

Heritage Pine Natural Area

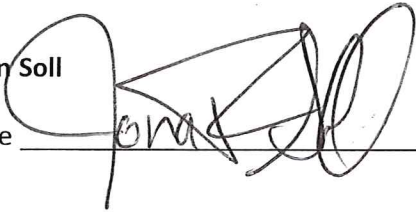
Approvals for Site Conservation Plan

Date first routed: 02-1-2016

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Date

4/19/16

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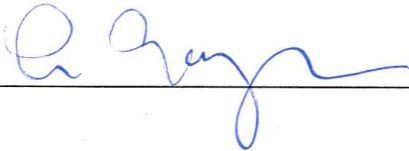


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6/6/16

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Date

5/13/16

Just see
me re my
commitments

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5/5/2016

SITE CONSERVATION PLAN

Heritage Pine Natural Area



February 2016



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INTRODUCTION

CONTEXT

Heritage Pine Natural Area is an approximately 147-acre property located near Sherwood, Oregon, just east of the Tualatin River National Wildlife Refuge (see Vicinity map). The site is roughly bordered by the Tualatin River to the north, Southwest Pacific Drive to the south, a high density residential neighborhood to the east and undeveloped farmland to the west. Heritage Pine is part of the Tualatin River Greenway target area and borders the urban growth boundary to the east. Heritage Pine falls within the Washington County rural reserve and is zoned as Exclusive Farm Use (EFU).

Heritage Pine Natural Area consists of the Morand Trust property, purchased under the 1995 Open Space Bond Measure. The Morand Trust property was acquired in 1996 and consisted of four separate tax lots. This acquisition contributed to the 1995 acquisition program goals of preserving the floodplain, wetland and riparian habitats along the river, while providing possible public access to natural areas in and around the access points, including distinctive habitats such as the interiors of oxbows and the confluences of major creek tributaries, and establishing acquisition or management partnerships with other public agencies providing for current, proposed or potential access sites and natural areas along the river. In August 2001, Metro and the Tualatin River National Wildlife Refuge entered into an intergovernmental agreement to allow restoration and management of approximately 50 acres of the Heritage Pine Natural Area as part of the National Wildlife Refuge system. In June 2015 this IGA was renewed for its third amendment.

This conservation plan has been developed by Metro staff and includes an overview of the history of the site, existing conditions, conservation targets and recreation and access objectives for the site.

PLANNING AREA

This site conservation plan includes Metro-owned property and considers adjacent parcels that contain important habitat features or would connect Metro ownership to the Tualatin River National Wildlife Refuge. Relevant habitat features include wet prairie, oak woodland, emergent wetland, and upland and riparian forest.

KEY METRO STAFF

Jeff Merrill, Associate Natural Resources Scientist
Adam Stellmacher, Lead Natural Resources Specialist
Ryan Jones, Natural Resources Specialist
Ariel Whitacre, Natural Resources Technician
Robert Spurlock, Regional Trails Planner
Ryan Ruggiero, Real Estate Negotiator
Laurie Wulf, Property Management Coordinator

KEY PARTNERS

USFWS Tualatin River National Wildlife Refuge – Erin Holmes, Refuge Manager; Curt Mykut, Refuge Biologist

KEY PRIVATE LANDOWNERS

Kummrow family – 18580 Kummrow Ave., Sherwood (various taxlots, includes Keck property) Properties could provide connectivity to Tualatin River National Wildlife Refuge, protect extensive Tualatin River floodplain area and associated riparian habitats and extend historic prairie and oak habitat.

Gregory Wallace Mallory – 17500 SW Elsner Road, Sherwood

Large agricultural parcel west of Heritage Pine Natural Area and north of the Refuge, would protect an additional 10,000 feet of Tualatin River frontage and its associated floodplain/riparian habitats, connect to the Refuge putting a large stretch of land along the Tualatin River under public ownership on both banks, and protect riparian habitat that appears to have a significant component of Oregon white oak.

EXISTING PLANNING DOCUMENTS

1995 and 2006 Bond refinement plans for the Tualatin River Greenway can be found here:

<M:\PN\Regional Properties\Tualatin River Greenway TA.>

The Morand *Metro Property Report 2001-2011* prepared by the USFWS, Tualatin River National Wildlife Refuge can be found in Terramet.

The intergovernmental agreement with the U.S. Fish and Wildlife Service regarding management of the Heritage Pine property can be found in Terramet.

EXISTING CONDITIONS

SITE DESCRIPTION

Heritage Pine Natural Area consists of a variety of habitats including upland and riparian mixed forest, wet prairie, emergent wetland and a small area of oak woodland (see Current Cover map). The site has approximately 3,800 feet of frontage on the Tualatin River and the riparian forest is relatively intact along most of that length. There are three areas with narrow riparian buffers – one to the north adjacent to the wet prairie, another cultivated area to the east and a third area to the east associated with ground water monitoring wells. The monitoring wells are in place due to a petrochemical spill from a Southern Pacific Pipelines distribution line that occurred prior to Metro ownership. In summer 2015 some of the remediation site infrastructure was decommissioned by permission of Oregon DEQ with some infrastructure remaining (see Appendix A). A detailed overview of the petrochemical spill and history of monitoring and mitigation is available on the DEQ Environmental Cleanup Site Information database for Site ID 1682 – Tualatin River pipeline leak (<http://www.deq.state.or.us/lq/ECSE/ecsdetail.asp?seqnbr=1682>).

The southern two-thirds of the site consists of a terrace that gradually slopes down to the Tualatin floodplain at the northern third of the site. The upland area is currently used primarily for agriculture, but also has a small area of upland mixed forest and oak woodland running along the top and side of the terrace escarpment. The bottomland area floods frequently, receiving new sediment deposition each time. The floodplain elevation ranges from 110 feet at the lowest point in the bottomland to 120 feet on higher ground near the river's edge. Natural levees are built adjacent to the river by deposition of coarser suspended sediment during high flows that overtop the banks.

These natural levees are an important ecological feature of the floodplain because they trap flood waters and create a mosaic of vegetation types that are adapted to various flood depths, durations and frequencies.

Two areas are considered developed for the purposes of this plan. One consists of the ground water monitoring area mentioned above; the other consists of the rental property and associated outbuildings, the landscaped lease area and a large agricultural structure/barn.

The riparian forest areas are in relatively good condition with an overstory of *Fraxinus latifolia* (Oregon ash), *Acer macrophyllum* (bigleaf maple) and scattered large conifers. There is also a significant *Quercus garryana* (Oregon white oak) component mixed throughout the riparian forest, much of it occurring on the emergent wetland edges. The main threats to the riparian forest structure consist of invasive trees such as *Crataegus monogyna* (common hawthorn), *Ilex aquifolium* (English holly) and non-native *Prunus* (cherry), but there are also patches of *Rubus armeniacus* (Himalayan blackberry) occurring on the edges adjacent to the prairie and emergent wetland.

The upland forest areas are relatively small because the majority of the potential upland habitat areas are in cultivation. The areas with upland forest cover experience the same threats as the riparian forest – invasive trees and blackberry patches. One area adjacent to the rental property has a more mature stand of upland forest with a fairly high density of *Psuedotsuga menziessi* (Douglas fir).

Emergent wetland covers approximately six acres of the site and the hydrology is currently controlled and enhanced by a water control structure. Currently the structure remains closed most of the time and impounded water in the emergent wetland is allowed to slowly evaporate over the dry season. Periodically, the Tualatin River overtops its banks and the emergent wetland is charged by these floodwaters. If a bank overtopping event of the Tualatin River does occur, Refuge staff open the structure and water is drawn down. This is to facilitate passage of juvenile fish that may have been trapped in the wetland by the overtopping event. After water is drawn down the structure is closed and the wetland is allowed to recharge. Beaver sometimes build dams adjacent to the water control structure making operation of the structure difficult and impeding flow of water out of the wetland complex. *Phalaris arundinacea* (reed canarygrass) is becoming the dominant vegetative cover in the majority of the wetland. Refuge staff will be reevaluating the effectiveness of the water control structure to determine whether it is fulfilling its purpose and whether continued operation is warranted. Depending on the outcome of this evaluation, decommissioning of the structure could be recommended.

Oak woodland comprises approximately five acres along the edge of the bluff that descends to the floodplain. A number of very large, open grown Oregon white oak trees are present along with bigleaf maple, Oregon ash and an understory of blackberry and assorted shrubs. Some bigleaf maple and ash are attaining sizes that are beginning to impact the oak trees, competing for light and resources. The home site, outbuildings, barn and agricultural operations are located in this area, limiting the current extent of the manageable oak woodland area.

The wet prairie was densely planted with *Pinus ponderosa* (ponderosa pine), oak and assorted shrubs (see Morand *Metro Property Report 2001-2011*) approximately 12 years ago with good survival. The area is quickly becoming a pine forest and to retain prairie characteristics a substantial number of the woody species will need to be removed. Non-native pasture grass and encroaching blackberry dominate the understory layer along with an common hawthorn component. The iconic tree that gives name to the site sits at the edge of the prairie. This candelabra-shaped tree has not yet been dated, but best professional judgment indicates the tree is several centuries old.

SOILS

Several soil types are present at Heritage Pine Natural Area. Soils present include Chehalis silt loam, Chehalis silty clay loam, Cove clay, Hillsboro loam and Wapato silty clay loam (see Soils map). Additionally, Xerochrepts and Haploxerolls (well-drained soils on rocky escarpments) reflect the steep slopes rising abruptly from the stream channel to the surrounding landscape.

Table 1. Soils present at the Heritage Pine Natural Area

Map soil symbol	Map unit name	Description
9	Chehalis silty clay loam	The Chehalis series consists of well-drained soils that formed in recent alluvium on bottomlands. Slope is 0 to 3 percent. Where these soils are not cultivated the vegetation is Oregon ash, cottonwood and willow.
10	Chehalis silt loam	The Chehalis series consists of well-drained soils that formed in recent alluvium on bottomlands. Slope is 0 to 3 percent. Where these soils are not cultivated, the vegetation is Oregon ash, cottonwood, and willow.
14	Cove clay	The Cove series consists of poorly drained soils that formed in recent clayey alluvium on floodplains. Slope is 0 to 2 percent. Where these soils are not cultivated, the vegetation is mainly Oregon ash and willow, with some sedges, cattails and grasses.
21	Hillsboro loam	The Hillsboro series consists of well drained soils that formed in mixed, silty and loamy, old alluvium on terraces. Where these soils are not cultivated, the vegetation is Douglas fir, Hazelnut, blackberries, grasses and forbs.
43	Wapato silty clay loam	The Wapato series consists of poorly drained soils that formed in recent alluvium on floodplains. Slope is 0 to 3 percent. Where these soils are not cultivated, the vegetation is Oregon ash, willow, rushes and grass.
46	Xerochrepts and Haploxerolls	The Xerochrepts and Haploxerolls occur as steep to very steep escarpments along the small streams that have cut deeply into the valley terraces and where the terraces meet the bottomlands and floodplains along major streams and rivers. These soils are well drained. They formed in a mixture of silt, sand and an accumulation of material that has moved down-slope. The short slopes range from 20 to 60 percent. Vegetation is Douglas-fir, Oregon white oak, shrubs, forbs and grasses.

HYDROLOGY

The hydrology of the Heritage Pine Natural Area has been altered over many years due to farming practices. According to the historic land cover assessments (GLO surveys and Willamette Valley Historical Vegetation layer), pre-settlement land cover at the site included wet prairie with mixed riparian forest and nearby seasonal wetlands. In 2001 the USFWS undertook a project to restore six acres of emergent wetland at Heritage Pine with the installation of a water control structure.

To restore seasonal flooding, drainage tiles that drained subsurface waters to the north into the Tualatin River were removed or crushed. An embankment and water control structure were constructed across an excavated drainage channel, located along the southern and eastern edge of the project site, allowing control of water levels in the wetland. The water control structure was designed to allow draining of the wetland basin when the river is down and also allow the river to back-flood through the structure to fill the basin during periods of high water. The structure consists of a 36-inch diameter overshot weir gate with the top of the gate containing a 45-degree v-notch to facilitate fish passage over the control gate during periods of minimum flow. In addition, a 24-inch diameter screw gate was installed to ensure complete dewatering of the wetland basin. Material to create the embankment was excavated from an area approximately 450 feet northwest of the water control structure. This expanded the wetland basin without impeding drainage. Water rights for storage in the wetland were requested in July 2001, under application #R-84813. In August 2002, permit #R-13319 was issued for the project by the Oregon Water Resources Department for a maximum storage capacity of 10 acre-feet.

Experience at other natural areas that have had historic agricultural drain tiles crushed or removed, show that on certain occasions water may continue to drain through the fill used to bury drain tiles if it consists of unconsolidated materials (e.g. bricks, concrete chunks, large cobble). Given this, a visual survey of the riverbank would be warranted to look for continuing drainage.

