Natural Resources Baseline Report

King City URA 6D Concept Plan
King City, Oregon



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SCJ ALLIANCE
CONSULTING SERVICES

Final Natural Resources Baseline Report

Project Information

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1. EXECUTIVE SUMMARY

This report provides a planning level assessment and description of natural resources in the King City Urban Reserve Area (URA) 6D study area. GOAL 5 resources discussed include: Riparian corridors; Wetlands; Wildlife Habitat; Groundwater Resources; Designated Natural Areas, and Trails. The following other GOAL 5 resources do not occur in the King City Urban Reserve Area (URA), and therefore are not discussed in the report: Oregon Scenic Waterways and Federal Wild and Scenic Rivers.

King City is in Washington County, covering about 460 acres in the southwest greater Portland metropolitan area at the edge of the regional Urban Growth Boundary (Figure 1). The City is northwest of Highway 99; north of the Tualatin River and south of Bull Mountain. Sanitary and stormwater services are provided by regional Clean Water Services (https://www.cleanwaterservices.org/), and water is provided by the City of Tigard which has a new water source completed in the City of Lake Oswego – the Tigard Water Partnership Project. The Clean Water Services Durham Sewage Treatment Plant that serves King City is in Tigard, about 2 to 3 miles to the east of the URA.

This report is intended to provide project planners with a hydrological and ecological baseline description of the King City URA. The information gathered is based only on paper research – a compilation of information already documented, but organized to provide context and to support an informed decision-making and planning process for the City. No field work has been conducted.

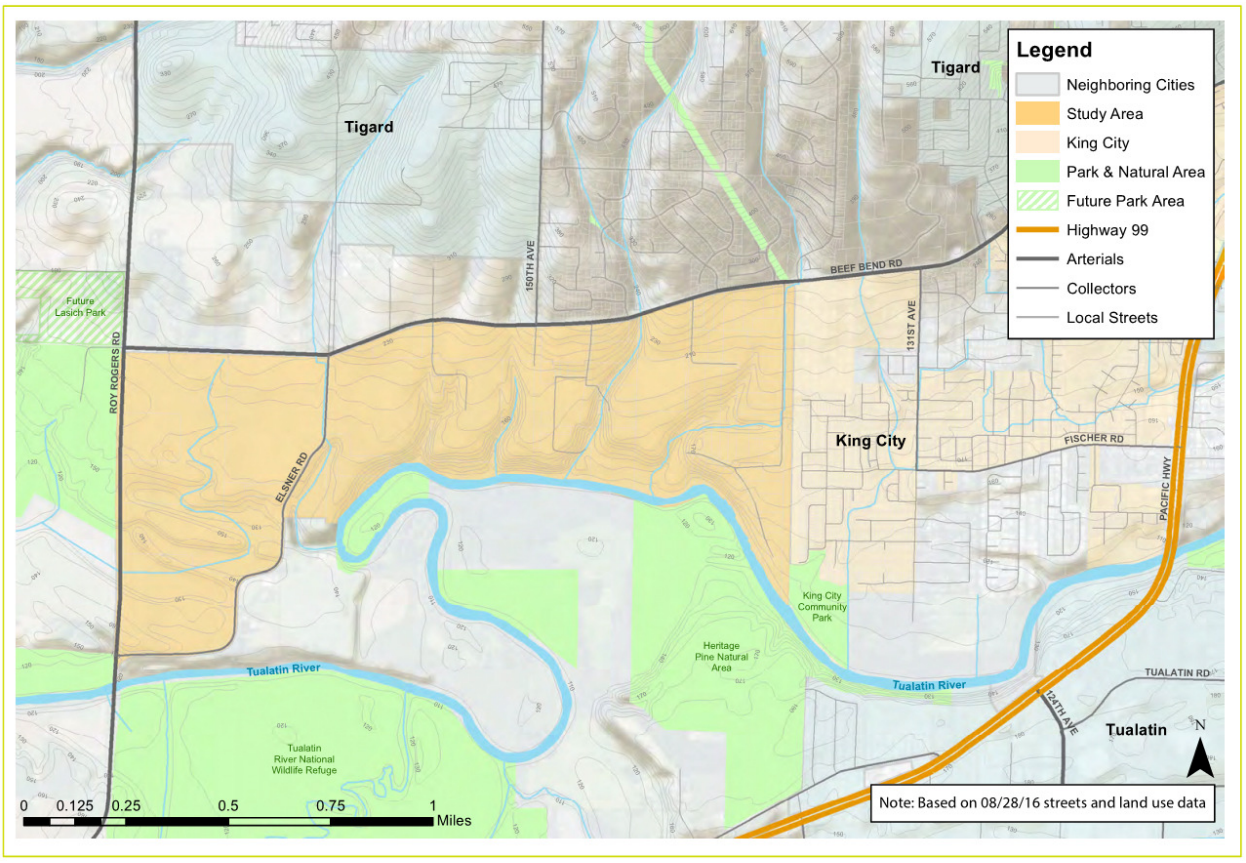

Figure 1. King City URA Study Area with Topography

The proposed King City URA (528 acres total, assumed to be about 460 acres of developable area) is directly adjacent and west of the existing King City limits, along the northern bank of the Tualatin River. It is bounded to the north by SW Beef Bend Road and by SW Roy Rogers Road to the west. The URA includes several north-to-south trending drainage ravines as well as some floodplain areas which create unique challenges for road building and development. Current land use in the URA area is dominantly agriculture with associated rural homesteads, but may include a few single-family homes unassociated with farming.

As noted, the Tualatin River forms the southern boundary of the URA, and is a key natural resource feature within the study area. The section adjacent to King City meanders and is a comparatively slow river, so does not provide ideal anadromous fish habitat, but according to local information, certain sections of the Tualatin River support a range of fish, including Coho salmon, cutthroat trout, squawfish, catfish, largemouth and smallmouth bass. The riverbank and stream corridors create opportunities for interconnected walking trails and wildlife habitat corridors within the City.

2. KING CITY URA PROJECT INTRODUCTION & BACKGROUND

2.1 NATURAL RESOURCES OVERVIEW

This report provides a description of natural features and conditions in the King City URA (Figure 2, Vicinity Map) that have potential to affect natural resource management, as well as planning and design for infrastructure and land use. This is a summary report, and intended to provide a general context of existing natural resource conditions in the URA west of King City.

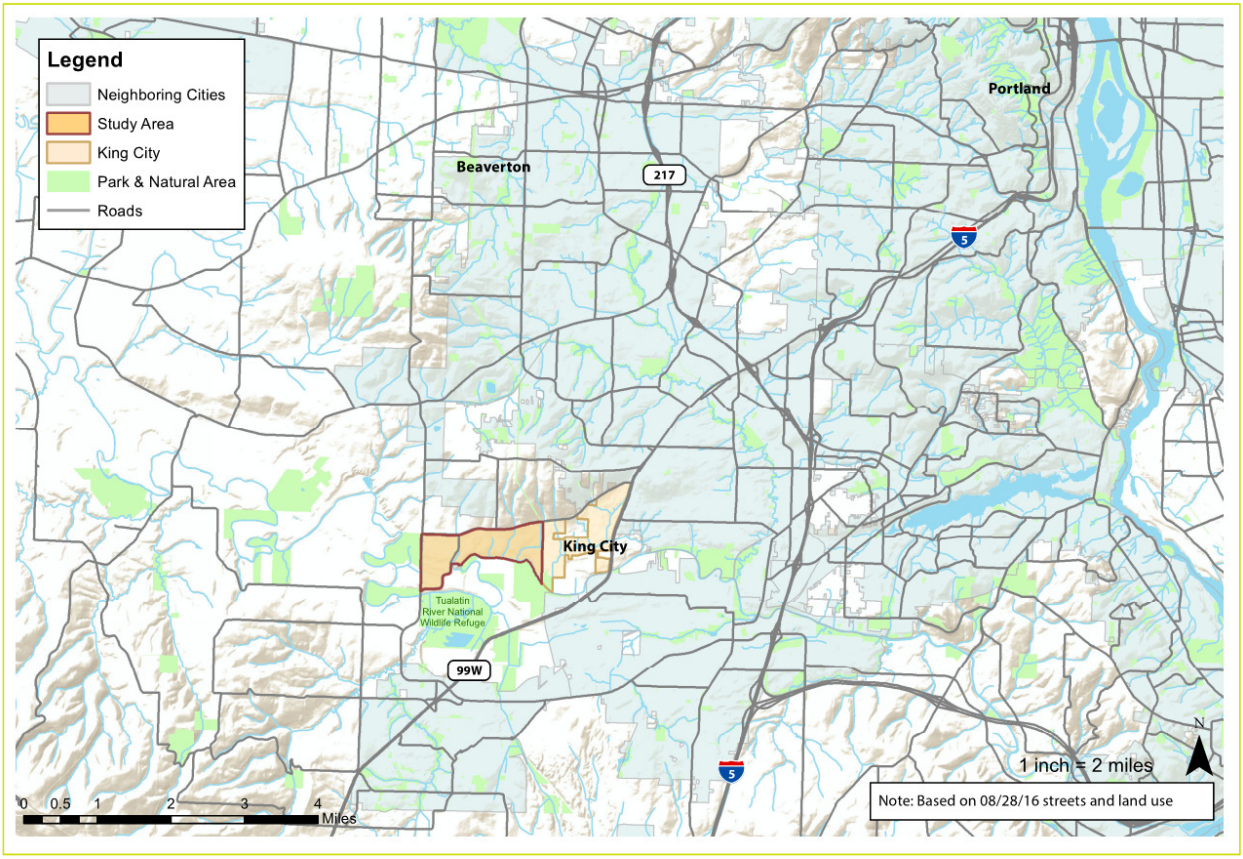

Figure 2. King City Vicinity Map

The existing incorporated area of King City includes about 460 acres and is situated in the Tualatin River Watershed at the southwestern edge of the Portland metropolitan area. Surface terrain in the area starts to transition from broad, flat alluvial valley floors of the Willamette Valley Ecoregion to the basalt foothills of the Coast Range Ecoregion. It is bordered to the south by the Tualatin River; to the north by SW Beef Bend Road, to the east by Highway 99W, and to the west by SW 137th Avenue.

The target URA is west of the current King City limits, along the north bank of the Tualatin River. It is bounded to the north by SW Beef Bend Road, and to the west by SW Roy Rogers Road. For purposes of this report, the URA has been split into two sub-areas, based on development potential and limitations (Figure 3).

2.1.1 Sub-Area Overview

The **Northeast URA sub-area** lies between SW Beef Bend Road and the river, bounded to the west by SW Elsner Road and to the east by 137th Avenue (Figure 3). This area has broad, relatively flat farm fields across the upper surface of the terraces, and four north-to-south draining stream ravines which become increasingly deep as they progress toward the Tualatin River.

The **West URA sub-area** lies between SW Elsner Road and SW Roy Rogers Road (Figure 3). This area is bisected by a west to east floodway / wetland swale about 2,000 feet south of Beef Bend Road. The floodway is crossed by an 800-foot bridge on Roy Rogers Road along the western URA boundary. The area from the southern edge of the floodway extending to Elsner Road is a farm, but includes a couple of single family homes that may not be associated with the farm. The area north of the floodway is a commercial plant nursery and a farm.

