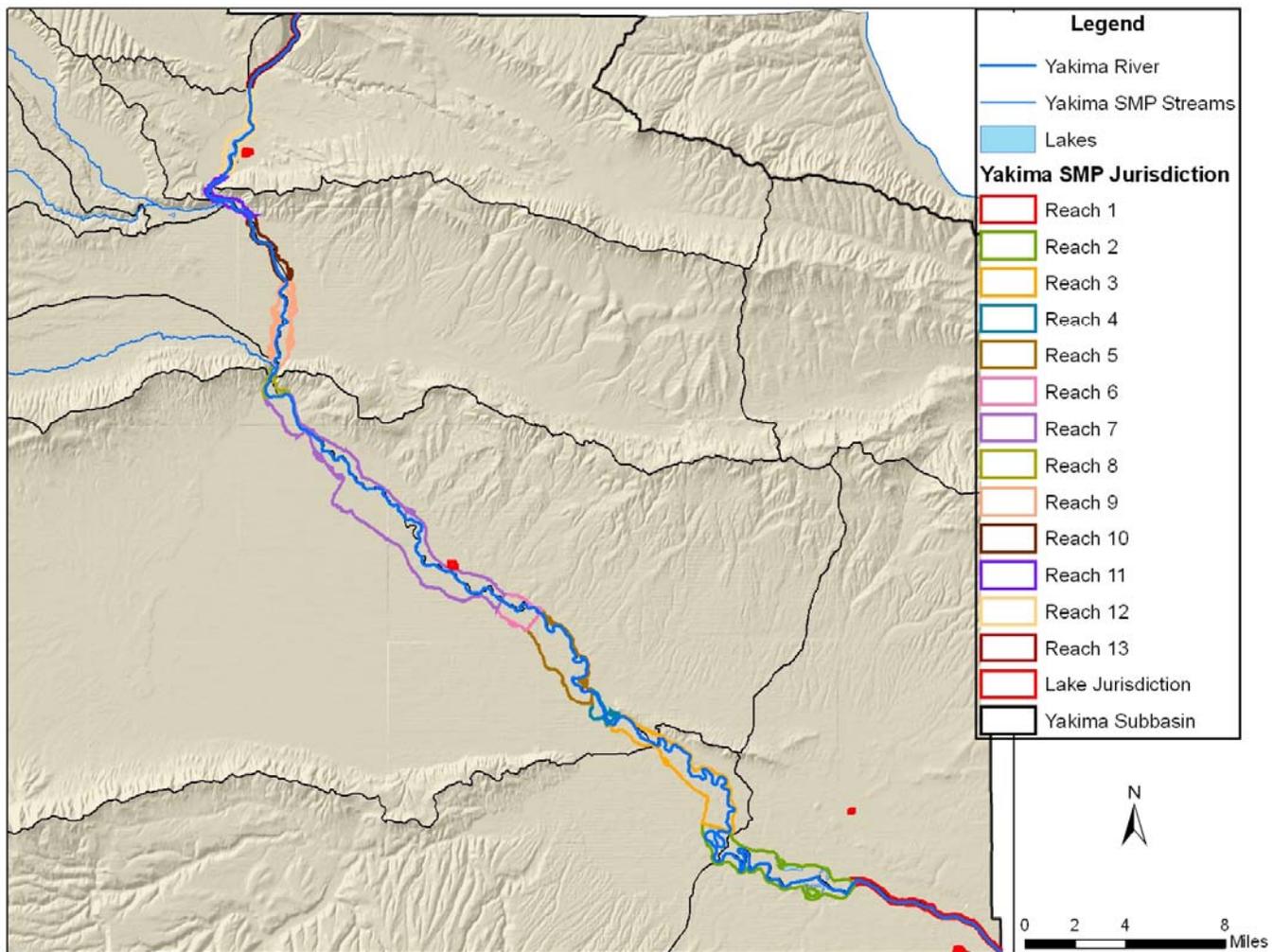


Figure Y5. SMP Jurisdiction Breaks for Yakima River.

Table Y1. SMP Reach Breaks for Inventory and Analysis, Yakima River.

| Reach | Length | Start | Reach Break Justification | End |
|-------|------------|--|---|---|
| 1 | 6.9 Miles | Benton County line (east line of S12, T8N, R23E) | Land use: County line, herbaceous rangeland | NE¼, SW¼, S30, T9N, R23E |
| 2 | 13.2 Miles | NE¼, SW¼, S30, T9N, R23E | Land use: Change from herbaceous rangeland to orchards, groves, vineyards, and cropland/pasture. Geomorphic: Change from meandering channel to straight channel. | NW¼, SE¼, S17, T9N, R22E |
| 3 | 11.0 Miles | NW¼, SE¼, S17, T9N, R22E | Land use: Change from forested wetlands to herbaceous rangeland | NE¼, NE¼, S28, T10N, R21E |
| 4 | 1.4 Miles | NE¼, NE¼, S28, T10N, R21E | Land use: Change to residential land use, City of Granger. Geomorphic: Reduced sinuosity and braiding. | SW¼, SW¼, S16, T10N, R21E |
| 5 | 6.2 Miles | SW¼, SW¼, S16, T10N, R21E | Land use: Floodplain changes to cropland and pasture. Geomorphic: Increased sinuosity and braiding. | SW¼, SW¼, S31, T11N, R21E |
| 6 | 2.3 Miles | SW¼, SW¼, S31, T11N, R21E | Land use change: Urban, City of Zillah | SW¼, NE¼, S35, T11N, R20E |
| 7 | 15.1 Miles | SW¼, NE¼, S35, T11N, R20E | Land use: Road crossing and change to mixed agriculture. | SW¼, NW¼, S20, T12N, R19E |
| 8 | 1.8 Miles | SW¼, NW¼, S20, T12N, R19E | Land use: Change from mixed agriculture to undeveloped. Geomorphic: Confined floodplain. | NE¼, SW¼, S17, T12N, R19E |
| 9 | 4.3 Miles | NE¼, SW¼, S17, T12N, R19E | Land use: Change to mixed agriculture. Geomorphic: Confluence with Ahtanum and change to wide floodplain. | NE¼, SW¼, S28, T13N, R19E |
| 10 | 3.2 Miles | NE¼, SW¼, S28, T13N, R19E | Land use: Change to commercial/industrial land use. | NE¼, NE¼, S18, T13N, R19E |
| 11 | 3.3 Miles | NE¼, NE¼, S18, T13N, R19E | Land use: Change to dense urban. Geomorphic: Floodplain confined by Selah Gap. | SE¼, NE¼, S1, T13N, R18E |
| 12 | 4.2 Miles | SE¼, NE¼, S1, T13N, R18E | Land use: Change to cropland and pasture. Geomorphic: Widened floodplain. | SE¼, SE¼, S18, T14N, R19E |
| 13 | 3.8 Miles | SE¼, SE¼, S18, T14N, R19E | Geomorphic: Floodplain confined by canyon. | Kittitas County line (north line of S4, T14N, R19E) |

Table Y2. Geology and Geohazard Characteristics for the Yakima River.

| REACH | Geology | | Geohazard | |
|--------------------------------|---|----------|--|------------------|
| | Lithology | Area (%) | Geohazard | Area (%) |
| 1 Area: 849.5 Acres | Alluvium | 53.2 | Oversteepened Slopes (Intermediate Risk) 100-Year Floodplain | 2.4 74 |
| | Outburst Flood Deposits, Sand and Silt | 5.6 | | |
| | Outburst Flood Deposits, Sand and Silt, Late Wisconsin | 2.8 | | |
| | Water | 38.1 | | |
| 2 Area: 3736.0 Acres | Alluvium | 81.2 | Stream Undercutting (High Risk) 100-Year Floodplain | 0.1 98.4 |
| | Outburst Flood Deposits, Sand and Silt, Late Wisconsin | 1.7 | | |
| | Water | 17.1 | | |
| 3 Area: 3405.3 Acres | Alluvium | 88.6 | Suspected Geologic Hazards (Intermediate Risk) Stream Undercutting (High Risk) 100-Year Floodplain | 0.5 0.3 96 |
| | Basalt Flows (Elephant Mountain Member [CRB, SMB]) | 0.4 | | |
| | Continental Sedimentary Deposits or Rocks, Conglomerate | 0.2 | | |
| | Outburst Flood Deposits, Sand and Silt, Late Wisconsin | 2.8 | | |
| | Water | 8.0 | | |
| 4 Area: 374.0 Acres | Alluvium | 95.7 | Stream Undercutting (High Risk) 100-Year Floodplain | 0.3 81.6 |
| | Outburst Flood Deposits, Sand and Silt, Late Wisconsin | 4.3 | | |
| 5 Area: 2737.8 Acres | Alluvium | 96.5 | Suspected Geologic Hazards (Intermediate Risk) 100-Year Floodplain | 0.5 96.9 |
| | Outburst Flood Deposits, Sand and Silt, Late Wisconsin | 3.5 | | |
| 6 Area: 958.5 Acres | Alluvium | 98.6 | Alluvial Fan/Flash Flooding (High Risk) 100-Year Floodplain | 0.5 96.5 |
| | Outburst Flood Deposits, Sand and Silt, Late Wisconsin | 1.4 | | |
| 7 Area: 8089.4 Acres | Alluvium | 99.4 | Alluvial Fan/Flash Flooding (High Risk) 100-Year Floodplain | 0.0 95.5 |
| | Basalt Flows (Pomona Member [CRB, SMB]) | 0.1 | | |
| | Outburst Flood Deposits, Sand and Silt, Late Wisconsin | 0.3 | | |
| | Water | 0.1 | | |
| | | | | |