VEGETATION AND WILDLIFE

Various wildlife and vegetation monitoring efforts have been undertaken at Heritage Pine by Refuge staff, volunteers and associated researchers. These efforts include fish trapping in the wetland, avian point count surveys, marsh bird surveys, waterfowl/wading bird surveys, small mammal research and vegetation transects (see Morand *Metro Property Report 2001-2011* for more detail).

Below is a summary list of the species recorded by these monitoring efforts.

Table 2. Wildlife present at the Heritage Pine Natural Area

Fish	Reptiles and Amphibians	Birds	Mammals
<ul style="list-style-type: none"> • Three-spined stickleback (<i>Gasterosteus aculeatus</i>) • Sculpin sp. (<i>Cottus sp.</i>) • Lamprey sp. (<i>Lampetra sp.</i>) • Mosquito fish (<i>Gambusia affinis</i>)* • Warmouth <i>Lepomis gulosus</i>)* • Bluegill (<i>Lepomis macrochirus</i>)* 	<ul style="list-style-type: none"> • Long toed salamander (<i>Ambystoma macrodactylum</i>) • Pacific chorus frog (<i>Pseudacris regilla</i>) • Rough-skinned newt (<i>Taricha granulose</i>) • Northern red-legged frog (<i>Rana aurora aurora</i>) 	<ul style="list-style-type: none"> • Sora (<i>Porzana Carolina</i>) • Pied-billed Grebe (<i>Podilymbus podiceps</i>) • Virginia Rail (<i>Rallus limicola</i>) • Great Blue Heron (<i>Ardea herodias</i>) • Great Egret (<i>Ardea alba</i>) • Wood Duck (<i>Aix sponsa</i>) • Dusky Canada Goose (<i>Branta canadensis occidentalis</i>) • Hooded Merganser (<i>Lophodytes cucullatus</i>) 	<ul style="list-style-type: none"> • Virginia Opossum (<i>Didelphis virginiana</i>)* • Northern flying squirrel (<i>Glaucomys sabrinus</i>) • Striped skunk (<i>Mephitis mephitis</i>) • Creeping vole (<i>Microtus oregoni</i>) • Townsend's vole (<i>Microtus townsendii</i>) • Short-tailed weasel (<i>Mustela ermine</i>) • Shrew-mole (<i>Neurotrichus gibbsii</i>) • Deer mouse (<i>Peromyscus maniculatus</i>) • Common raccoon (<i>Procyon lotor</i>)

Fish	Reptiles and Amphibians	Birds	Mammals
			<ul style="list-style-type: none"> • Townsend's mole (<i>Scapanus townsendii</i>) • Fox squirrel (<i>Sciurus niger</i>)* • Trowbridge shrew (<i>Sorex trowbridgii</i>) • Vagrant shrew (<i>Sorex vagrans</i>) • Brush rabbit (<i>Sylvilagus bachmani</i>) • Townsend's chipmunk (<i>Tamias townsendii</i>) • Pacific jumping mouse (<i>Zapus trinotatus</i>) • Beaver (<i>Castor Canadensis</i>)

* non-native species

RECENT MANAGEMENT HISTORY

As part of the intergovernmental agreement between Metro and the Tualatin River National Wildlife Refuge, the Refuge undertook restoration work on the Heritage Pine Natural Area consisting of three elements: restore six acres of seasonal wetland, restore 13 acres of oak/pine wet prairie, and restore 3.5 acres of riparian forest (see Conservation Targets map for approximate location). The initial work for these restoration activities took place in 2001 and 2002 (see *Morand Metro Property Report 2001-2011* for more detail).

The installation of the water control structure to restore the emergent wetland is described above in the hydrology section. The wetland restoration was initially successful with many desirable species colonizing the area. Periodic mowing by Refuge staff has kept woody species such as Oregon ash to a minimum in an attempt to provide desirable conditions for wintering waterfowl and other waterbird species. However, subsequent surveys by the Refuge have shown that waterfowl usage of the wetlands have been relatively low. The wetland supports seasonal moist soil annuals such as *Beckmannia syzigachne* (American slough grass) and perennial species such as *Carex* (sedges) and *Juncus* (rushes). Despite the initial successes of the wetland enhancement, reed canarygrass has become the dominant cover in this area and efforts will be needed to control this species to prevent further degradation.

To prepare the site for the 13-acre oak/pine wet prairie restoration, the area was mowed and disked to provide a bed for native grass seed. Native grasses were sown in fall 2001 following completion of wetland restoration work. During February and March 2002 Oregon white oak and ponderosa pine were planted. See Table 3 for species composition and planting rates. Maintenance activities include periodic mowing to prevent encroachment of woody species.

Table 3. Species composition and density of oak/pine wet prairie plantings

Scientific name	Common name	Density (per acre)
<i>Agrostis exarata</i>	Spike bentgrass	1.0 lbs
<i>Bromus carinatus</i>	California brome	2.0 lbs
<i>Carex scoparia</i>	Pointed-broom sedge	1.0 lbs
<i>Deschampsia caespitosa</i>	Tufted hairgrass	2.0 lbs

Scientific name	Common name	Density (per acre)
<i>Deschampsia elongata</i>	Slender hairgrass	2.0 lbs
<i>Elymus glaucus</i>	Blue wildrye	5.0 lbs
<i>Hordeum brachyantherum</i>	Meadow barley	4.0 lbs
<i>Pinus ponderosa</i>	Ponderosa pine	61 Ea
<i>Quercus garryana</i>	Oregon white oak	38 Ea

The Oregon white oak and ponderosa pine planting has been very successful from a plant survival perspective. An unintended consequence of this success is that the prairie is quickly becoming pine/oak woodland with high density of trees in excess of 15 feet tall. Planted oak trees have been heavily browsed and pine dominates the area. If the desired future condition remains prairie, a significant reduction in woody species will be necessary. The native grasses still persist, but encroachment by non-native species is occurring. Reed canarygrass and *Holcus mollis* (creeping velvet grass) are becoming problematic.

Three-and-a-half acres were planted with species representative of local riparian forest. Native grasses were planted in fall 2001, and trees and shrubs were planted during February and March 2002. Table 4 lists plant species planted in the riparian forest restoration site. Mowing was conducted during the first few years to prevent grass species from crowding desired species.

Table 4. Species composition and density of riparian forest plantings

Scientific Name	Common Name	Density (per acre)
<i>Abies grandis</i>	Grand fir	86 plants
<i>Acer circinatum</i>	Vine maple	7 plants
<i>Acer macrophyllum</i>	Big leaf maple	86 plants
<i>Alnus rubra</i>	Red alder	314 plants
<i>Amelanchier alnifolia</i>	Serviceberry	14 plants
<i>Bromus carinatus</i>	California brome	18.0 lbs
<i>Cornus sericea</i>	Red osier dogwood	14 plants
<i>Crataegus douglasii</i>	Black hawthorn	143 plants
<i>Elymus glaucus</i>	Blue wildrye	9.0 lbs
<i>Fraxinus latifolia</i>	Oregon ash	229 plants
<i>Malus fusca</i>	Crab apple	14 plants
<i>Philadelphus lewisii</i>	Mock orange	3 plants
<i>Physocarpus capitatus</i>	Pacific ninebark	71 plants
<i>Populus trichocarpa</i>	Black cottonwood	14 plants
<i>Pseudotsuga menziesii</i>	Douglas fir	171 plants
<i>Rosa pisocarpa</i>	Wild rose	40 plants
<i>Salix scouleriana</i>	Scouler's willow	27 plants
<i>Sambucus racemosa</i>	Red elderberry	14 plants

This riparian restoration effort was largely unsuccessful. Heavy predation by deer has hampered success on this site. Tree protection tubes were installed on trees and shrubs at this site. Many of the tubes are still on the plants and the plants are still alive, but are constantly nipped off at the top of the tube by deer. Given the reliance on mechanical maintenance (mowing) and lack of herbicide treatments, grass competition, vole damage and re-growth of Himalayan blackberry likely also played a role in tree and shrub mortality.

Metro is beginning to undertake site-wide invasive weed treatments (2014-2015) as part of its Natural Areas Levy natural areas maintenance project. The work will initially target invasive woody species such as Scots broom, English holly and laurel, European hawthorn and non-native cherry

species. Future targets may include blackberry and reed canarygrass, though some areas may be treated as part of a future levy restoration project rather than long term maintenance.

NATURAL RESOURCES OF SPECIAL INTEREST

Sidalcea nelsoniana (Nelson’s checkermallow), federally listed as threatened, is found at Heritage Pine in two known locations. One patch was planted along the margin between the wetland and wet prairie area during 2008 and 2010 by Refuge staff. The seed was sourced from the Basket Slough National Wildlife Refuge west of Salem, OR and from Metro’s Penstemon Prairie Natural Area. In February 2008, 57 plants were installed. Plants were planted in three rows parallel to the shoreline of the wetland. A survey was conducted in July 2008 and revealed 100 percent survival of plants sampled. Subsequent sampling of all plants in June 2009 revealed a survival rate of 93 percent. In 2010 an additional 230 plants were installed in the same area. Spring sampling during 2010 following additional planting revealed a survival rate of 88 percent.

A second patch appears to be natural and was discovered by Refuge staff after the planting of the first patch had occurred. It is located along the grassy portion of the access road just to the north of the water control structure.

Operational limitations of the water control structure are linked to Upper Willamette River Chinook salmon (spring run) and Upper Willamette River steelhead (winter run) ESUs, both which are listed as threatened by the National Marine Fisheries Service. In flooding events where water from the Tualatin overtops the floodplain and fills the wetland, there is the possibility that juvenile salmon and steelhead will travel into the wetlands trapping them. Detail on the operations of the water control structure to account for such events are mentioned in the site description section and can also be found in the Morand *Metro Property Report 2001-2011* Appendix A section 1.5.1.3.

CONSERVATION

CONSERVATION TARGETS

Conservation targets are composed of a species, suites of species (guilds), communities and ecological systems that represent and encompass the full array of native biodiversity of the site, reflect local and regional conservation goals and are viable or at least feasibly restorable (The Nature Conservancy, 2007).

There are five conservation targets for Heritage Pine Natural Area: wet prairie, riparian forest, oak woodland, upland forest and emergent wetland (see Conservation Targets map).

Table 5. Non-technical status and desired future condition of conservation targets

CONSERVATION TARGET	CURRENT CONDITION	DESIRED FUTURE CONDITION
Wet prairie	Currently trending towards pine/oak woodland with high invasive cover (blackberry, pasture grass, etc.)	Trending towards wet prairie with woody cover reduced to <5% total cover in the near term.
Riparian forest	Generally good condition with moderate amounts of invasive trees and patchy blackberry spots. Some riparian oak being suppressed by taller trees.	Good condition with healthy mix of species and sizes of trees and shrubs. Oak released in a targeted manner where feasible and appropriate.
Oak woodland	Understory currently invaded by blackberry and invasive trees. Moderate encroachment of big leaf maple, Douglas-fir and Oregon ash trees resulting	Fully released open grown oak trees with native shrub and forb understory. Structures removed and expansion of oak woodland through plantings.

CONSERVATION TARGET	CURRENT CONDITION	DESIRED FUTURE CONDITION
	in near term suppression of oak trees. House, outbuildings and agricultural operations located in area of potential oak woodland.	
Upland forest	Generally a small area and in similar condition to the riparian forest. Most areas that would become upland forest are currently in agriculture.	Low levels of invasive plants in the understory, healthy shrub/forb understory and young trees scattered throughout.
Emergent wetland	Invaded by reed canarygrass and blackberry on the fringes. Water control structure left open full time.	Reduction of invasives and enhancement of plant community. Clearer direction on operation of water control structure.

Table 6. Metro property stewardship classification (acres)

	0 PRE-INITIATION	1 INITIATION	2 ESTABLISHMENT	3 CONSOLIDATION	4 MAINTENANCE
Wet Prairie					
Present Condition	12.8	0	0	0	0
Oak Woodland					
Present Condition	40.6	0	0	4.8	0
Riparian Forest					
Present Condition	2.4	3.2	0	0.9	24.6
Upland Forest					
Present Condition	38.7	0	0	1.7	11.5
Emergent Wetland					
Present Condition	0	0	0	5.7	0

KEY ECOLOGICAL ATTRIBUTES

Key ecological attributes are the features that define that target and aspects of a conservation target’s biology or ecology that, if missing or altered, would lead to the loss of that target over time (The Nature Conservancy, 2007). KEAs define the conservation target’s viability. They are the biological or ecological components that most clearly define or characterize the conservation target, limit its distribution or determine its variation over space and time. They are the most critical components of biological composition, structure, interactions and processes, and landscape configuration that sustain a target’s viability or ecological integrity. KEAs are rated from poor to good. This rating helps establish the restoration goals and guide us in development of restoration actions for the conservation targets.