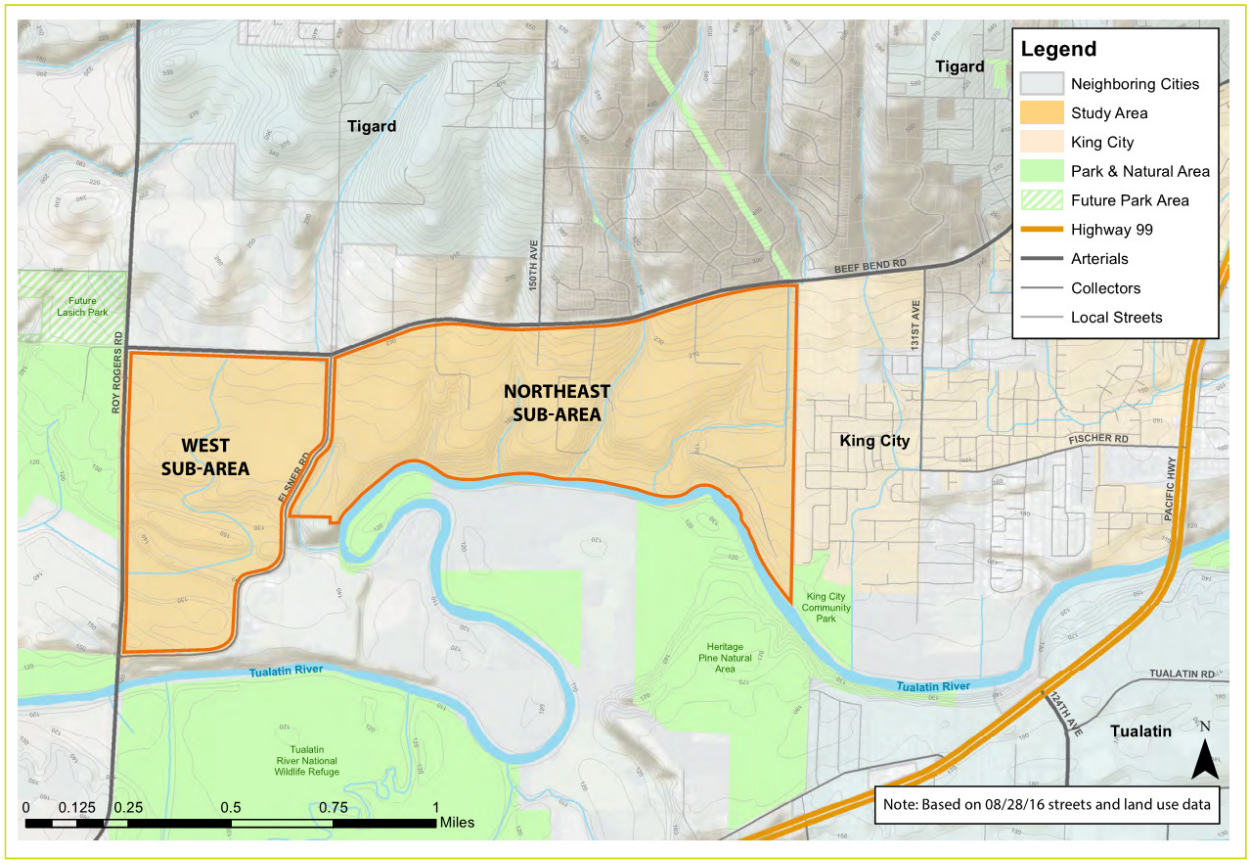

Figure 3. King City URA Sub-areas

2.1.2 GOAL 5 Guidelines

Under Oregon State GOAL 5 guidelines (OAR 660-015-0000[5]), local governments are encouraged to adopt programs designed to protect natural resources, as well as to conserve scenic and historic areas and open space. Local governments and state agencies are also encouraged to maintain current inventories for Historic Resources, Open Spaces and Scenic Views and Sites. The intent of this report is to provide information to King City about local Natural Resources to help carry out certain aspects of the King City URA planning process.

Goal 5 (adopted in 1982 and updated in 1996) provides a five-step planning process:

1. Inventory local occurrences of resources listed in Goal 5, and decide which ones are important.
2. Identify potential land uses on or near each resource site and any conflicts that might result.
3. Analyze economic, social, environmental, and energy (ESEE) consequences of such conflicts.
4. Decide whether the resource should be fully or partially protected, and justify the decision.
5. Adopt measures such as zoning to put that policy into effect

Under GOAL 5 guidance, the following resources are to be inventoried:

a. Riparian corridors, including water and riparian areas and fish habitat;
b. Wetlands;
c. Wildlife Habitat;
d. Federal Wild and Scenic Rivers;
e. State Scenic Waterways;
f. Groundwater Resources;
g. Approved Oregon Recreation Trails;
h. Natural Areas;
i. Wilderness Areas;
j. Mineral and Aggregate Resources;
k. Energy Sources;
l. Cultural Areas.

In addition, local governments and state agencies are encouraged to maintain current inventories of the following resources:

a. Historic Resources;
b. Open Space;
c. Scenic Views and Sites.

GUIDELINES FOR GOAL 5

See http://www.oregon.gov/LCD/docs/goals/goal5.pdf for more detailed information about guidelines for implementing Goal 5.

A. PLANNING

1. *The need for open space in the planning area should be determined, and standards developed for the amount, distribution, and type of open space.*

2. *Criteria should be developed and utilized to determine what uses are consistent with open space values and to evaluate the effect of converting open space lands to inconsistent uses. The maintenance and development of open space in urban areas should be encouraged.*

3. *Natural resources and required sites for the generation of energy (i.e. natural gas, oil, coal, hydro, geothermal, uranium, solar and others) should be conserved and protected; reservoir sites should be identified and protected against irreversible loss.*
4. *Plans providing for open space, scenic and historic areas and natural resources should consider as a major determinant the carrying capacity of the air, land and water resources of the planning area. The land conservation and development actions provided for by such plans should not exceed the carrying capacity of such resources.*
5. *The National Register of Historic Places and the recommendations of the State Advisory Committee on Historic Preservation should be utilized in designating historic sites.*
6. *In conjunction with the inventory of mineral and aggregate resources, sites for removal and processing of such resources should be identified and protected.*
7. *As a general rule, plans should prohibit outdoor advertising signs except in commercial or industrial zones. Plans should not provide for the reclassification of land for the purpose of accommodating an outdoor advertising sign. The term "outdoor advertising sign" has the meaning set forth in ORS 377.710(23).*

3. METHODS

3.1 RESOURCE INFORMATION AND MAPPING RESOURCES REVIEWED

A synopsis of the resource information and mapping resources consulting in the preparation of this report is presented in this section. Additional materials listed in References section.

- Oregon Department of Land Conservation and Development GOAL 5 regulations (OAR 660-015-0000(5) and guidelines were reviewed to ensure that this report provided adequate discussion on GOAL 5 resource assessment requirements. http://www.oregon.gov/LCD/docs/goals/goal5.pdf
- Oregon Dept. of Fish & Wildlife (http://www.dfw.state.or.us/) Oregon Plan for Salmon & Watersheds (http://www.oregon.gov/OPSW/pages/index.aspx)
- GIS mapping layers provided by project engineers
- City of King City website (http://www.ci.king-city.or.us/) for additional information on regulations, parks, and related plans.
- Clean Water Services, which provides for regional sewer and stormwater system management and infrastructure (http://www.cleanwaterservices.org/about-us/)
- The Oregon State Department of Environmental Quality, Drinking Water Program, which provides information on the King City water supply system, served through the City of Tigard: (http://www.tigard-or.gov/city_hall/departments/PublicWorks/Water/water_quality_report.pdf)
- The Tualatin River Water Shed Council website provides several resource maps as well as excellent description of the Tualatin Basin watershed (http://trwc.org/tualatin-basin-information/)
- Washington County NRCS Soil Survey (online version: WEB Soil Survey)[1] (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)
- National Wetland Inventory Mapper (http://www.fws.gov/wetlands/data/mapper.HTML)
- Google Earth historic timeline aerial photos of the project areas

[1] SOIL SURVEY OF WASHINGTON COUNTY, OREGON By George L. Green, Soil Conservation Service Fieldwork by George E. Otte, Duane K. Setness, Richard T. Smythe, and Calvin T. High, Soil Conservation Service United States Department of Agriculture, Soil Conservation Service, in cooperation with the Oregon Agricultural Experiment Station, 1982

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4. FINDINGS

4.1 GOAL 5 SUMMARY

Oregon State GOAL 5 guidelines (OAR 660-015-0000[5]) encourage local governments to adopt natural resource protection programs and to conserve scenic and historic areas and open space. The following Resources are to be inventoried under GOAL 5 guidelines: Riparian corridors; Wetlands; Wildlife Habitat; Federal Wild and Scenic Rivers; State Scenic Waterways; Groundwater Resources; Approved Oregon Recreation Trails; Natural Areas; Wilderness Areas; Mineral and Aggregate Resources; Energy sources; Cultural areas.

4.1.1 GOAL 5 Existing Resources

The following GOAL 5 Resources **do exist** in or near the King City URA planning area, and will be characterized in the report below:

- Riparian corridors;
- Wetlands;
- Wildlife Habitat;
- Groundwater Resources;
- Natural Areas;
- Oregon Recreation Trails;
- Mineral and Aggregate Resources;
- Cultural areas.

4.1.2 GOAL 5 Non-Existing Resources

The following GOAL 5 Resources **do not exist or are not currently designated** in the King City URA planning Area, and therefore, are not discussed below:

- **Oregon Scenic Waterways and Federal Wild and Scenic Rivers**: No local rivers are designated as wild and/or scenic in the King City area.
- **Wilderness Areas**: No wilderness areas are located near King City; they occur in the Cascade Range (about 80 miles east) and along the Oregon Coastline (about 40 miles west).
- **Energy Sources**: This is predominantly focused on large-scale wind, geothermal or water energy facilities, although may also control issues along powerline transmission corridors. No new energy facility sites are located in or near King City.

4.2 PLANNING AREAS: KING CITY URBAN RESERVE AREA & VICINITY

King City is situated in the greater Tualatin River Drainage Basin, which forms the foundation for surface and subsurface hydrologic systems in and around the King City URA. The basin headwaters emanate from the Coast Range foothills, dominated by a basalt bedrock foundation. Lower elevation portions of the basin east of the foothills flow through Willamette Valley floodplains, eventually flowing into the Willamette River. King City is situated at the transition between the Middle Tualatin Sub-watershed Basin and the Lower Tualatin Sub-watershed Basin as illustrated in Figure 4.