| REACH | Geology | | Geohazard | |
|--------------------------------|---|--|---|--------------|
| | Lithology | Area (%) | Geohazard | Area (%) |
| 8 Area: 329.2 Acres | Alluvium Basalt Flows (Frenchman Springs Member [CRB, WB]) Basalt Flows (Pomona Member [CRB, SMB]) Basalt Flows (Priest Rapids Member [CRB, WB]) Basalt Flows (Roza Member [CRB, WB]) Basalt Flows (Umatilla Member [CRB, SMB]) Continental Sedimentary Deposits or Rocks Terraced Deposits Total Water | 79.4 7.6 0.4 1.1 0.3 1.0 0.3 0.4 9.5 | Oversteepened Slopes (High Risk) 100-Year Floodplain | 2.6 85.6 |
| 9 Area: 1355.5 Acres | Alluvium Basalt Flows (Frenchman Springs Member [CRB, WB]) Terraced Deposits Water | 86.7 1.0 0.2 12.1 | Oversteepened Slopes (High Risk) 100-Year Floodplain | 0.4 94.4 |
| 10 Area: 629.8 Acres | Alluvium Water | 74.9 25.1 | 100-Year Floodplain | 98.5 |
| 11 Area: 435.3 Acres | Alluvium Basalt Flows (Frenchman Springs Member [CRB, WB]) Basalt Flows (GrandeRondeBasalt, upper flows of norm.mag.pol.) Basalt Flows (Priest Rapids Member [CRB, WB]) Basalt Flows (Roza Member [CRB, WB]) Mass-Wasting Deposits, Mostly Landslides Water | 53.5 3.3 1.3 0.6 1.0 8.4 32.0 | Oversteepened Slopes (High Risk) 100-Year Floodplain | 13.2 78.8 |
| 12 Area: 853.7 Acres | Alluvium Basalt Flows (Pomona Member [CRB, SMB]) Water | 76.1 0.6 23.2 | 100-Year Floodplain | 96.7 |
| | | | | |

| REACH | Geology | | Geohazard | |
|--------------------------------|--|----------|--|----------|
| | Lithology | Area (%) | Geohazard | Area (%) |
| 13 Area: 329.2 Acres | Alluvium | 25.4 | Alluvial Fan/Flash Flooding (High Risk) | 8.9 |
| | Basalt Flows (Frenchman Springs Member [CRB, WB]) | 3.4 | Landslides (High Risk) | 6.9 |
| | Basalt Flows (GrandeRondeBasalt, upper flows of norm.mag.pol.) | 9.3 | Oversteepened Slopes (Intermediate Risk) | 4.2 |
| | Basalt Flows (GrandeRondeBasalt, upper flows of rev.mag.pol.) | 5.4 | Oversteepened Slopes (High Risk) | 15.2 |
| | Basalt Flows (Pomona Member [CRB, SMB]) | 1.4 | 100-Year Floodplain | 56.4 |
| | Basalt Flows (Priest Rapids Member [CRB, WB]) | 2.6 | | |
| | Basalt Flows (Roza Member [CRB, WB]) | 2.0 | | |
| | Continental Sedimentary Deposits or Rocks | 1.4 | | |
| | Mass-Wasting Deposits, Mostly Landslides | 5.3 | | |
| | Terraced Deposits | 6.9 | | |
| | Water | 35.8 | | |
| 1a Area: 49.1 Acres | Basalt Flows (Elephant Mountain Member [CRB, SMB]) | 100.0 | N/A | N/A |
| 1b Area: 49.2 Acres | Basalt Flows (Elephant Mountain Member [CRB, SMB]) | 100.0 | N/A | N/A |
| 2a Area: 12.9 Acres | Alluvium | 100.0 | N/A | N/A |
| 7a Area: 23.1 Acres | Alluvium | 100.0 | N/A | N/A |
| 12a Area: 22.9 Acres | Alluvium | 73.0 | 100-Year Floodplain | 41.7 |
| | Water | 27.0 | | |

Table Y3. Soil Characteristics for the Yakima River.

| REACH | Soil Characteristics | | | | | | Aquic Soils Area (%) |
|--------------------------------|----------------------|----------|---------------------|----------|--------------------|----------|----------------------|
| | Permeability | Area (%) | Runoff | Area (%) | Hazard of Erosion | Area (%) | |
| 1 Area: 849.5 Acres | moderate | 40.5 | medium | 7.1 | moderate | 10.5 | 15.0 |
| | moderately slow | 4.6 | N/A | 44.2 | N/A | 57.3 | |
| | N/A | 44.2 | slow | 33.3 | slight | 31.8 | |
| | rapid | 7.4 | very slow | 15.0 | | | |
| | slow | 3.0 | | | | | |
| 2 Area: 3736.0 Acres | moderate | 35.6 | N/A | 14.4 | moderate | 0.5 | 54.1 |
| | moderately slow | 19.7 | ponded | 0.8 | N/A | 22.0 | |
| | N/A | 14.4 | slow | 49.7 | none to slight | 11.9 | |
| | rapid | 2.6 | slow to medium | 1.9 | slight | 58.7 | |
| | slow | 22.7 | very slow | 16.8 | slight to moderate | 1.9 | |
| | | | very slow to ponded | 11.5 | | | |
| 3 Area: 3405.3 Acres | moderate | 55.0 | medium | 0.1 | high | 1.6 | 23.9 |
| | moderately slow | 2.0 | N/A | 8.5 | moderate | 0.8 | |
| | N/A | 8.5 | rapid | 1.8 | N/A | 9.7 | |
| | rapid | 8.0 | slow | 68.3 | none to slight | 4.3 | |
| | slow | 1.5 | slow to medium | 5.8 | slight | 70.9 | |
| | very rapid | 18.3 | very slow | 7.0 | slight to moderate | 5.8 | |
| | | | very slow to ponded | 1.9 | very high | 0.2 | |
| 4 Area: 374.0 Acres | moderate | 46.1 | medium | 1.7 | high | 0.4 | 16.0 |
| | moderately slow | 4.4 | N/A | 5.5 | moderate | 1.7 | |
| | N/A | 5.5 | rapid | 0.4 | N/A | 5.5 | |
| | rapid | 14.5 | slow | 73.4 | none to slight | 2.1 | |
| | very rapid | 26.3 | slow to medium | 5.5 | slight | 81.5 | |
| | | | very slow | 10.3 | slight to moderate | 5.5 | |
| | | | | | | | |

| REACH | Soil Characteristics | | | | | | Aquic Soils Area (%) |
|--------------------------------|---|---|--|--|---|---|----------------------|
| | Permeability | Area (%) | Runoff | Area (%) | Hazard of Erosion | Area (%) | |
| 5 Area: 2737.8 Acres | moderate moderately slow N/A rapid very rapid | 52.5 4.0 2.6 8.9 25.4 | medium N/A rapid slow slow to medium very slow very slow to ponded | 1.0 2.6 0.1 50.6 15.7 19.4 4.0 | high moderate N/A none to slight slight slight to moderate | 0.1 1.0 3.3 18.4 54.9 15.7 | 12.7 |
| 6 Area: 958.5 Acres | moderate moderately slow N/A rapid very rapid | 18.5 1.9 4.9 15.7 7.1 | medium N/A slow slow to medium very slow | 1.9 4.9 34.2 3.1 3.9 | moderate N/A none to slight slight slight to moderate | 2.0 6.1 3.0 33.9 3.1 | 23.6 |
| 7 Area: 8089.4 Acres | moderate moderately rapid moderately slow N/A rapid very rapid | 27.3 4.4 0.9 2.0 16.1 29.1 | medium N/A rapid slow slow to medium very slow very slow to ponded | 0.1 2.0 0.4 65.7 4.7 5.0 1.9 | high moderate N/A none to slight slight slight to moderate | 0.4 0.1 3.1 4.2 67.2 4.7 | 23.3 |
| 8 Area: 329.2 Acres | N/A moderate moderately slow rapid very rapid | 10.9 9.5 0.1 33.1 35.1 | N/A medium rapid slow slow to medium | 10.9 2.5 0.4 61.7 13.1 | N/A high moderate slight slight to moderate | 10.9 0.4 2.4 61.7 13.2 | 34.3 |
| | | | | | | | |

| REACH | Soil Characteristics | | | | | | Aquic Soils Area (%) |
|--------------------------------|---|------------------------------------|---|--|-----------------------------------|-----------------------------|----------------------|
| | Permeability | Area (%) | Runoff | Area (%) | Hazard of Erosion | Area (%) | |
| 9 Area: 1355.5 Acres | moderate moderately rapid moderately slow N/A rapid | 6.5 1.8 0.0 17.3 74.4 | medium N/A slow very slow | 0.5 17.3 76.7 5.5 | moderate N/A slight | 0.5 17.3 82.2 | 85.9 |
| 10 Area: 629.8 Acres | N/A rapid | 33.2 66.8 | N/A slow | 33.2 66.8 | N/A slight | 33.2 66.8 | 67.4 |
| 11 Area: 435.3 Acres | moderate moderately slow N/A rapid | 15.9 0.2 28.9 55.0 | medium N/A ponded rapid slow very slow | 5.0 28.9 0.9 9.9 55.0 0.2 | high moderate N/A slight | 9.9 5.0 28.9 56.1 | 54.5 |
| 12 Area: 853.7 Acres | moderate moderately slow | 3.1 1.6 | medium N/A slow very slow | 0.3 24.1 55.6 19.9 | moderate N/A slight | 0.3463 24.28 75.374 | 74.5 |
| 13 Area: 329.2 Acres | N/A rapid moderate moderately slow slow | 49.5 23.7 19.8 0.4 5.3 | medium N/A rapid slow very slow | 13.7 49.5 7.9 27.6 0.1 | high moderate N/A slight | 7.9 15.7 49.6 25.5 | 20.5 |
| 1a Area: 49.1 Acres | moderate | 100.0 | medium slow | 61.3 38.7 | moderate slight | 61.3 38.7 | 40.3 |
| 1b Area: 49.2 Acres | rapid moderate N/A | 0.8 93.3 6.7 | medium N/A slow | 93.0 6.7 0.3 | moderate N/A slight | 93.0 6.7 0.3 | 0.3 |

| REACH | Soil Characteristics | | | | | | Aquic Soils Area (%) |
|--------------------------------|-------------------------------------|----------------------|--------------------------|---------------------|-------------------|---------------|----------------------|
| | Permeability | Area (%) | Runoff | Area (%) | Hazard of Erosion | Area (%) | |
| 2a Area: 12.9 Acres | rapid moderate N/A | 18.6 50.0 31.4 | very slow N/A | 68.6 31.4 | N/A slight | 31.4 68.6 | 12.7 |
| 7a Area: 23.1 Acres | moderately rapid moderate N/A | 84.1 12.6 3.3 | very slow N/A | 68.6 31.4 | slight N/A | 84.1 15.9 | 0.0 |
| 12a Area: 22.9 Acres | rapid N/A | 91.1 8.9 | slow very slow N/A | 63.1 28.0 8.9 | N/A slight | 8.9 91.072 | 89.8 |