Table 7. Key ecological attributes for wet prairie – Heritage Pine Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Size	Grassland bird habitat	Number of potential male meadowlark territories (8 ha, or 20 ac units)	<16 ha (40 ac) contiguous habitat: mix of prairie and degraded prairie, savanna or, appropriate pasture habitat, i.e. insufficient prairie/savanna habitat for 2 male meadowlarks.	16-49 ha (40-120 ac) of contiguous prairie or other suitable habitat, i.e. enough suitable habitat for 2-5 male meadowlark territories	49-162 ha (120-400 ac) of suitable contiguous/connected habitat, i.e. enough for 6-20 male territories; alternatively, 3 patches of closely associated suitable habitat, each >16 ha (40 ac) in size	>162 ha (400 ac) of suitable contiguous or connected habitat, i.e. enough suitable habitat for >20 male meadowlark territories; alternatively, 3 patches of suitable contiguous or connected habitat, each >57 ha (140 ac)	Poor	Poor	Fair	Constrained by area available, need to avoid loss of area. Future acquisition to the west could expand prairie area.
Condition	Vegetative cover: woody species	Area of woody vegetation (trees and shrubs) with cover less than 5%	Total woody cover less than 5% cover over less than 50% of the area being managed for prairie	Total woody cover <5% over 50% to 90% of the area being managed for prairie	Total woody cover <5% over at least 90% of the area being managed for prairie, though trees saplings and/or shrub sprouts may be present within these areas	Total woody cover is <5% over at least 90% of the area being managed for prairie, and trees saplings and/or shrub sprouts are absent	Poor	Very Good	Very Good	Removal of 95% of woody cover should be feasible.
Condition	Native grass and forb presence	Native species richness (for the mosaic)	<20 native herbaceous plant species with high fidelity to the system types present within the patch	20-39 native herbaceous plant species with high fidelity to the system types present at the patch	40-59 native herbaceous plant species with high fidelity to the system types present at the patch	> 60 native herbaceous plant species with high fidelity to the system types present at the patch	Poor	Fair	Fair	Current rating presumed poor but would be possible to ascertain through a botanical survey of prairie. Short- and long-term DFC dependent on funding and long-term maintenance considerations.
Landscape context	Proximity (distance) to other target habitat patches	Number of habitat patches ≥ 40 (16 ha) ac within 2 km (1.25 mi)	No patches within 2km (1.25 mi)	1 patch within 2 km (1.25 mi)	2 patches within 2 km (1.25 mi)	At least 3 patches within 2 km (1.25 mi)	Poor	Poor	Fair	Acquisition of additional natural areas has the potential to lead to improvement of landscape context.

*Desired future condition

Table 8. Key ecological attributes for oak woodland – Heritage Pine Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT STATUS	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Size	Habitat area	Number of 8 ha (20 acre) units: based on a combination of white-breasted nuthatch, acorn woodpecker and gray squirrel territory size	<16 ha (40 ac) of oak woodland or oak forest in a functionally contiguous patch (multiple patches totaling 16 ha, or 40 acres, located in close proximity), i.e. insufficient oak woodland/forest for home range of 2 nuthatch pairs or acorn woodpecker colonies	16-49 ha (40-120 ac) oak woodland or forest in a functionally contiguous patch, i.e. enough suitable habitat for 2-5 nuthatch pairs or acorn woodpecker colonies	49-162 ha (120-400 ac) oak woodland or forest in a functionally contiguous patch, i.e. enough suitable habitat for 6-20 nuthatch pairs or acorn woodpecker colonies <u>OR</u> 3 patches of closely associated suitable habitat, each >16 ha (40 ac) in size	>162 ha (400 ac) of oak woodland or oak forest in a functionally contiguous patch, i.e. enough suitable habitat for >20 nuthatch pairs or acorn woodpecker colonies <u>OR</u> 3 patches of suitable contiguous or connected habitat, each >57 ha (140 ac)	Poor	Poor	Fair	Constrained by area available, need to avoid loss of area. It is an isolated patch but could potentially expand to greater area in agricultural field if oak woodland was to take priority over upland forest. A larger area of oak/fir woodland could be blended into the upland forest.
Condition	Native grass and forb presence	Native species richness (for the patch)	<20 native herbaceous plant species with high and moderate fidelity to oak woodland occur within the patch	20 -39 native herbaceous plant species with high and moderate fidelity to oak woodland occur within the patch	40 -59 native herbaceous plant species with high and moderate fidelity to oak woodland occur within the patch	>60 native herbaceous plant species with high and moderate fidelity to the system types present within the patch	Poor	Fair	Fair	Current rating presumed poor but would be possible to ascertain through a botanical survey of oak woodland. Short- and long-term DFC dependent on funding and long-term maintenance considerations.
Condition	Native grass and forb abundance	Relative cover of native forb and grass species	<20% of total herbaceous cover	20-30% of total herbaceous cover	30-50% of total herbaceous cover	>50% of total herbaceous cover	Poor	Fair	Good	Current extent of oak woodland has a heavy understory of blackberry.
Condition	Vegetation structure	Canopy cover and architecture of woody vegetation	Woody vegetation (e.g., Douglas fir) is encroaching and total native canopy cover is acceptable (30-60%) over less than half of the target area	Woody vegetation encroaching but total native canopy cover is 30-60% at least half of the target area	Woody vegetation encroaching but total native canopy cover is 30-60% at least 90% of the target area	Woody vegetation encroaching is generally absent, total native canopy cover is 30-60% in the target area, and canopy architecture is appropriate mix of large open grown trees/younger trees	Fair	Good	Very Good	Improvements can be made by reducing encroaching woody vegetation and planting or natural recruitment of oak seedlings.
Landscape context	Edge condition	% of edge bordered by natural habitats and/or managed for conservation	Patch surrounded by non-natural habitats (0-25% natural habitat)	25%+ of patch bordered by natural habitats	50-75% of patch bordered by natural habitats or managed for conservation	75-100% of patch bordered by natural habitats or managed for conservation	Fair	Good	Very Good	Eventual structure removal will improve the edge condition. Longer term retirement of the agricultural lease will improve edge condition further.

*Desired future condition

Table 9. Key ecological attributes for riparian forest – Heritage Pine Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT STATUS	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Size	Riparian forest width	Average width of riparian forest	<15 m (50 ft) each side of stream	15-30 m (50-100 ft) each side of stream	30-61 m (100-200 ft) each side of stream	>61 m (200 ft) each side of stream	Good	Good	Very Good	Limited to one side of stream. Some gaps in riparian cover limit rating to Good. Eventual revegetation of these areas will achieve a Very Good rating.
Condition	Vegetative structure: tree layer	% native tree canopy cover	<20% cover	20-30% cover	30-40% cover	40% or more	Good	Good	Very Good	Some gaps in riparian area limit rating to Good. Eventual revegetation of these areas will achieve a Very Good rating.
Condition	Native tree and shrub richness	# native tree and shrub species per 0.4 ha (1 ac)	<5 species	5-10 species	10-15 species	>15 species	Good	Good	Very Good	Based on USFWS tree/shrub plot data. Understory enhancement could raise DFC to Very Good.
Condition	Standing and downed dead trees	Average # snags and large wood (> 50 cm, or 20 in, DBH) per 0.4 ha (1 ac)	< 5 snags and <5% down wood	5-11 snags and 5-10% down wood	12-18 snags and 10-20% down wood with moderate variety of size and age classes	> 18 snags and >20% cover down wood in a good variety of size and age classes	Poor(Fair)	Fair	Good	Presumed Poor to Fair through visual assessment and assumptions about past land use. Snag/downed wood creation could move condition firmly into Fair. Would be possible to ascertain with a stand assessment. Long-term growth and recruitment of standing dead and downed trees will eventually raise level to Good.

*Desired future condition

Table 10. Key ecological attributes for upland forest – Heritage Pine Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT STATUS	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Size	Forested habitat patch size	Patch size (includes native shrub patches or natural clearings)	< 12 ha (30 ac)	12-40 ha (30-100 ac)	40-61 ha (100-150 ac)	>61 ha (150 ac)	Poor	Poor	Good	Eventually retirement of agricultural lease will improve the size of the upland forest patch.
Condition	Native tree and shrub richness	Number of native tree and shrub species per acre	<5 species per 0.4 ha (1 ac)	5-8 species 0.4 ha (1 ac)	8-12 species per 0.4 ha (1 ac)	>12 species per 0.4 ha (1 ac)	Very Good	Very Good	Very Good	Maintain tree and shrub richness. Based on USFWS tree/shrub plot data.
Condition	Mature trees	Number and size (dbh) of species such as Douglas fir, western red cedar, western hemlock and grand fir	Mature trees lacking	<3 per ac with dbh >24 in	3-5 per ac with dbh >24 in	>5 per ac with dbh >24 in	Fair	Fair	Good	Presumed Fair to Good through visual assessment. Would be possible to ascertain with a stand assessment.
Condition	Standing and downed dead trees	Average # snags and large wood (> 50 cm, or 20 in, DBH) per acre	< 5 snags and <5% down wood	5-11 snags and 5-10% down wood	12-18 snags and 10-20% down wood with moderate variety of size and age classes	>18 snags and >20% cover down wood in a good variety of size and age classes	Poor(Fair)	Fair	Good	Presumed Poor to Fair through visual assessment and assumptions about past land use. Would be possible to ascertain with a stand assessment. Snag/downed wood creation could move condition firmly into Fair. Long-term growth and recruitment of standing dead and downed trees will eventually raise level to Good.
Landscape context	Edge condition	% of edge bordered by natural habitats and/or managed for conservation	Patch surrounded by non-natural habitats (0-25% natural habitat)	25%+ of patch bordered by natural habitats	50-75% of patch bordered by natural habitats or managed for conservation	75-100% of patch bordered by natural habitats or managed for conservation	Fair	Fair	Very Good	Eventual retirement of agricultural lease and structure removal will improve the edge condition.

*Desired future condition

Table 11. Key ecological attributes for emergent wetland – Heritage Pine Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT STATUS	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Native wetland plant cover in emergent area	Dominance of native herbaceous plants characteristic of the region's wetlands	<25% cover of vegetated areas	25-50% cover of vegetated areas	50-75% cover of vegetated areas	>75% cover of vegetated areas	Fair	Good	Very Good	Reed canarygrass and blackberry in the emergent wetland area are crowding out native vegetation.
Condition	Vegetative structure	Percent tree and shrub canopy cover in emergent area	>20% cover	20-15% cover	15-5% cover	<5% cover	Good	Good	Food	Minor encroachment by ash trees. Periodic mowing should keep younger trees from persisting.
Condition	Hydrology	Hydroperiod	Both the filling/inundation and drawdown/drying of the site deviate from natural conditions (either increased or decreased magnitude and/or duration)	Site's filling or inundation patterns are characterized by natural conditions, but thereafter are subject to more rapid/extreme drawdown or drying compared to more natural wetlands <u>OR</u> patterns are of substantially lower magnitude or duration than under natural conditions, but thereafter site is subject to natural drawdown or drying	The filling or inundation patterns in the site are of greater magnitude (and greater or lesser duration than would be expected under natural conditions, but thereafter, the site is subject to natural drawdown or drying.	Hydroperiod of the site is characterized by natural patterns of filling or inundation and drying or drawdown	Fair	Fair	Fair	Patterns are likely lower magnitude or duration due to incised nature of Tualatin River. Water control structure has improved water storage capacity.

*Desired future condition

THREATS AND THEIR SOURCES

An effective conservation strategy requires an understanding of threats (stresses) to targets and the sources of those threats. Adjacent development and subsequent disruption of natural systems place stress on the resource and its inhabitants and threaten the health of the greater ecosystem.

Table 12. Summary of Heritage Pine’s threats

CONSERVATION TARGET	STRESS (DEGRADED KEA)	SEVERITY	SCOPE	OVERALL STRESS RANK	SOURCE (THREAT)	CONTRIBUTION	IRREVERSIBILITY	OVERALL SOURCE RANK	OVERALL THREAT RANK	COMMENTS
Wet prairie	High cover of woody species	Very High	Very High	Very High	Planted pine, oak and shrub species	Very High	Medium	High	Very High	Continued growth of trees and shrubs will quickly move the wet prairie farther from DFC and make future actions more challenging and costly
Wet prairie	Reduced native species richness/cover	High	High	High	Invasive species	Very High	Medium	High	High	Invasion by reed canarygrass, blackberry and non-native grasses has reduced native species richness/cover.
Oak woodland	Encroaching over story vegetation	Medium	High	Medium	Native tree species (D.fir, BL maple and O.ash)	Very High	Low	High	Medium	Continued growth of encroaching trees will begin to impact open grown oak trees. However, release should be fairly straightforward.
Oak woodland	Reduced native species richness	High	High	High	Invasive Species (including EDRR)	High	Medium	Medium	Medium	Blackberry is currently invading the understory of the oak woodland reducing the native species richness/cover.
Emergent wetland	Reduced native herbaceous plant cover	High	High	High	Invasive species/altered hydroperiod	Very High	Medium	High	High	Invasion by reed canarygrass has reduced the native species richness/cover.
Emergent wetland	Altered hydroperiod	Medium	High	Medium	Drain tiles and Non-functioning water control structure	Medium	High	Medium	Low	Water control structure has improved water storage and increased hydroperiod. Visual survey for functioning drain tiles would indicate if additional improvement is possible.
Wet prairie/oak woodland	Small patch size	High	High	High	Previous and current land use	Low	Medium	Low	Low	Though small patch size is a problem for large patch-dependent species it doesn’t continue to degrade the conservation target over time per se.