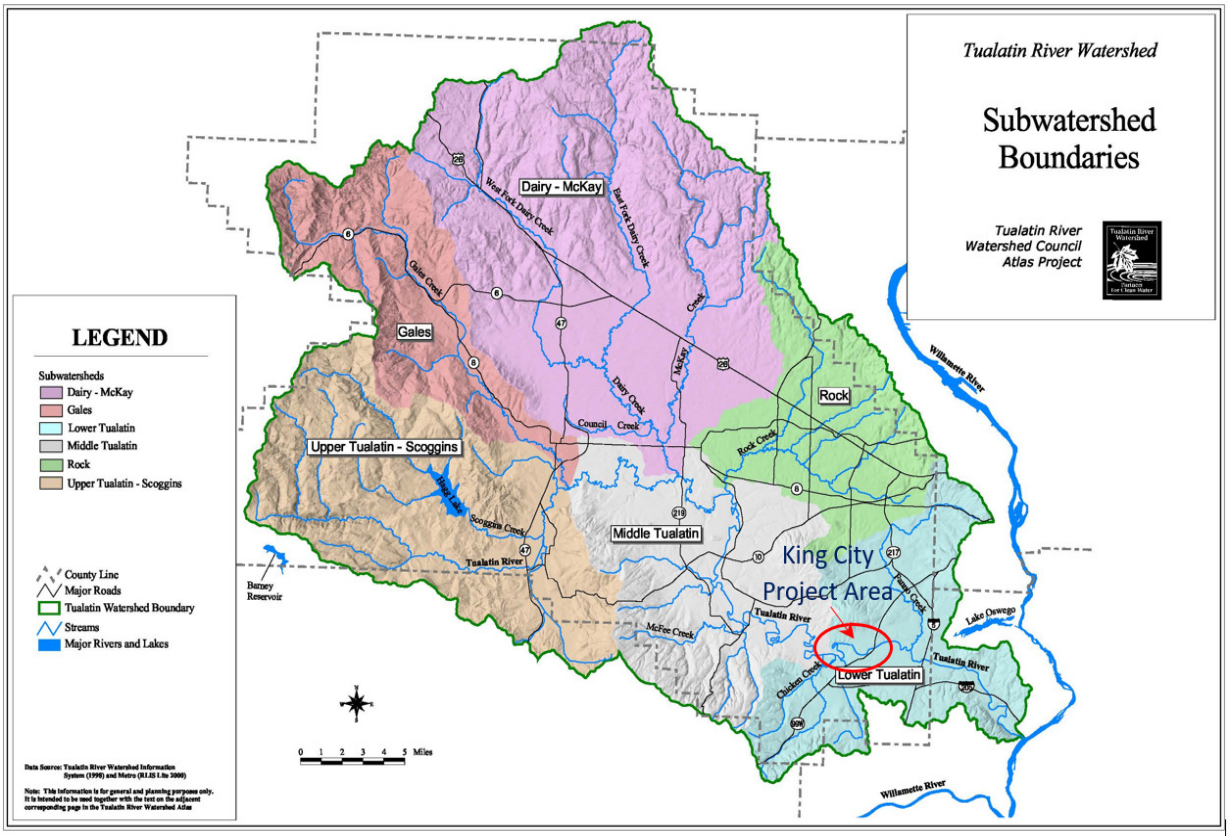

Figure 4. King City Location in the Tualatin River Basin (Figure adapted from Tualatin River Watershed Council map gallery http://trwc.org/tualatin-basin-information/)

4.3 KING CITY URA SUB-AREA DESCRIPTIONS

The **Northeast URA sub-area** is between SW Beef Bend Road and the river, bounded to the west by SW Elsner Road and to the east by 137th Avenue (Figure 5). Elevations range from 200 to 260 feet above sea level along the north boundary (Beef Bend Road) down to 110 feet at the river surface. This area has broad, relatively flat farm fields across the upper surface of the terraces (about 5 percent slopes), and five north-to-south draining stream ravines (about 8 percent slopes), which become increasingly deep, cutting down through the upper terrace as they drain toward the Tualatin River. Four of the five drainages are heavily wooded with only a few crossings, indicating that they are deep enough to make them unsuitable for clearing and farming. The fifth drainage has been redirected to flow in a ditch along Elsner Road at the western end of this sub-area. The most easterly drainage has also been partially redirected from its primary flow channel into a ditch along 137th Avenue down to Watson Street, then back into its natural drainage course into the Tualatin River. These streams appear to be fed by seasonal stormwater runoff, but maps indicate that some of them may have year-round flow. Recent reports describing surface stormwater hydrology in the surrounding area indicate that some of these drainages

(particularly the first, second and fourth drainages, counting from the west) may be downcutting and eroding significantly due to impacts of stormwater runoff from developing areas to the north[2].

There are a few interior farm roads, some of which cross the drainages to access single-family homes (SFH), not associated with farming activities. These existing crossings may be advantageous when developing future road systems in this area, as permitting processes for existing crossings tend to be simpler, and farm roads are often located where it is easiest to cross. The upper farmed terraces in this area can be relatively easily developed, with the biggest challenge how to develop an effective east to west road system across the drainages.

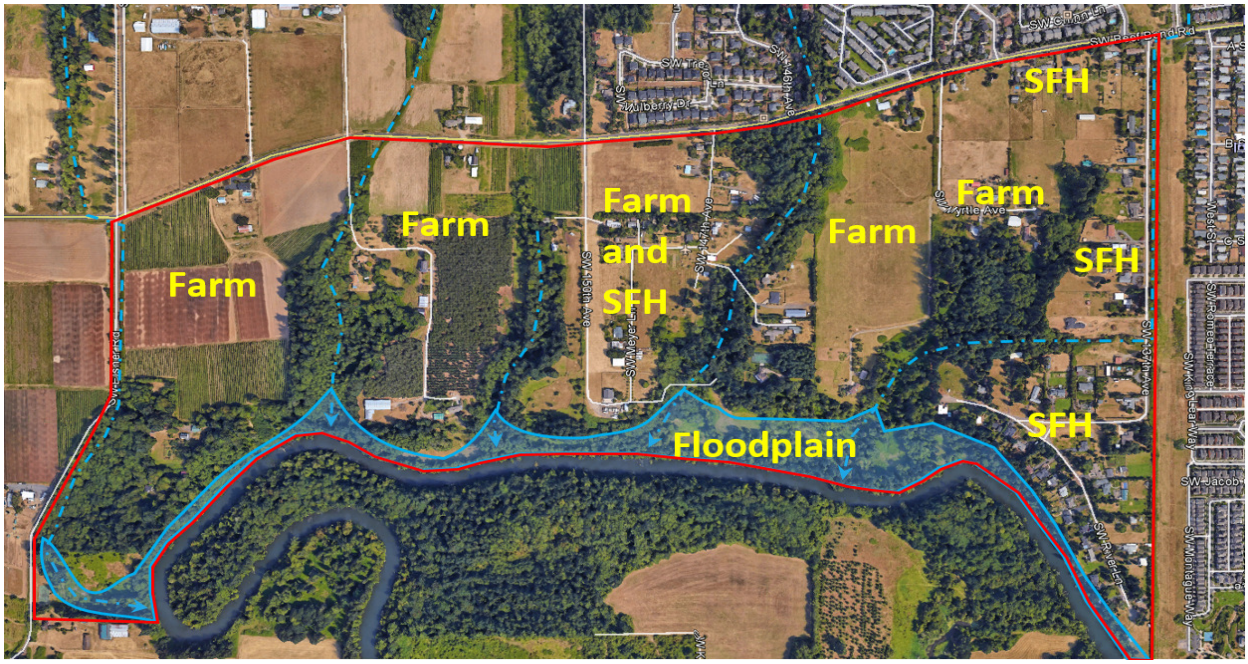

Figure 5. Northeast Sub-Area Current Land Use – Farms and Single-family Homes (SFH)

The **West URA sub-area** is between SW Elsner Road and SW Roy Rogers Road (Figure 6). This area is bisected by a floodway / wetland swale about 2,000 feet south of Beef Bend Road. The floodway is crossed by an 800- foot bridge on Roy Rogers Road. The area south of the floodway swale to Elsner Road is a farm, but includes a couple of single family homes that may not be associated with the farm. Surface elevation ranges from 180 to 200 along the north side (Beef Bend Road) down to about 120 feet in the central floodway (approximately a 3-4 percent slope).

A wholesale/commercial nursery operation is located between the floodway and the intersection of Beef Bend Road and Roy Rogers Road. A kidney-shaped pond is excavated in southeast corner of the nursery. The pond is the final remnant of an old redirected stream channel, but is well above the floodplain and has been a farm pond since before the early 1990s. The commercial nursery operation is called Al's Garden Center, with an entry from Roy Rogers Road. The wholesale nursery surrounds Al's

[2] Otak Memorandum describing River Terrace Area High Flow Conveyance Alternatives to the Tigard City Engineer dated October 15, 2015; onsite drainages are described as T8, T9 and T10 in the Otak Memorandum.

Garden Center on all sides, and has an entrance along Beef Bend Road. Most of the soil surface in the wholesale nursery is covered with plastic, indicating that most of the plants are grown in pots.

A farm operation currently exists between the east side of the nursery and Elsner Road, with row crops in the north, and a horse stable operation at its southern end (adjacent to the floodway). This operation has a barn, a riding arena, a lunging pen and at least 38 paddocks of various sizes and dimensions. Only the paddocks closest to the barn appear to get regular use; the southern paddocks may flood periodically in winter months.

Maps of the West URA sub-area area indicate a stream drainage used to meander across the eastern nursery area. The stream is barely visible in 1952 photos, and was redirected into ditches and drains over the years as farming activities expanded. Under current conditions, several diagonal ditches send water from the eastern nursery edge to a central roadside ditch, and then south to the floodway swale described previously. Aerial photo records indicate the nursery has been at this location at least since the early 1990s, and the area has been farmed since at least 1952.

Aside from a need to avoid the floodway areas and a possible need for drainage maintenance/ improvement in the area between the nursery and the farm north of the floodway, this portion of the western URA can be developed.

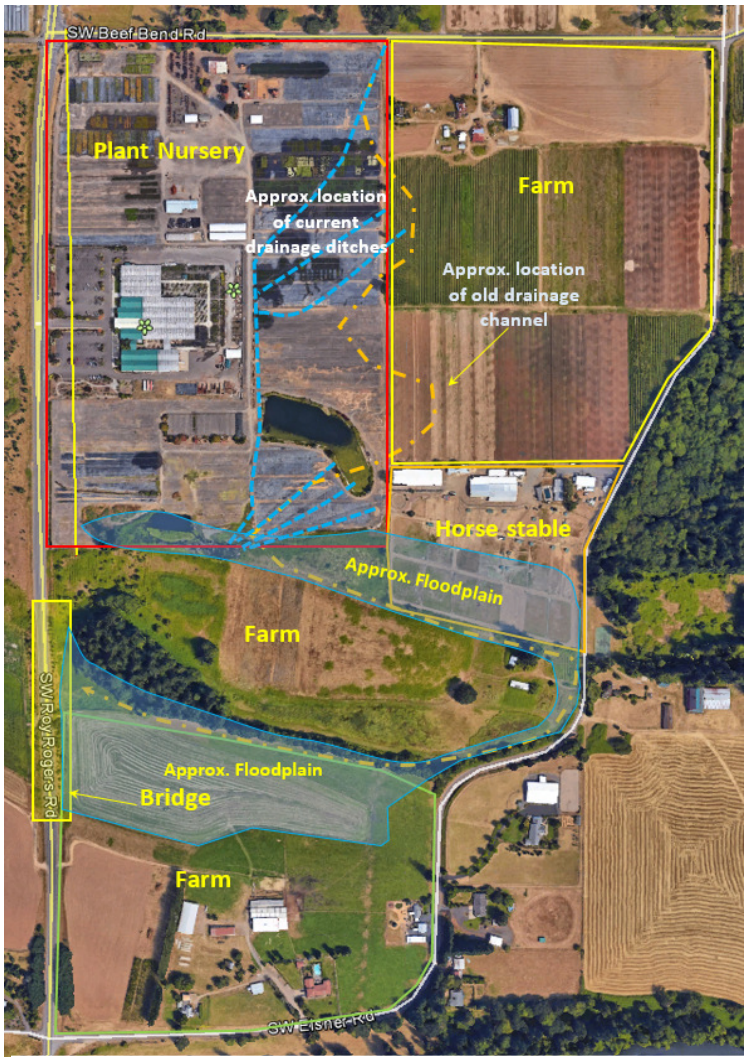

Figure 6. West Sub-Area Conditions

4.4 Riparian Corridors; Wetlands, Wildlife Habitat Resources

4.4.1 Tualatin River Watershed and Wetlands

King City lies in the southern portion of the greater Tualatin River Watershed, which covers over 700 miles and lays southwest of the Portland metropolitan area. The watershed initiates in the Oregon Coast Range and extends approximately 83 miles southeast where it merges into the Willamette River system. King City is in the Rock Creek Sub-basin, along the banks of the Tualatin River.