Table Y4. Stream Channel Characteristics for the Yakima River.

| REACH | Stream Lengths | | Channel Migration | | Stream Type | | | |
|--|-----------------------|--------------------|-------------------------|---------------------|--|---|---|--|
| | Total Streams (Miles) | SMP Stream (Miles) | Potential | Area (%) | 1884 to 1915 | | 1965 to 1995 | |
| | | | | | Type | Length (Miles) | Type | Length (Miles) |
| 1 Area: 849.5 Acres Length: 6.9 Miles | 7.8 | 6.9 | no zones | no zones | N/A | N/A | N/A | N/A |
| 2 Area: 3736.0 Acres Length: 13.2 Miles | 16.2 | 13.2 | high moderate | 6.8 17.9 | N/A | N/A | N/A | N/A |
| 3 Area: 3405.3 Acres Length: 11.0 Miles | 14.9 | 11.0 | high low moderate | 46.1 0.1 38.7 | Main Channel Side Channel Oxbow Alcove Springbrook Trib | 7.0 5.2 1.3 0.7 3.2 0.1 | Main Channel Side Channel Oxbow Alcove Abandoned Channel Braid Springbrook | 7.1 1.5 1.1 0.9 0.1 1.9 |
| 4 Area: 374.0 Acres Length: 1.4 Miles | 1.9 | 1.4 | high moderate | 24.7 49.1 | Main Channel Side Channel Oxbow Springbrook | 1.7 0.3 0.2 0.3 | Main Channel Outflow Oxbow Springbrook | 1.7 0.1 0.3 1.5 |
| 5 Area: 2737.8 Acres Length: 6.2 Miles | 12.4 | 6.2 | high moderate | 29.6 19.6 | Main Channel Side Channel Outflow Oxbow Alcove Abandoned Channel Braid Springbrook | 7.0 0.8 0.1 0.8 0.8 0.5 7.2 | Main Channel Outflow Oxbow Alcove Springbrook | 8.6 0.3 0.3 1.1 6.2 |
| | | | | | | | | |

| REACH | Stream Lengths | | Channel Migration | | Stream Type | | | |
|--|-----------------------|--------------------|-------------------|--------------|-------------------------|----------------|-------------------------|----------------|
| | Total Streams (Miles) | SMP Stream (Miles) | Potential | Area (%) | 1884 to 1915 | | 1965 to 1995 | |
| | | | | | Type | Length (Miles) | Type | Length (Miles) |
| 6 Area: 958.5 Acres Length: 2.3 Miles | 5.3 | 2.3 | high moderate | 29.0 16.6 | Main Channel | 3.6 | Main Channel | 3.8 |
| | | | | | Side Channel | 0.8 | Side Channel | 1.3 |
| | | | | | Outflow | 0.6 | Oxbow | 0.1 |
| | | | | | Oxbow | 0.6 | Alcove | 0.8 |
| | | | | | Alcove | 1.1 | Springbrook | 4.9 |
| | | | | | Springbrook | 4.9 | | |
| 7 Area: 8089.4 Acres Length: 15.1 Miles | 37.5 | 5.1 | high moderate | 34.2 3.9 | Main Channel | 25.5 | Main Channel | 23.8 |
| | | | | | Side Channel | 9.7 | Side Channel | 16.6 |
| | | | | | Outflow | 0.3 | Outflow | 0.2 |
| | | | | | Oxbow | 0.2 | Oxbow | 0.3 |
| | | | | | Alcove | 3.3 | Alcove | 3.4 |
| | | | | | Abandoned Channel Braid | 0.2 | Abandoned Channel Braid | 0.9 |
| Springbrook | 17.7 | Springbrook | 17.8 | | | | | |
| 8 Area: 329.2 Acres Length: 1.8 Miles | 3.8 | 1.8 | high | 53.5 | Main Channel | 2.6 | Main Channel | 2.4 |
| | | | | | Side Channel | 0.8 | Side Channel | 0.6 |
| | | | | | Springbrook | 1.4 | Springbrook | 1.8 |
| | | | | | Trib | 0.4 | | |
| 9 Area: 1355.5 Acres Length: 4.3 Miles | 12.7 | 2.4 | high moderate | 47.3 28.3 | Main Channel | 4.7 | Main Channel | 6.7 |
| | | | | | Side Channel | 7.9 | Side Channel | 6.3 |
| | | | | | Outflow | 0.3 | Alcove | 2.6 |
| | | | | | Oxbow | 0.3 | Springbrook | 6.2 |
| | | | | | Alcove | 1.4 | | |
| | | | | | Abandoned Channel Braid | 0.1 | | |
| | | | | | Springbrook | 2.5 | | |
| Trib | 0.0 | | | | | | | |
| 10 Area: 629.8 Acres Length: 3.2 Miles | 6.6 | 3.2 | high moderate | 66.9 6.6 | Main Channel | 4.0 | Main Channel | 8.0 |
| | | | | | Side Channel | 5.8 | Side Channel | 2.1 |
| | | | | | Outflow | 0.0 | Alcove | 0.7 |
| | | | | | Alcove | 2.1 | Springbrook | 1.7 |
| | | | | | Springbrook | 1.1 | | |

| REACH | Stream Lengths | | Channel Migration | | Stream Type | | | |
|---|--------------------------|--------------------------|-------------------|-------------|--------------|-------------------|--------------|-------------------|
| | Total Streams (Miles) | SMP Stream (Miles) | Potential | Area (%) | 1884 to 1915 | | 1965 to 1995 | |
| | | | | | Type | Length (Miles) | Type | Length (Miles) |
| 11 Area: 435.3 Acres Length: 3.3 Miles | 5.0 | 3.3 | high moderate | 49.6 0.0 | Main Channel | 4.0 | Main Channel | 4.5 |
| | | | | | Side Channel | 1.0 | Side Channel | 0.7 |
| | | | | | Outflow | 0.1 | Alcove | 0.5 |
| | | | | | Alcove | 0.7 | Springbrook | 0.5 |
| | | | | | Springbrook | 0.7 | Trib | 0.1 |
| | | | | | Trib | 0.1 | | |
| 12 Area: 853.7 Acres Length: 4.2 Miles | 4.8 | 4.2 | high moderate | 54.2 1.1 | Main Channel | 4.1 | Main Channel | 6.3 |
| | | | | | Side Channel | 1.4 | Side Channel | 4.0 |
| | | | | | Alcove | 0.3 | Alcove | 1.6 |
| | | | | | Springbrook | 0.1 | Springbrook | 0.3 |
| | | | | | Trib | 0.0 | | |
| | | | | | | | | |
| 13 Area: 329.2 Acres Length: 3.8 Miles | 5.8 | 3.8 | high moderate | 1.5 0.3 | Main Channel | 1.5 | Main Channel | 1.5 |
| | | | | | Side Channel | 0.4 | Side Channel | 0.4 |
| | | | | | Alcove | 0.2 | Alcove | 0.2 |
| | | | | | Springbrook | 0.1 | Springbrook | 0.1 |

Table Y5. Habitat Characteristics for the Yakima River.

| REACH | Wildlife Heritage Locations Common Name | Wildlife Heritage Locations (#) | Wetlands Area (%) | Riparian Areas Area (%) | Priority Species & Habitats | | Barriers | |
|--------------------------------|--|------------------------------------|----------------------|----------------------------|------------------------------------|-------------|----------|-----------------|
| | | | | | Habitat | Area (%) | Type | Species Blocked |
| 1 Area: 849.5 Acres | 0 | 0 | 47.0 | No Data | Riparian Zones | 54.8 | N/A | N/A |
| 2 Area: 3736.0 Acres | Great Blue Heron | 4 | 60.2 | 15.4 | Great Blue Heron Riparian Zones | 1.1 90.8 | N/A | N/A |
| 3 Area: 3405.3 Acres | Great Blue Heron Bald Eagle | 7 1 | 64.1 | 36.3 | Great Blue Heron Riparian Zones | 1.3 93.6 | N/A | N/A |
| 4 Area: 374.0 Acres | Mountain Sucker | 1 | 17.9 | 37.6 | Riparian Zones | 66.4 | N/A | N/A |
| 5 Area: 2737.8 Acres | Great Blue Heron | 2 | 27.5 | 31.3 | Riparian Zones | 54.3 | N/A | N/A |
| 6 Area: 958.5 Acres | Great Blue Heron Umatilla Dace Mountain Sucker Leopard Dace | 1 1 1 1 | 18.8 | 52.6 | Riparian Zones | 85.7 | N/A | N/A |
| | | | | | | | | |

| REACH | Wildlife Heritage Locations Common Name | Wildlife Heritage Locations (#) | Wetlands Area (%) | Riparian Areas Area (%) | Priority Species & Habitats | | Barriers | |
|----------------------------|--|------------------------------------|----------------------|----------------------------|--|--------------|---------------------------------------|-----------------|
| | | | | | Habitat | Area (%) | Type | Species Blocked |
| 7 Area: 8089.4 Acres | Osprey | 5 | 32.0 | 35.8 | Great Blue Heron Riparian Zones Wetlands | 0.4 | Passable,Dam, Insufficient Flow | N/A |
| | Great Blue Heron | 4 | | | | 56.6 | | |
| | Mountain Sucker | 1 | | | | 0.2 | | |
| | Leopard Dace | 1 | | | | | | |
| 8 Area: 329.2 Acres | 0 | 0 | 64.8 | 37.8 | Bald Eagle Riparian Zones | 14.0 79.5 | Passable, Dam | N/A |
| 9 Area: 1355.5 Acres | Great Blue Heron | 1 | 59.7 | 35.3 | Bald Eagle | 0.6 | N/A | N/A |
| | Mountain Sucker | 2 | | | Great Blue Heron | 3.0 | | |
| | Osprey | 1 | | | Riparian Zones Waterfowl Concentrations | 85.2 3.0 | | |
| 10 Area: 629.8 Acres | Bald Eagle | 1 | 57.6 | 46.4 | Bald Eagle | 2.6 | N/A | N/A |
| | Leopard Dace | 1 | | | Riparian Zones | 84.1 | | |
| | Mountain Sucker | 1 | | | | | | |
| 11 Area: 435.3 Acres | 0 | 0 | 46.4 | 29.6 | Bald Eagle | 0.4 | N/A | N/A |
| | | | | | Riparian Zones | 72.8 | | |
| | | | | | Urban Natural Open Space | 10.9 | | |
| | | | | | Waterfowl Concentrations | 0.8 | | |
| | | | | | Wetlands | 0.4 | | |
| | | | | | Wood Duck | 0.4 | | |
| | | | | | | | | |

