SCP Title: Richardson Creek NA

Approvals for Site Conservation Plan

Date first routed: 12/21/15

Please return to Lori Hennings (Primary author: Guillozet)

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Signature  Date 12/21/2015

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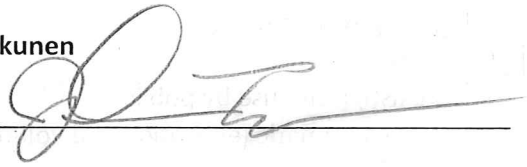
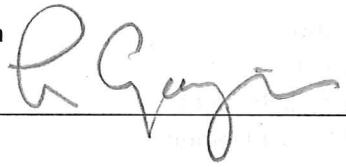
Signature  Date 3/21/16

Lisa Goorjian

Signature  Date 11/15/16

sorry it took so long!

Dan Moeller

Signature  Date 11/28/16

SCP Title:

Primary Author:

Standard SCP Template Checklist* ☐

- ☑ **Introduction**
  - ☑ Context
  - ☑ Planning area
    - *Table X. Included properties*
  - ☑ Key Metro staff and partners
  - ☑ Existing planning documents
- ☑ **Existing conditions**
  - ☑ Physical environment (e.g., geology, soils, hydrology)
  - ☑ Major habitat types
  - ☑ Vegetation and wildlife
  - ☑ Recent management history
  - ☑ Natural resources of special interest
- ☑ **Conservation**
  - ☑ Conservation targets
  - ☑ Key ecological attributes
    - *Table X. KEA tables*
    - *Table X. Summary of current cover, conservation targets and status, and stewardship type*
  - ☑ Threats
    - *Table X. Threats and their sources*
  - ☑ Climate change considerations (see doc)
  - ☑ Prioritized strategies to address threats
    - *Table X. Threats and actions for KEAs*
- ☑ **Management actions** (10-year timeframe)
    - *Table X. Management actions tied to strategies with estimated cost and timing*
    - *Table X. Monitoring tied to maintaining or improving KEAs*
- ☑ **Access and recreation**
- ☑ **Coordination**
  - ☑ Key stakeholders
  - ☑ Public involvement
- ☑ Map – Vicinity map
- ☑ Map – Site map
- ☑ Map – Historical vegetation (optional)
- ☑ Map – Current cover
- ☑ Map – Conservation targets
- ☑ Map – Stewardship classes
- ☑ Map – Management status
- ☑ **References**

- For additional details, see *Site Conservation Plan Template JAS updated version 08-23-2012*

Outward Facing SCP Template Checklist* ☐

- ☐ **Introduction**
  - ☐ Context
  - ☐ Goals and objectives of the conservation plan
- ☐ **Planning process summary**
  - ☐ Planning area
  - ☐ Planning process
- ☐ **Existing conditions**
  - See Standard Template
- ☐ **Conservation**
  - ☐ Summary of Appendix content
    - ☐ Conservation targets
    - ☐ Key ecological attributes
    - ☐ Threats and sources
    - ☐ Climate change considerations
- ☐ **Strategic restoration and stewardship**
  - ☐ Prioritized actions linked to KEAs and threats
  - ☐ Ongoing stewardship and restoration programs
  - ☐ Estimated cost
  - ☐ Monitoring plan
  - ☐ Long-term strategies
- ☐ **Visitor experience**
  - ☐ Existing site use by public
  - ☐ Programmatic (education and volunteers)
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  - ☐ Strategic actions (access and site management)
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- ☐ Appendix A – Historical context
- ☐ Appendix B – Conservation in detail
  - Relationship to other conservation plans
  - Key ecological attributes
  - Threats and sources
  - Invasive species
  - Monitoring framework
- ☐ Appendix D – References and Additional Resources

SITE CONSERVATION PLAN

Richardson Creek Natural Area



October 2015

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SECTION 1: INTRODUCTION

CONTEXT

Richardson Creek Natural Area is located on the Clackamas River, a tributary to the Willamette River, at approximately river mile 9.2. The Clackamas River supplies drinking water to over 200,000 people and supports significant runs of federal and state listed fish species, including Chinook and coho salmon, steelhead trout, cutthroat trout, bull trout and pacific lamprey. The natural area's native habitats include stream channels, floodplains and riparian and upland forests that support diverse populations of native fish and wildlife.

The Clackamas River Basin has been used by people for thousands of years. The Richardson Creek Natural Area is reported to be within the traditional territory of the Clackamas, a Chinookan-speaking tribe who lived on the Willamette River near Willamette Falls, along the Clackamas River, and on nearby tributary streams. French and English fur traders began to explore the area in the early 1800s bringing diseases which decimated tribes in the Pacific Northwest. Oregon City was founded in 1829 at Willamette Falls to take advantage of the water power to run a lumber mill. Additional use of the area followed, including for transportation, commodity extraction, and human settlement. Much of the land in the Richardson Creek watershed is currently used for agriculture, nurseries, private forestland, open space and rural residences. Metro acquired the Richardson Creek Natural Area in 2013 through the Natural Areas Bond Measure.

This site conservation plan is a tool for protecting and enhancing the unique characteristics of the site to support native plants, aquatic species and wildlife habitat. The plan includes an overview of the site's history as well as existing conditions, conservation targets and access objectives. The goal of this plan is to describe a course of action that will protect and enhance the area as an environmental resource for Clackamas County and the Portland metropolitan region. Richardson Creek Natural Area will be preserved as a historical remnant of the Willamette Valley, providing an ecological showcase of native habitats and wildlife. A salmon-bearing stream and floodplains add value for wildlife and water quality. The area will be maintained and enhanced, to the extent possible, in a manner that is faithful to its original natural condition and important ecological functions. To achieve this goal, this plan establishes a series of priority objectives, including:

- Restore and maintain high quality habitat including remnant riparian forests and aquatic habitats.
- Restore and enhance existing streams within the natural area for native aquatic species.

PLANNING AREA

This site conservation plan addresses conditions, plans and activities for Metro's current 96.5-acre parcel under ownership plus an additional 3.9 acres owned by the Oregon Department of State Lands, which Metro will manage via a Memorandum of Agreement. Furthermore, Metro is currently in the process of acquiring property to the west and north of the existing main parcel to fully manage the Richardson Creek confluence area. Table 1 includes the history of purchases at Richardson Creek Natural Area. Map 1 in Section 7 shows the location of the site in context to adjacent townships. Map 2 in Section 7 illustrates the Metro ownership boundary and the roads and streams adjacent to the site.

Table 1: Properties comprising Richardson Creek Natural Area

PROPERTY	ACRES	BOND	DATE PURCHASED	OWNERSHIP
Clackamas County	2.5	1995	09/19/2000	Metro
Calcagno	94.0	1995	08/07/2001	Metro

KEY METRO STAFF AND PARTNERS

Staff

Peter Guillozet, senior natural resources scientist
Brian Vaughn, senior natural resources scientist
Chris Hagel, lead natural resource specialist
Kristina Prosser, natural resources specialist
Laurie Wulf, property management specialist
Tom Heinicke, real estate negotiator

Partners

Calcagno Farms – Ambrose Calcagno
Portland General Electric – John Esler, Tim Shibahara
Oregon Department of Fish and Wildlife – Todd Alsbury, Susan Barnes
Clackamas Soil and Water Conservation District – Jenne Reische, Sam Leininger
Clackamas River Basin Council – Jenny Dezso, Cheryl McGiniss
Oregon Department of Agriculture – Kevin Fenn
Clackamas County – Tonia Burns

EXISTING PLANNING DOCUMENTS

The Northwest Power and Conservation Council – Willamette Subbasin Plan
Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan
Clackamas River Basin Council – Clackamas River Basin Action Plan
Clackamas River Basin Council – Rock and Richardson Creek Watersheds Action Plan
ODFW Comprehensive Wildlife Conservation Strategy
River Island Natural Area Site Conservation Plan

SECTION 2: EXISTING CONDITIONS

PHYSICAL ENVIRONMENT

Richardson Creek Natural Area is primarily situated on a floodplain complex, bounded by the Clackamas River on the southwest and Highway 224 on the north and east. A disconnected portion of the property is located on an island within the Clackamas River south of the main parcel. Another portion of property is disconnected and situated to the west of the main parcel. Richardson Creek bisects the northwest corner of the main natural area parcel. An unnamed tributary, which has been heavily altered and channelized, flows in an east-west direction bisecting the natural area. An existing excavated pond is located near the northern boundary of the main parcel.

The western portion of the natural area is predominantly a mixed coniferous/deciduous riparian forest and the eastern portion is currently used for agricultural production. Map 8 in Section 7 includes a shaded relief depiction of the topography for the site based on LiDAR elevation data.

The geology of the lower Clackamas River watershed is characterized by volcanic and sedimentary formations located between the Cascade Mountains and the Portland Basin. Five major geologic units in the area of Richardson Creek Natural Area include two volcanic units (the Sardine aka the Rhododendron Formation and the Boring Lava Field) and three sedimentary units (Troutdale Formation, Sandy River Mudstone, and Alluvial deposits).

Bedrock is exposed along the valley floor of the Richardson Creek canyon. The portion of Richardson Creek downstream of Highway 224 flows through Clackamas River Quaternary alluvium (Schlicker and Finlayson, 1979).

The properties of soils found within a watershed influence to a large extent the movement of water through and within the soil layers, as well as the vegetation they support. Information on soils in the soil survey of the Clackamas area is published by the USDA Natural Resources Conservation Service and is available online through the web soil survey website. Soil descriptions and percent coverage for Richardson Creek Natural Area are located in Table 2 and the soils are displayed in Map 9 in Section 7.