There are 6 major sub-basins in the greater Tualatin watershed: Upper Tualatin-Skoggins; Middle Tualatin; Lower Tualatin; Gales; Dairy-McKay; and Rock Sub-basins (see Figure 4). King City is located

the Lower Tualatin Basin – the last basin before the Tualatin River merges with the Willamette River, about 12 to 14 miles to the east of King City. In the King City area, there are two minor sub-basins: Chicken Creek, which flows into the Tualatin River along the south side of the URA, and Saum Creek, which is downstream to the east, and so does not affect the URA (Figure 7).

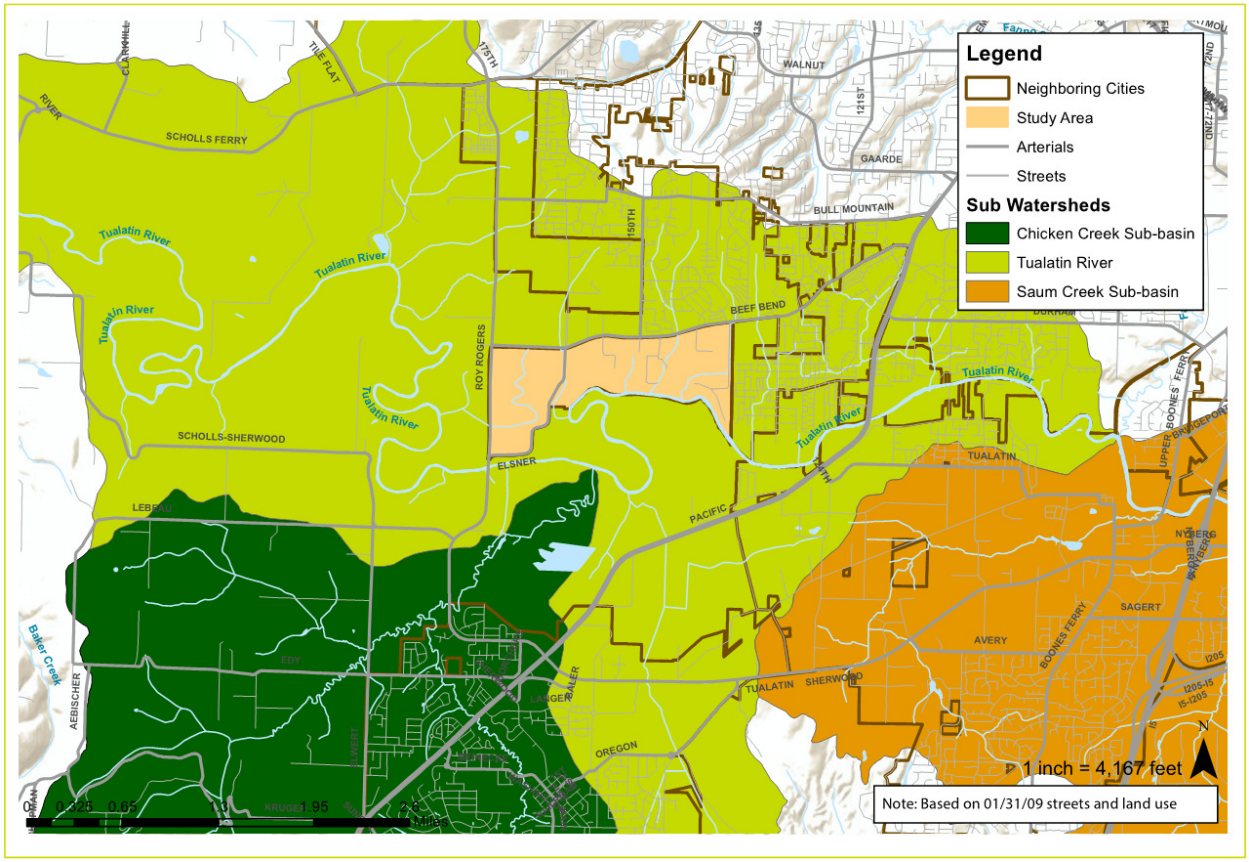

Figure 7. Sub-basins in the King City URA Area

The Lower Tualatin basin downstream of the URA is densely urbanized, but still includes some farmlands along the river, mostly in floodplain areas. The upstream basin is mostly in farmland.

The Tualatin River meanders around the southern edge of the URA, in an incised channel between farm fields. The standard buffer ranges from 125 to 200 feet dependent on the slope of uplands adjacent to the river. Mitigation would be required for minor encroachment but major encroachment would not be permitted. The river surface is at about 110 feet in elevation in summer months; the adjacent floodplain in the southern portion of the study area is about 10 feet higher. Total width of the vegetated (trees and shrubs) riparian corridor ranges about 300 feet, with the main flow channel being about 120 feet wide. Wetlands in this area are mostly farmed, ditched, and drained to varying degrees, although there are some protected areas that remain in natural vegetation, mostly on the southern side of the river.

Anadromous and resident fish habitat in these farmed portions of the slow-moving Tualatin not high quality, due to lack of large woody debris, lack of clean spawning gravels, lack of rearing and overwintering habitat (side channels) and high water temperatures (from lack of stream-side vegetation). However, Coho salmon, and cutthroat trout, and other resident fish are documented as being present in certain areas of the Tualatin River.

Aside from the National Wetland Inventory and information that can be gleaned from local Soil Survey maps (provided below), there is no local wetland inventory of the area. NWI maps indicate only a few small wetlands are in the URA, mostly associated with floodplain areas (Figure 8). However, there may be wetlands associated with the drainages, or on broad flat terrace surfaces where drainage is limited.

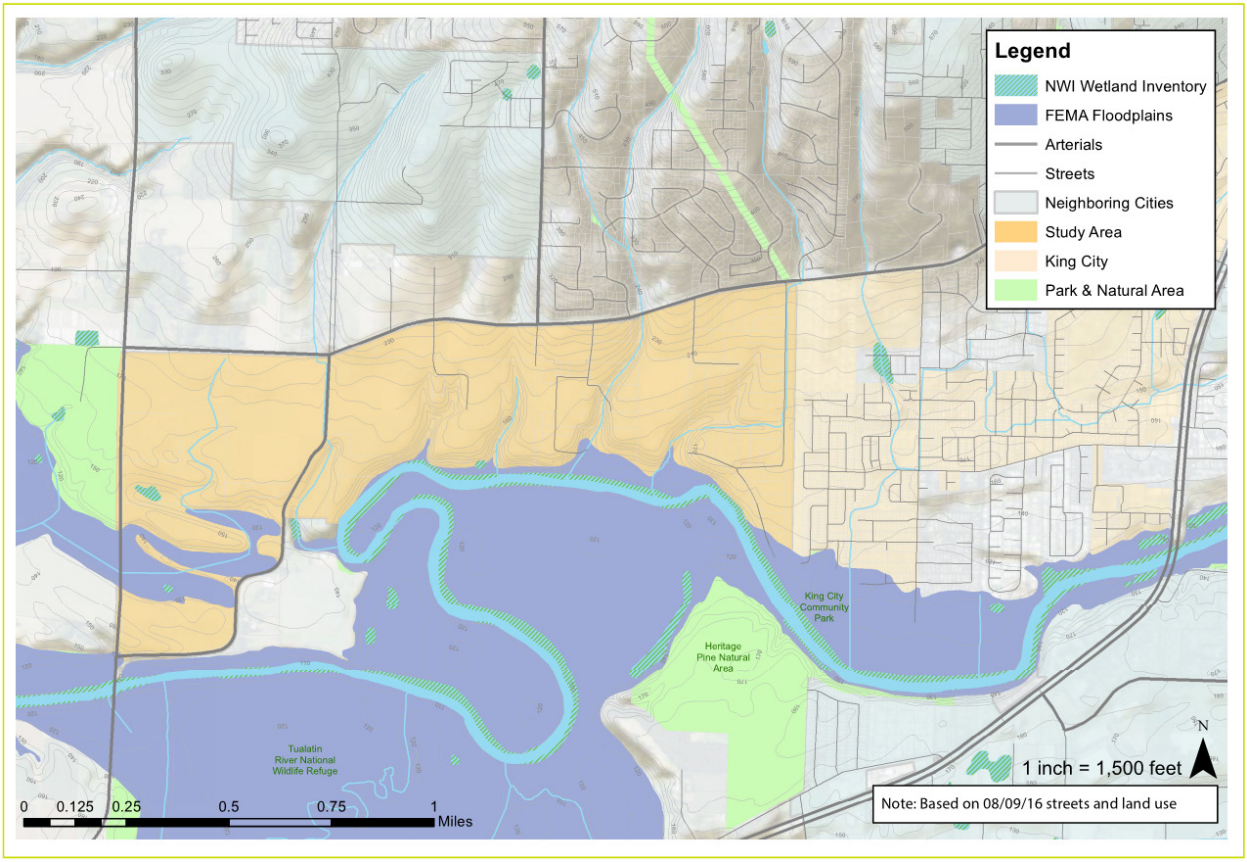

Figure 8. National Wetland Inventory Maps and FEMA 100-year Floodplain Maps

4.4.2 NRCS Soil Survey

The local Soil Survey can be used to evaluate potential for wetland conditions, or shallow groundwater by identifying Hydric Soils (sols typically found in wetlands) and those with shallow water tables. There are 13 soil series mapped in the URA planning area, some with 2 to 4 different slope classes (Figure 9, and Table 1). Most represent some form of silty floodplain soil, but also reflect proximity to the more clay dominated foothills to the west.

The flatter floodplain soils in the Willamette Valley are formed in sediments that were deposited during the last Ice Age – 10,000 to 100,000 years before present. These floodplain deposits were carried in hundreds of catastrophic floods that flowed periodically across eastern Washington and down the Columbia River from a glacial lake in near what is now Missoula, Montana. Water from the floods ponded in the Willamette Valley as far south as Eugene, depositing many feet of sediment on the valley floor. Soils from these floods near the Columbia River are sand dominated, but most of the floodplain deposits between Portland and Corvallis are silt loams.

Soils farther west, in the foothills of the Coast Range, are much older – having formed in place for hundreds of thousands of years. Thus, the foothill soils are highly weathered and relatively stable kaolinite3 1:1 clay dominated. Some of those clays wash downstream along the Tualatin River and collect on terraces and in backwater areas; other smectite or montmorillonite 2:1 clays form in place, usually in low-lying areas. These clays can cause problems when building due to shrinking and swelling potential.