| REACH | Wildlife Heritage Locations Common Name | Wildlife Heritage Locations (#) | Wetlands Area (%) | Riparian Areas Area (%) | Priority Species & Habitats | | Barriers | |
|--------------------------------|--|------------------------------------|----------------------|----------------------------|-----------------------------|----------|---------------|-----------------|
| | | | | | Habitat | Area (%) | Type | Species Blocked |
| 12 Area: 853.7 Acres | Osprey | 1 | 27.6 | 9.6 | Great Blue Heron | 1.1 | Diversion Dam | N/A |
| | Great Blue Heron | 1 | | | Riparian Zones | 38.9 | | |
| | | | | | Waterfowl Concentrations | 69.8 | | |
| | | | | | Wetlands | 18.8 | | |
| 13 Area: 329.2 Acres | 0 | 0 | 34.8 | 15.2 | Bighorn Sheep | 14.1 | N/A | N/A |
| | | | | | Cliffs/Bluffs | 0.9 | | |
| | | | | | Elk | 38.1 | | |
| | | | | | Golden Eagle | 0.9 | | |
| | | | | | Mule and Black-Tailed Deer | 31.8 | | |
| | | | | | Riparian Zones | 22.1 | | |
| 1a Area: 49.1 Acres | 0 | 0 | 55.6 | No data | Wetlands | 100.0 | N/A | N/A |
| | | | | | | | | |
| 1b Area: 49.2 Acres | 0 | 0 | 43.5 | No data | Wetlands | 99.9 | Dam | N/A |
| | | | | | | | | |
| 2a Area: 12.9 Acres | 0 | 0 | 80.0 | No data | N/A | N/A | N/A | N/A |
| | | | | | | | | |
| 7a Area: 23.1 Acres | Common Loon | 1 | 17.3 | 9.1 | Riparian Zones | 39.8 | N/A | N/A |
| | | | | | | | | |

| REACH | Wildlife Heritage Locations Common Name | Wildlife Heritage Locations (#) | Wetlands Area (%) | Riparian Areas Area (%) | Priority Species & Habitats | | Barriers | |
|-------------------------|--|------------------------------------|----------------------|----------------------------|-----------------------------|----------|----------|-----------------|
| | | | | | Habitat | Area (%) | Type | Species Blocked |
| 12a Area: 22.9 Acres | 0 | 0 | 8.7 | 0.0 | Waterfowl Concentrations | 100.0 | N/A | N/A |

Table Y6. Fish Characteristics for the Yakima River.

| REACH | Anadromous Fish | | | | | | Bulltrout | | Resident Fish | | |
|--|------------------|----------------|--------------|----------------|----------------|----------------|--|---------------------|-----------------|---------------------|------|
| | Presence | | Spawning | | Rearing | | Presence | Length (Miles) | Species | Length (Miles) | |
| | Species | Length (Miles) | Species | Length (Miles) | Species | Length (Miles) | | | | | |
| 1 Area: 849.5 Acres Length: 6.9 Miles | Coho Salmon | 6.9 | Fall Chinook | 6.9 | Fall Chinook | 6.9 | Potentially Occupied | 6.9 | Bullhead | 5.7 | |
| | Fall Chinook | 6.9 | | | Spring Chinook | 6.9 | | | Carp | 6.9 | |
| | Spring Chinook | 6.9 | | | Chinook | | | | Channel Catfish | 6.9 | |
| | Summer Steelhead | 6.9 | | | | | | | Chiselmouth | 6.9 | |
| | | | | | | | | | Crappie | 1.0 | |
| | | | | | | | | Eastern Brook Trout | 5.8 | | |
| | | | | | | | | Largemouth Bass | 6.9 | | |
| | | | | | | | | Mountain Whitefish | 6.9 | | |
| | | | | | | | | Northern Pike | | | |
| | | | | | | | | Minnow | 6.9 | | |
| | | | | | | | | Rainbow Trout | 6.9 | | |
| | | | | | | | | Shiner Perch | 6.9 | | |
| | | | | | | | | Smallmouth Bass | 6.9 | | |
| | | | | | | | | Sucker | 6.9 | | |
| | | | | | | | | Tui Chub | 5.6 | | |
| | | | | | | | | Yellow Perch | 1.1 | | |
| 2 Area: 3736.0 Acres Length: 13.2 Miles | Coho Salmon | 13.3 | Fall Chinook | 13.2 | Fall Chinook | 13.2 | Other Undetected Potentially Occupied | 0.4 | Bullhead | 13.2 | |
| | Fall Chinook | 13.6 | | | Spring Chinook | 13.7 | | | 13.2 | Carp | 13.2 |
| | Spring Chinook | 13.7 | | | Chinook | | | | | Channel Catfish | 13.2 |
| | Summer Steelhead | 13.8 | | | | | | | | Chiselmouth | 13.2 |
| | | | | | | | | | | Eastern Brook Trout | 13.2 |
| | | | | | | | | Largemouth Bass | 13.2 | | |
| | | | | | | | | Mountain Whitefish | 13.2 | | |
| | | | | | | | | Northern Pike | 13.4 | | |

| REACH | Anadromous Fish | | | | | | Bulltrout | | Resident Fish | |
|--------------------------|------------------|----------------|--------------|----------------|----------------|----------------|----------------------|----------------|---------------------|----------------|
| | Presence | | Spawning | | Rearing | | Presence | Length (Miles) | Species | Length (Miles) |
| | Species | Length (Miles) | Species | Length (Miles) | Species | Length (Miles) | | | | |
| | | | | | | | | | Minnow | |
| | | | | | | | | | Rainbow Trout | 13.2 |
| | | | | | | | | | Shiner Perch | 13.2 |
| | | | | | | | | | Smallmouth Bass | 13.2 |
| | | | | | | | | | Sucker | 13.2 |
| | | | | | | | | | Tui Chub | 13.2 |
| 3 | Coho Salmon | 11.0 | Fall Chinook | 11.0 | Fall Chinook | 11.0 | Potentially Occupied | 11.0 | Bullhead | 11.0 |
| | Fall Chinook | 11.0 | | | Spring Chinook | 11.0 | | | Carp | 11.0 |
| Area: 3405.3 Acres | Spring Chinook | 11.0 | | | Chinook | | | | Channel Catfish | 11.0 |
| Length: 11.0 Miles | Summer Steelhead | 11.0 | | | | | | | Chiselmouth | 11.0 |
| | | | | | | | | | Eastern Brook Trout | 11.0 |
| | | | | | | | | | Largemouth Bass | 11.0 |
| | | | | | | | | | Mountain Whitefish | 11.0 |
| | | | | | | | | | Northern Pike | 11.0 |
| | | | | | | | | | Minnow | 11.0 |
| | | | | | | | | | Rainbow Trout | 11.0 |
| | | | | | | | | | Shiner Perch | 11.0 |
| | | | | | | | | | Smallmouth Bass | 11.0 |
| | | | | | | | | | Sucker | 11.0 |
| | | | | | | | | | Tui Chub | 11.0 |
| 4 | Coho Salmon | 1.4 | Fall Chinook | 0.4 | Fall Chinook | 0.4 | Potentially Occupied | 1.4 | Bullhead | 1.4 |
| | Fall Chinook | 0.4 | | | Spring Chinook | 1.5 | | | Carp | 1.4 |
| Area: 374.0 Acres | Spring Chinook | 1.5 | | | Chinook | | | | Channel Catfish | 1.4 |
| Length: 1.4 Miles | Summer Steelhead | 1.5 | | | | | | | Chiselmouth | 1.4 |
| | | | | | | | | | Eastern Brook Trout | 1.4 |

| REACH | Anadromous Fish | | | | | | Bulltrout | | Resident Fish | |
|---|--|-----------------------|----------|----------------|-------------------|----------------|-------------------------|----------------|---|--|
| | Presence | | Spawning | | Rearing | | Presence | Length (Miles) | Species | Length (Miles) |
| | Species | Length (Miles) | Species | Length (Miles) | Species | Length (Miles) | | | | |
| | | | | | | | | | Largemouth Bass Mountain Whitefish Northern Pike Minnow Rainbow Trout Shiner Perch Smallmouth Bass Sucker Tui Chub | 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 |
| 5 Area: 2737.8 Acres Length: 6.2 Miles | Coho Salmon Spring Chinook Summer Steelhead | 6.2 7.9 6.2 | N/A | | Spring Chinook | 6.2 | Potentially Occupied | 6.2 | Bullhead Carp Channel Catfish Chiselmouth Eastern Brook Trout Largemouth Bass Mountain Whitefish Northern Pike Minnow Rainbow Trout Shiner Perch Smallmouth Bass Sucker Tui Chub | 6.2 6.2 6.2 6.2 6.2 6.2 6.2 8.6 6.2 6.2 6.2 6.2 6.2 6.2 |
| 6 Area: 958.5 Acres | Coho Salmon Spring Chinook Summer Steelhead | 2.1 2.1 2.1 | N/A | | Spring Chinook | 2.1 | Potentially Occupied | 2.1 | Bullhead Carp Channel Catfish | 2.1 2.1 2.1 |