Table 2: Mapped soil units, acres, and descriptions for Richardson Creek Natural Area soil units (derived from Green 1982 and the USDA SCS Web Soil Survey)

MAP UNIT SYMBOL	MAP UNIT NAME	ACRES	PERCENT	DESCRIPTION
19	Cloquato silt loam	46.3	55%	Very deep, well drained soils formed in mixed alluvium
56	McBee silty clay loam	9.1	11%	Very deep, moderately well drained soils that formed in alluvium weathered mostly from sedimentary and basic igneous bedrock
68	Newberg loam	22.5	27%	Very deep, somewhat excessively drained soils formed in loamy and sandy alluvium from sedimentary and basic igneous rocks
91B	Woodburn silt loam, 3 to 8 percent slopes	0.5	1%	Very deep, moderately well drained soils that formed in silty stratified glacio-lacustrine deposits
92F	Xerochrepts and Haploxerolls, very steep	1.5	2%	Deep, well drained soils with moderate to moderately slow permeability
W	Water	4.0	5%	Open or flowing water

PRECIPITATION AND HYDROLOGY

Richardson Creek Natural Area is located at approximately 110 feet NAVD88 elevation in the lower Clackamas River watershed. The climate at the site is typical of the Willamette Valley region, characterized by cool, wet winters and warm, dry summers. The Willamette Valley has a predominant winter rainfall climate, with the typical distribution of precipitation including about 50 percent of the annual total precipitation from November through February, with lesser amounts occurring in the spring and fall, and very little during summer. Table 3 presents annual climate data weather stations located at Oregon City and Estacada, Oregon, the two closest weather stations to Richardson Creek Natural Area.

Table 3: Annual climate statistics for the Oregon City and Estacada weather stations from the Western Regional Climate Center

Station	Oregon City (356334)	Estacada (3562693)
Average max temp (F)	64.1	62.5
Average min temp (F)	44.5	42.1
Average total precipitation (in)	46.4	57.8
Average total snowfall (in)	4.4	7.1

The Clackamas River emanates from the west side of the Cascade Range and is a large tributary to the Willamette River. The Clackamas River watershed is located in the Willamette Valley physiographic province, a broad alluvial plain that spans the lowlands between the Coast Range and Cascade Range. The watershed is a complex network of underlying soil formation types formed by water, volcanic inputs and continental uplift.

The Clackamas River flows northwesterly for approximately 70 miles from its headwaters in the Cascade Range, then westerly for 10 miles to its confluence with the Willamette River. The total drainage area of the Clackamas River is 942 square miles.

Richardson Creek Natural Area is located at approximately river mile 9.2 on the Clackamas River. The headwaters of Richardson Creek rise along 222nd Avenue north of Highway 212, and the creek flows in a generally southwesterly direction to its confluence with the Clackamas River. Richardson Creek drains an area of approximately 4.2 square miles above its confluence with the Clackamas River. Hydrologic characteristics for both the Clackamas River and Richardson Creek are presented in Table 4.

The Clackamas River in the Richardson Creek reach is characterized by a moderate gradient (0.4 percent) semi-confined channel with point and mid-channel gravel bars. The channel exhibits riffle-pool morphology, with occasional glides. Substrate ranges from boulders to silts, but is predominately gravels and cobbles.

Lower Richardson Creek upstream of the natural area consists of cobble-sized coarse alluvium over the bedrock channel floor within a steep canyon. Downstream of Highway 224, the stream channel is unconstrained within a broad valley floor, and wide floodplain as the creek reaches the confluence with the Clackamas River. Scour pools, glides and riffles dominate the stream habitat types. Gravel and sand are the dominant substrate types with some cobble. The occurrence of large wood is infrequent in the reach (ODFW, 2002). Low depositional benches comprised of a mix of coarse and fine alluvium occur in the lower reach and are generally associated with landslides or large wood. These benches are typically colonized with young (mostly herbaceous) vegetation, suggesting that they may have been formed by recent flood events (Ecotrust, 2000).

Table 4: Drainage area and peak discharge statistics for the Clackamas River and Richardson Creek from OWRD

LOCATION	Drainage area (sq miles)	PEAK DISCHARGE (CFS) 2-year return period	10-year return period	25-year return period	50-year return period	100-year return period
Richardson Creek at mouth	4.2	139	255	316	361	407
Clackamas River	942	34,400	62,200	76,700	87,600	98,600
Clackamas River above Richardson Creek	846	31,400	57,400	71,100	81,500	92,000

An east to west flowing unnamed tributary is located in the northern portion of the natural area and meets Richardson Creek before Richardson Creek turns south and joins the Clackamas River. The tributary has been heavily modified by straightening and ditching, likely to drain historical wetlands for agricultural purposes. Much of the native vegetation has been removed from the riparian corridor and an undersized culvert is located at the site access road crossing. Water quality conditions are often poor in the unnamed tributary and the stream contributes fine sediment into Richardson Creek and the Clackamas River as illustrated in Figure 2.

Additionally, an existing excavated pond is situated near the northern boundary of the main parcel. The pond edges support invasive yellow flag iris and minimal native vegetation. The occurrence of stagnant water, solar inputs, as well as agricultural and highway runoff lead to persistently poor water quality conditions and render the pond inhospitable to native fish and wildlife.

Portions of the Richardson Creek corridor and the low-lying areas of the northern property edge are listed on the National Wetland Inventory. Wetlands occur primarily along the floodplains of Richardson Creek and the unnamed tributary as shown on Map 10 in Section 7. The area along Richardson Creek near the confluence with the Clackamas River is shown on a 1961 USGS quad map as Lake Pigeon. Once the alignment of the Clackamas River mainstem, the feature now appears on the map as a grassy swamp, or bog surrounded by shrubs and forest. Other wetlands along the northeastern property edge appear to have been ditched and drained as a consequence of agricultural conversion.

The majority of wetlands occurring at the site are Palustrine wetlands, most commonly represented by emergent, scrub/shrub, and forested classes. Palustrine emergent wetlands are characterized by numerous and various species of wetland plants; some of the most common genera being C*arex , Eleocharis, Juncus, Scirpus, Typha, Phalaris, Rumex, Deschampsia*, and *Alopecurus*. Palustrine scrub/shrub and Palustrine forested wetlands are characterized by woody species. Typical scrub/shrub wetland plants include willows, red alder and salmonberry. Common forested wetland species include red alder, black cottonwood, Oregon ash, big leaf maple and western red cedar. The classification of scrub/shrub or forested wetlands is determined by height of woody vegetation; with forested greater than six meters and scrub/shrub less than six meters.

AGRICULTURE AND MAJOR HABITAT TYPES

The Richardson Creek watershed is located in the transition zone between the conifer forests of the Cascade Mountains and the oak/prairie grasslands of the Willamette Valley (Ecotrust, 2000). Based on review of historical aerial photographs and General Land Office maps, the river edge and

floodplain areas of Richardson Creek Natural Area were historically comprised of red alder-mixed conifer riparian forest; likely containing combinations of red cedar, grand and Douglas fir, hemlock, bigleaf maple and black cottonwood. More upland areas along the northern edge of the property were typically comprised of mesic mixed conifer forests with mostly deciduous understory. Dominant species likely included Douglas fir, western hemlock, red cedar, grand fir, bigleaf maple, yew, dogwood, white oak and red alder (Christy et al., 2011). Map 3 in Section 7 shows the distribution of these vegetation communities based on GIS digitization of historical GLO maps.

Today, Richardson Creek Natural Area can be characterized by three primary habitat and cover types: agriculture, riparian forest, and mixed upland forested areas. Table 5 contains the percentages of the different current cover types that are present at the site today, and Map 4 in Section 7 shows the spatial partitioning of these habitat and cover types based on current conditions.

Table 1: Approximate area and percentage statistics for current cover types found at Richardson Creek Natural Area

CURRENT COVER TYPE	ACRE (AC)	PERCENT
Agriculture	42.7	50.9%
Beaches, bars, and mudflats	1.2	1.4%
Developed - (impervious)	0.2	0.2%
Developed - (pervious/non ag)	1.5	1.8%
Open water	6.2	7.4%
Riparian forest	18.8	22.4%
Upland forest - mixed	13.3	15.9%
Total	**83.9**	**100%**

Agriculture

Currently, 51 percent of the site is in agricultural production, primarily for row crop agriculture. The cropland is primarily irrigated using sprinklers and portable hand lines with the soils consisting of Cloquato silt loam and McBee silty clay loam. The land is continuously farmed throughout the year with much of the land exposed to soil erosion due to a lack of ground cover and row crop farming techniques. Figure 1 provides an aerial view of the agricultural portion of Richardson Creek Natural Area.

Figure 1. Aerial view to the south showing the row crops within Richardson Creek Natural Area and the Clackamas River in background.

Riparian forest

Richardson Creek Natural Area includes approximately 19 acres of forested floodplain and riparian habitat. The creek corridor supports mixed stands of alder, bigleaf maple, Douglas fir, cedar and cottonwood. Understory vegetation is dominated by salmonberry, vine maple, elderberry, hazelnut, skunk cabbage and reed canarygrass. Open water represents over six acres and includes approximately one mile of stream channel.

Riparian vegetation and floodplain forests provide essential habitat for aquatic systems by shading streams, contributing large wood that provides cover and pools for fish, and supplying important nutrients. Riparian habitats occur along streams throughout the Clackamas Basin. Floodplain forests are concentrated along the Clackamas River and larger tributary streams where wide areas are subject to periodic flooding.

Upstream of the property, lower Richardson Creek flows through a steep canyon that has allowed the riparian corridor to remain fairly intact and well forested. Downstream of Highway 224, Richardson Creek now occupies a remnant channel of the Clackamas River that was abandoned in the early 1900s. Figure 2 shows the typical riparian corridor along Richardson Creek.

Figure 2. An upstream view to the confluence of Richardson Creek and unnamed tributary showing riparian forests that provide shade and cover as well as large wood and detrital inputs that support important native species at Richardson Creek Natural Area. Water quality in the tributary is currently impacted by runoff from farming and a lack of riparian buffers upstream of this photo.