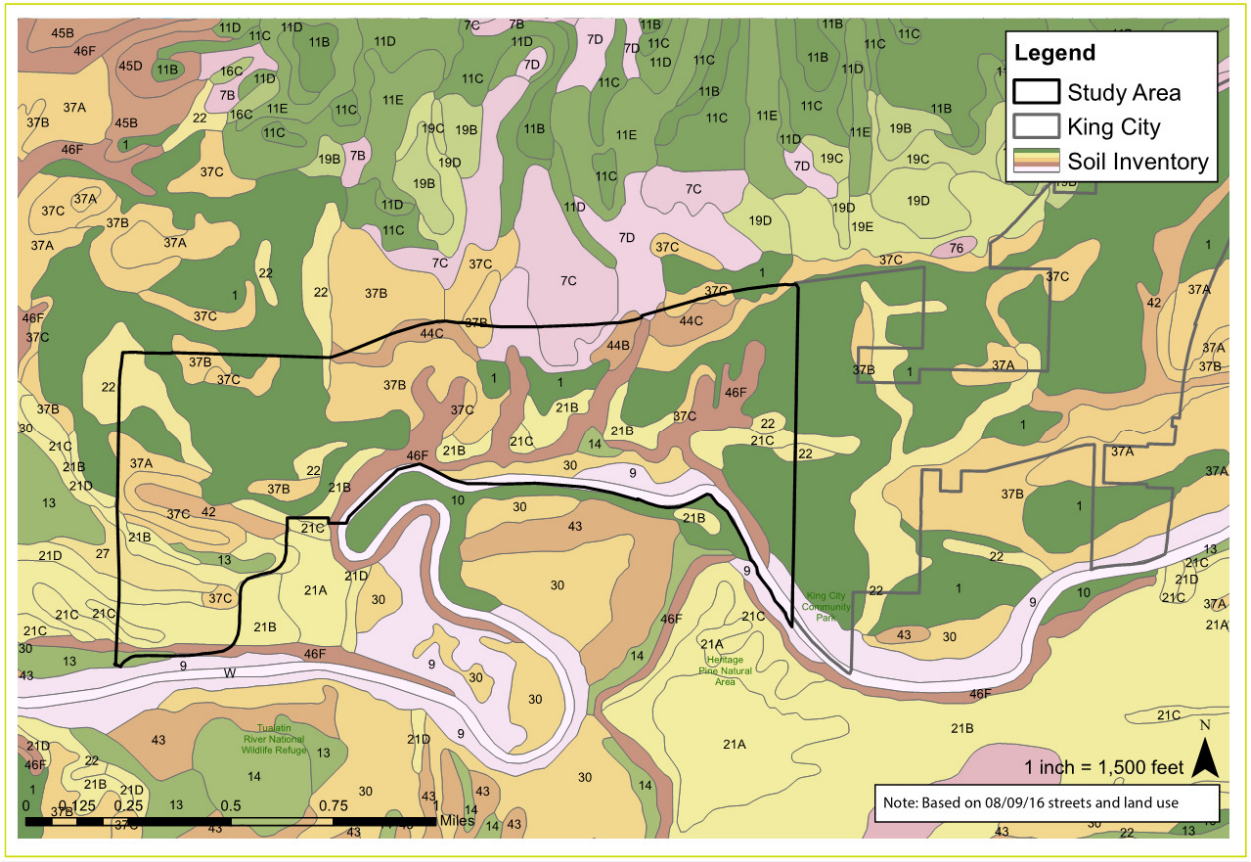

Figure 9. NRCS Soil Survey of the King City URA and Surrounding Area

The dominant soils types in the northern portions of the URA are the Aloha silt loams (SMU 1); the Cascade silt loams (SMU 7C, 7D); the Hillsboro loam (21A, 21B, 21C, 21D); and the Quatama loams (SMU 37a, 37B, 37C). These soils are all relatively fine-textured (silt-dominated), and the Aloha and Cascade soils in particular may have a shallow water table during winter months if not drained or managed properly. Erosion and sediment control during construction will be very important.

[3] Kaolinite clay is a 1:1 clay, very old and very stable; Smectite or montmorillonite clay is a 2:1 clay, younger and more active; will shrink and swell as it dries and wets.

Table 1. Soil Map Unit Names and Brief Descriptions

Map Unit Symbol	Soil Map Unit Name	Description	Hydric Soil (Y/N)
1	Aloha silt loam	Very deep, somewhat poorly drained soils that formed in mixed alluvium or lacustrine silts on river terraces. Somewhat poorly drained; slow runoff; moderately slow permeability. A perched water table is expected at 1-2 feet below the soil surface from December through April (unless drained).	Yes
7C, 7D	Cascade silt loam, 7-12% slope (7C), and 12-20% slope (7D)	Moderately deep to a fragipan [weakly cemented layer], somewhat poorly drained soils that formed in silty materials on uplands. Somewhat poorly drained; slow to rapid runoff; slow permeability.	No
9	Chehalis silt loam	Very deep, well drained soils that formed in silty/loamy mixed alluvium on nearly level to undulating flood plains. Well-drained; slow runoff; moderate permeability; flooding from November to April.	Yes
13, 14	Cove silty clay loam and Cove clay	Very deep, poorly and very poorly drained soils that formed in mixed alluvium from sedimentary and basic igneous rocks on flood plains. Smectite clays. Poorly and very poorly drained; slow to ponded runoff; very slow permeability; flooding occurs from December to April; high water table fluctuates at 0-1-foot depth below soil surface from December to June.	Yes
21A, 21B, 21C, 21D	Hillsboro loam, 0-3% (A), 3-7% (B), 7-12% (C), 12-20% slope (D)	Deep, well drained soils that formed in mixed alluvium on terraces. Well drained; slow to medium runoff; moderate permeability.	No
22	Huberly silt loam	Deep, poorly drained soils that formed in stratified glacio-lacustrine deposits on terraces. Poorly drained; slow to ponded runoff; slow permeability. Soils are saturated with water during the winter season unless artificially drained.	Yes
27	Labish mucky clay	Deep, poorly drained soils that formed in mixed alluvial and lacustrine material stratified with lenses of peat or muck on bottomlands. Smectite clays. Soils are saturated with water during the winter season unless artificially drained.	Yes
30	McBee silty clay loam	Very deep, moderately well drained soils that formed in alluvium weathered mostly from sedimentary and basic igneous bedrock on flood plains and low terraces. Moderately well drained; slow runoff; moderate permeability; on flood plains are subject to flooding from December to April. High water table at about 3-foot depth from December to March.	Yes
37A, 37B, 37C	Quatama loam, 0-3% (37A), 3-7% (37B), and 7-12% (37C) slopes	Deep, moderately well drained soils that formed in stratified glaciolacustrine deposits on low terraces. Moderately well drained; slow runoff; moderately slow permeability.	Yes (Huberly inclusions)
42	Verboort silty clay loam	Very deep, poorly drained soils that formed in loamy alluvium over silty and clayey glaciolacustrine deposits. Verboort soils are on narrow low terraces. Poorly drained; slow runoff; very slow permeability; Flooding from December to April. The profiles are usually saturated with water many months of the year unless drained.	Yes
44B, 44C	Willamette silt	Very deep, well drained soils that formed in silty glaciolacustrine	Yes

	loam, 3-7% (44B) and 7-12% (44C) slopes	deposits on broad valley terraces. Well drained; slow or medium runoff; moderately slow permeability. Seasonal water table at 40+ inches.	(Dayton inclusions)
46F	Xerochrepts and Haploxerolls, very steep	Steep side slopes on drainage ravines; no detailed soil profile description.	No

4.4.3 Wildlife Habitat – Streams, Wetlands and Tualatin River

As mentioned above, only a few small wetlands are mapped in the URA planning area. However, an inventory process consistent with Title 13 of the Metro Functional Plan which "combines Regionally Significant Riparian & Upland Wildlife habitat, Habitats of Concern, and impact areas into one integrated layer" provides a relatively robust map of local intact habitat and hydrography systems – rivers, streams and floodplains – which are expected to encompass most natural wetlands in the area (https://databasin.org/datasets/afdbf390255549418f26855af59b2f79). Some of the wetlands have been drained or are being farmed, so do not provide typical wetland functions and values. Figure 10 illustrates the riparian corridors and related floodplain and upland habitat in the vicinity of the King City URA.

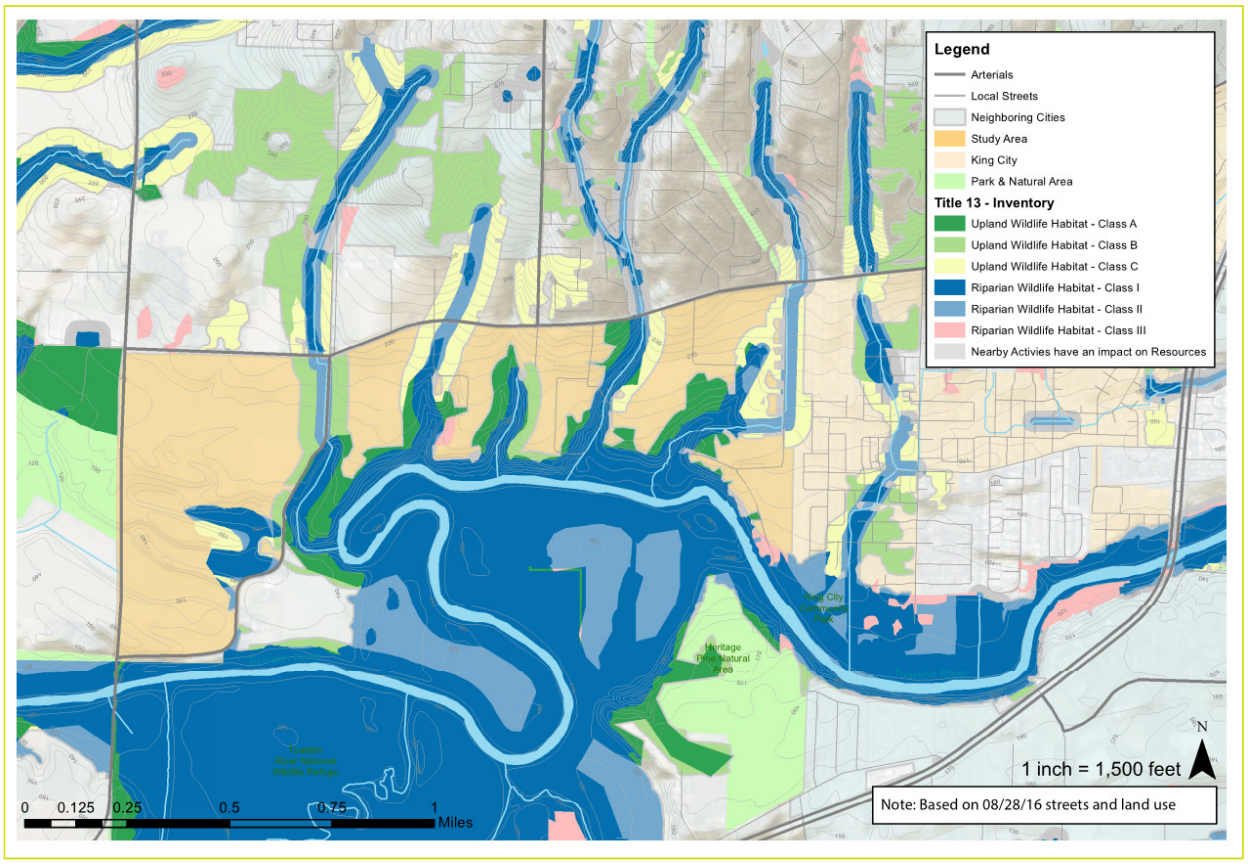

Figure 10. Riparian Corridors and Related Floodplain and Upland Habitat in the URA Project Area

The vegetated stream drainages across the site provide wildlife habitat corridors to the Tualatin River, and they also provide excellent opportunities for public trail systems, but make road development from east to west more challenging from the standpoint of both engineering and permitting.

4.4.4 Wastewater Treatment

Clean Water Services manages and operates the Durham Wastewater Treatment Facility that serves King City. This facility is located in the City of Tigard about 2-3 miles to the east of King City. This "state of the art" facility processes and cleans about 22 million gallons of wastewater per day, then either returns it to the Tualatin River after treatment, or provides water for local irrigation. The commercial nutrient recovery system in this facility captures 80 percent of the phosphorus in the waste stream and converts it into a slow-release fertilizer. The system also recovers fats, oils and grease from the waste stream and converts those materials into an alternative energy resource that provides for 60 percent of the power needed to run the plant. (https://www.cleanwaterservices.org/media/1225/durham-at-a-glance.pdf)

Conversion of the URA area from septic systems to CWS sanitary treatment systems will improve groundwater quality in the URA over time.

4.4.5 Stormwater Conveyance

There are no formal stormwater systems serving the URA at present, aside from some interior farm ditches and pond systems that ultimately direct runoff toward stream systems and the Tualatin River. However, stormwater runoff from offsite areas north of the URA is directed to the headwaters of three out of five drainages that cross the URA. As mentioned previously, a technical memorandum and associated technical report from October 2015 describes plans to manage stormwater runoff from the River Terrace area, which is located about a mile upstream and north of the King City URA. The report indicates that steep terrain and excess runoff from that densely urbanized area has resulted in destabilizing and downcutting the stream channels at several locations[4].