| REACH | Anadromous Fish | | | | | | Bulltrout | | Resident Fish | |
|--|--|--------------------------|----------------|----------------|-------------------|----------------|-------------------------------------|----------------|---|--|
| | Presence | | Spawning | | Rearing | | Presence | Length (Miles) | Species | Length (Miles) |
| | Species | Length (Miles) | Species | Length (Miles) | Species | Length (Miles) | | | | |
| Length: 2.3 Miles | | | | | | | | | Chiselmouth Eastern Brook Trout Largemouth Bass Mountain Whitefish Northern Pike Minnow Rainbow Trout Shiner Perch Smallmouth Bass Sucker Tui Chub | 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 |
| 7 Area: 8089.4 Acres Length: 15.1 Miles | Coho Salmon Spring Chinook Summer Steelhead | 15.4 15.4 15.4 | N/A | | Spring Chinook | 15.4 | Potentially Occupied | 15.4 | Bullhead Carp Channel Catfish Chiselmouth Eastern Brook Trout Largemouth Bass Mountain Whitefish Northern Pike Minnow Rainbow Trout Shiner Perch Smallmouth Bass Sucker Tui Chub | 15.1 15.1 15.1 15.1 15.1 15.1 15.1 15.1 15.1 15.1 15.1 15.1 |
| 8 | Coho Salmon Spring Chinook | 1.8 1.8 | Coho Salmon | 0.4 | Spring Chinook | 1.8 | Potentially Occupied Presumed | 1.1 0.7 | Bullhead Carp | 1.4 1.4 |

| REACH | Anadromous Fish | | | | | | Bulltrout | | Resident Fish | |
|---|------------------|----------------|-------------|----------------|----------------|----------------|-----------|----------------|---------------------|----------------|
| | Presence | | Spawning | | Rearing | | Presence | Length (Miles) | Species | Length (Miles) |
| | Species | Length (Miles) | Species | Length (Miles) | Species | Length (Miles) | | | | |
| Area: 329.2 Acres Length: 1.8 Miles | Summer Steelhead | 1.8 | | | | | | | Channel Catfish | 1.4 |
| | | | | | | | | | Chiselmouth | 1.4 |
| | | | | | | | | | Eastern Brook Trout | 1.4 |
| | | | | | | | | | Largemouth Bass | 1.4 |
| | | | | | | | | | Mountain Whitefish | 1.4 |
| | | | | | | | | | Northern Pike | |
| | | | | | | | | | Minnow | 1.8 |
| | | | | | | | | | Rainbow Trout | 1.4 |
| | | | | | | | | | Shiner Perch | 1.4 |
| | | | | | | | | | Smallmouth Bass | 1.4 |
| | | | | | | | | | Sucker | 1.4 |
| | | | | | | | | | Tui Chub | 1.4 |
| 9 Area: 1355.5 Acres Length: 4.3 Miles | Coho Salmon | 4.8 | Coho Salmon | 0.4 | Spring Chinook | 4.8 | Presumed | 4.3 | Bridgelip Sucker | 0.5 |
| | Spring Chinook | 4.8 | | | | | | | Brown Trout | 0.5 |
| | Summer Steelhead | 4.3 | | | | | | | Bullhead | 4.3 |
| | | | | | | | | | Carp | 4.3 |
| | | | | | | | | | Channel Catfish | 4.3 |
| | | | | | | | | | Chiselmouth | 4.3 |
| | | | | | | | | | Eastern Brook Trout | 4.3 |
| | | | | | | | | | Largemouth Bass | 4.3 |
| | | | | | | | | | Largescale Sucker | 0.5 |
| | | | | | | | | | Mountain Sucker | 0.5 |
| | | | | | | | | | Mountain Whitefish | 4.3 |
| | | | | | | | | | Northern Pike | |
| | | | | | | | | | Minnow | 1.0 |
| | | | | | | | | | Rainbow Trout | 4.3 |

| REACH | Anadromous Fish | | | | | | Bulltrout | | Resident Fish | |
|---|--|-------------------|--|----------------|--|----------------|-----------------------------------|----------------|--|---|
| | Presence | | Spawning | | Rearing | | Presence | Length (Miles) | Species | Length (Miles) |
| | Species | Length (Miles) | Species | Length (Miles) | Species | Length (Miles) | | | | |
| | | | | | | | | | Redside Shiner Shiner Perch Smallmouth Bass Speckled Dace Sucker Tui Chub | 0.5 4.3 4.3 0.5 4.3 4.3 |
| 10 Area: 629.8 Acres Length: 3.2 Miles | Coho Salmon Spring Chinook Summer Steelhead | 3.2 3.2 3.2 | N/A | | Spring Chinook | 3.2 | Presumed | 3.2 | Bullhead Carp Channel Catfish Chiselmouth Eastern Brook Trout Largemouth Bass Mountain Whitefish Rainbow Trout Shiner Perch Smallmouth Bass Sucker Tui Chub | 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 |
| 11 Area: 435.3 Acres Length: 3.3 Miles | Coho Salmon Spring Chinook Summer Steelhead | 1.5 3.4 3.3 | Spring Chinook Summer Steelhead | 1.3 0.0 | Spring Chinook Summer Steelhead | 3.4 1.8 | Currently Occupied Presumed | 1.8 1.4 | Bullhead Carp Channel Catfish Chiselmouth Crappie Eastern Brook Trout Largemouth Bass Mountain Whitefish | 1.1 3.1 1.4 2.9 1.8 1.3 3.0 2.9 |

| REACH | Anadromous Fish | | | | | | Bulltrout | | Resident Fish | |
|---|---------------------------------------|----------------|--|----------------|--|----------------|--|----------------|---|---|
| | Presence | | Spawning | | Rearing | | Presence | Length (Miles) | Species | Length (Miles) |
| | Species | Length (Miles) | Species | Length (Miles) | Species | Length (Miles) | | | | |
| | | | | | | | | | Northern Pike Minnow Peamouth Rainbow Trout Redside Shiner Sculpin Shiner Perch Smallmouth Bass Speckled Dace Sucker Tui Chub Yellow Perch | 1.2 1.8 3.1 0.0 1.7 1.1 3.1 1.8 1.1 1.1 1.8 |
| 12 Area: 853.7 Acres Length: 4.2 Miles | Spring Chinook Summer Steelhead | 4.3 4.2 | Spring Chinook Summer Steelhead | 4.2 4.2 | Spring Chinook Summer Steelhead | 4.3 4.2 | Currently Occupied Other Undetected | 4.2 0.1 | Brown Trout Carp Chiselmouth Crappie Largemouth Bass Mountain Whitefish Northern Pike Minnow Peamouth Rainbow Trout Redside Shiner Sculpin Smallmouth Bass Speckled Dace Yellow Perch | 0.1 4.2 4.2 4.2 4.2 4.2 4.2 0.1 4.2 4.2 4.2 |
| | | | | | | | | | | |

| REACH | Anadromous Fish | | | | | | Bulltrout | | Resident Fish | |
|---|------------------|----------------|------------------|----------------|------------------|----------------|--------------------|----------------|--------------------|----------------|
| | Presence | | Spawning | | Rearing | | Presence | Length (Miles) | Species | Length (Miles) |
| | Species | Length (Miles) | Species | Length (Miles) | Species | Length (Miles) | | | | |
| 13 Area: 329.2 Acres Length: 3.8 Miles | Spring Chinook | 3.8 | Spring Chinook | 3.8 | Spring Chinook | 3.8 | Currently Occupied | 3.8 | Bridgelip Sucker | 2.4 |
| | Summer Steelhead | 3.8 | Summer Steelhead | 3.8 | Summer Steelhead | 3.8 | | | Carp | 1.4 |
| | | | | | | | | | Chiselmouth | 3.8 |
| | | | | | | | | | Crappie | 1.4 |
| | | | | | | | | | Largemouth Bass | 1.4 |
| | | | | | | | | | Largescale Sucker | 2.3 |
| | | | | | | | | | Longnose Dace | 2.4 |
| | | | | | | | | | Mountain Whitefish | 3.8 |
| | | | | | | | | | Northern Pike | |
| | | | | | | | | | Minnow | 3.9 |
| | | | | | | | | | Peamouth | 1.4 |
| | | | | | | | | | Rainbow Trout | 3.8 |
| | | | | | | | | | Redside Shiner | 2.4 |
| | | | | | | | | | Sculpin | 3.8 |
| | | | | | | | | | Smallmouth Bass | 1.4 |
| | | | | | | | | | Speckled Dace | 3.8 |
| | | | | | | | | | Yellow Perch | 1.4 |

Table Y7. GAP Analysis of SMP Jurisdiction the Yakima River.

| REACH | GAP Analysis | | | | | |
|--------------------------------|--------------------------|----------|---------------|----------|---------------------|----------|
| | Mammals | | Birds | | Vegetation | |
| | Type | Area (%) | Type | Area (%) | Type | Area (%) |
| 1 Area: 849.5 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 28.9 | Central Arid Steppe | 100.0 |
| 2 Area: 3736.0 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 22.2 | Central Arid Steppe | 100.0 |
| 3 Area: 3405.3 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 4.8 | Central Arid Steppe | 100.0 |
| 4 Area: 374.0 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 36.1 | Central Arid Steppe | 100.0 |
| 5 Area: 2737.8 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 42.8 | Central Arid Steppe | 100.0 |
| 6 Area: 958.5 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 5.0 | Central Arid Steppe | 100.0 |
| | | | | | | |

| REACH | GAP Analysis | | | | | |
|--------------------------------|----------------------------|----------|------------------|----------|---------------------|----------|
| | Mammals | | Birds | | Vegetation | |
| | Type | Area (%) | Type | Area (%) | Type | Area (%) |
| | | | | | | |
| 7 Area: 8089.4 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 52.7 | Central Arid Steppe | 100.0 |
| 8 Area: 329.2 Acres | Black-Tailed Jack Rabbit | 18.9 | Burrowing Owl | 23.6 | Central Arid Steppe | 100.0 |
| | Townsend's Big-Eared Bat | 100.0 | Ferruginous Hawk | 18.9 | | |
| | Townsend's Ground Squirrel | 18.9 | Sage Sparrow | 18.9 | | |
| | | | Sage Thrasher | 18.9 | | |
| 9 Area: 1355.5 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 11.3 | Central Arid Steppe | 100.0 |
| 10 Area: 629.8 Acres | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 6.6 | Central Arid Steppe | 100.0 |
| 11 Area: 435.3 Acres | Black-Tailed Jack Rabbit | 7.7 | Burrowing Owl | 10.5 | Central Arid Steppe | 100.0 |
| | Townsend's Big-Eared Bat | 100.0 | Ferruginous Hawk | 1.6 | | |
| | Townsend's Ground Squirrel | 7.7 | Sage Grouse | 1.6 | | |
| | | | Sage Sparrow | 6.0 | | |
| | | | Sage Thrasher | 7.7 | | |
| 12 | Townsend's Big-Eared Bat | 100.0 | Burrowing Owl | 59.4 | Central Arid Steppe | 100.0 |