Over 50 percent of Richardson Creek Natural Area's historical riparian and floodplain forest along the tributary and between Richardson Creek and the Clackamas River has been cleared and converted for agricultural purposes. The remaining floodplain areas, primarily on the western half of the site, are relatively intact. Although much of the vegetation is young in age, and some invasive species are present, much of the forested portions of the site appear to be functioning properly and likely have the ability to support diverse populations of fish and wildlife.

Upland forest

Richardson Creek Natural Area includes approximately 13 acres of mixed upland forest habitat. These areas are typically associated with the valley walls and slightly elevated portions of the floodplain that are not frequently inundated.

Upland coniferous and mixed conifer/deciduous forests are the dominant habitat of the region. Low elevation Pacific Northwest old growth forests are typically characterized by Douglas fir, western red cedar and western hemlock, often in association with grand fir and hardwood species. Under historical conditions, trees of many of the dominant species lived to be 350 to 750 years old or older and frequently had diameters of eight feet or more (Intertwine, 2012a). Plant and animal use of forests followed the changes in forests over time, with different suites of species dominating depending on forest age, canopy closure and site conditions. Biodiversity is higher in forests where some light reaches the forest floor and where standing and fallen dead wood is ample and of mixed age and size. Forests younger than 60 years dominate western Oregon due to current forestry practices, and the decline of old growth-associated species reflects these changes in overall forest structure across the region (Metro, 2013). Figure 3 includes a picture of vegetation conditions adjacent to the unnamed tributary.

Figure 3. Himalayan blackberry and reed canary grass are the dominant vegetation along the unnamed tributary.

VEGETATION AND WILDLIFE

Historical vegetation and land use

The Richardson Creek watershed is located in a transition zone between the conifer forests of the Cascade Mountains and the oak/prairie grasslands of the Willamette Valley. Based on review of historical vegetation and GLO maps, Richardson Creek Natural Area was historically dominated by riparian and wetland forests with patches of upland forest along the valley walls at higher elevations (Christy et al, 2011). Riparian forests of the area likely included cottonwood gallery forests, Douglas fir, western red cedar, Oregon ash/Pacific willow swamps, and various mixes of Oregon ash, red alder, big leaf maple, Oregon white oak and black cottonwood (Intertwine, 2012a).

The uplands of the lava domes were characterized by closed canopy old growth Douglas-fir, grand fir and bigleaf maple. Hazelnut, Pacific dogwood, vine maple and Pacific yew composed the understory. The valley floors were similar, but also included western hemlock and western red cedar (Ecotrust, 2000).

Other shrubs and trees likely present at the site may have included black hawthorn, Western serviceberry and shrubs such as tall and dull Oregon grape, mock orange, blue and red elderberry, salal, red huckleberry, Indian plum and snowberry. Native forbs likely included sword fern, licorice fern, false Solomon's seal, false lily of the valley, trillium, fairy bells, miner's lettuce, stinging nettle and other species (Christy et al., 2011).

Humans have been present in the Willamette River basin for around 10,000 years, with approximately 30,000 Native Americans living in the basin prior to settlement. The Clackamas Band, related to the larger Chinookan-language group of the lower Columbia River, were likely the primary residents of the Clackamas River subbasin and the Richardson Creek watershed. Their primary use of the area would have been fishing in the Clackamas River and it's tributaries. Patches of heavily burned forests in the watershed indicate that Native Americans may have used fire to manage the area for hunting and gathering (Ecotrust, 2000).

French and English fur traders began to explore the area in the early 1800s with the first large wave of Euro-American settlers arriving in the 1840s. During the late 1800s and early 1900s, Euro-Americans gradually converted the forested landscape to a patchwork of farms, including cropland, pasture and orchards. Richardson Creek Natural Area area was likely cleared for agricultural production during this time period. Because the soils in the Richardson Creek watershed were typically over-saturated and not ideal for farming, early settlers installed extensive tile and drainage networks, including channel straightening and ditching. In the early 1900s, the development of the railroad accelerated the pace and scope of human uses of the lower Clackamas Valley. Land uses included commodity extraction, farming, timber harvest and human settlement. By the 1950s, large farms began to be subdivided into lots for residential development with most remaining agricultural production shifting to nurseries and Christmas tree farms (Ecotrust, 2000).

Invasive plants

Metro has completed mapping of invasive weeds at the site, but periodic reassessment will be necessary. Invasive species present are primarily located along stream corridors and in disturbed areas. Himalayan blackberry, reed canary grass, English ivy, clematis, yellow flag iris and Japanese or Bohemian knotweed are prevalent at the site.

Wildlife

Upland forests in the greater Portland-Vancouver region provide primary habitat for at least 94 species and are used by at least 129 more species (The Intertwine Alliance, 2012b). Many of these wildlife species, including amphibians, reptiles, birds and mammals use the site for breeding, nesting, foraging and migration. The western portion of the site has diverse cover, breeding and migration habitats which provide numerous food sources including seeds, fruit, pollen sources, bark and insects. This includes hawks, falcons and neotropical migrants such as willow flycatcher and solitary vireo as well as gallinaceous birds such as ruffed grouse. Small and large mammals and birds also provide food for species such as raptors and large predatory mammals including cougar, which is known to occur in the area. Forest habitats could support additional small mammals including Douglas' squirrel and several bat species. Other possible species for this site include wood rat, chipmunks, voles and mice, mink, weasel, bobcat, black bear, black tail deer and elk.

Typical avian species found with riparian habitats at the site include tree swallow, violet-green swallow, Western kingbird and olive-sided flycatcher. Other birds utilizing this habitat may include green heron, great blue heron, Wilson's and other warblers, and American goldfinch. Other wildlife species dependent on this habitat type include Pacific tree frog, northern red-legged frog, various salamanders, common garter snake, black-tailed deer, elk, black bear, beaver, coyote and fox. Ponded areas near the Clackamas River confluence may support migrating waterfowl species and also provide suitable resting habitat for painted and pond turtles.

Native fish populations

Anadromous fish occurring in the Clackamas River basin include spring and fall Chinook salmon, coho salmon, winter steelhead, summer steelhead (non-native), migratory cutthroat trout and Pacific lamprey (Runyon and Salminen 2005). Most populations of native salmonids in the Clackamas basin have been listed under the Endangered Species Act.

Table 2 includes federal and state listing status information for those species.

Table 2: Species of concern present at Richardson Creek Natural Area and current federal and state listing status

SPECIES	FEDERAL STATUS	STATE STATUS
Coho, Lower Columbia River ESU	Threatened	Endangered
Steelhead, Lower Columbia River ESU	Threatened	Sensitive–Critical
Chinook, Lower Columbia River ESU	Threatened	Sensitive–Critical
Coastal cutthroat trout, SW WA/Columbia River ESU	Species of Concern	Sensitive–Vulnerable
Pacific lamprey	Species of Concern	Sensitive–Vulnerable

Resident native fish that inhabit the Clackamas River include coastal cutthroat trout, rainbow trout and bull trout. Bull trout, once thought to be eliminated from the basin were reintroduced beginning in 2011, and in both 2011 and 2012, the fish were observed spawning (Allen and Koski, 2013). Other native fish potentially occurring in proximity to Richardson Creek Natural Area include sculpin, longnose dace, speckled dace, shiners, brook lamprey, suckers and northern pike minnow.

Native fish habitat in the mainstem Clackamas River and tributaries is moderately to severely degraded within much of the region. Widespread development and land use activity affect habitat quality and complexity, water quality, and watershed processes in lower Willamette River and Columbia River tributaries. Stream habitat degradation is primarily due to past and current land use practices that have affected properly functioning stream channels, riparian areas and floodplains, as well as watershed processes. The Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan identifies the Clackamas River and its tributaries as primary habitat necessary to the recovery of coho salmon and winter steelhead, and as important contributing habitat for fall Chinook salmon and chum salmon (WRI, 2004).

Although fish population data is limited for Richardson Creek, listed anadromous fish have been documented using the lower 1.5 -2 miles of the creek (Ecotrust, 2000). Ecotrust also identified lower Richardson Creek as a "Salmonid Hot Spot" in the 2000 Watershed Assessment (Ecotrust,

2000). Richardson Creek likely supports small populations of spawning and rearing coho salmon and winter steelhead as well as rearing and migrating Chinook salmon. Populations of coastal cutthroat trout and Pacific lamprey are also likely present. During elevated winter flows, confluence areas and inundated floodplain habitats present at the site also support juvenile rearing habitat for listed species.

RECENT MANAGEMENT HISTORY

Richardson Creek Natural Area was acquired by Metro in 2013 and has been maintained primarily for agricultural production. Metro is currently managing invasive species in the forested areas and will increase the level of effort in areas bordering farmed areas in association with planned restoration at the site.

NATURAL RESOURCES OF SPECIAL INTEREST

Some rare or special status species that may be found on, or approximate to the site may include Pacific lamprey, Western brook lamprey, coho salmon, steelhead, Chinook salmon, bull trout, Northern red-legged frog, Western toad, Western pond turtle, willow flycatcher and Western Meadowlark. No rare plant or formal archeological surveys have been completed at the site at this time.

SECTION 3: CONSERVATION

CONSERVATION TARGETS

The habitat conservation targets represent major habitat types present at the site. Conservation targets are composed of a species, suites of species, 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). To further advance local scale conservation targets, the Clackamas Basin Action Plan (2005) identifies key strategies to meet limiting factors for fish and wildlife populations in three specific areas: water quality, aquatic and riparian habitat, and wildlife habitat. Key strategies identified by the Clackamas Basin Action Plan for meeting limiting factors applicable to Richardson Creek Natural Area include:

Water quality

- Increase width of shrub and forested riparian areas.
- Develop buffer strips to capture runoff from agricultural areas.
- Reduce soil erosion.
- Encourage alternatives to pesticides.
- Protect mature riparian forests.