CLIMATE CHANGE CONSIDERATIONS

In coming decades, climate change is expected to increase summer temperatures and the severity of winter storms, as well as reduce precipitation in summer.

Direct effects that may occur

- Increased summer temperatures
- Increased severity of winter rain events leading to flashier stream flows
- Decreased water availability in summer; future summer flow and its deviation from historic conditions are not known

Indirect effects that may occur

- Range shifts by undesirable plants increasing competition
- Disease introductions and/or increased vulnerability to disease
- Loss of synchronicity of plant reproduction and pollinators
- Loss of synchronicity of resident and migratory animals, habitat and food sources (e.g., insect hatches and stream flows for rearing Chinook salmon)

Heritage Pine Natural Area may provide a stepping stone and habitat for organisms that must shift their ranges in response to climate change. Its proximity to the Tualatin River National Wildlife Refuge adds to its habitat value by creating a larger protected core area.

Table 13. Threats and actions for KEAs of important targets affected by climate change

TARGET	KEA	THREAT	ACTION	NOTES
Riparian forest	Floodwater access to the floodplain	Increased severity and flashiness of flows in storm events	Maintain riparian forest in good condition and with a good density of over and understory species. Restore and plant patchy areas to increase roughness on floodplain.	
Upland forest; riparian forest	Native tree and shrub richness	Less resilience in plant community to respond to climatic changes	Implement understory and riparian enhancement through invasive abatement and native planting where needed.	Invasive weed abatement initiated in FY15 and continuing in FY16.
Wet prairie; emergent wetland	Surface hydrology	Possible change in timing and amount of flow	Revisit function of water control structure to understand operation limitations. Visual assessment of residual drain tile function.	

NATURAL RESOURCE STRATEGIES

This conservation plan outlines strategic actions to be carried out at Heritage Pine Natural Area over the next 10-15 years. They are based on the short- and long-term goals for the conservation targets. The strategic actions described here are general courses of action to achieve these objectives and not highly prescriptive courses of action. Specific prescriptions and projects will be developed collaboratively by Metro and Refuge staff to address site-specific conditions encountered in the areas targeted for restoration action. Strategies have been ranked high, medium and low based on a combination of overall threat rank, ease and cost of implementation and regional importance of the conservation target.

High priority strategies

- Initiate wet prairie restoration by removal of woody vegetation, invasive control and native species enhancement. Restoration could be implemented at various scales or intensities depending on a program-wide prioritization of Metro's prairie sites as well as budgetary considerations. For example, this could cover the spectrum from full restoration to restoration that restores a prairie structure (i.e. removal of woody vegetation) without significant enhancement of the herbaceous layer.
- Treat invasive reed canarygrass and blackberry in emergent wetland and enhance native species cover.
- Eliminate small patch of garlic mustard to stop it from spreading; track through site-wide EDRR.

Medium priority strategies

- Investigate current operation of water control structure, limitations and opportunities in addition to scouting for still-functioning drain tiles to assess the function/value of the structure and look for further opportunities to enhance emergent wetland habitat.
- Improve riparian and upland forest understory through invasive tree treatments.
- Treat patches of blackberry and other invasives across site and plant native trees and shrubs or seed grasses/forbs where appropriate, including riparian planting failure north of wet prairie.
- Explore removal of house and outbuildings and implement if feasible; expansion of oak woodland.
- Explore acquisition opportunities to connect Heritage Pine Natural Area with Tualatin River National Wildlife Refuge or to expand natural area.
- Implement oak release on large open grown oaks; remove encroaching overstory trees.

Lower priority strategies

- Enhance upland and riparian forest complexity by snag and downed wood creation where appropriate.
- Targeted oak release in riparian forest.
- Explore retirement of agricultural lease and expand upland forest and oak woodland.
- Assess and record the characteristics of the iconic Heritage Pine tree, including age, diameter, height, health and structural integrity.

Table 14. List of proposed strategies

STRATEGY	SOURCES OF STRESS ADDRESSED	FOCAL CONSERVATION TARGETS/KEAS AFFECTED	WHY IMPORTANT AND TIMING ISSUES	MEASURE(S) OF SUCCESS	RANK*
Initiate wet prairie restoration by removal of woody vegetation, invasive control and native species enhancement	Planted pine, oak and shrub species	Wet prairie/vegetative cover: woody species and native grass and forb presence	Continued growth of trees and shrubs will move the wet prairie farther from DFC and make future actions challenging and costly. Adequate funding to implement and maintain wet prairie restoration must be available. Could be done in stages.	5% woody cover remaining on prairie. Low invasive cover and Fair native species richness	High
Treat invasive reed canarygrass and blackberry in emergent wetland and enhance native species cover	Invasive species	Emergent wetland/native wetland plant cover in emergent area	Reed canarygrass and blackberry infringing on emergent wetland. Would most logically be done by restoration of adjacent wet prairie.	<5% cover of invasives and good native wetland plant cover.	High
Eliminate small patch of garlic mustard to stop it from spreading; track through site-wide EDRR	Invasive species	Oak woodland (known infestation)/native grass and forb abundance	Garlic mustard has ecosystem changing effects and should not be allowed to become established.	Eradication of garlic mustard from site.	High
Investigate current operation of water control structure limitations and opportunities in addition to scouting for still functioning drain tiles to further enhance emergent wetland habitat	Altered hydroperiod	Emergent wetland and to lesser extent wet prairie/hydrology	Water control structure currently left open due to juvenile fish escape-ment requirements; beaver damming has partially closed it. Holding water longer would benefit emergent wetland and wet prairie enhancement.	Clarification of control structure's operation and beneficial effects. Examination of drain tile demolition success.	Med
Improve riparian and upland forest under- story through invasive tree treatments	Invasive species	Riparian and upland forest/native tree and shrub richness	In relatively good condition. Spread of invasive trees will over time crowd out native understory.	<5% cover of invasive trees across site.	Med
Treat patches of blackberry and other invasives across site and plant native trees and shrubs and/or seed grasses/forbs where appropriate, including riparian planting failure north of wet prairie	Invasive species	Riparian forest, upland forest and oak woodland/ native tree and shrub richness	Riparian and upland forest in relatively good condition (other than field edges). Oak woodland in poor condition with heavy understory blackberry cover.	<5% cover of blackberry. Increased tree, shrub, grass and forb richness.	Med
Explore removal of house and outbuildings and implement if feasible; expansion of oak woodland	Development, land conversion	Oak woodland/habitat area	Lease renewals are opportunities to re-visit cost/benefits of rentals. Current oak woodland provides poor habitat for oak indicator species.	Removal of house, outbuildings and hay barn.	Med

STRATEGY	SOURCES OF STRESS ADDRESSED	FOCAL CONSERVATION TARGETS/KEAS AFFECTED	WHY IMPORTANT AND TIMING ISSUES	MEASURE(S) OF SUCCESS	RANK*
Explore acquisition opportunities to connect Heritage Pine Natural Area with TRNWR or to expand natural area	Development, land conversion, land use	All/proximity to other target habitat patches, forested habitat patch size, edge condition and habitat area	Future development and land conversion will interrupt wildlife/plant migration corridors. Last 2006 Bond sale is planned for 2017.	Key private parcels brought into public ownership; connect natural area to TRNWR.	Med
Implement oak release on large open grown oaks; remove encroaching overstory trees	Shade producing native tree species (Douglas fir, big leaf maple and Oregon ash)	Oak woodland/vegetation structure	Continued growth of encroaching trees will begin to impact open grown oak trees. Can be done any time.	Removal of competing trees and release of open grown oaks.	Med
Enhance upland and riparian forest complexity by snag and downed wood creation where appropriate	Previous land use	Riparian and upland forest/standing and downed dead trees	Low levels of snags and downed wood provide inadequate habitat for dependent species (e.g. cavity nesting birds, amphibians).	Snag and downed wood levels to raise condition to Fair levels.	Low
Targeted oak release in riparian forest	Shade producing native tree species (Douglas fir, big leaf maple and Oregon ash)	Riparian forest	To maintain oak as a component of the riparian forest.	Appropriate release of larger oaks through snag creation.	Low
Explore retirement of agricultural lease and expand upland forest and oak woodland	Development, land conversion, current land use	Oak woodland and upland forest/forested habitat patch size and habitat area	Increase of habitat sizes support a wider range of dependent species. Agricultural land uses have their own costs in terms of chemical use, soil erosion and loss. Funding necessary to undertake and maintain a large restoration project must be available.	Restoration of agricultural areas to oak woodland and upland forest habitat.	Low
Assess age and health of the iconic Heritage Pine tree	N/A	N/A	To tell the history of the tree that exemplifies the site	Completed assessment	Low

***High:** Must do within 5 years to protect target viability.

Medium: Target will persist without it but will degrade over 5-10 years or require additional future management.

Low: Addresses a non-critical threat or one that is unlikely to threaten target viability within 10 years.

Table 15. Specific actions to implement strategies

STRATEGY	TARGET	PRIORITY (HOW SOON)	SPECIFIC TASKS	ESTIMATED COST
Initiate wet prairie restoration by removal of woody vegetation, invasive control and native species enhancement	Wet prairie	As funding becomes available. Removal of woody vegetation should happen relatively soon.	Work with TRNWR to develop restoration plan (possibly engage on-call environmental resources firm); remove woody vegetation, site prep spray/tillage, procure seed, drill seed, maintenance.	\$300,000

STRATEGY	TARGET	PRIORITY (HOW SOON)	SPECIFIC TASKS	ESTIMATED COST
Treat invasive reed canarygrass and blackberry in emergent wetland and enhance native species cover	Emergent wetland	With wet prairie restoration	First explore operation of water control structure. Site prep/invasive control; procure seed, spread/drill seed, maintenance.	Covered by wet prairie costs above
Eliminate small patch of garlic mustard to stop it from spreading; track through site-wide EDRR	Oak woodland	FY16	Initial spray treatment; subsequent monitoring and sprays.	In-house (if larger area than presumed) then \$2,000 yearly
Investigate current operation of water control structure limitations and opportunities in addition to scouting for still-functioning drain tiles to further enhance emergent wetland habitat	Emergent wetland and wet prairie	FY16	Work with TRNWR to gain understanding of operation/explore possibilities. Scout drain tile demolition success, implement further demolition if necessary.	N/A unless further drain tile demolition is necessary then <\$5,000
Improve riparian and upland forest under-tory through invasive tree treatments	Riparian forest; upland forest	FY15-16	Implement weed treatments.	\$5,000
Treat patches of blackberry and other invasives across site and plant native trees and shrubs and/or seed grasses/forbs where appropriate, including riparian planting failure north of wet prairie	Riparian forest, upland forest and oak woodland	FY16	Cut and spray blackberry; procure plants/seed; plant and subsequent maintenance.	\$15,000
Explore removal of house and outbuildings and implement if feasible; expansion of oak woodland	Oak woodland		Management approval; coordination with property management team; house demolition; site prep, planting and maintenance.	\$25,000 (demolition) \$20,000 (expansion of oak woodland into former lease footprint)
Explore acquisition opportunities to connect Heritage Pine Natural Area with TRNWR or to expand natural area	All	Before 2006 Bond funds run out	Engage real estate negotiators and TRNWR; outreach to landowners; due diligence site walks.	Unknown
Implement oak release on large open grown oaks; remove encroaching overstory trees	Oak woodland	FY16 or 17	Identify trees for removal or snagging (possibly engage professional forester); hire arborist.	\$15,000

STRATEGY	TARGET	PRIORITY (HOW SOON)	SPECIFIC TASKS	ESTIMATED COST
Enhance upland and riparian forest complexity by snag and downed wood creation where appropriate	Riparian forest and upland forest	Anytime	Identify trees for snagging; hire arborist.	\$7,500
Targeted oak release in riparian forest	Riparian forest	Anytime	Identify trees for removal/snagging; hire crew.	\$5,000
Explore retirement of agricultural lease and expand upland forest and oak woodland	Oak woodland and upland forest	Anytime	Approval by management; communication with farmer; site prep, planting, maintenance.	\$250,000
Assess age and health of the iconic Heritage Pine tree	N/A	Anytime	Work with arborist to date and otherwise measure tree.	\$7,000

Total: \$656,500

MONITORING PLAN

Monitoring will be done to evaluate habitat, wildlife and plant population responses to management action, as well as progress toward achieving habitat, wildlife and plant population objectives.

Monitoring addresses threats directly and indirectly, by tracking changes in certain ecological attributes. It implements techniques that are well-established and continues many monitoring efforts already in place. Recent and current monitoring activities have included remote sensing/GIS, amphibian and avian breeding season surveys, and monitoring the success of revegetation efforts. The monitoring plan is likely to change over time, including monitoring of key ecological attributes.

Monitoring for KEAs associated with the conservation targets is shown below.