| REACH | GAP Analysis | | | | | |
|--------------------------------|--|-----------------------|--|------------------------------|---------------------|----------|
| | Mammals | | Birds | | Vegetation | |
| | Type | Area (%) | Type | Area (%) | Type | Area (%) |
| Area: 853.7 Acres | | | | | | |
| | | | | | | |
| 13 Area: 329.2 Acres | Townsend's Big-Eared Bat Black-Tailed Jack Rabbit Townsend's Ground Squirrel | 100.0 34.6 34.3 | Burrowing Owl Ferruginous Hawk Sage Sparrow Sage Thrasher | 46.8 34.6 12.4 34.6 | Central Arid Steppe | 100.0 |
| 1a Area: 49.1 Acres | Townsend's Big-eared Bat Black-tailed Jack Rabbit | 100.0 0.3 | Burrowing Owl | 0.3 | Central Arid Steppe | 100.0 |
| 1b Area: 49.2 Acres | Townsend's Big-eared Bat Black-tailed Jack Rabbit | 100.0 11.3 | Burrowing Owl | 11.3 | Central Arid Steppe | 100.0 |
| 2a Area: 12.9 Acres | Townsend's Big-eared Bat Black-tailed Jack Rabbit | 100.0 100.0 | Burrowing Owl | 100.0 | Central Arid Steppe | 100.0 |
| 7a Area: 23.1 Acres | Townsend's Big-eared Bat Black-tailed Jack Rabbit | 100.0 100.0 | Burrowing Owl | 100.0 | Central Arid Steppe | 100.0 |
| 12a | Black-tailed Jack Rabbit | 27.7 | Burrowing Owl | 27.7 | Central Arid Steppe | 100.0 |

| REACH | GAP Analysis | | | | | |
|------------------|--------------------------|----------|-------|----------|------------|----------|
| | Mammals | | Birds | | Vegetation | |
| | Type | Area (%) | Type | Area (%) | Type | Area (%) |
| Area: 22.9 Acres | Townsend's Big-eared Bat | 100.0 | | | | |

Table Y8. Land-use Characteristics for the Yakima River

| REACH | Land Use | | Land Use Types on Rapid Runoff Soil | | Impervious Surface | |
|-------------------------|---|-------------|-------------------------------------|----------|--------------------|------------|
| | Type | Area (%) | Type | Area (%) | Range | Area (%) |
| 1 Area: 849.5 Acres | Residential - Single Family | 2.3 | N/A | N/A | 0% | 98.5 |
| | Agriculture - Pasture/Grazing | 3.4 | | | 1-10% | 0.2 |
| | Agriculture - Orchard/Vineyard | 5.7 | | | 11-25% | 0.4 |
| | Agriculture - Row Crops | 18.6 | | | 26-50% | 0.0 |
| | Agriculture - Hay | 13.8 | | | 51-75% | 0.2 |
| | Industrial - Communication | 2.5 | | | 76+% | 0.3 |
| | Industrial - Transportation | 0.5 | | | | |
| | Vacant/Natural Government (School/Work Camp) | 52.7 0.1 | | | | |
| 2 Area: 3736.0 Acres | Agriculture - Pasture/Grazing | 1.7 | N/A | N/A | 0% | 97.5 |
| | Agriculture - Row Crops | 4.1 | | | 1-10% | 2.2 |
| | Agriculture - Hay | 20.7 | | | 11-25% | 0.0 |
| | Industrial - Transportation | 0.3 | | | 26-50% | 0.0 |
| | Vacant/Natural | 73.1 | | | 51-75% 76+% | 0.3 0.0 |
| 3 Area: 3405.3 Acres | Residential - Single Family | 2.3 | Residential - Single Family | 0.4 | 0% | 96.3 |
| | Agriculture - Pasture/Grazing | 10.0 | Agriculture - Pasture/Grazing | 0.3 | 1-10% | 3.5 |
| | Agriculture - Orchard/Vineyard | 0.2 | Agriculture - Row Crops | 0.4 | 11-25% | 0.1 |
| | Agriculture - Row Crops | 2.1 | Agriculture - Hay | 0.1 | 26-50% | 0.0 |
| | Agriculture - Hay | 10.7 | Industrial - Transportation | 0.2 | 51-75% | 0.0 |
| | Industrial - Transportation | 0.2 | Vacant/Natural | 0.4 | 76+% | 0.0 |
| | Vacant/Natural | 74.4 | Residential - Single Family | 0.1 | | |

| REACH | Land Use | | Land Use Types on Rapid Runoff Soil | | Impervious Surface | |
|--------------------------------|----------------------------------|----------|-------------------------------------|----------|--------------------|----------|
| | Type | Area (%) | Type | Area (%) | Range | Area (%) |
| 4 Area: 374.0 Acres | Residential - Single Family | 5.0 | Agriculture - Pasture/Grazing | 0.1 | 0% | 53.6 |
| | Agriculture - Pasture/Grazing | 14.7 | Industrial - Light Manufacturing | 0.2 | 1-10% | 41.8 |
| | Agriculture - Row Crops | 0.1 | Industrial - Transportation | 0.1 | 11-25% | 0.6 |
| | Agriculture - Hay | 37.3 | | | 26-50% | 3.7 |
| | Industrial - Light Manufacturing | 1.0 | | | 51-75% | 0.1 |
| | Industrial - Transportation | 3.3 | | | 76+% | 0.2 |
| | Vacant/Natural | 37.6 | | | | |
| | Government (School/Work Camp) | 1.0 | | | | |
| 5 Area: 2737.8 Acres | Residential - Single Family | 0.7 | Vacant/Natural | 0.1 | 0% | 78.3 |
| | Agriculture - Pasture/Grazing | 24.1 | Industrial - Transportation | 0.2 | 1-10% | 21.1 |
| | Agriculture - Orchard/Vineyard | 0.1 | | | 11-25% | 0.3 |
| | Agriculture - Row Crops | 0.3 | | | 26-50% | 0.0 |
| | Agriculture - Hay | 19.6 | | | 51-75% | 0.1 |
| | Industrial - Light Manufacturing | 0.1 | | | 76+% | 0.2 |
| | Industrial - Transportation | 0.4 | | | | |
| | Vacant/Natural | 54.7 | | | | |
| 6 Area: 958.5 Acres | Residential - Single Family | 0.4 | N/A | N/A | 0% | 92.9 |
| | Agriculture - Pasture/Grazing | 1.9 | | | 1-10% | 0.6 |
| | Agriculture - Hay | 30.9 | | | 11-25% | 0.0 |
| | Industrial - Light Manufacturing | 0.2 | | | 26-50% | 0.1 |
| | Industrial - Transportation | 6.5 | | | 51-75% | 5.8 |
| | Vacant/Natural | 60.0 | | | 76+% | 0.6 |
| | | | | | | |

| REACH | Land Use | | Land Use Types on Rapid Runoff Soil | | Impervious Surface | |
|-------------------------------|----------------------------------|----------|-------------------------------------|----------|--------------------|----------|
| | Type | Area (%) | Type | Area (%) | Range | Area (%) |
| 7 Area: 8089.4 Acres | Residential - Single Family | 3.8 | Vacant/Natural | 0.3 | 0% | 59.7 |
| | Residential - Multi-Family | 6.7 | Industrial - Transportation | 0.3 | 1-10% | 33.0 |
| | Agriculture - Pasture/Grazing | 28.8 | | | 11-25% | 4.0 |
| | Agriculture - Orchard/Vineyard | 3.8 | | | 26-50% | 0.7 |
| | Agriculture - Row Crops | 1.6 | | | 51-75% | 2.1 |
| | Agriculture - Hay | 10.7 | | | 76+% | 0.9 |
| | Industrial - Light Manufacturing | 0.8 | | | | |
| | Industrial - Transportation | 7.8 | | | | |
| | Vacant/Natural | 36.4 | | | | |
| 8 Area: 329.2 Acres | Vacant/Natural | 78.6 | Industrial - Transportation | 0.3 | 0% | 56.2 |
| | Agriculture - Orchard/Vineyard | 3.4 | Vacant/Natural | 0.1 | 1-10% | 17.3 |
| | Industrial - Transportation | 18.1 | | | 11-25% | 26.2 |
| | | | | | 26-50% | 0.3 |
| | | | | | 51-75% | 0.0 |
| 9 Area: 1355.5 Acres | | | | | 76+% | 0.0 |
| | Residential - Single Family | 4.9 | N/A | N/A | 0% | 76.0 |
| | Residential - Multi-Family | 0.2 | | | 1-10% | 15.6 |
| | Residential - Other | 0.6 | | | 11-25% | 0.6 |
| | Agriculture - Pasture/Grazing | 4.1 | | | 26-50% | 5.7 |
| | Agriculture - Row Crops | 0.8 | | | 51-75% | 0.6 |
| | Mining (Gravel Pits) | 6.1 | | | 76+% | 1.4 |
| | Commercial - Retail | 0.5 | | | | |
| | Commercial - Wholesale/Warehouse | 0.1 | | | | |
| | Industrial - Light Manufacturing | 0.7 | | | | |
| | Industrial - Communication | 0.2 | | | | |
| | Industrial - Transportation | 6.3 | | | | |
| | Vacant/Natural | 75.2 | | | | |
| Government (School/Work Camp) | 0.5 | | | | | |
| | | | | | | |