Aquatic and riparian habitat quality

- Restore and improve historical side channels and other backwater areas along the river and tributaries.
- Add wood to existing side channels.
- Protect existing high quality floodplain forest and riparian areas.

Wildlife habitat

- Improve and restore key wildlife habitats, emphasizing the lower basin eco-regions such as Richardson Creek.
- Improve terrestrial habitats by controlling weeds, vegetation control and planting native vegetation.
- Protect large intact areas comprised of key habitats to promote core areas for habitat connectivity.

Using onsite natural habitat types and regional conservation planning efforts as guides, conservation targets were selected that encompass the site's biodiversity values and regional conservation priorities and that are feasibly restorable. These conservation targets are:

- Riparian forest
- Upland forest
- Native fish

These targets reflect the historical habitat conditions that likely were present at the site, and the habitat types support the native focal species that presently or previously occupied the site. Although a large portion of the site is currently leased for agricultural use, it is anticipated that most of the site will eventually be restored to native forest habitat. The conservation targets are shown on Map 5 and described briefly in Table 7. Acreages of existing cover types, conservation targets, stewardship types, and management status are presented in Table 8.

Table 7: Current status and desired future conditions of the selected conservation targets

TARGET	CURRENT STATUS	DESIRED FUTURE CONDITION
Riparian forest	Generally in fair condition, where present. Some presence of invasive species and relatively simplified stand structure and age class composition. Floodplain areas that have been cleared for agricultural or residential purposes are in poor condition.	A diverse native riparian forest on stream banks and across the re-connected floodplain, with restored upstream-downstream habitat connectivity.
Upland forest	Degraded by invading non-native shrubs and cherry trees, and lacking legacy features typical of old forests: senescent trees, snags, and downed wood.	A re-established native shrub layer, with a more diverse stand composition and conditions, including older trees, canopy gaps, snags and downed wood.
Native fish	Most stream channels at the site lack instream cover, pool habitat, and are subjected to degraded water quality. Lack of riparian buffer along tributary to provide shade and detrital inputs.	Abundant instream cover, frequent pool habitat, large wood to retain spawning gravels, connectivity to floodplain and off-channel habitats. Volitional fish passage provided at all times.

Table 8: Corresponding acreages for current cover, conservation targets, stewardship types and management status

CURRENT COVER	ACRES
Agriculture	42.7
Beaches, bars and mudflats	1.2
Developed (impervious)	0.2
Developed (pervious / non ag)	1.5
Open water	6.2
Riparian forest	14.3
Upland forest – mixed	13.3
Upland forest – shrub stage	4.5
Total	**83.9**

STEWARDSHIP TYPE	ACRES
Beaches, bars and mudflats	0.1
Open water	5.1
Riparian forest	62.6
Upland forest – mixed	16.1
Total	**83.9**

CONSERVATION TARGET	ACRES
Riparian forest	62.6
Upland forest – mixed	16.1
No target	5.2
Total	**83.9**

MANAGEMENT STATUS	ACRES
0 - Pre-Initiation	83.9
1 – Initiation	0.0
2 - Establishment	0.0
3 - Consolidation	0.0
4 - Refinement & Maintenance	0.0
9 - No targets (developed)	0.0
Total	**83.9**

KEY ECOLOGICAL ATTRIBUTES

Key ecological attributes are the features that define 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 Metro in development of restoration actions for the conservation targets.

KEAs and their indicators for the Richardson Creek Natural Area conservation targets are provided in Table 9 through Table 11.

Table 9: Key ecological attributes for riparian forest at Richardson Creek Natural Area

CATEGORY	KEA	INDICATOR	---------- INDICATOR RATING ----------				CURRENT RATING	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	Fair	Good	Good	Riparian forest structure is generally in fair to good along Richardson Creek, but is in poor condition along the unnamed tributary stream and along a portion of the Clackamas River. Riparian forest width positively correlates with water and wildlife habitat quality, including biodiversity corridors. Restoration of channel-adjacent flood-prone lands will provide additional riparian forest width.
Condition	Vegetative structure: shrub layer	% native shrub cover	<10% cover	10-25% cover	25-50% cover	>50% cover	Fair	Good	Very Good	Riparian understory is presently dominated by invasive Himalayan blackberry and reed canarygrass, with small patches of English ivy. Clearing of invasive plants, native shrub plantings, and periodic maintenance – in combination with native riparian tree re-establishment – could boost native shrub cover.
Condition	Mature trees	Number and size (dbh) of species such as Douglas fir, western red cedar 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	Very Good	Riparian forest structure is generally in fair to good condition along Richardson Creek, but is in poor condition along the tributary stream and along a portion of the Clackamas River.
Condition	Floodwater access to the floodplain; upstream habitat connectivity	Degree of connection between stream/ floodplain during high water events	Extensively disconnected by channel incision, dikes, tide gates, elevated culverts, etc.	Moderately disconnected by channel incision, dikes, tide gates, elevated culverts, etc.	Minimally disconnected by channel incision, dikes, tide gates, elevated culverts, etc.	Completely connected (backwater sloughs, channels)	Poor	Good	Very Good	Stream is incised 3-5 ft below adjacent flood prone lands. A farm access road crossing with an undersized culvert isolates upstream habitat.

*Desired future condition

Table 10: Key ecological attributes for upland forest at Richardson Creek Natural Area

CATEGORY	KEA	INDICATOR	---------- INDICATOR RATING ----------				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
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	Good	Very Good	
Condition	Vegetative structure: shrub layer	% native shrub cover	<10% cover	10-25% cover	25-50% cover	>50% cover	Fair	Good	Very Good	
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	Fair	Fair	Very Good	

*Desired future condition

Table 11: Key ecological attributes for native fish at Richardson Creek Natural Area

CATEGORY	KEA	INDICATOR	---------- INDICATOR RATING ----------				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Complexity of habitat	# of different stream habitat units per 305 m (1,000 foot) reach	Less than 2 habitat units	Between 2-5 habitat units	Between 5-10 habitat units	Greater than 10 habitat units	Poor	Very Good	Very Good	Pools provide resting and feeding opportunities for a variety of native fish and other wildlife. Pools also can provide cold water refugia in summer months and low velocity refugia during elevated flows. A 2002 ODFW habitat survey documented 9 total pools in lower Richardson Creek or 5.3 pools/1000ft.
Condition	Key pieces and # of pieces of large wood in wetted areas of the stream and adjacent streambank	# key pieces and large wood per 305 m (1,000 ft) reach	<10 large wood pieces and 0-1 key pieces	10-20 large wood pieces and 2-5 key pieces	20-40 large wood pieces and 6-10 key pieces	>40 large wood pieces and >10 key pieces	Poor	Very Good	Very Good	Key pieces of large wood greater than 24" are lacking from the channel in Richardson Creek and the unnamed tributary. These pieces of wood are considered highly important for channel forming processes, pool development, sediment and nutrient retention and for cover for native fish. A 2002 ODFW habitat survey documented 1 key piece of wood in lower Richardson Creek or 0.6 pieces/1000ft.
Condition	Substrate in wetted areas of stream	% area of fines and gravel substrate per 305 m (1,000 ft) reach	Fines >30% and gravel <10% of area	Fines 20-30% and gravel 10-20% of area	Fines 10-20% and gravel 20-35% of area	Fines <10% and gravel >35% of area				Gravel (39%) and sand (35%) dominated stream substrate.
Condition	Fish passage	Fish able to move to and from mainstem and tributaries	Complete blockage	Blocked more than half the year	Blocked less than half the year	Passage open year-round	Poor	Good	Very Good	Floodplain inundation is currently limited by manmade berms located on Richardson Creek and the southern portion of the property along the Clackamas River. The tributary stream channel has been ditched and straightened and is incised below the adjacent floodplain elevation.
Condition	Floodwater access to the floodplain	Degree of connection between stream/ floodplain during high water events	Extensively disconnected by channel incision, dikes, tide gates, elevated culverts, etc.	Moderately disconnected by channel incision, dikes, tide gates, elevated culverts, etc.	Minimally disconnected by channel incision, dikes, tide gates, elevated culverts, etc.	Completely connected (backwater sloughs, channels)	Poor	Good	Very Good	Measure based on field walk, aerials. Adapted from Washington DNR's Ecological Integrity Assessment for North Pacific Lowland Riparian Forest and Shrubland, "Hydrologic Connectivity (Riverine)." Added channel incision. Not appropriate for higher gradient streams. (Stanford et al. 1996; Rocchio 2011)

*Desired future condition

THREATS

A stress is the "impairment or degradation of the size, condition, and landscape context of a conservation target, and results in reduced viability of the target," (The Nature Conservancy, 2007) or, in other words, a degraded key ecological attribute that is outside its acceptable range of variation. Stresses may also reduce the viability of nested conservation targets such as grassland birds. A source of stress is an extraneous factor, either human (e.g., policies, land use) or biological (e.g., non-native species) that infringes upon a habitat or species target. Put together, stresses and their sources constitute a threat.

Metro follows The Nature Conservancy's method of identifying threats at a site. Analysis of threats to conservation targets at Richardson Creek Natural Area involves three parts:

- Identify stresses and apply stress-rating criteria.
- Identify sources of stress, rank and assign threat-to-system rank.
- Use the combination of stress and source ranks to assign overall threat rank.

Threats for each conservation target are identified and ranked as low, medium, high or very high (Table 12 through Table 14). The most severe threats are those that are likely to seriously degrade or destroy a large portion in the next 10 years or so, and that we are able to reasonably address. Threats that we have no control over receive low ratings. This method helps identify restoration and stewardship activities that can abate the more severe threats. Threat rankings may change over time, for example if invasive species become a much more severe problem in a given conservation target.