Table 16. Monitoring

TARGET KEA(S)	INDICATOR	METHOD	THRESHOLD FOR ACTION?	FREQUENCY
Riparian forest - vegetative structure: tree layer	% native tree canopy cover	Visual inspection; simple survival survey (where applicable)	Reinvasion of invasive trees and/or blackberry	Check yearly first 3 years after implementation
Upland forest - vegetative structure: native tree and shrub layer	% native tree and shrub canopy cover (combined)	Visual inspection; simple survival survey (where applicable)	Reinvasion of invasive trees and/or blackberry	Check yearly first 3 years after implementation
Oak woodland – native grass and forb abundance	Native species richness	Visual inspection; plot data	Reinvasion of blackberry	Check yearly first 3 years after implementation
Oak woodland - vegetation structure	Canopy cover and architecture of woody vegetation	Visual inspection	Reinvasion of native trees before reaching a size to impinge on oaks	Check every 5 years
Garlic mustard (EDRR)*	Presence/absence	Visual inspection	Plants found	Yearly in spring

* Not KEA but important item to monitor

ACCESS AND RECREATION

OVERVIEW

Metro staff conducted an internal process to consider an appropriate level of access for each of the natural areas. That process looked at determining, strictly from a working staff level, what would be an appropriate level of access (Habitat Preserve, Natural Area/Low Access, Natural Area/High Access, or Nature Park) to Metro natural area properties. The access designation offered here is a starting point with the understanding that judgment will always be needed on a case-by-case basis, and indicates that some part of that site can accept people at the stated level. It does not suggest that the entire site should have that level of access. Access level definitions can be found here: <M:\PN\Teams\Target Area Teams\Conservation & Stewardship Planning\Access planning>.

The current designated site access level for Heritage Pine Natural Area is Natural Area/High Access. This is defined as follows:

Natural Area (High) – Per the Metro access planning evaluation process described above, access at these sites is allowed and may be modestly promoted on a site by site basis. Gravel parking areas may or may not be developed at these sites to facilitate access if necessary. Portable or vault restrooms may be installed on a site by site basis. Basic rules and site identification signage are standard. Soft surface, mineral soil or gravel trails are formalized and wayfinding signage may be posted to channel access and protect sensitive habitat. These sites are visited weekly or bi-weekly by Metro staff to inspect for unauthorized use and to conduct maintenance. These sites could move to a Nature Park designation in the future.

Heritage Pine Natural Area rises to the level of “High” access based on the proposed alignment of the Ice Age Tonquin Trail and the Tualatin River Greenway Trail, both of which are planned to pass through the site. There is also the desire to explore possibilities of a non-motorized boat launch on the site to provide water access for the Tualatin River Water Trail.

ACCESS FOR MANAGEMENT

The main access to Heritage Pine Natural Area is a driveway off of Southwest Pacific Drive, with a site address of 18805 SW Pacific Drive. This driveway is shared with two residences and also services the rental house located at Heritage Pine. The access road continues past the rental house and down to the water control structure. As part of the wetland restoration project the existing access road was upgraded to make it passable during wet weather conditions. The road was graded, 4-inch minus rock was added, and the road surface was compacted with a roller.

EXISTING PUBLIC ACCESS

There is no formal public access at Heritage Pine Natural Area and the site appears to have little public use. Past documentation indicated that local partygoers used the access road, adjacent private property and Kummerow Road to drive a loop and access the river. This usage seems to have abated as there is no evidence of vehicular access through the site.

The entry driveway is off Southwest Pacific Drive and is shared by two private properties. This road passes the rental property on the site and effectively ends just past the water control structure providing access to the prairie and wetland.

FUTURE ACCESS

Trail network

Metro park and trail planners do not currently anticipate the need for a nature trail network at the site. At this point, planned trails at the site are limited to the three regional trails and two local access trails mentioned above. The regional trails would be 10- to 12-foot wide and paved in either concrete or asphalt. The bike-pedestrian bridge deck would be wider (most likely 14 feet) and the local access trails would be narrower (6 to 8 feet) and also paved.

Pedestrian access

Due to its location at the junction of three regional trails, the site could have as many as five trail access points in the future (see Site map). Pedestrians and bicyclists will access the site from the north via a future bike-ped bridge across the Tualatin River. This bridge will simultaneously be the southern terminus of the Westside Trail, the northern terminus of the Ice Age Tonquin Trail, and the western terminus of the Tualatin River Greenway Trail. Each of these regional trails is only partially built, but once complete, these trails will extend as far as Beaverton, Tualatin and Wilsonville. From the bridge, the Ice Age Tonquin Trail will continue south along the eastern edge of the power transmission corridor to the southern edge of the site and beyond. Two short local access trails will be built to connect to the adjacent neighborhood to the east when the Ice Age Tonquin Trail is built. A short segment of the Tualatin River Greenway Trail is currently built on the adjacent parcel to the northeast of the site. The City of Tualatin is extending the trail eastward, toward Highway 99W. The City will extend the trail west to the site to connect to the bike-pedestrian bridge when it is built.

Vehicular access

Vehicular access should be feasible via either the existing driveway or a future driveway off Southwest Pacific Drive. Traffic volumes on Southwest Pacific Drive are low and sight distances seem to be adequate, but additional research in traffic analysis and engineering will need to be considered.

River access

In 2011, Metro studied the feasibility of developing a new non-motorized boat launch at Heritage Pine Natural Area and several other sites along the Tualatin River. As a result, Metro is developing the new boat launch at a different site, but as water trail demand increases and funding becomes available, Metro may choose to build an additional boat launch at Heritage Pine Natural Area in the future. The boat launch would serve paddlers in kayaks, canoes, stand up paddle boards, and other non-motorized watercraft, such as inner-tubes and row boats. Amenities could potentially include a dock, ramp, trailer parking, drinking water and restrooms.

Signage

Standard rules and regulations and wayfinding signage should be installed at each entry point.

Zoning

There are four different zoning designations that cover different parts of the site. The power transmission corridor is zoned RR5 Rural Residential. The parcels east of the transmission corridor are zoned FD10 Future Development and are within the Tualatin Community Plan District. The

parcels west of the power transmission corridor are zoned EFU Exclusive Farm Use and AF20 Agriculture & Forestry.

Parks are permitted as special uses through a Type II approval in the FD10 and RR5 zones. Attaining land use approval for public parks in the EFU and AF20 zones is more challenging, but it is possible to permit parks in these zones through a type II process.

EDUCATION AND VOLUNTEERS

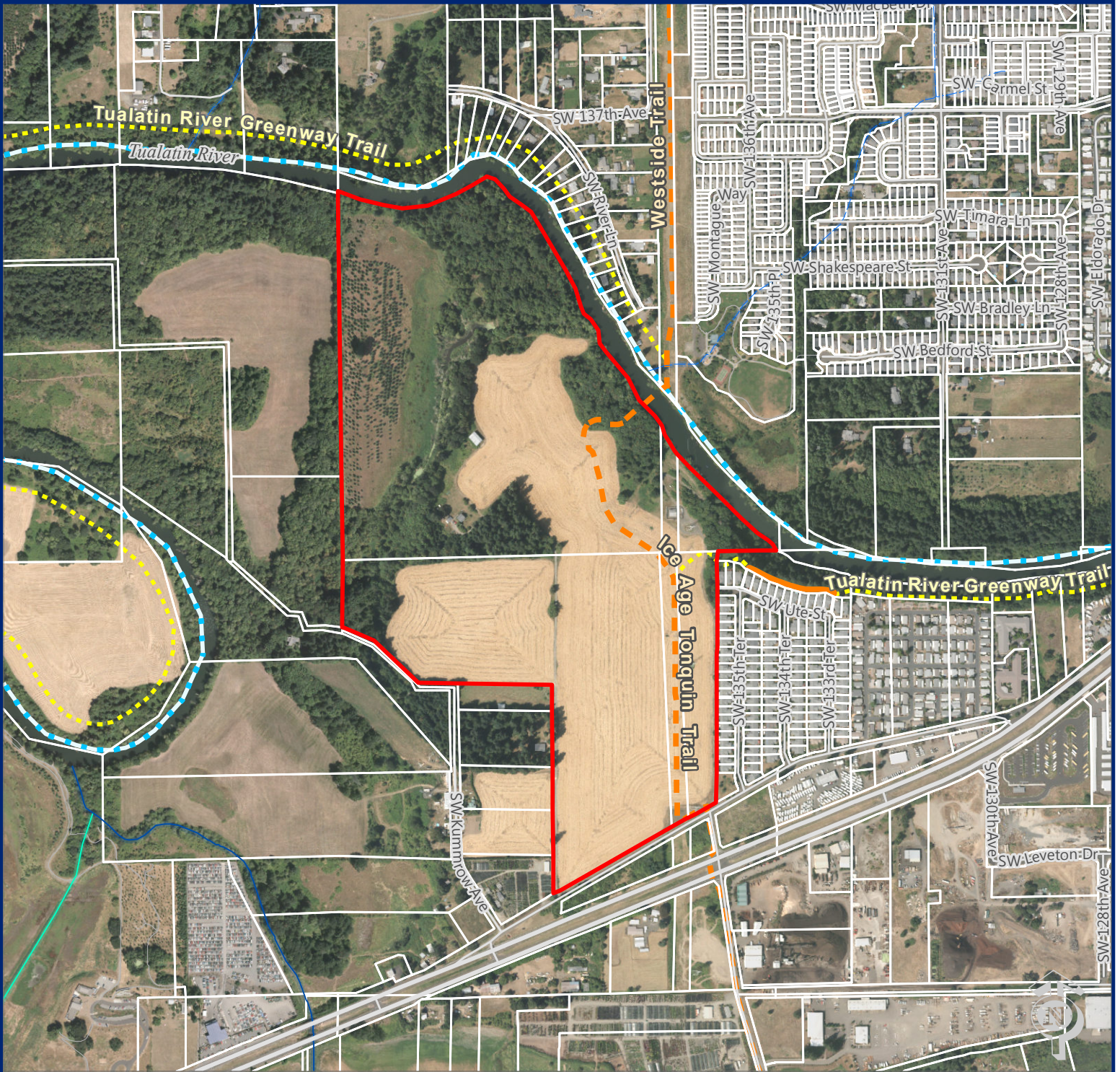
Metro's regional parks and natural areas were created to intentionally give residents within our region opportunities to enjoy, experience, participate in, and understand the natural world. Conservation education staff at Metro work with schools, civic organizations and the general public to provide nature programs that thoughtfully connect people to Metro's parks and natural areas. Schools and civic groups that are interested in programs contact Metro to request a program.

Heritage Pine Natural Area is currently not a focus area for Metro's volunteer program. However, the Tualatin River National Wildlife Refuge offers volunteer and educational opportunities through Friends of the Refuge and will look for opportunities to utilize this resource at the Heritage Pine Natural Area.