| REACH | Land Use | | Land Use Types on Rapid Runoff Soil | | Impervious Surface | |
|--------------------------------|----------------------------------|----------|-------------------------------------|----------|--------------------|----------|
| | Type | Area (%) | Type | Area (%) | Range | Area (%) |
| 10 Area: 629.8 Acres | Residential - Single Family | 4.6 | N/A | N/A | 0% | 95.9 |
| | Residential - Other | 0.6 | | | 1-10% | 13.5 |
| | Recreation - Parks | 6.0 | | | 11-25% | 2.4 |
| | Commercial - Retail | 3.2 | | | 26-50% | 3.8 |
| | Commercial - Wholesale/Warehouse | 0.8 | | | 51-75% | 2.8 |
| | Commercial - Lodging | 0.7 | | | 76+% | 4.4 |
| | Industrial - Light Manufacturing | 0.2 | | | | |
| | Industrial - Heavy Manufacturing | 0.7 | | | | |
| | Industrial - Communication | 0.1 | | | | |
| | Industrial - Transportation | 7.1 | | | | |
| | Vacant/Natural | 75.8 | | | | |
| Government (School/Work Camp) | 0.2 | | | | | |
| 11 Area: 435.3 Acres | Residential - Single Family | 1.8 | Residential - Single Family | 0.6 | 0% | 58.1 |
| | Agriculture - Pasture/Grazing | 1.3 | Recreation - Parks | 0.3 | 1-10% | 11.2 |
| | Recreation - Golf Courses | 3.8 | Industrial - Transportation | 5.3 | 11-25% | 4.1 |
| | Recreation - Parks | 2.2 | Vacant/Natural | 3.8 | 26-50% | 11.4 |
| | Industrial - Transportation | 20.9 | | | 51-75% | 6.4 |
| | Vacant/Natural | 70.1 | | | 76+% | 8.9 |
| 12 Area: 853.7 Acres | Residential - Single Family | 5.9 | N/A | N/A | 0% | 69.1 |
| | Agriculture - Pasture/Grazing | 31.8 | | | 1-10% | 26.2 |
| | Agriculture - Hay | 0.4 | | | 11-25% | 3.1 |
| | Mining (Gravel Pits) | 21.6 | | | 26-50% | 0.2 |
| | Recreation - Golf Courses | 0.8 | | | 51-75% | 0.0 |
| | Industrial - Transportation | 1.8 | | | 76+% | 1.4 |
| | Vacant/Natural | 25.1 | | | | |
| | Government (School/Work Camp) | 12.5 | | | | |
| | | | | | | |

| REACH | Land Use | | Land Use Types on Rapid Runoff Soil | | Impervious Surface | |
|--------------------------------|-------------------------------|----------|-------------------------------------|----------|--------------------|----------|
| | Type | Area (%) | Type | Area (%) | Range | Area (%) |
| 13 Area: 329.2 Acres | Residential - Single Family | 5.5 | Vacant/Natural | 7.9 | 0% | 71.9 |
| | Agriculture - Pasture/Grazing | 6.6 | | | 1-10% | 21.5 |
| | Agriculture - Hay | 0.2 | | | 11-25% | 5.4 |
| | Industrial - Transportation | 14.5 | | | 26-50% | 0.2 |
| | Vacant/Natural | 72.2 | | | 51-75% | 0.0 |
| | | | | | 76+% | 0.0 |
| 1a Area: 49.1 Acres | Vacant/Natural | 100.0 | N/A | N/A | 0% | 99.4 |
| | | | | | 1-10% | 0.0 |
| | | | | | 11-25% | 0.0 |
| | | | | | 26-50% | 0.0 |
| | | | | | 51-75% | 0.0 |
| | | | | | 76+% | 0.6 |
| 1b Area: 49.2 Acres | Vacant/Natural | 100.0 | N/A | N/A | 0% | 100.0 |
| | | | | | 1-10% | 0.0 |
| | | | | | 11-25% | 0.0 |
| | | | | | 26-50% | 0.0 |
| | | | | | 51-75% | 0.0 |
| | | | | | 76+% | 0.0 |
| 2a Area: 12.9 Acres | Residential - Single Family | 12.6 | N/A | N/A | 0% | 87.7 |
| | Agriculture - Pasture/Grazing | 0.1 | | | 1-10% | 12.3 |
| | Agriculture - Hay | 5.0 | | | 11-25% | 0.0 |
| | Vacant/Natural | 82.3 | | | 26-50% | 0.0 |
| | | | | | 51-75% | 0.0 |
| | | | | | 76+% | 0.0 |
| 7a Area: 23.1 Acres | Residential - Single Family | 31.2 | N/A | N/A | 0% | 13.4 |
| | Agriculture - Pasture/Grazing | 1.6 | | | 1-10% | 71.1 |
| | Industrial - Transportation | 9.8 | | | 11-25% | 2.8 |
| | Vacant/Natural | 54.9 | | | 26-50% | 0.4 |
| | Government | 2.5 | | | 51-75% | 0.0 |
| | | | | | 76+% | 0.0 |
| | | | | | | |

| REACH | Land Use | | Land Use Types on Rapid Runoff Soil | | Impervious Surface | |
|--------------------------------|-------------------------------|----------|-------------------------------------|----------|--------------------|----------|
| | Type | Area (%) | Type | Area (%) | Range | Area (%) |
| 12a Area: 22.9 Acres | Residential - Single Family | 13.0 | N/A | N/A | 0% | 0.9 |
| | Agriculture - Pasture/Grazing | 0.4 | | | 1-10% | 52.5 |
| | Industrial - Transportation | 34.1 | | | 11-25% | 0.0 |
| | Government | 52.5 | | | 26-50% | 12.5 |
| | | | | | 51-75% | 0.0 |
| | | | 76+% | 34.1 | | |

Table Y9. Cultural Jurisdiction Characteristics for the Yakima River.

| REACH | Zoning | | Public Land Ownership | | Environmental Designation (1981) | |
|--------------------------------|--------------------------|----------|---|--------------------|----------------------------------|----------------------|
| | Type | Area (%) | Owner | Area (%) | Designation | Area (%) |
| 1 Area: 849.5 Acres | Agriculture | 88.0 | WA Dept. of Fish and Wildlife Yakima County | 12.2 0.1 | Conservancy Rural | 10.1 89.5 |
| | Light Industrial | 6.4 | | | | |
| | Remote/Extremely Limited | 4.1 | | | | |
| | Valley Rural | 1.1 | | | | |
| 2 Area: 3736.0 Acres | Agriculture | 6.2 | WA Dept. of Fish and Wildlife Yakama Nation | 57.5 36.2 | Conservancy Rural | 79.6 20.4 |
| | Industrial | 0.1 | | | | |
| | Remote/Extremely Limited | 60.3 | | | | |
| | Tribal | 33.5 | | | | |
| 3 Area: 3405.3 Acres | Agriculture | 12.1 | WA Dept. of Fish and Wildlife Yakama Nation Yakima County | 1.2 69.8 0.1 | Conservancy Rural | 90.2 9.8 |
| | Light Industrial | 0.2 | | | | |
| | Remote/Extremely Limited | 8.7 | | | | |
| | Tribal | 78.4 | | | | |
| | Valley Rural | 0.5 | | | | |
| 4 Area: 374.0 Acres | Light Industrial | 13.9 | WA Dept. of Fish and Wildlife Yakama Nation | 0.1 66.8 | Conservancy Rural Urban | 21.3 66.8 11.9 |
| | Remote/Extremely Limited | 7.3 | | | | |
| | Tribal | 78.8 | | | | |
| 5 Area: 2737.8 Acres | Agriculture | 13.6 | WA Dept. of Fish and Wildlife Yakama Nation | 0.6 83.5 | Conservancy Rural Urban | 9.3 90.5 0.3 |
| | Highway Commercial | 0.0 | | | | |
| | Light Industrial | 0.3 | | | | |
| | Remote/Extremely Limited | 2.7 | | | | |
| | Tribal | 80.0 | | | | |
| | Valley Rural | 3.3 | | | | |

| REACH | Zoning | | Public Land Ownership | | Environmental Designation (1981) | |
|--------------------------------|-----------------------------------|----------|-------------------------------|----------|----------------------------------|----------|
| | Type | Area (%) | Owner | Area (%) | Designation | Area (%) |
| 6 Area: 958.5 Acres | Industrial | 0.0 | WA Dept. of Fish and Wildlife | 3.2 | Rural | 100.0 |
| | Light Industrial | 0.5 | Yakama Nation | 70.6 | | |
| | Remote/Extremely Limited | 16.1 | | | | |
| | Tribal | 82.0 | | | | |
| | Valley Rural | 0.4 | | | | |
| 7 Area: 8089.4 Acres | Agriculture | 8.9 | Blank | 0.7 | Conservancy | 1.4 |
| | Industrial | 0.3 | WA Dept. of Fish and Wildlife | 15.8 | Rural | 98.6 |
| | Light Industrial | 0.2 | WA Dept. of Transportation | 0.1 | | |
| | Single Family Residential | 0.5 | Yakama Nation | 70.3 | | |
| | Remote/Extremely Limited | 23.8 | Yakima County | 0.5 | | |
| | Rural Settlement | 0.0 | | | | |
| | Tribal | 64.4 | | | | |
| | Valley Rural | 1.8 | | | | |
| 8 Area: 329.2 Acres | Agriculture | 5.3 | WA Dept. of Fish and Wildlife | 39.0 | Conservancy | 91.6 |
| | Mining | 0.7 | Yakama Nation | 46.7 | Rural | 8.4 |
| | Remote/Extremely Limited | 66.2 | Yakima County | 0.4 | | |
| | Suburban Residential | 7.7 | | | | |
| | Tribal | 20.0 | | | | |
| 9 Area: 1355.5 Acres | Agriculture | 6.9 | WA Dept. of Transportation | 8.4 | Conservancy | 83.7 |
| | Current Business District Support | 0.2 | Yakima County | 0.5 | Rural | 16.3 |
| | Light Industrial | 18.6 | | | | |
| | Mining | 4.5 | | | | |
| | Remote/Extremely Limited | 42.0 | | | | |
| | Suburban Residential | 27.5 | | | | |
| | Valley Rural | 0.4 | | | | |