CLIMATE CHANGE CONSIDERATIONS

The following section is adapted from the 2013 River Island site conservation plan. Because of the close proximity of the two sites, the effects of climate change will likely be mirrored at each site.

At Richardson Creek Natural Area, stressors from climate change will likely derive primarily from increased competition from invasive species, intensified summer drought and altered hydrology and water temperature. Altered hydrology may result in flashier streams from more severe winter storms and decreased summer flows from loss of snowpack, reducing or degrading native fish and riparian habitat. However, there could also be potential floodplain benefits from flashier streams – for example, larger floods could inundate floodplains for longer time periods. In forests, drier summer conditions could curtail tree growth and increase the risk of stand-replacing wildfires.

Metro will need to be vigilant in Early Detection-Rapid Response activities for invasive species, and more staff and financial resources may be needed to deal with invasive species in the future. At the site level, probability of native species persistence will be enhanced by restoration actions that remove or remedy habitat fragmentation (e.g. culvert repair/removal), re-establish and reconnect at-risk native habitats, restore legacy habitat features that serve as refugia (in-stream large wood debris, and upland forest snags) and buffer extreme climate events by restoring natural hydrology. The potential for altered hydrology increases the importance of riparian forest health and width, as well as looking at the larger landscape for biological connectivity. Creating and enhancing in- and off-channel habitat in the near future, including increasing the resilience of such habitat elements against altered hydrology, can help enhance native fish habitat.

Table 12: Threats and sources of stress for riparian forest

Source of stress		**Stresses** (rank each as L-M-H-VH for contribution, irreversibility & source) Habitat destruction/ conversion	Stress rank	Altered composition/ structure[1]	Stress rank	Competition for resources	Stress rank	Human disturbance	Stress rank	Altered hydrology	Stress rank	Impaired habitat connectivity	Stress rank	Threat rank	Comments
Development, land conversion	Contribution	High										High			Unnamed tributary stream is ditched, straightened, and incised. Undersized access road culvert blocks upstream passage for aquatic fauna. Soil erosion and runoff impacts water quality.
	Irreversibility	Medium	High									Low	Med	High	
	Source rank	Medium										Medium			
Invasive species	Contribution					High									Heavy infestation of Himalayan blackberry and reed canarygrass, with lesser amounts of English ivy, clematis, knotweed, and yellow flag iris.
	Irreversibility					Medium	High							High	
	Source rank					High									
Human use, dogs, trails, fishing, etc.	Contribution							Low							No trails are present and no human or dog access is currently planned or authorized.
	Irreversibility							Low	Low					Low	
	Source rank							Low							
Diking, filling, draining	Contribution									High					Channel straightening, agricultural drainage, and floodplain berms have contributed to altered stream, wetland, and floodplain function.
	Irreversibility									Medium	Med			Med	
	Source rank									Medium					
Previous forest management	Contribution			High											Riparian clearing and active farming of outer riparian fringe and flood prone areas. Lack of downed wood for fish and wildlife habitat.
	Irreversibility			Medium	Med									Low	
	Source rank			Medium											
Climate change	Contribution									High					Potential long-term effects due to alterations in runoff patterns and microclimates.
	Irreversibility									High	Low			Low	
	Source rank									High					

Table 13: Threats and sources of stress for upland forest at Richardson Creek Natural Area

Source of stress		**Stresses** (rank each as L-M-H-VH for contribution, irreversibility & source)													
		Habitat destruction/ conversion	Stress rank	Altered composition/ structure[1]	Stress rank	Competition for resources	Stress rank	Human disturbance	Stress rank	Altered hydrology	Stress rank	Impaired habitat connectivity	Stress rank	Threat rank	Comments
Development, land conversion	Contribution	Medium													Land clearing for farming has led to loss of upland forests and simplified stand structure. Road building adjacent to site has fragmented upland areas site from surrounding habitats.
	Irreversibility	Medium	Med											Med	
	Source Rank	Medium													
Fire suppression	Contribution			Medium											Wildfire suppression has altered stand composition and structure, leading to a more densely stocked stand with more Douglas-fir and fewer, less viable oaks.
	Irreversibility			Medium	Low									Low	
	Source Rank			Medium											
Invasive species	Contribution					High	High							High	Encroachment of non-native species may limit upland forest structure and composition.
	Irreversibility					Med									
	Source Rank					High									
Human use, dogs, trails, fishing, etc.	Contribution							Low							No trails are currently present and no human or dog access is currently planned or authorized.
	Irreversibility							Low	Med					Med	
	Source Rank							Low							
Previous forest management	Contribution	High													Historical land clearing has led to loss of characteristic elements of old forest: large trees, snags, downed wood, canopy complexity/gaps and high accumulations of soil organic matter.
	Irreversibility	Medium	High											Med	
	Source Rank	Medium													
Climate change	Contribution			High											Potential long-term effects from altered forest microclimate, new diseases and pests, as well as altered fire and drought regimes.
	Irreversibility			High	Low									Low	
	Source Rank			High											

Table 14: Threats and sources of stress for native fish habitat at Richardson Creek Natural Area

Source of stress		**Stresses** (rank each as L-M-H-VH for contribution, irreversibility & source)													
		Habitat destruction/ conversion	Stress rank	Altered composition/ structure[1]	Stress rank	Competition for resources	Stress rank	Human disturbance	Stress rank	Altered hydrology	Stress rank	Impaired habitat connectivity	Stress rank	Threat rank	Comments
Development, land conversion	Contribution	Medium										High			Straightening and ditching for agricultural has led to loss of habitat; undersized culvert limits fish passage on the unnamed tributary. A floodplain berm along Clackamas River limits river-floodplain connectivity.
	Irreversibility	Medium	Med									Medium	High	Med	
	Source Rank	Medium										High			
Previous forest management	Contribution	High													Historical land clearing has led to loss of characteristic elements of old forest and recruitment of LW for instream habitat complexity.
	Irreversibility	Medium	High											Med	
	Source Rank	Medium													
Climate change	Contribution									High					Potential long-term effects due to alterations in stream flow and microclimates.
	Irreversibility									High	Low			Low	
	Source Rank									High					

PRIORITIZED STRATEGIES TO ADDRESS THREATS

This site conservation plan outlines strategic actions to be carried out at Richardson Creek Natural Area over the next ten years, based upon short- and long-term goals for the various identified conservation targets. The strategic actions described below are intentionally general in nature and are not highly specific prescriptions. Specific prescriptions will be developed by Metro staff to address site-specific conditions encountered in areas targeted for restoration. Proposed strategic actions to address threats are summarized in Table 13.

Weed management is likely to pose an ongoing challenge for Metro managers, given that invasive vegetation is widespread across the property and the extensive boundary edges bordering adjacent residential and agricultural lands. Annual treatments will be required, at least initially, to keep weed populations suppressed. More intensive treatments will likely be needed to facilitate re-establishment of native shrubs where reed canary grass currently dominates.

Table 15: Threats and actions for key ecological attributes of important conservation targets

CONSERVATION TARGET	KEA	THREAT	ACTION(S)	NOTES
All	Species composition and competition	Invasive species	Integrated approach of monitoring, cutting, herbicide spraying and controlled burns.	Will be an ongoing challenge.
Riparian forest and native fish	Floodplain connectivity and upstream habitat connectivity	Land conversion	Remove berms that limit floodplain connectivity. Relocate channels into historical alignments. Repair/remove culvert blockage at farm access road crossing.	
Riparian and upland forest	Habitat area	Land conversion	Re-establish native trees and shrubs on portions of area that is currently farmed.	Could be completed in stages, initially focused on near-stream area and expanding outwards over time.

SECTION 4: MANAGEMENT ACTIONS

Restoration actions, anticipated challenges and estimated costs are described in this section and in Table 14Table, below. For several restoration actions, there are options for Metro to stage interventions in order to gage initial success, manage costs, and maintain working relationships with leaseholders and neighbors.

INVASIVE SPECIES

Due to the proximity of fringing rural residential and agricultural lands, regular management of invasive species will be necessary to reduce the current extent of invasive species and to address new introductions. In the near term, Metro will continue monitoring and treatment of false brome, garlic mustard, butterfly bush, knotweed, blackberry, ivy, clematis, holly, hawthorn and other common agricultural weeds.

Among the available approaches is the phased restoration for current agricultural and developed areas in discrete management blocks to manage weeds and ensure the successful re-establishment of native vegetation. Over the medium to long-term, Metro will address threats from new invasive plants through cooperative management agreements with neighboring landowners, and active

management of Richardson Creek Natural Area recreational users to limit the arrival of new weed propagules. Metro will also continue to develop and refine its cooperative weed management activities with partner agencies and stakeholders and is participating in the Clackamas River Invasive Species Partnership (CRISP), a multi-partner effort to reduce the threat of invasive species to riparian habitat and water quality in the Clackamas basin. Finally, the farm leaseholder should be engaged to ensure farm equipment is not transporting weed materials onto the site, and to consider how the lease agreement could help serve and implement the restoration plan.

RIPARIAN FOREST AND NATIVE FISH

The stream corridor and floodplain areas located at Richardson Creek Natural Area represent an important restoration opportunity. A series of inter-related management actions will help reduce erosion and runoff, re-establish natural hydrological processes, improve habitat conditions for native fish and wildlife, and support the re-establishment of native vegetation.