POTENTIAL PARTNERS

- Clean Water Services
- Tualatin Riverkeepers
- Columbia Land Trust

SITE MAP



 Heritage Pine NA site

NHDplusStrmFlowline

--- Intermittent stream

— Perennial stream

— Canal

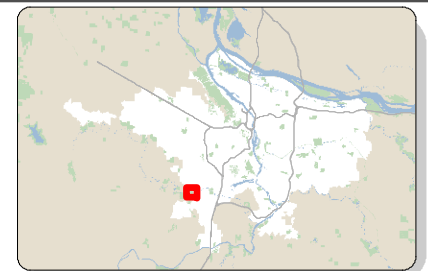
--- Existing Regional Multi-use Trail

- - - Planned Multi-use Trail

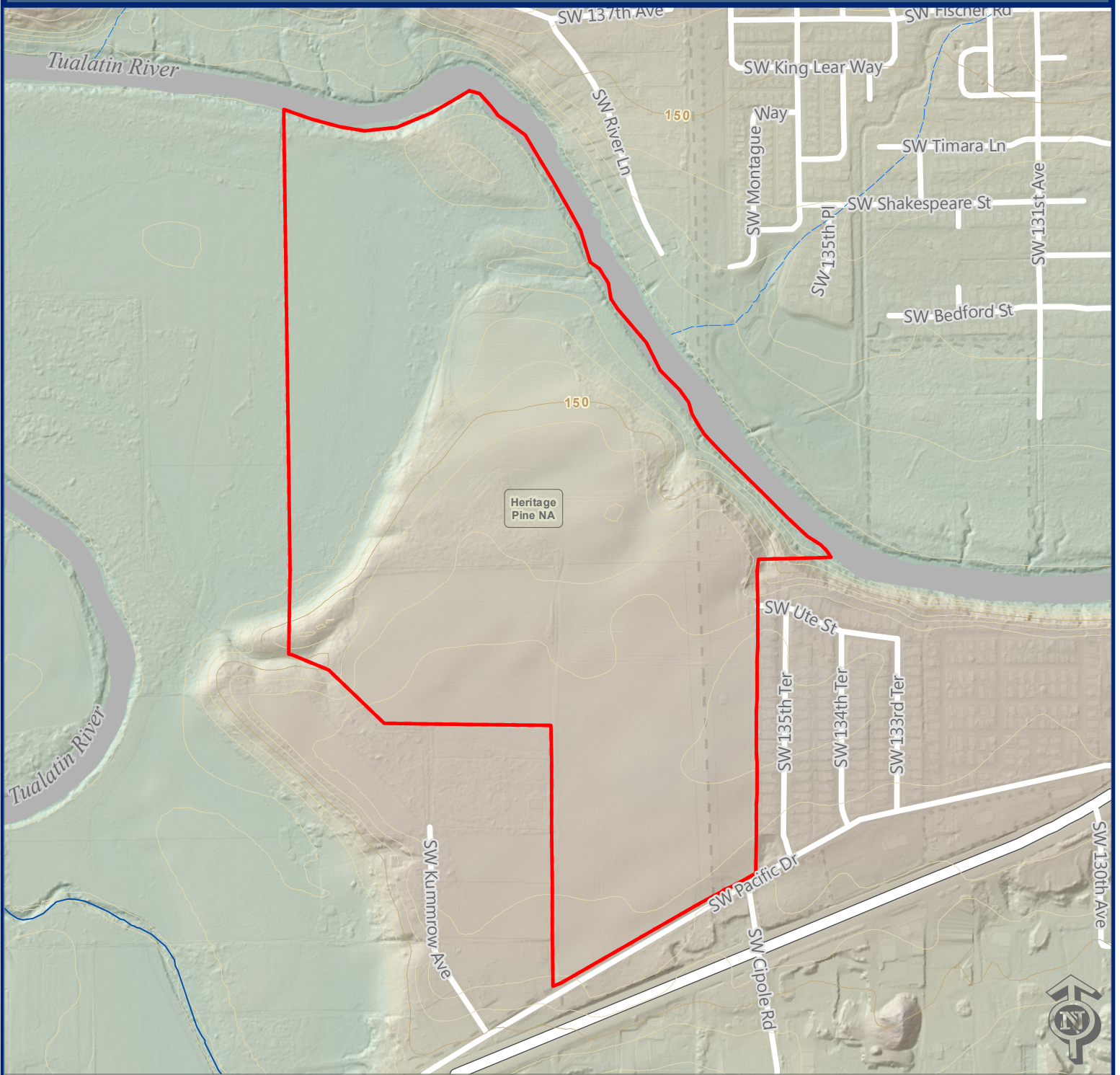
- - - Proposed Trail

- - - Water Trail

0 1,100 2,200 Feet



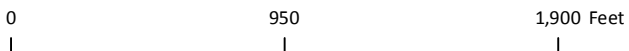
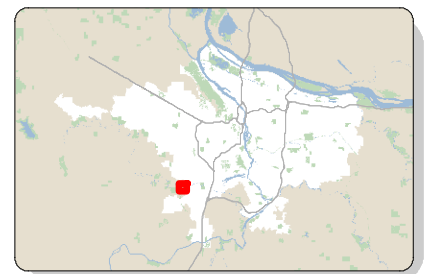
TOPOGRAPHY



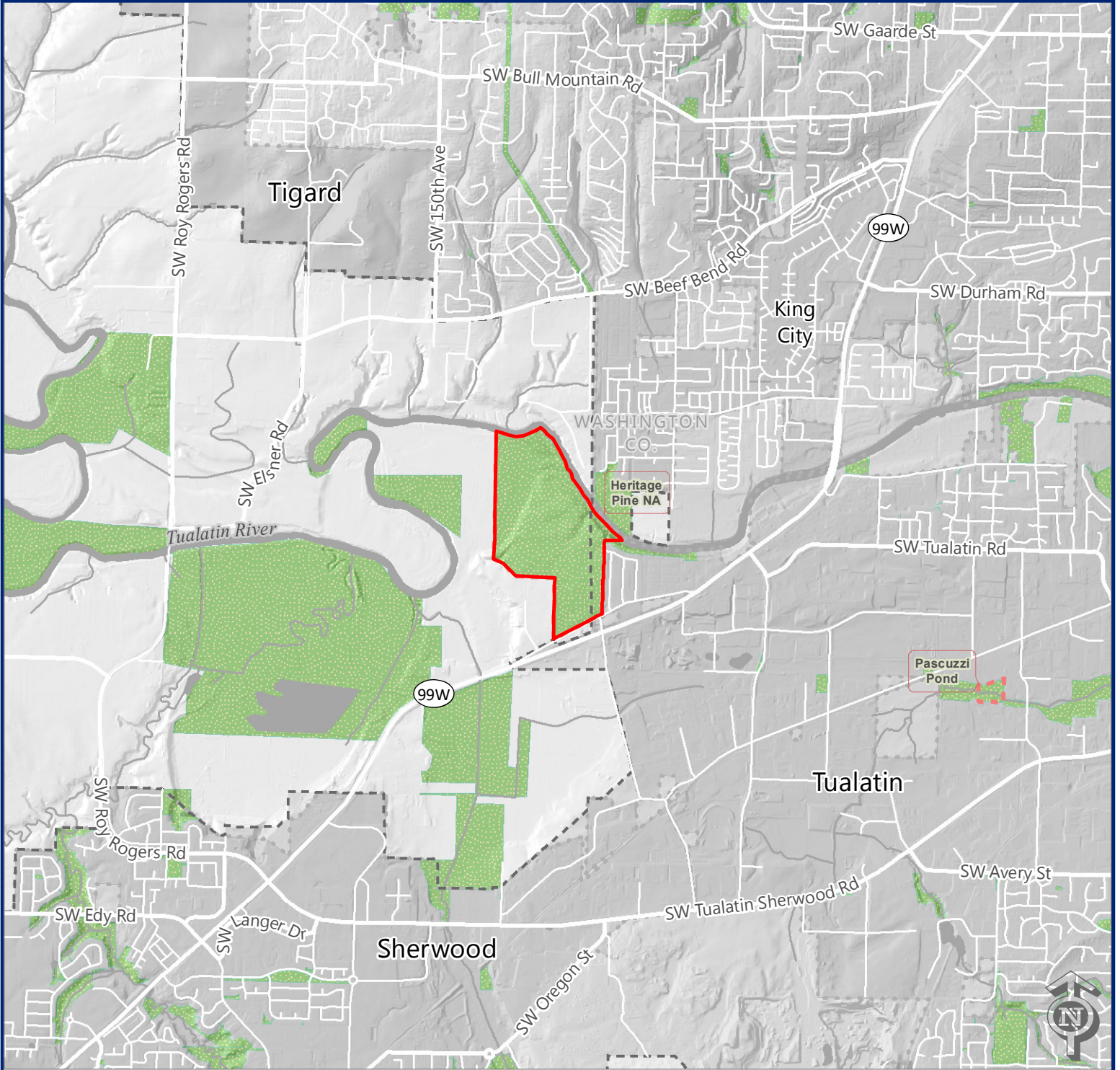
- site
- Other Metro sites
- 10 ft contour
- 50 ft contour




NHDplusStrmFlowline

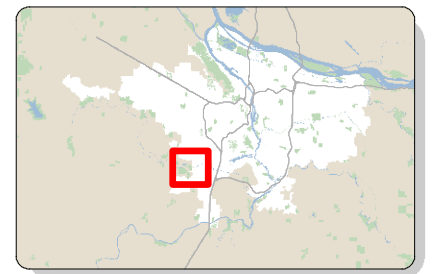
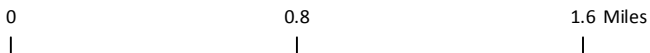
- Intermittent stream
- Perennial stream