The memo describes two approaches intended to resolve the water quantity/quality control problem: a high flow bypass pipe, which would divert excess water from the stream and send the treated stormwater directly to the Tualatin River, and/or a stream channel rehabilitation project, which would rebuild stream structure in such a way as to increase storage and residence time. The proposed rehabilitation projects would potentially include sections of streams within the URA.

An Existing Conditions report attached to the Technical Memo provides descriptions and photographs of various stream reaches along what are called Tributary 8, Tributary 9 and Tributary 10 (T8, T9, and T10). Downstream reaches of these tributaries flow through the URA (Figure 11). Access was not allowed by adjacent landowners for certain sections of T8 and T9 streams within the URA (marked in red in Figure 11), but the rest of the reaches and all of T10 were directly assessed and photographed. Fish passage barriers were marked.

The report describes evidence of human impacts to the streams within the URA, such as old concrete foundations or woody remains of old dams; current dams with man-made ponds upstream of the dam structure; and many culverts. They also describe where these structures are not installed properly, such as a culvert under Elsner Road that is "perched 30 feet above the stream channel" with large rip rap at

[4] October 15, 2015, Otak Technical Memorandum to the City of Tigard, River Terrace High Flow Conveyance Alternatives

the outfall in the channel. Access to the lowest T9 reaches (Reaches 1, 2 and 3) adjacent to the Tualatin River was not allowed by adjacent landowners. However, Reach 4 of T9, which starts at Beef Bend Road and extends southward for about 600 feet, was described as having once been used to dump garbage from the surrounding area, with "bottles, machinery and plastics" clearly evident on incised ravine sidewalls. Reaches along T10 also included some evidence of alternations, including diversions into ponds; a slide-gate weir and several culverts.

The proposed stream restoration projects described in the Otak Technical memo would improve stream habitat and hydrology functions and would reduce water quality impacts to the Tualatin River.

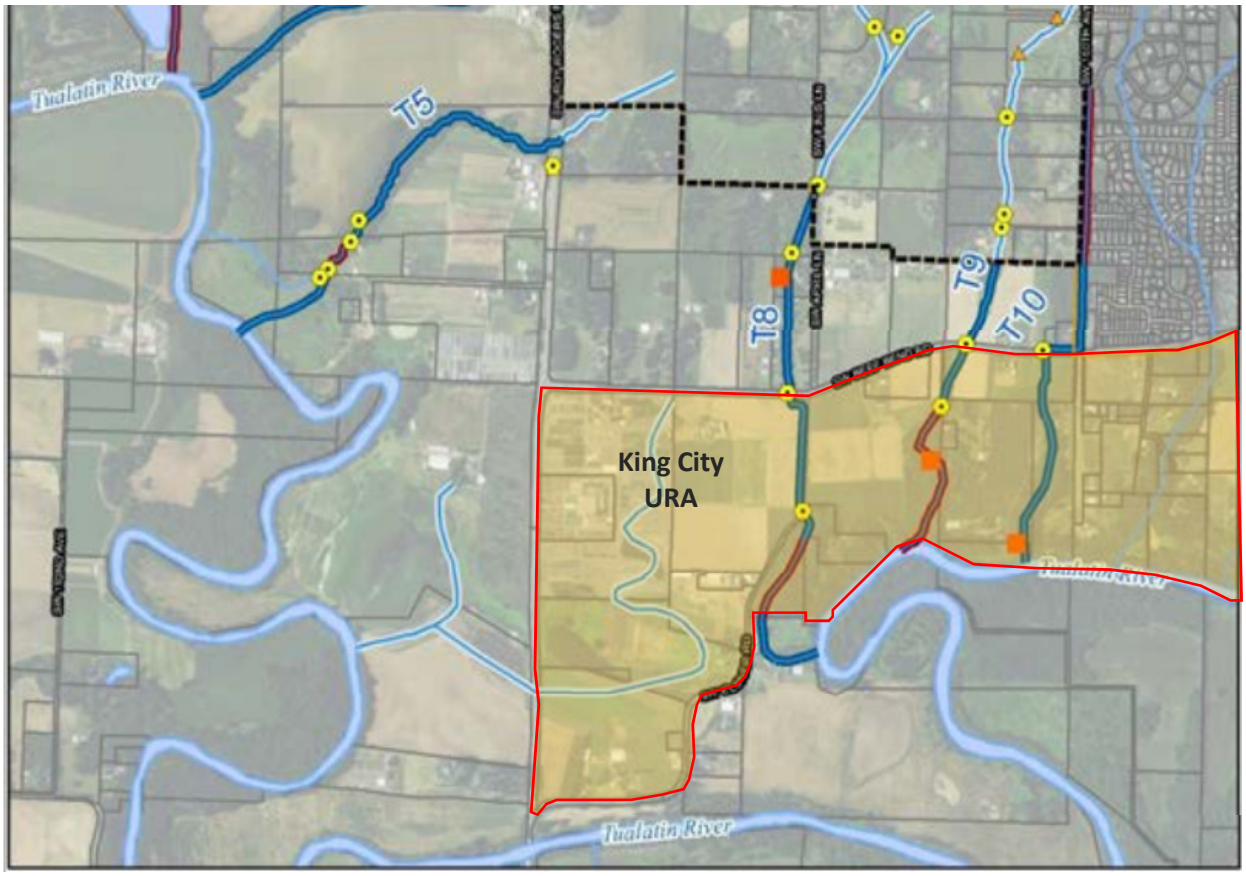

Figure 11. Adapted from Otak Technical Memorandum Figure 1, River Terrace RSA Stream Access

4.5 REGULATIONS: WETLANDS, STREAMS, WATER BODIES, WILDLIFE HABITAT

All streams, wetlands and associated ponds are potentially regulated by the U.S. Army Corps of Engineers (COE) and U.S. Environmental Protection Agency (EPA) under Sections 404 and 401 of the Clean Water Act. Under certain circumstances, the COE may not take jurisdiction over isolated wetlands and small ponds (with no surface water connection to streams). All jurisdictional[5] wetlands are also

[5] Jurisdictional wetlands are those areas that have been determined by a government agency to warrant regulation, based on presence of hydric soils, hydrophytic vegetation and wetland hydrology, as defined in the 1987 Wetland Delineation Manual, and in the 2010 Western Mountains, Valleys and Coast Regional Supplement, and as adopted and regulated under Oregon State Law.

regulated by the Oregon Department of State Lands (DSL[6]), which also makes determinations as to whether certain highly impacted areas that were once wetlands or streams may still be regulated at some level. Title 13 of Metro's Urban Growth Management Functional Plan regulation was adopted in 2005. This regulation requires that all cities and counties in the Metro area () the develop land use codes and policies that protect water quality and related fish and wildlife habitat, including for new lands incorporated into the Metro Urban Growth Boundary. Title 13 does not preclude development in these areas, but instead requires that certain measures be taken to mitigate or minimize impacts to habitat or water quality adjacent to development.

As mentioned above, it is possible that not all jurisdictional wetlands are known in the King City URA as no detailed wetland inventory has been carried out. Some wetlands in the area have been ditched and drained for farming to various degrees, and some of these areas are likely to be regulated as wetlands, depending on whether they were only partially drained versus have been effectively drained and no longer have wetland hydrology. Current state and federal laws provide descriptions and definitions of how a disturbed area is assessed for presence of wetland conditions; standardized processes and methodologies are used to determine whether a wetland is present.

Adoption of urban land use designations in the new planning areas may trigger application of the Goal 5 Administrative Rule, which requires local governments to conduct and adopt a local wetlands inventory, and to develop a list of locally significant wetlands (per rules described in ORS 197.279(3)(b)). A local wetland inventory will be needed for the URA. Jurisdictional wetlands not currently identified or inventoried will still be regulated under state and federal law. The city is also encouraged to develop land use codes protecting streams, water bodies, and wetland resources. New lands brought into the Urban Growth Boundary must protect Upland and Riparian habitat, per Title 13.

Clean Water Services (CWS) provides review and environmental service provider letters (SPL) for the City. This includes the review of vegetated corridors on streams and wetlands[7] through a Pre-screening Site Assessment process to assess whether there are sensitive areas (wetlands, lakes, ponds, springs, streams, or rivers) within 100 to 200 feet of a proposed development activity. Avoidance of direct impacts that may affect water quality is the primary goal of regulations. Unavoidable impacts to these resources may require additional reports, permitting and review processes. Consultants should review Chapter 3 of CWS Design and Construction standards for discussion on how to protect Natural Resources.

The City may also protect upland wildlife habitat or critical wildlife corridors through development of voluntary compliance programs or by formal designation of certain areas with high quality habitat, such as an area supporting an extensive and healthy native forest plant community. These areas may be designated as Significant Natural Resource Areas (SNRAs). SNRA protections processes or rules can incorporated into the planning process.

4.6 GROUNDWATER RESOURCES

The King City drinking water system is provided by the City of Tigard which has a new water source completed in the City of Lake Oswego – the Tigard Water Partnership Project. According to a 2015 technical memo provided by the City of Tigard[8], King City, Durham and the City of Tigard all fall within

[6] Oregon Wetland Regulations and Permits: http://www.oregon.gov/DSL/WW/Pages/Permits.aspx

[7] CWS guidance and links to regulations: http://www.cleanwaterservices.org/permits-development/step-by-step-process/environmental-review/

[8] http://www.tigard-or.gov/city_hall/departments/PublicWorks/Water/water_quality_report.pdf

the Tigard Water Service Area (TWSA). About 90 percent of the TWSA water supply is described as coming from three wholesale water providers: Portland Water Bureau (PWB), the Joint Water Commission (JWC) and the City of Lake Oswego.

The PWB manages the Bull Run Watershed (Mt. Hood area), and accesses the Columbia South Shore Well Field (Troutdale area) as a backup system. The JWC draws surface water from the Trask and Tualatin River watersheds via rivers or reservoirs. During the winter, the majority of raw water comes from the Tualatin River; during summer months, water supply is supplemented by drawing from Barney reservoir and Scoggins Reservoir (Hagg Lake). Lake Oswego withdraws water from the Clackamas River basin. They have a Clackamas River intake facility at Gladstone, near Oregon City. Water is treated and pumped to the Waluga Reservoir near Waluga Park, then to Tigard into the water supply system. All of the water from these three sources is filtered and chlorinated to ensure a safe drinking water supply.

The URA is not currently served by the City for drinking water. However, there are dozens of domestic wells in the area. Some are irrigation wells, but most serve primarily as a drinking water supply. GOAL 5 requires protection for a certain critical groundwater areas. King City and most of the URA fall within the Cooper/Bull Mountain Critical Ground Water Area – an area with a basalt aquifer that has experienced significant drawdown. Special restrictions help stabilize ground water levels in these areas.

Wells in the URA are only allowed for single family domestic and stock water purposes on 10 acres or more. Water for stock must be piped to tanks or troughs, and not allowed to overflow. In certain areas, domestic users may irrigate up to 1/4 acre of noncommercial lawn and garden, but in areas where water in the well has declined 20+ feet from the original static water level, no irrigation from the well is allowed. Water use cannot exceed one acre-foot (325,850 gallons) per year[9].