Potential actions

- Realign unnamed tributary stream channel to a more natural channel location that increases sinuosity and reconnects the channel with the adjacent floodplain.
- Realign portion of Richardson Creek downstream of Highway 224 and remove existing floodplain berm to increase energy dissipation and floodplain connectivity.
- Remove or replace undersized conveyance culvert with fish passable structure that allows volitional fish passage and sediment continuity.
- Install large wood habitat structures throughout Richardson Creek and the unnamed tributary to increase channel complexity and instream cover.
- Excavate pools adjacent to large wood structures in Richardson Creek and the unnamed tributary to provide additional habitat complexity and provide resting and feeding stations for native salmonids.
- Remove invasive plants and replant native trees and shrubs within a 200-foot wide area fringing the active stream channel to provide shade, detrital inputs and future large wood recruitment.
- Re-establish native shrubs in channel fringe areas and actively manage vegetation to foster expansion of native shrub cover and suppression of reed canarygrass.
- Excavate connector channels through existing berm located along the bank of the Clackamas River to allow more frequent inundation of floodplain habitats and floodplain function.
- Install floodplain large wood roughness elements to slow overland velocities and create complex flow paths.
- Remove invasive species and revegetate floodplain areas currently used for agriculture.
- Remove existing buildings/structures contained in a FEMA mapped floodplain area and revegetate with native shrubs and trees.
- Fill existing pond and revegetate with native shrubs and trees to reduce potential for degraded water quality and proliferation by invasive species.

Over the medium- to long-term – beyond the present site conservation plan planning horizon – the riparian corridor will be managed to expand the lateral extent of native plantings in the stream-riparian and floodplain areas to the whole of the mapped riparian forest management areas. As the stream channel aggrades and reconnects with the floodplain, and more extensive riparian vegetation becomes established, extremes of drought and flooding will be moderated through the creation of more transient water storage along the corridor. Over the long-term, the goal for the site is the re-establishment of a natural hydrologic regime and native trees and shrubs.

UPLAND FOREST

Upland forest habitats are located along the valley walls on the northern portion of the site and interspersed in the floodplain areas where topographic elevation limits frequent inundation. Though degraded by past management and invasive species, there is potential to improve forest structure and composition, further diversifying the habitats and benefitted species at the site. Over the long-term, the goal for upland forests is to foster development of more diverse, late-seral forest characteristics.

Potential actions

- Remove English ivy and holly to reduce competition with native shrub species.
- Replant approximately 2.5-acres of existing farm field at the southern portion of the property.
- Manage existing Douglas-fir/big leaf maple to foster re-establishment of late-seral habitat attributes, including canopy gaps, snags and downed wood.

Table 16: Management actions, prioritization, costs and monitoring important to maintaining/improving KEAs at Richardson Creek Natural Area over the next ten years

CONSERVATION TARGET	KEAS	SOURCE OF STRESS	MANAGEMENT ACTIONS	PRIORITY	SEQUENCING	ESTIMATED COST	MONITORING
Riparian forest (and shrub wetland)	Floodplain connectivity and natural hydrology	Berms, filling, draining, land conversion	Create openings in existing berm, locate and remove or break agricultural drain tiles to restore natural hydrology	High: floodplain connectivity will not improve without active intervention. Expanded and restored riparian forest and wetlands are dependent on re-establishment of natural hydrology.	Near term	$100,000-125,000	Project dependent, but at a minimum should include photo points, channel cross sections and longitudinal elevation profiles.
Riparian forest	Upstream habitat connectivity	Development	Remove culvert blockage at farm access road crossing	High: culvert work needs to be planned and integrated with channel restoration.	Medium term	$125,000 to remove existing culvert and replace with bridge	Photo points, project design and as-built drawings, and elevation survey.
Native fish	Instream habitat, fish passage, floodplain connectivity	Land conversion, simplified stream structure, lack of wood	Restore existing streams to natural conditions that are sustainable, augment large wood, remove relic structure	High	Near term Near term	$450,000 for Richardson Creek restoration $1,300,000 for unnamed tributary restoration	Photo points, vegetation transects, cross-sections, longitudinal profile, fish surveys.
Upland forest	Mature trees, standing and downed dead trees	Previous forest management; invasive species	Remove blackberry, ivy and other noxious weeds and restore native shrub community; replant farm field	Medium	Medium or long term	$30,000 ($1,500-$2,000/acre) for initial treatments and planting $30,000 to enhance existing upland forest and establish new upland forest ($4,000/acre)	Permanent vegetation plots or transects, photo points.

Map 6 and Map 7 in Section 7 show the distribution of natural area stewardship classes and present-day management status at Richardson Creek Natural Area, respectively. Stewardship class is a high-level, generalized land cover classification of all Metro properties, reflecting desired future conditions. Stewardship classes are not as specific as conservation target classes, and they include both natural and non-natural land covers.

Management status describes how far a given portion of a site is from DFC, with a score of "0" for those that are the farthest away from DFC, and "4" for areas currently at DFC. Areas lacking a conservation target are scored as "9" (unclassified). Table 15 defines Metro's management status categories.

Table 17: Conservation management status categories under the Metro site conservation planning framework

MANAGEMENT STATUS	SCORE	TIMEFRAME	DESCRIPTION
Pre-initiation	0	N/A	Highly disturbed sites where restoration work has not been initiated. Few native plants typically present (farm fields, clearcuts, oak woodlands/ prairies with high levels of invasive/colonizing vegetation encroachment).
Initiation	1	0-3 years post-restoration	Sites under initial restoration establishment phase. Includes areas under treatment with tilling, mowing, grading, invasive species control and initial planting.
Establishment	2	3-8 years post-restoration	Sites undergoing treatments to reduce competition to vegetation planted or released during the initiation phase. Areas generally stay in this phase until priority native plants have established dominance over competing vegetation.
Consolidation	3	8-20 years post-restoration	Sites with developing native plant communities that require periodic management to reach the DFC (tree thinning, mowing and weed control).
Refinement and long-term maintenance	4	Indefinite	Sites that have reached their DFC or are on a clear path towards it, requiring only modest additional intervention.
Unclassified	9	N/A	Sites with unclassified conservation targets, representing developed areas.

SECTION 5: ACCESS AND RECREATION

Richardson Creek Natural Area represents an important linkage between Clackamas Bluffs Natural Area and the Clackamas River floodplain. The site does not have any identified recreational uses and there is currently no formal master plan for public access and use, but there is no gate or fence to restrict public use. Access to the site is currently limited due to lack of on-site parking and trails and access infrastructure is expected to remain primitive for the ten-year planning horizon. Farm field access roads are present on Highway 224 (Map 2 in Section 7) and at the south end of the property, but the southern boundary is used only by the leasing farmer.

SECTION 6: COORDINATION

PUBLIC INVOLVEMENT

As projects are developed, Metro will provide local stakeholders and residents surrounding Richardson Creek Natural Area with pertinent information about conservation work before it is implemented. This may include background on the project, timing, cost, material types, and other information necessary to keep the public informed.

KEY STAKEHOLDERS AND PERMITTING AGENCIES

Several stakeholders have already been involved with the site review process and provided input. Key stakeholders and permitting agencies include:

- Calcagno Farms – leasing farmer
- Portland General Electric – potential project funder and partner
- Clackamas Soil and Water Conservation District – invasive species control
- Clackamas River Basin Council – potential riparian revegetation partner
- Clackamas County Planning and Development Services - building or demolition permits are required for removal of the existing residential structure and work within the managed floodplain areas and site access/right-of-way
- Oregon Department of Forestry – regulate forest practices and burning.
- Oregon Department of State Lands – regulate removal-fill within waterways and general authorization to remove culvert
- Oregon Department of Fish and Wildlife – consultation on potential in-water work to ensure fish passage criteria met
- U.S. Army Corps of Engineers – federal section 404 or regional general permits covering any new fill placed in wetlands or waters, including restoration of ditched channels