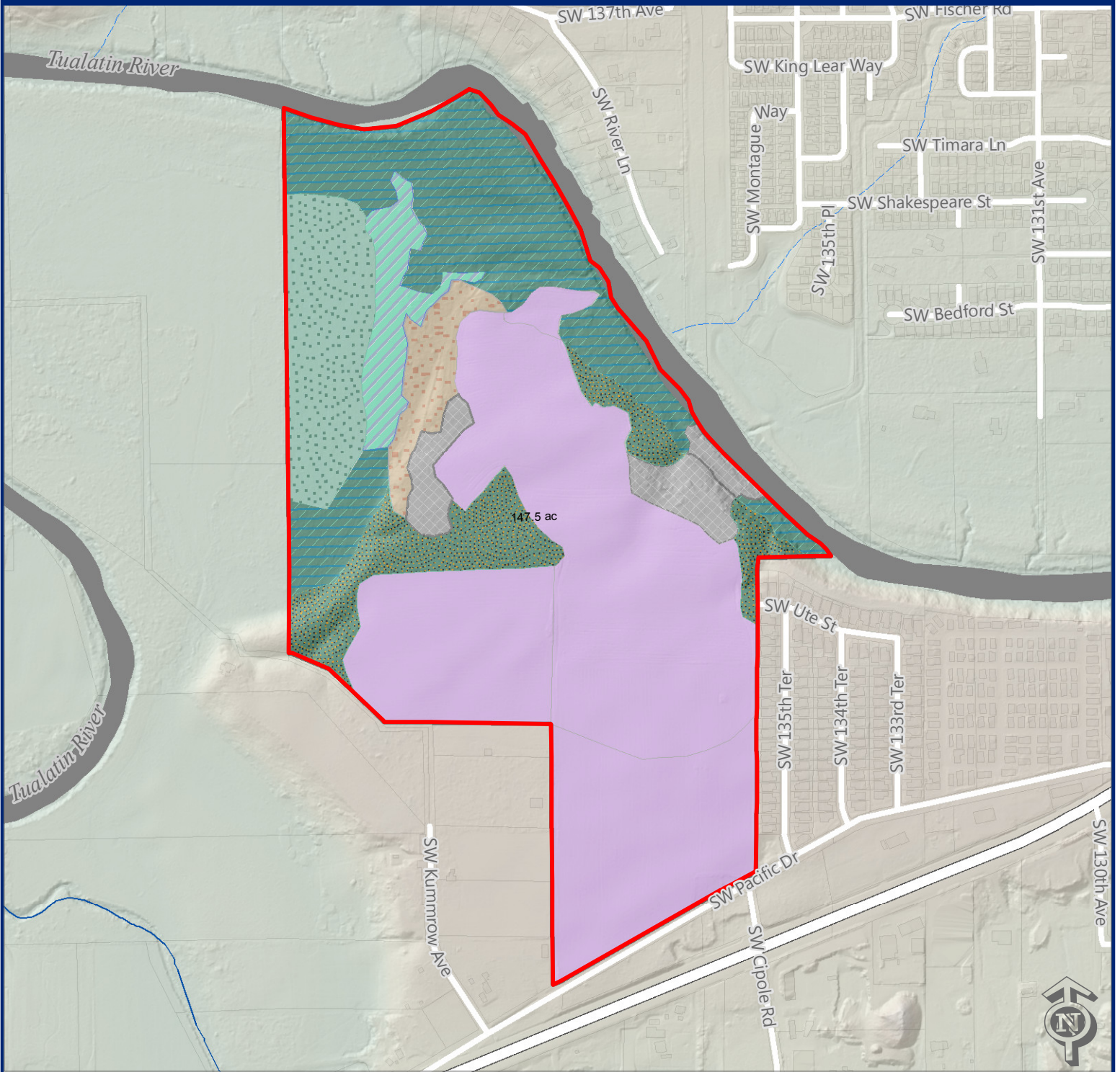
VICINITY MAP



-  site
-  Other Metro sites
-  Parks and/or Natural Areas



CURRENT COVER

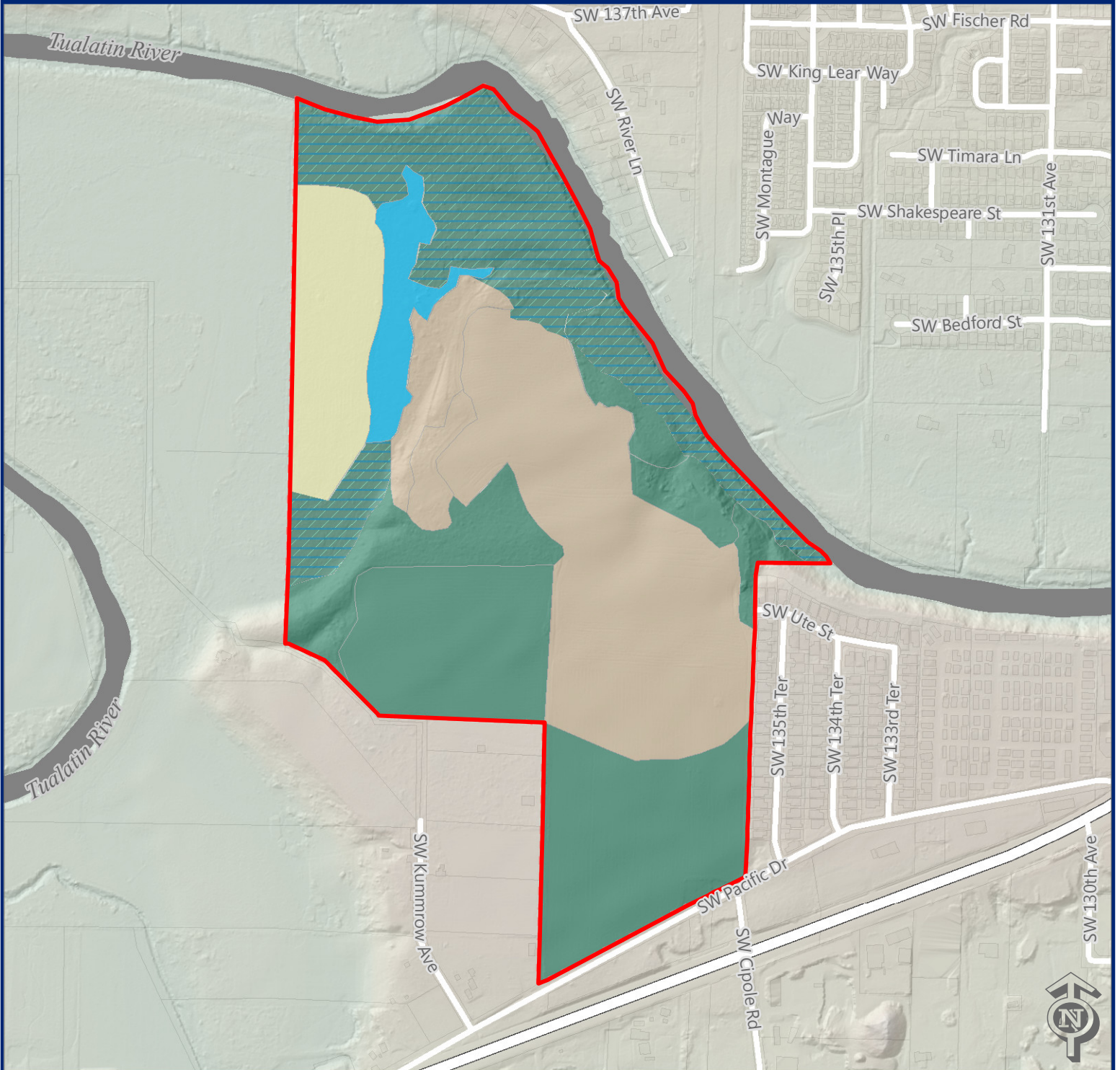




- | | | |
|----------------------|-------------------------------|-------------------------------|
| site | Current cover | Upland forest - mixed |
| Other Metro sites | Agriculture | Upland forest - shrub (stage) |
| NHD Flowlines | Developed - (previous/non ag) | Wetland - emergent |
| Intermittent stream | Riparian forest | Woodland - oak |
| Perennial stream | | |

0 830 1,660 Feet








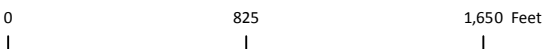
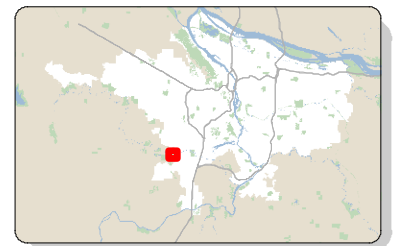
STEWARDSHIP CLASSIFICATION



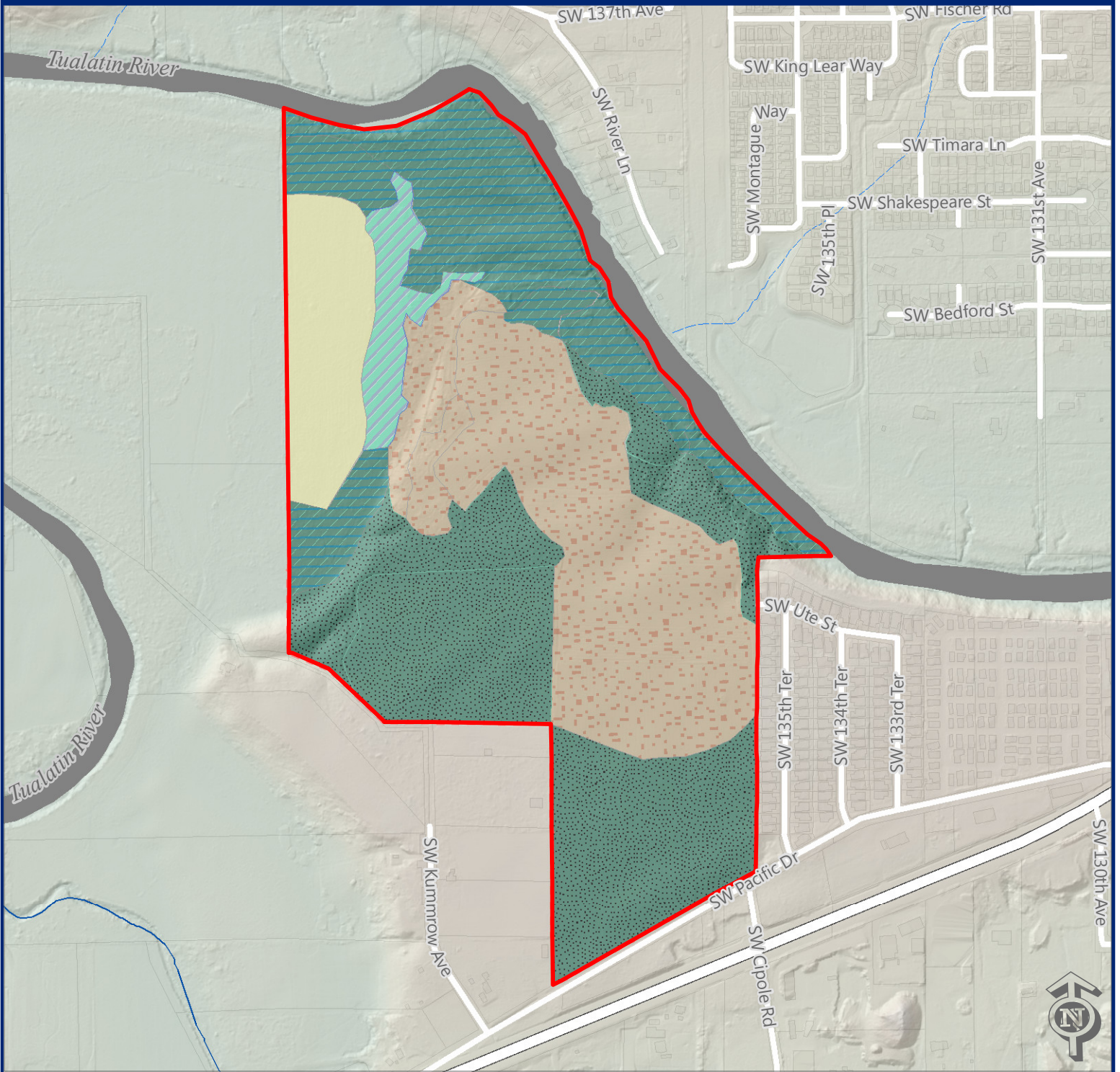
-  site
-  Other Metro sites

Stewardship Type

-  Prairie
-  Riparian forest
-  Upland forest
-  Wetland
-  Woodland



CONSERVATION TARGETS

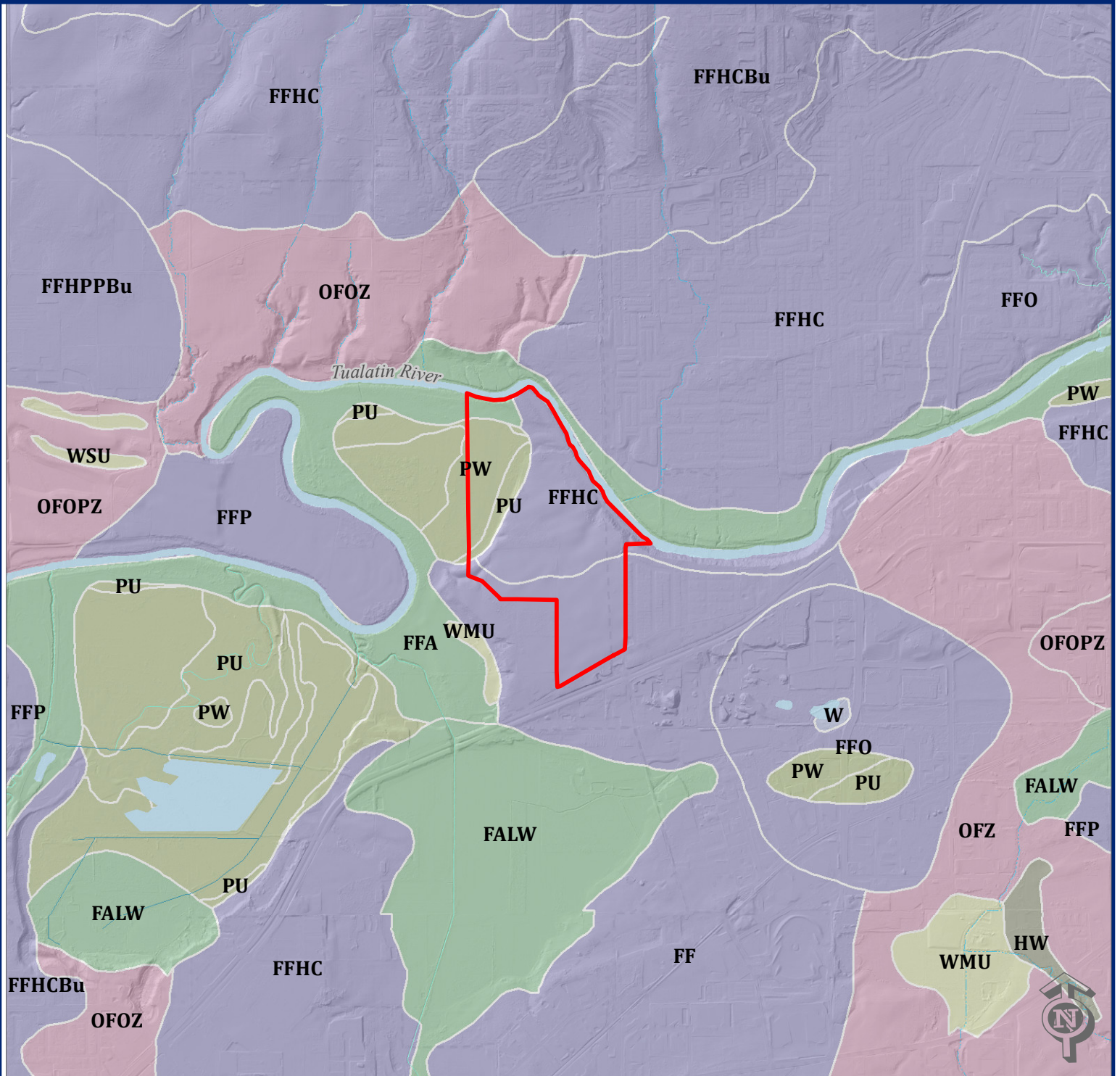


- | | | |
|--|--|--|
|  site | Conservation targets |  Prairie - wet or dry |
|  Other Metro sites |  Emergent wetland |  Riparian forest |
| NHD Flowlines |  Oak woodland |  Upland forest |
|  Intermittent stream | | |
|  Perennial stream | | |

0 830 1,660 Feet



HISTORICAL VEGETATION (1851-1910)






site



Other Metro sites

Historical vegetation

-  Closed forest; Riparian & Wetland
-  Closed forest; Upland
-  Emergent wetlands