| REACH | Zoning | | Public Land Ownership | | Environmental Designation (1981) | |
|---|---|--|--|----------------------------------|----------------------------------|----------------------|
| | Type | Area (%) | Owner | Area (%) | Designation | Area (%) |
| <p>10</p> <p>Area: 629.8 Acres</p> | Current Business District Support Light Industrial Suburban Residential | 1.6 27.5 71.0 | Blank Irrigation Districts Other State Agencies WA Dept. of Transportation Yakima County | 0.3 0.1 20.6 8.3 7.6 | Conservancy Rural Urban | 31.0 27.3 41.8 |
| <p>11</p> <p>Area: 435.3 Acres</p> | Light Industrial Mining Remote/Extremely Limited Suburban Residential | 38.1 0.6 38.1 23.2 | WA Dept. of Fish and Wildlife WA Dept. of Transportation Yakima County | 5.5 2.1 10.8 | Conservancy Rural Urban | 7.7 91.0 1.3 |
| <p>12</p> <p>Area: 853.7 Acres</p> | Agriculture Light Industrial Mining Remote/Extremely Limited Rural Transitional Valley Rural | 7.2 0.9 23.9 67.2 0.3 0.5 | Yakima County | 0.0 | Conservancy Rural | 1.8 98.2 |
| <p>13</p> <p>Area: 329.2 Acres</p> | Remote/Extremely Limited | 98.9 | Irrigation Districts US Bureau of Land Management WA Dept. of Fish and Wildlife WA Dept. of Natural Resources | 5.2 25.3 17.7 0.8 | Conservancy | 98.9 |

| REACH | Zoning | | Public Land Ownership | | Environmental Designation (1981) | |
|-------------------------------|---|---------------------|-------------------------------|----------|----------------------------------|----------|
| | Type | Area (%) | Owner | Area (%) | Designation | Area (%) |
| 1a Area: 49.1 Acres | Remote/Extremely Limited | 100.0 | WA Dept. of Fish and Wildlife | 100.0 | Conservancy | 100.0 |
| 1b Area: 49.2 Acres | Remote/Extremely Limited | 100.0 | WA Dept. of Fish and Wildlife | 100.0 | Conservancy | 100.0 |
| 2a Area: 12.9 Acres | Rural Transitional Agriculture | 99.9 0.1 | N/A | N/A | Conservancy | 100.0 |
| 7a Area: 23.1 Acres | Valley Rural Rural Settlement Agriculture | 78.1 21.9 0.0 | WA Dept. of Fish and Wildlife | 26.2 | Rural | 100.0 |

| REACH | Zoning | | Public Land Ownership | | Environmental Designation (1981) | |
|------------------------------------|---------------------|-------------|----------------------------|----------|----------------------------------|----------|
| | Type | Area (%) | Owner | Area (%) | Designation | Area (%) |
| 12a Area: 22.9 Acres | Valley Rural Mining | 99.6 0.4 | WA Dept. of Transportation | 52.5 | Rural | 100.0 |

Table Y10. Transportation Characteristics for the Yakima River.

| REACH | Length of Revetments | | Total Road Length (Miles) | Length of Railroads | | Bridge Crossing (#) |
|------------------------------------|----------------------|----------------|---------------------------|---------------------|-------------------|---------------------|
| | Type | Length (Miles) | | Active (Miles) | Abandoned (Miles) | |
| 1 Length: 6.9 Miles | N/A | 0.0 | 0.4 | 0.0 | 0.0 | 1 |
| 2 Length: 13.2 Miles | N/A | 0.0 | 1.3 | 0.0 | 0.0 | 1 |
| 3 Length: 11.0 Miles | N/A | 0.2 | 1.0 | 0.0 | 1.0 | 0 |
| 4 Length: 1.4 Miles | N/A | 0.0 | 1.2 | 0.0 | 0.0 | 1 |

| REACH | Length of Revetments | | Total Road Length (Miles) | Length of Railroads | | Bridge Crossing (#) |
|--------------------------------|------------------------|-------------------|---------------------------|---------------------|-------------------|---------------------|
| | Type | Length (Miles) | | Active (Miles) | Abandoned (Miles) | |
| 5 Length: 6.2 Miles | Dike | 0.7 | 1.3 | 1.3 | 0.6 | 0 |
| 6 Length: 2.3 Miles | N/A | 1.7 | 4.1 | 0.2 | 0.2 | 2 |
| 7 Length: 15.1 Miles | Dike N/A | 6.1 12.3 | 37.3 | 0.4 | 4.5 | 15 |
| 8 Length: 1.8 Miles | Road | 0.3 | 3.4 | 1.3 | 0.5 | 3 |
| 9 Length: 4.3 Miles | Dike Road | 2.9 2.2 | 6.1 | 0.0 | 0.0 | 0 |
| 10 Length: 3.2 Miles | Bridge Dike Road | 0.2 5.6 0.7 | 1.5 | 0.5 | 0.0 | 1 |
| 11 Length: 3.3 Miles | Bridge Dike Road | 1.0 0.8 1.4 | 6.5 | 0.9 | 0.0 | 4 |
| | | | | | | |

| REACH | Length of Revetments | | Total Road Length (Miles) | Length of Railroads | | Bridge Crossing (#) |
|--------------------------------|------------------------|-------------------|---------------------------|---------------------|-------------------|---------------------|
| | Type | Length (Miles) | | Active (Miles) | Abandoned (Miles) | |
| 12 Length: 4.2 Miles | Bridge Dike Road | 0.4 2.1 0.6 | 1.0 | 0.5 | 0.0 | 1 |
| 13 Length: 3.8 Miles | N/A | 0.0 | 0.2 | 2.6 | 0.0 | 0 |
| 1a Length: N/A | N/A | N/A | 0.0 | 0.0 | 0.0 | 0 |
| 1b Length: N/A | N/A | N/A | 0.0 | 0.0 | 0.0 | 0 |
| 2a Length: N/A | N/A | N/A | 0.0 | 0.0 | 0.0 | 0 |
| 7a Length: N/A | N/A | N/A | 0.0 | 0.0 | 0.0 | 0 |
| 12a Length: N/A | N/A | N/A | 0.7 | 0.0 | 0.0 | 0 |

Table Y11. Yakima Cultural Analysis of SMP Jurisdiction

| REACH | Leaking Storage Tanks (#) | Storage Tanks in Permeable Soil (#) | Dairies with High Runoff Hazard (#) | Floodgates (#) | Wellhead Area of Influence Area (%) | Boat Launches (#) | Campsites (#) | Known Cultural Sites (#) | DOE Sites/facilities and 303(d)-Stream Listings | |
|---|---------------------------|-------------------------------------|-------------------------------------|----------------|-------------------------------------|-------------------|---------------|--------------------------|---|----------------|
| | | | | | | | | | Sites/facilities (#) | Stream (Miles) |
| 1 Area: 849.5 Acres Length: 6.9 Miles | 0 | 0 | 0 | 0 | 0 | 0 | NO DATA | 0 | 2 | 1.2 |
| 2 Area: 3736.0 Acres Length: 13.2 Miles | 0 | 0 | 0 | 0 | 0 | 3 | NO DATA | 2 | 1 | 2.2 |
| 3 Area: 3405.3 Acres Length: 11.0 Miles | 0 | 0 | 0 | 0 | 0 | 0 | NO DATA | 2 | 0 | 0 |
| 4 Area: 374.0 Acres Length: 1.4 Miles | 0 | 0 | 0 | 0 | 0 | 0 | NO DATA | 0 | 2 | 1.2 |
| 5 Area: 2737.8 Acres Length: 6.2 Miles | 0 | 0 | 0 | 0 | 0 | 0 | NO DATA | 0 | 3 | 0 |
| | | | | | | | | | | |

| REACH | Leaking Storage Tanks (#) | Storage Tanks in Permeable Soil (#) | Dairies with High Runoff Hazard (#) | Floodgates (#) | Wellhead Area of Influence Area (%) | Boat Launches (#) | Campsites (#) | Known Cultural Sites (#) | DOE Sites/facilities and 303(d)-Stream Listings | |
|--|---------------------------|-------------------------------------|-------------------------------------|----------------|-------------------------------------|-------------------|---------------|--------------------------|---|----------------|
| | | | | | | | | | Sites/facilities (#) | Stream (Miles) |
| 6 Area: 958.5 Acres Length: 2.3 Miles | 0 | 0 | 0 | 0 | 0 | 0 | NO DATA | 0 | 4 | 0 |
| 7 Area: 8089.4 Acres Length: 15.1 Miles | 0 | 0 | 0 | 0 | 0 | 2 | NO DATA | 5 | 3 | 2.7 |
| 8 Area: 329.2 Acres Length: 1.8 Miles | 0 | 0 | 0 | 0 | 0 | 1 | NO DATA | 0 | 2 | 1 |
| 9 Area: 1355.5 Acres Length: 4.3 Miles | 0 | 0 | 0 | 0 | 0 | 0 | NO DATA | 1 | 2 | 2.4 |
| 10 Area: 629.8 Acres Length: 3.2 Miles | 0 | 0 | 0 | 13 | 0 | 0 | NO DATA | 0 | 4 | 0 |

| REACH | Leaking Storage Tanks (#) | Storage Tanks in Permeable Soil (#) | Dairies with High Runoff Hazard (#) | Floodgates (#) | Wellhead Area of Influence Area (%) | Boat Launches (#) | Campsites (#) | Known Cultural Sites (#) | DOE Sites/facilities and 303(d)-Stream Listings | |
|---|---------------------------|-------------------------------------|-------------------------------------|----------------|-------------------------------------|-------------------|---------------|--------------------------|---|----------------|
| | | | | | | | | | Sites/facilities (#) | Stream (Miles) |
| 11 Area: 435.3 Acres Length: 3.3 Miles | 0 | 0 | 0 | 4 | 0 | 1 | NO DATA | 0 | 1 | 0.1 |
| 12 Area: 853.7 Acres Length: 4.2 Miles | 0 | 0 | 0 | 0 | 0 | 0 | NO DATA | 0 | 0 | 0 |
| 13 Area: 329.2 Acres Length: 3.8 Miles | 0 | 0 | 0 | 0 | 0 | 0 | NO DATA | 0 | 0 | 0 |