4.7 DESIGNATED OREGON RECREATION TRAILS RESOURCES

There are several planned and proposed connectors to regional trail systems in and around the King City URA (See Figure 12). The City of Tigard has a proposed park (Lasich property) located northwest of the intersection of Beef Bend Road and Roy Rogers Road, directly across from the northwest corner of the URA. The planned Westside Trail would run along the BPA powerline easement that forms the eastern boundary of the URA, and then loop around Bull Mountain to the north to connect with other secondary planned trails to the northwest and south along Roy Rogers Road. Connections would also be available to the proposed trail system in the recently approved River Terrace project which could substitute for or augment the steep portions of the Westside Trail north of Beef Bend Road.

There will also be opportunities to connect south to branches of the "Ice Age Tonquin Trail" that will lead to Sherwood and Wilsonville. Other locally planned trails include an extension of the Tualatin River Greenway from the east, which would follow the north shore of the Tualatin River through the King City URA, and continue offsite to the west, eventually connecting to the planned Reedville Trail. (http://www.oregonmetro.gov/sites/default/files/2014%20Regional%20Trails%20and%20Greenways%20publication_print.pdf)

These regional trail systems provide opportunities for long-distance bike rides, but also provide for local walking and running users. In addition to the trail systems, there are some existing opportunities for bicycling along the wide shoulders of Roy Rogers Road and there are some bike-friendly streets in the area north of Beef Bend Road and on lower volume streets within King City. Washington County is currently improving Fischer Road between 131st Avenue and Highway 99W to add bike lanes. There are

[9] http://www.co.washington.or.us/Watermaster/GroundWater/GroundWaterManagementAreas/cooper-bull-mountain.cfm

few other opportunities for comfortable bicycling within or near the URA as many streets carry higher volumes of traffic and operate at higher speeds. This situation not only increases the need for caution but also makes plans for completion of the connected regional trails systems even more important when carrying out long-range planning processes for the King City URA.

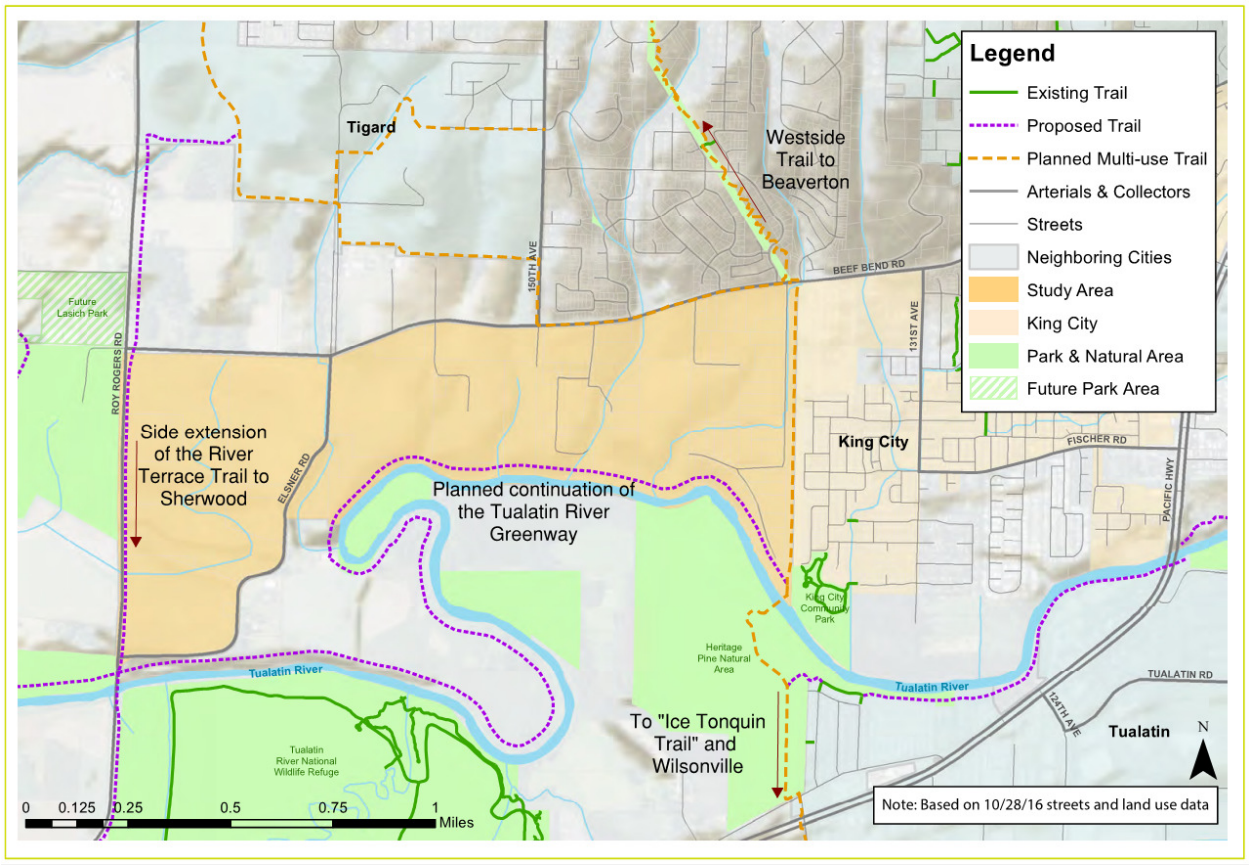

Figure 12. Existing, Proposed and Planned Trails in the URA 6D Vicinity

4.8 OPEN SPACE RESOURCES

The King City URA has no internal parks, but the Tualatin River National Wildlife Refuge and the Heritage Pine Natural Area are directly across the river to the south. King City to the east has a 9-hole Golf Course in the northeast portion of the City (which may not be considered Open Space), and a 17-acre Community Park in the southwest corner of the City, near the Tualatin River, with a soccer field and playground. Figure 13 shows natural areas and parks that are located within and near to King City and the URA. This figure also illustrates locations with extensive natural tree canopy cover.

To expand and connect Open Space, Parks and Trails systems, the City could develop cooperative relationships with regional organizations and agencies outside of the City – such as the Intertwine Alliance (http://theintertwine.org/partners), and Metro and Washington County Parks. These and other similar organizations or adjacent Cities could be helpful in developing trail connections and other ideas for providing access to these nearby natural areas, most of which are currently unavailable due to being on the opposite side of the River.

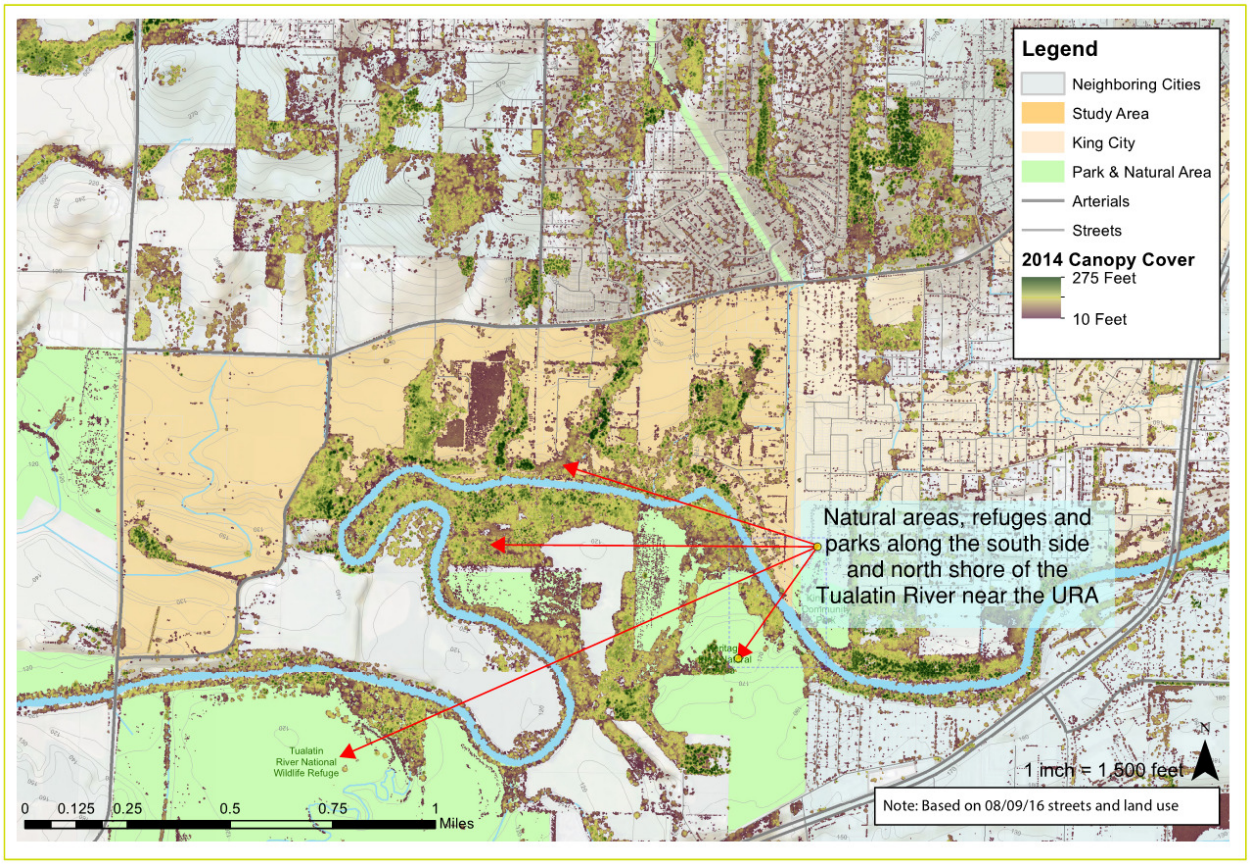

Figure 13. Naturally Vegetated Areas, Tualatin River National Wildlife Refuge, King City Community Park, Heritage Pine Natural Heritage area, and Open Space in and near King City

Information provided below is extracted from Metro's Portfolio of Natural Areas, Parks and Trails: Opportunities and Challenges: http://www.oregonmetro.gov/sites/default/files/portfolio_report.pdf. These areas are directly adjacent to or within the King City URA. Descriptions provided include the current organizations managing or planning for these nearby natural areas and preserves, providing opportunities for developing planning partnerships. For example, some sections of the Tualatin River are defined as a "water trail" system – an idea that might be adopted by King City along the naturally-vegetated section of the river south of the City.

The areas below can be linked together by trails. The nearest area, Map Location 21, is associated with the Tualatin River National Wildlife Refuge, located just across the river to the south, and connects to other areas upstream. Map location 14 is connected to the same natural areas south of the river, but is farther south, in the Chicken Creek basin, which flows into the Tualatin River through the refuge along the south side of the King City URA.