 Prairie

 Shrubland

 Water

 Woodland

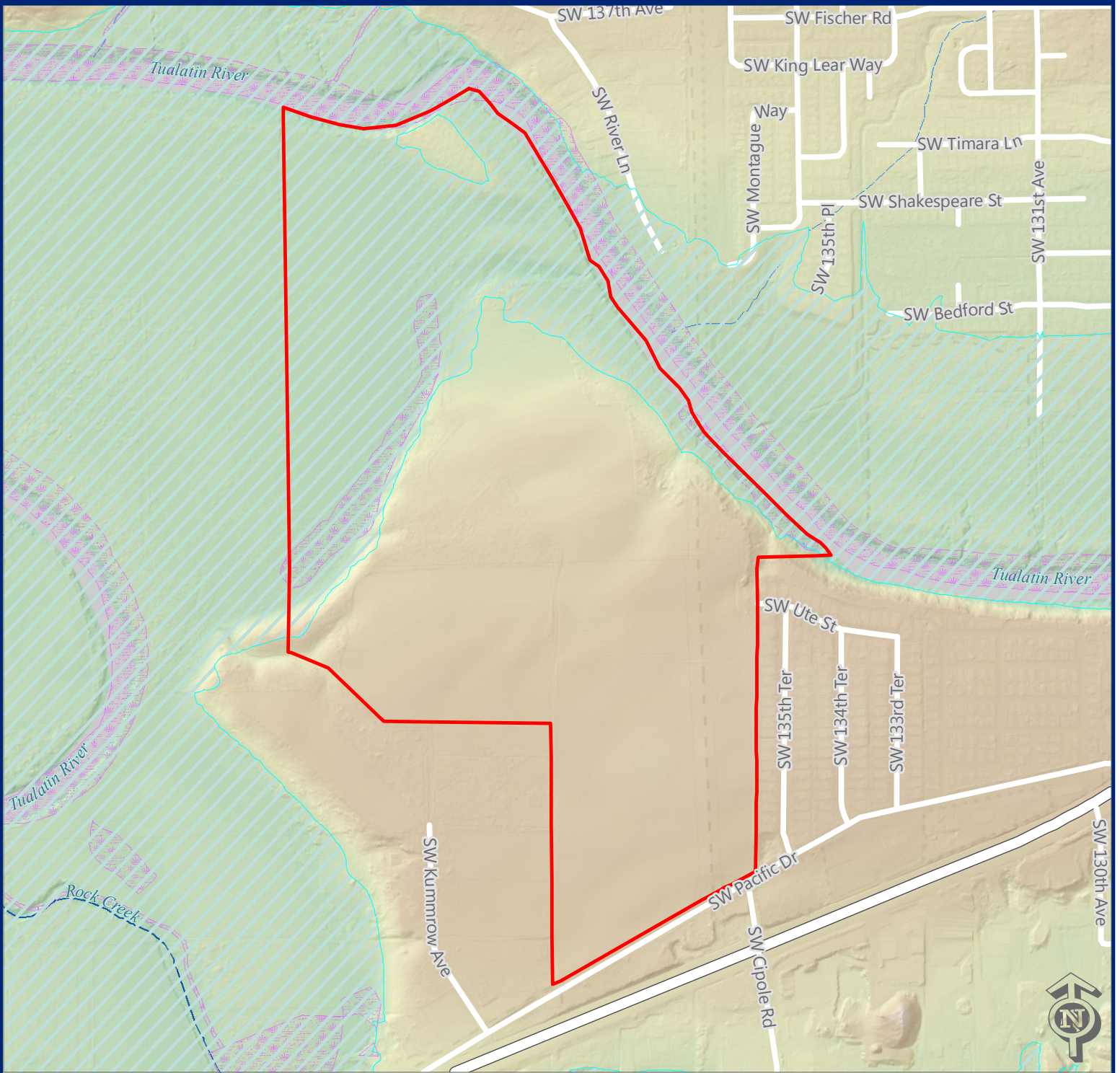
* The historical vegetation map should be interpreted as a coarse resolution view into existing vegetation types in the late 1800s.





* Labels refer to vegetation subclasses. Detailed descriptions can be found in T:\OBMO\GIS\DATA_V\vegetation\Historical



0 2,000 4,000 Feet

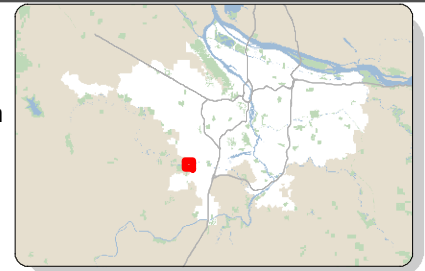
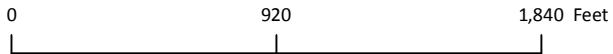


HYDROLOGY

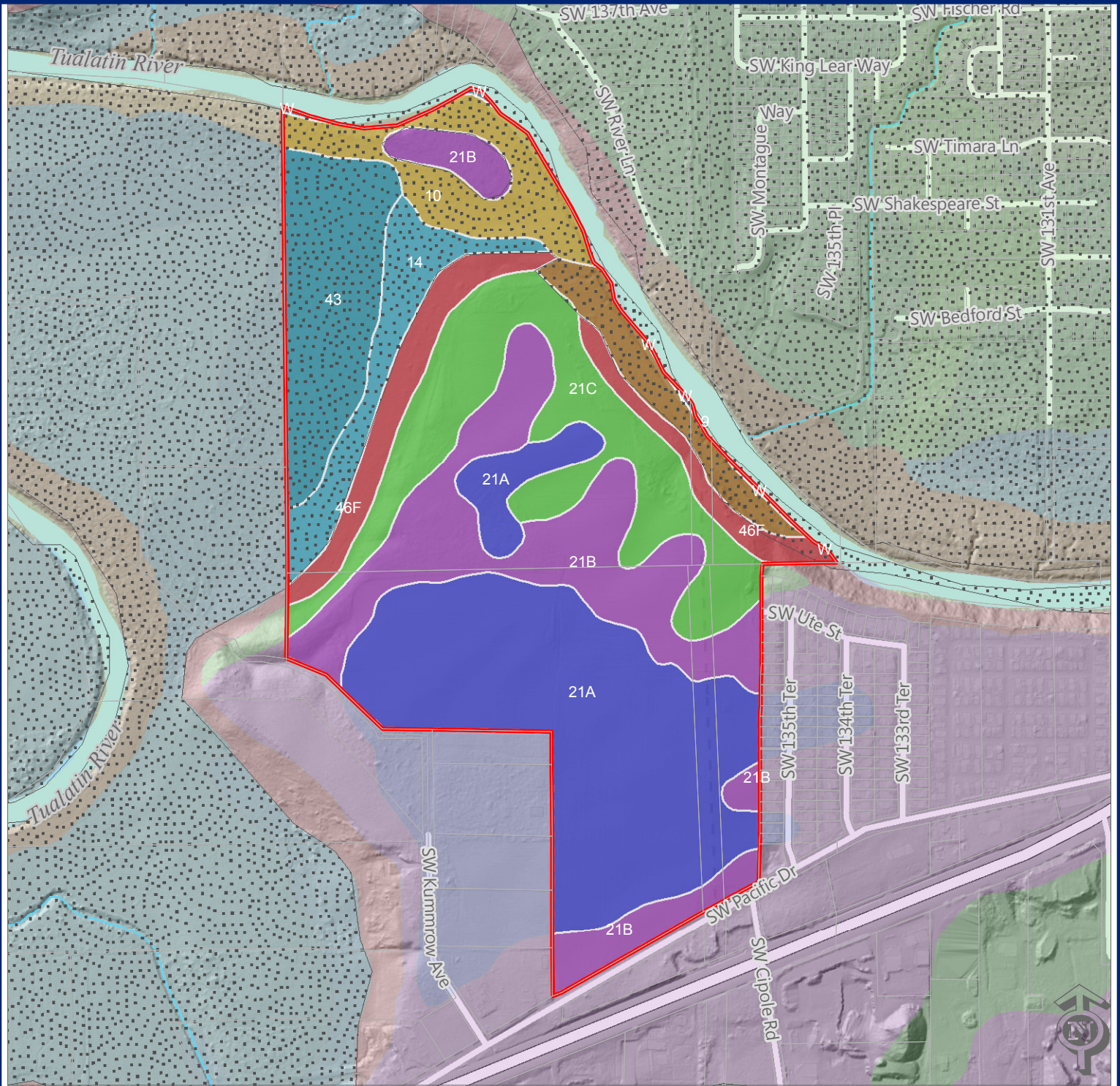














-  site
-  Other Metro sites
-  100 year floodplain
-  Wetlands (Wetlands Conservancy data)

- NHD Flowlines**
-  Intermittent stream
 -  Perennial stream



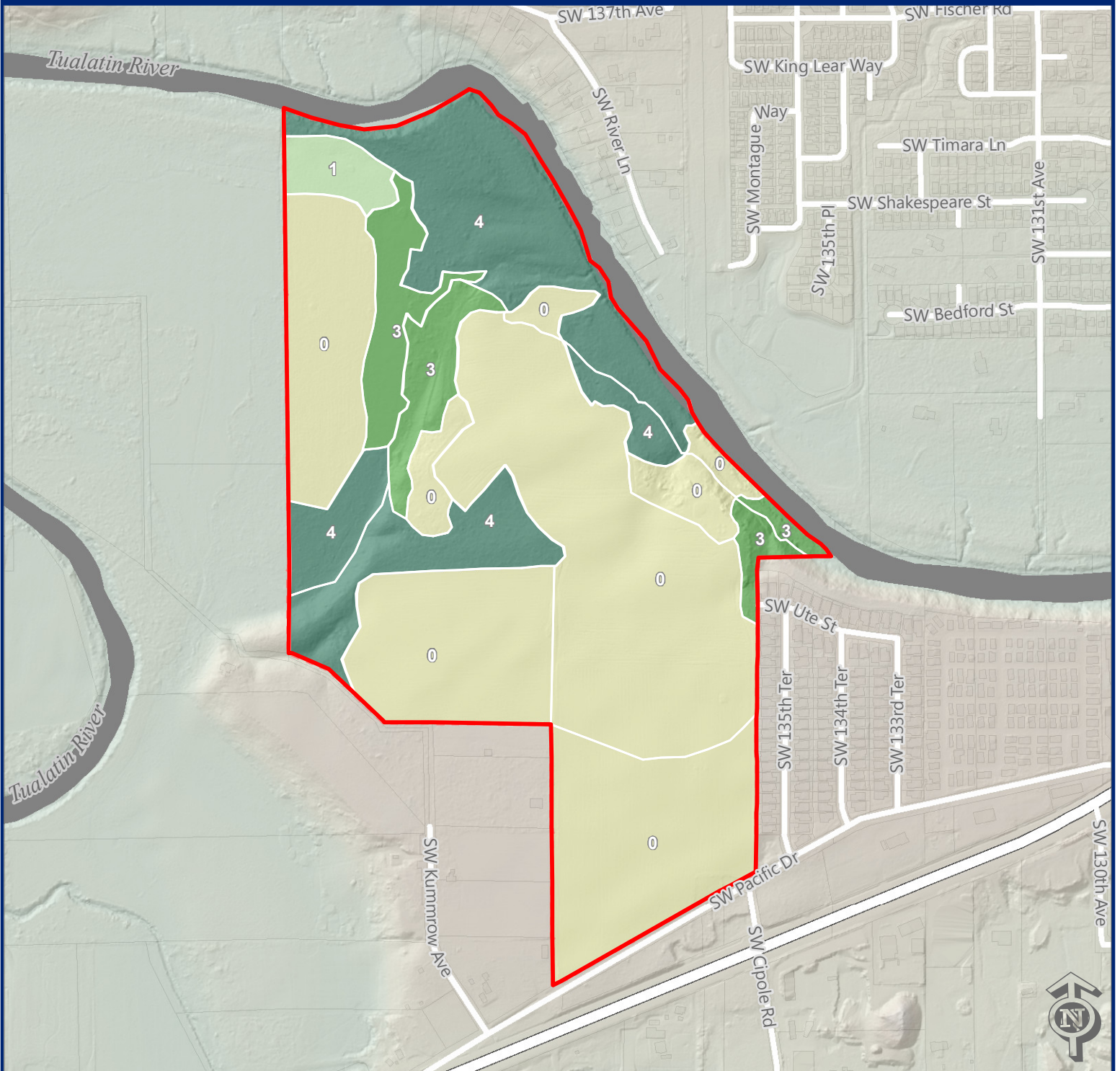
SOILS





- | | | |
|--|---|---|
|  site | NRCS soils (munam) |  Hillsboro loam, 3 to 7 percent slopes |
|  Other Metro sites |  Chehalis silt loam, occasional overflow |  Hillsboro loam, 7 to 12 percent slopes |
|  Hydric soils |  Chehalis silty clay loam, occasional overflow |  Wapato silty clay loam |
| |  Cove clay |  Water |
| |  Hillsboro loam, 0 to 3 percent slopes |  Xerochrepts and Haploxerolls, very steep |







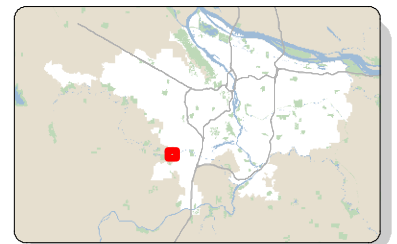
CONSERVATION TARGET STATUS



-  site
-  Other Metro sites

Management status

-  0 - Pre-Initiation
-  1 - Initiation
-  3 - Consolidation
-  4 - Refinement and long-term maintenance



APPENDIX A

ARCADIS/KINDER MORGAN DECOMMISSIONING OF SOUTHERN PACIFIC PIPELINE SPILL REMEDATION INFRASTRUCTURE – SUMMER 2015

Approved by DEQ to be abandoned

- Sparge trench wells (*STW-1 through STW-11*)
- Groundwater interceptor trench extraction wells (*TW-1, TW-2, TW-3*)
- Soil vapor extraction system piping
- Air sparge trench piping
- Air sparge well piping
- Groundwater interceptor trench piping

May be abandoned; scope and approval still pending

- Current air sparge wells (*SP-1 through SP-12*)
- Current soil vapor extraction wells (*RW-1 through RW-13, ORW-1, and ORW-2*)
- Temporary monitoring wells (*TMW-1 through TMW-5*)
- Treatment system building

To remain in place

- Monitoring wells (*MW-1 through MW-9, MW-11, MW-12, MW-14 through MW-3*)