SECTION 7: MAPS

Map 1 Vicinity map

Map 2 Site map

Map 3 Historical vegetation map

Map 4 Current Cover

Map 5 Conservation targets

Map 6 Stewardship class

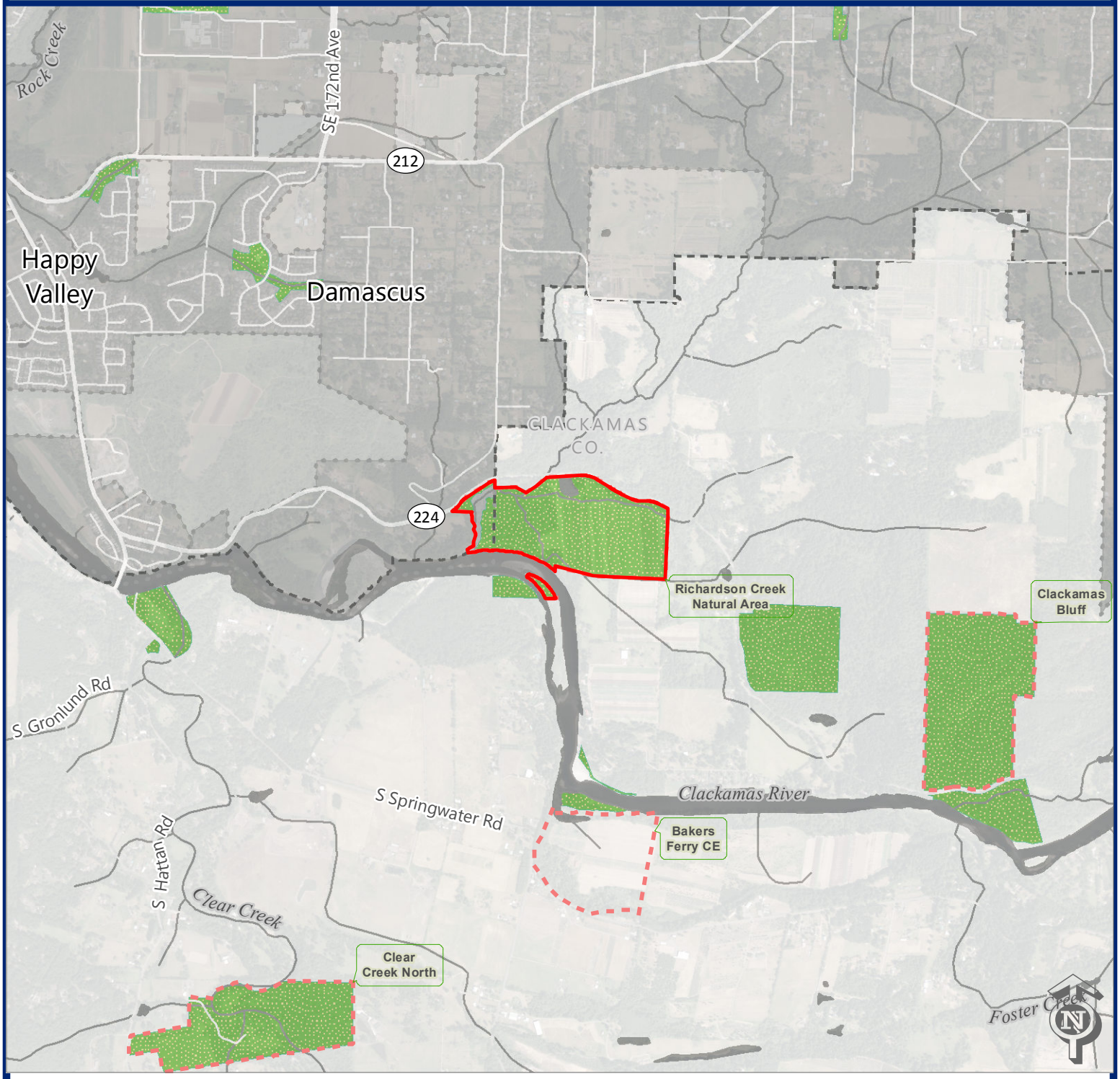
Map 7 Management status

Map 8 Topographic map

Map 9 Soils map

Map 10 Hydrologic map

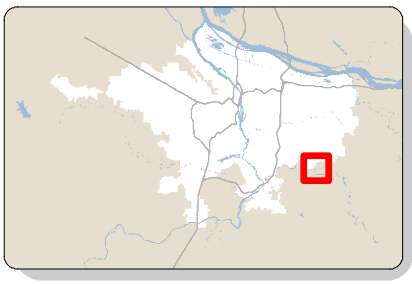
VICINITY MAP



Richardson Creek Natural Area site

Other Metro sites

Parks and/or Natural Areas



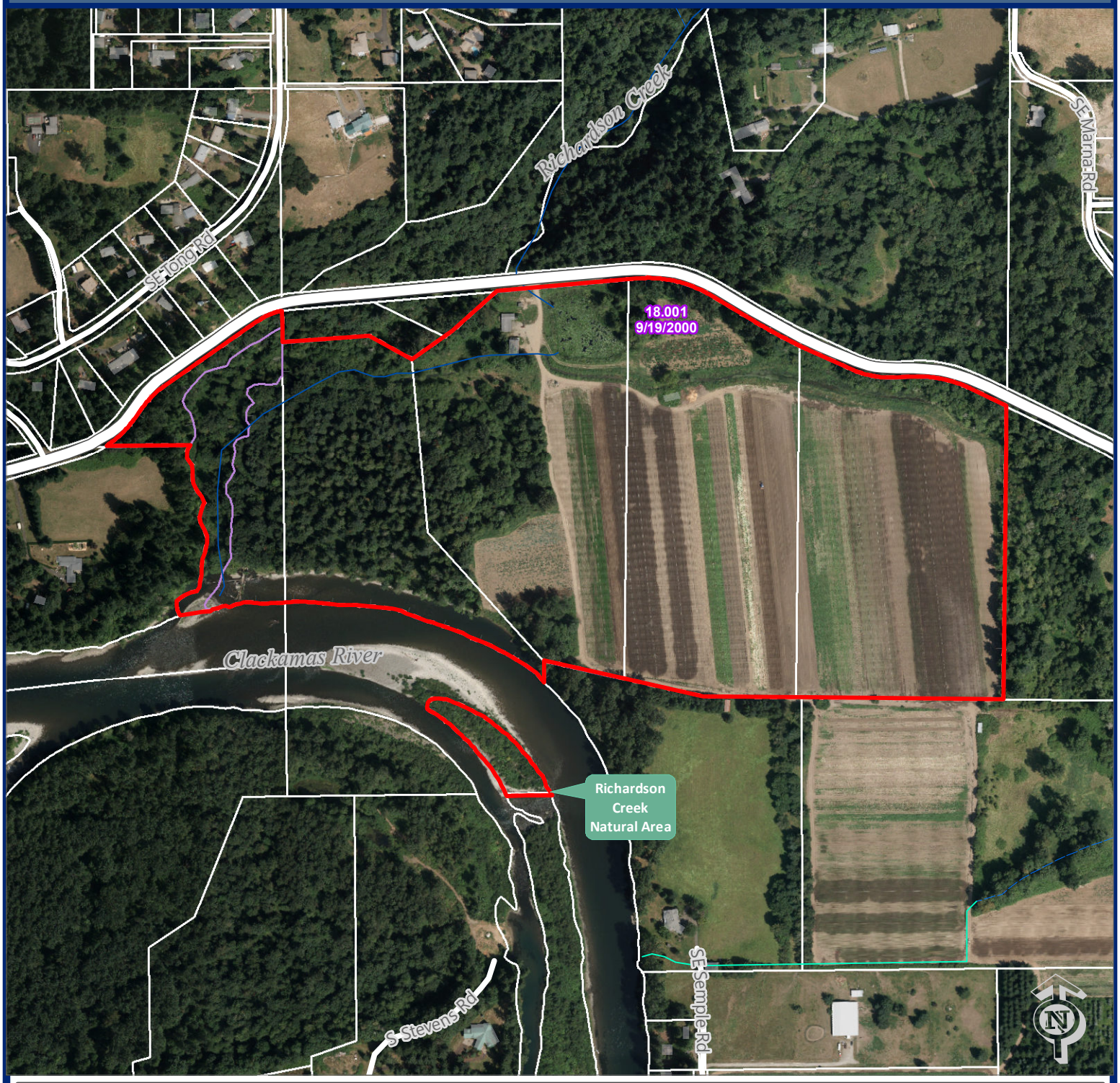
0 0.6 1.2 Miles

Metro

Richardson Creek Natural Area Site Conservation Plan

map date: 9/17/2015

SITE MAP



Richardson Creek Natural Area site

Other Metro sites

Bond Measure

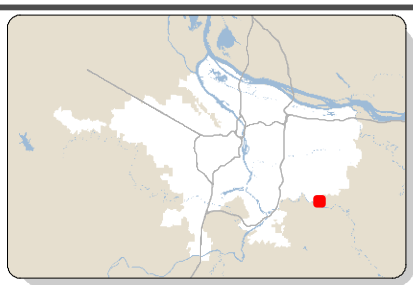
1995 Bond Measure

NHD Flowlines

Intermittent stream

Perennial stream

Canal



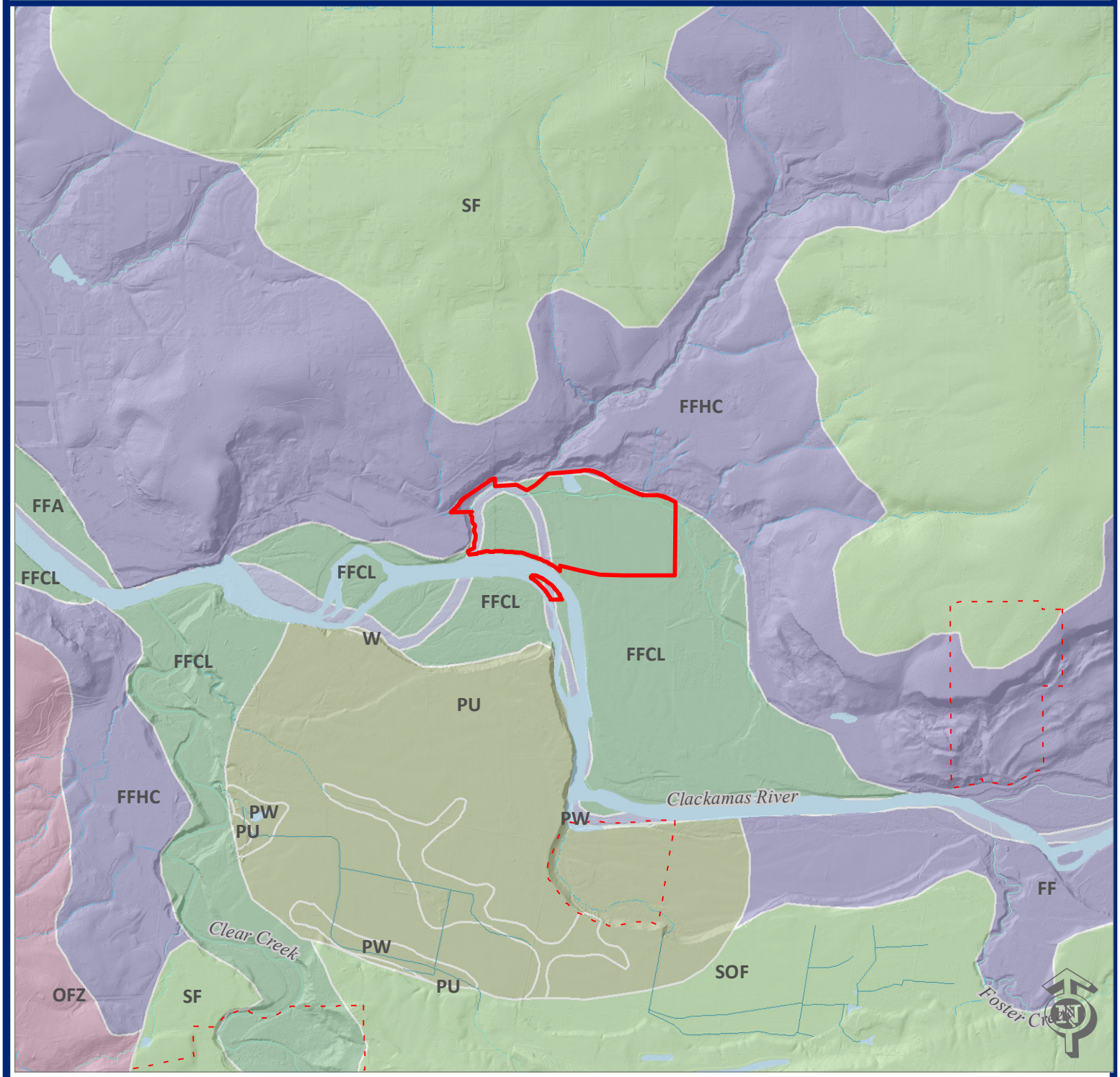
0 700 1,400 Feet

Metro

Richardson Creek Natural Area Site Conservation Plan

map date: 9/17/2015

HISTORICAL VEGETATION (1851-1910)