Tualatin River Washington County 400 acres | Map location 21 	The Tualatin River is home to an abundance of fish and wildlife. Washington County's only river is also important to human health – it provides drinking water to 200,000 homes and businesses. Metro's protected land includes potential river access points and property next to the Tualatin River Wildlife Refuge. At Gotter Prairie, restoration has transformed a farm field into a wetland with thousands of native trees, shrubs and plants.	**Nature parks and natural areas** While floodplain and riparian protection are critical, nature parks could be supported at five sites: Gotter, Munger, Farmington, Morand and Borland. Water access would be a key feature.	City of Tualatin Natural Resources Conservation Service Tualatin Riverkeepers U.S. Fish and Wildlife Service	Multiple sites protect Tualatin River water quality and wildlife through riparian, floodplain, forest and prairie restoration and provide potential river access. Metro Council directed natural areas staff to identify a river access site that will facilitate a water trail; additional acquisitions may present opportunities to expand on this project.
Lower Tualatin River headwaters Washington County 210 acres | Map location 14 	Flowing from the Chehalem Mountains, headwaters of the Tualatin River provide significant wildlife habitat and safeguard water quality. Though it traverses urban areas of Sherwood, Cedar Creek supports many fish. Chicken Creek provides wetland, riparian and upland habitat for migratory birds, endangered fish and other wildlife. And, nestled in forests of fir, maple, alder and cedar trees, Baker Creek is home to sensitive wildlife such as Northern red-legged frogs.	**Habitat preserves** Public access is not compatible with the goal of improving water quality in this target area.	Tualatin Riverkeepers U.S. Fish and Wildlife	This target area includes the headwaters of streams that feed the Tualatin River at the Tualatin River Wildlife Refuge. Acquisition is in early stages; future opportunities will depend on what land Metro can protect.
Tualatin River Water Trail **Tualatin River Greenway Trail** Tualatin, Durham, King City, Hillsboro, West Linn 	Someday, people will be able to explore the Tualatin River by boat, bike or foot on two sister trails: a greenway trail along the banks and a water trail in the river itself. Metro has acquired five sites along the river that could serve both trails, but none has been developed yet. Partners have built sections of the six-mile greenway trail in Browns Ferry Park and Cook Park, and developed nine launch sites for the 40-mile water trail.	310,000 trips in 2010 Metro Council directed natural areas staff to identify a river access site that will facilitate a water trail; additional acquisitions may present opportunities to expand on this project. Existing launch sites are at Rood Bridge Park, Eagle Landing, 99W Bridge, Jurgens Park, Cook Park, Tualatin Community Park, Browns Ferry Park and River Grove Boat Ramp.	Cities of Tualatin, West Linn, Tigard and Hillsboro Tualatin Riverkeepers Washington County	The water trail and the greenway trail will connect to the future Westside Trail and Tonquin Trail, where those two trails meet at the Tualatin River. The greenway trail will provide access to Brown's Ferry Park, Tualatin Community Park, Cook Park, Durham Park, Jurgens Park and the Tualatin River National Wildlife Refuge.

4.9 CULTURAL AREA RESOURCES

A search of the Oregon Historic Sites database indicates that only one property within the boundaries of the King City URA is listed on the National Register of Historic Places, the Gustave Plieth House at 16170 SW Beef Bend Road (Figure 13). The house was built in 1890, and a direct descendent of Mr. Plieth still owns the house. The historical record (Resource number 48387, Resource number 115/409) indicates that in addition to the house, there are several outbuildings that were constructed between the 1890s and 1940s: "*A small, older log framed barn is situated directly behind the residence. It has vertical plank siding and shed attachments. A pole barn, probably the oldest on the property, is to the east of the plank barn. A gambrel roof barn, lean-to, outhouse, shop, and storage building are other outbuildings on the property*."

Mr. Plieth was married to Ulrike Hildgendorf of West Point, Nebraska in 1889, after which they moved to Oregon and settled on this property – which was called the Hikland Land Claim. They had three children before Ulrike passed away in 1901. Gustav remarried to Anna Zwerer – a neighbor's daughter. They had one child – Fred, who still owns the property and lives nearby.

"*This farm complex is significant as an example of historical settlement in the county during the post frontier era. The number of outbuildings that remain intact adds support to the architectural merit of this resource*."

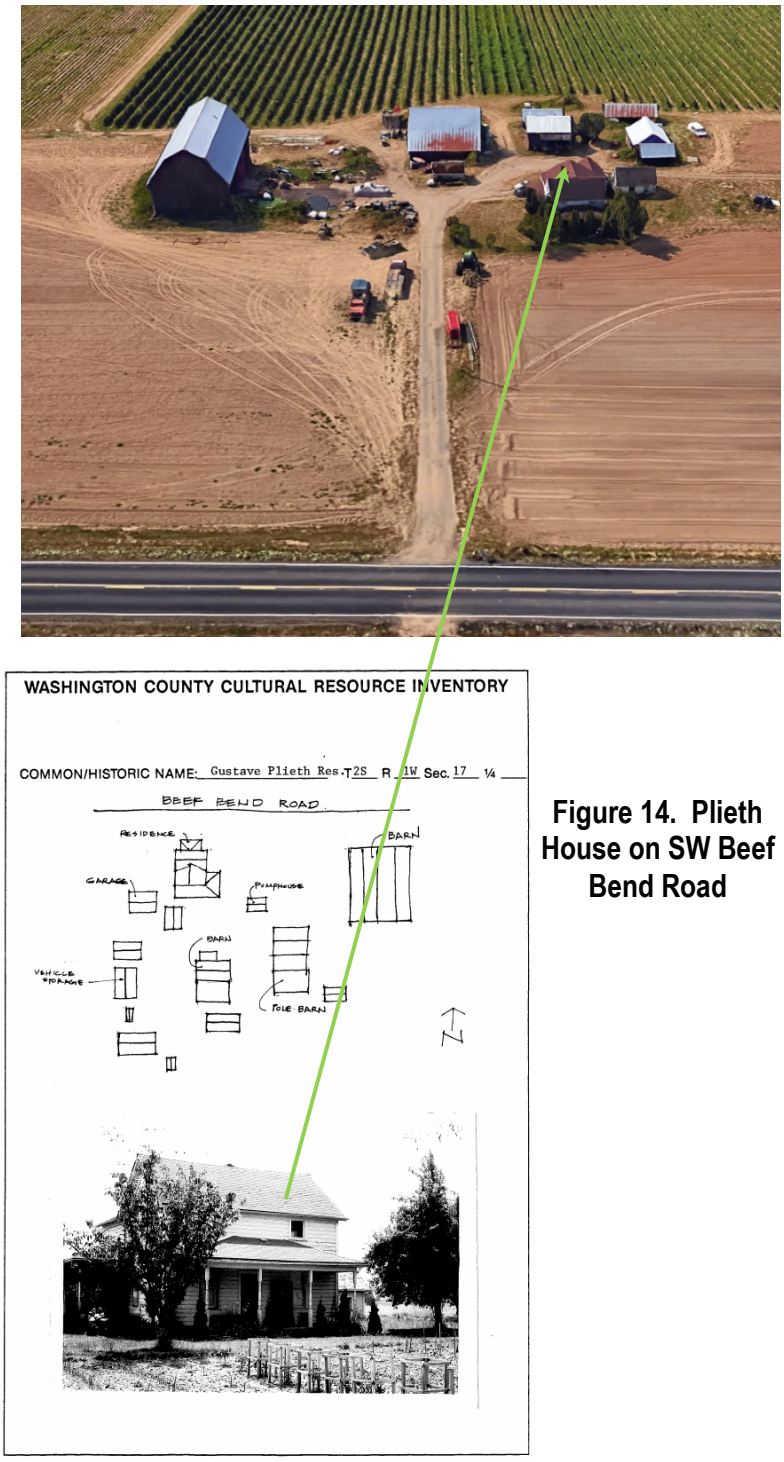

Figure 14. Plieth House on SW Beef Bend Road

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5. OPPORTUNITIES

5.1 WETLAND MAPPING

There is no current wetland inventory for the URA. However, soil maps indicate potential for wetlands in the URA, as well as redirected stream channels that may provide opportunities for mitigation or enhancement. A wetland inventory will help with planning and development, in that areas with problems due to shallow groundwater or regulatory challenges will be identified in advance.

5.2 SOIL MAPPING

The NRCS Soil Survey of the area is relatively high quality. However, more detailed, targeted mapping at key locations – such as at stream crossings, or in ditched and drained farmlands -- will help define areas with shallow groundwater and other limiting soil and hydrology characteristics that must be properly managed before detailed planning is carried out. This will also decrease the potential for later problems from erosion or poor sediment control.

5.3 POTENTIAL ECOLOGICAL PROTECTION & ENHANCEMENT OPPORTUNITIES WITHIN PLANNING AREA

This review of project area resources helps in development of a list of potential opportunities to protect and improve natural resource conditions in the project planning area.

Potential Ecological Protection and Enhancement Opportunities in the URA include:

- The edge of the Tualatin River and several of the north to south drainage ravines within the URA are already naturally forested with some trees almost 300 feet tall. These areas provide opportunities for a public trail system as well as improved wildlife habitat and water quality treatment.
- Per recent reports, some of the drainages in the URA are damaged and incised from excessive runoff emanating from densely developed areas offsite to the north. Stream restoration projects planned in cooperation with regional stormwater management plans currently in the works would improve water quality in the Tualatin River, and would improve habitat functions within the URA.
- Maintaining and improving deep-rooted native vegetation in areas with steep slopes (such as the drainage ravines) will minimize or avoid erosion and sediment problems. Steep slopes near sensitive areas that are not currently vegetated can be replanted with deep-rooted native vegetation to reduce erosion problems and provide for habitat connections.
- Provision and protection of a fully vegetated buffer area ranging from 125 to 200 feet wide (dependent on the slope of uplands) adjacent to the Tualatin River will greatly enhance river habitat functions and water quality.
- Development of the Plieth Historic Home site into a new park or special events facility will provide a connection to the history of the King City area.
- Promoting voluntary conservation measures and integration of built and natural systems to enhance habitat will integrate citizens into the plan to protect water quality and sensitive areas in the URA.

5.3.1 General Opportunities

- Provide for a Wetland and Stream Inventory using current definitions and mapping processes.
- Blend storm water management with natural systems (using constructed wetlands or planted buffers adjacent to natural systems to improve water quality and wildlife habitat opportunities).
- Remove invasive plants throughout City riparian and wetland areas to minimize invasive growth, reduce stream bank erosion and improve wildlife habitat.

6. REFERENCES

City of King City website (http://www.ci.king-city.or.us/) for additional information on regulations, parks, and related plans.

City of Tigard Water Quality Report: http://www.tigard-or.gov/city_hall/departments/PublicWorks/Water/water_quality_report.pdf

Clean Water Services: (https://www.cleanwaterservices.org/); https://www.cleanwaterservices.org/media/1225/durham-at-a-glance.pdf

National Wetland Inventory Mapper (http://www.fws.gov/wetlands/data/mapper.HTML)

NRCS Soil Survey of Washington County: https://casoilresource.lawr.ucdavis.edu/gmap/ ; http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Oregon State Department of Environmental Quality, Drinking Water Program, which provides information on the King City water supply system, served through the City of Tigard: (http://www.tigard-or.gov/city_hall/departments/PublicWorks/Water/water_quality_report.pdf)

Oregon Department of Land Conservation and Development GOAL 5 regulations (OAR 660-015-0000(5) and guidelines were reviewed to ensure that this report provided adequate discussion on GOAL 5 resource assessment requirements. http://www.oregon.gov/LCD/docs/goals/goal5.pdf

Oregon Dept. of Fish & Wildlife (http://www.dfw.state.or.us/)

Oregon Plan for Salmon & Watersheds (http://www.oregon.gov/OPSW/pages/index.aspx)

Title 13 Inventory, Portland Metro Region, Oregon: https://databasin.org/datasets/afdbf390255549418f26855af59b2f79

Tualatin Basin Water Supply Project: http://www.tualatinbasinwatersupply.org/about/)

Tualatin River Watershed Council website provides several resource maps as well as excellent description of the Tualatin Basin watershed (http://trwc.org/tualatin-basin-information/)

Tualatin River Watershed Council map gallery: http://trwc.org/tualatin-basin-information/

Washington County NRCS Soil Survey (online version: WEB Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Google Earth historic timeline aerial photos of the project areas

Washington County Watermaster information about King City water supply: http://www.co.washington.or.us/Watermaster/GroundWater/GroundWaterManagementAreas/cooper-bull-mountain.cfm

Metro Regional Trail Planning:
http://www.oregonmetro.gov/sites/default/files/2014%20Regional%20Trails%20and%20Greenways%20publication_print.pdf;

Metro's Portfolio of Natural Areas, Parks and Trails: Opportunities and Challenges:
http://www.oregonmetro.gov/sites/default/files/portfolio_report.pdf