Richardson Creek Natural Area site

Other Metro sites

Historical vegetation

- Closed forest; Riparian & Wetland
- Closed forest; Upland
- Prairie
- Savanna
- Water
- Woodland

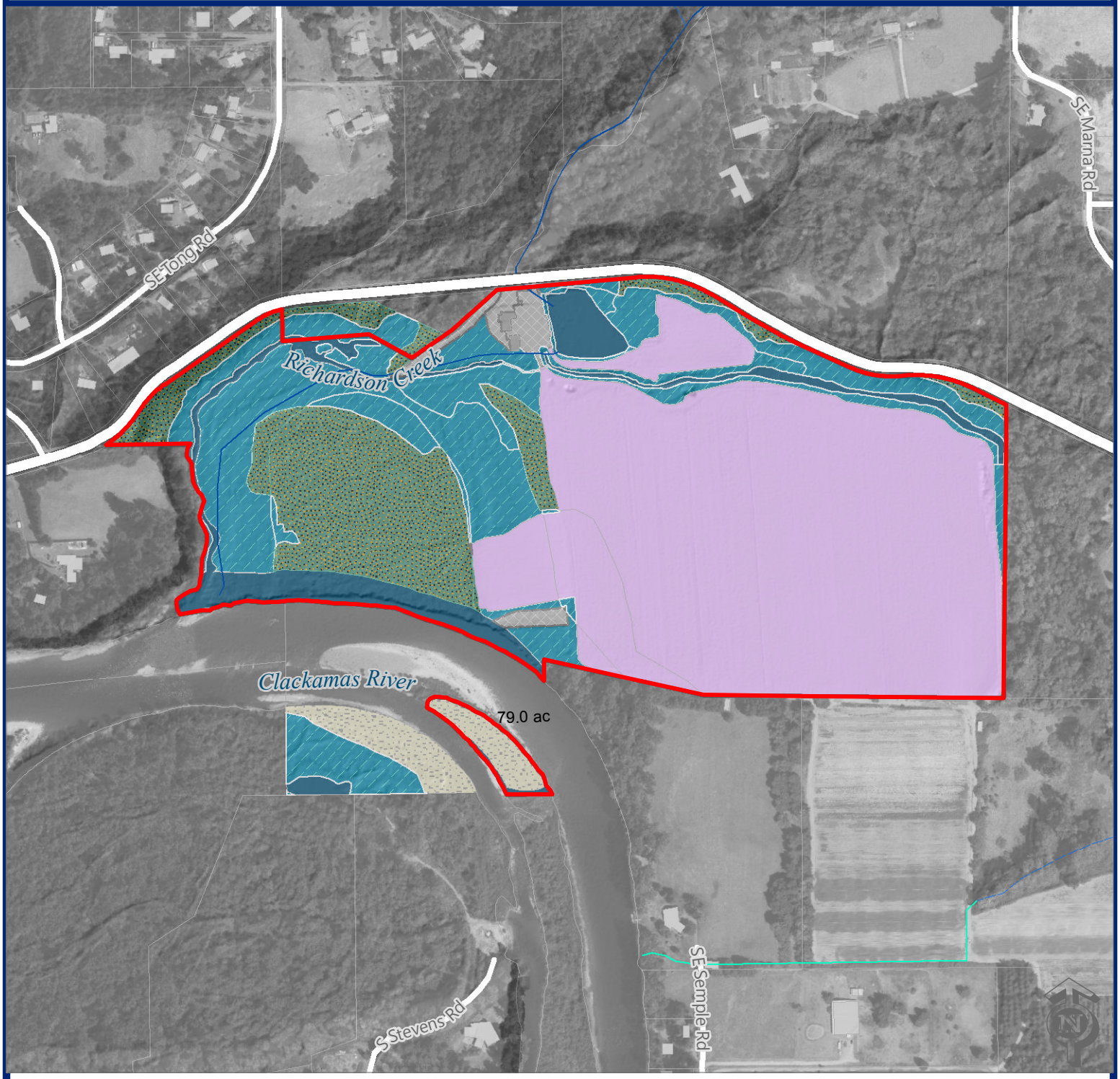
*** The historical vegetation map should be interpreted as a coarse resolution view into existing vegetation types in the late 1800s.**

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

0 2,000 4,000 Feet

Metro

CURRENT COVER



Richardson Creek Natural Area site

Other Metro sites

NHD Flowlines

Intermittent stream

Perennial stream

Canal

Current cover

Agriculture

Beaches, bars, and mudflats

Developed - (impervious)

Developed - (pervious/non ag)

Open water

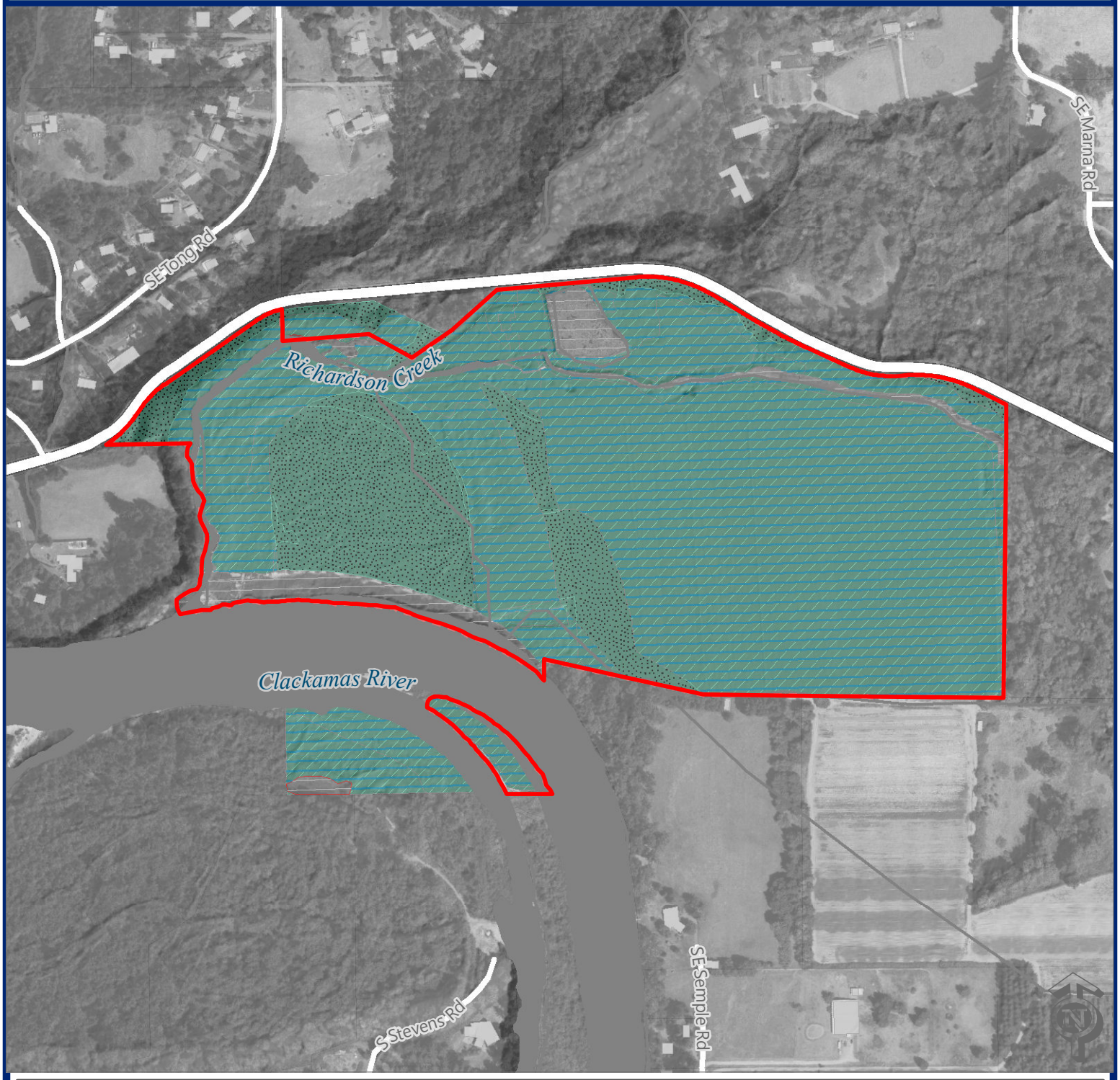
Riparian forest

Upland forest - mixed

0 620 1,240 Feet

Metro

CONSERVATION TARGETS



Richardson Creek Natural Area site

Other Metro sites

Conservation targets

No targets

Riparian forest

Upland forest

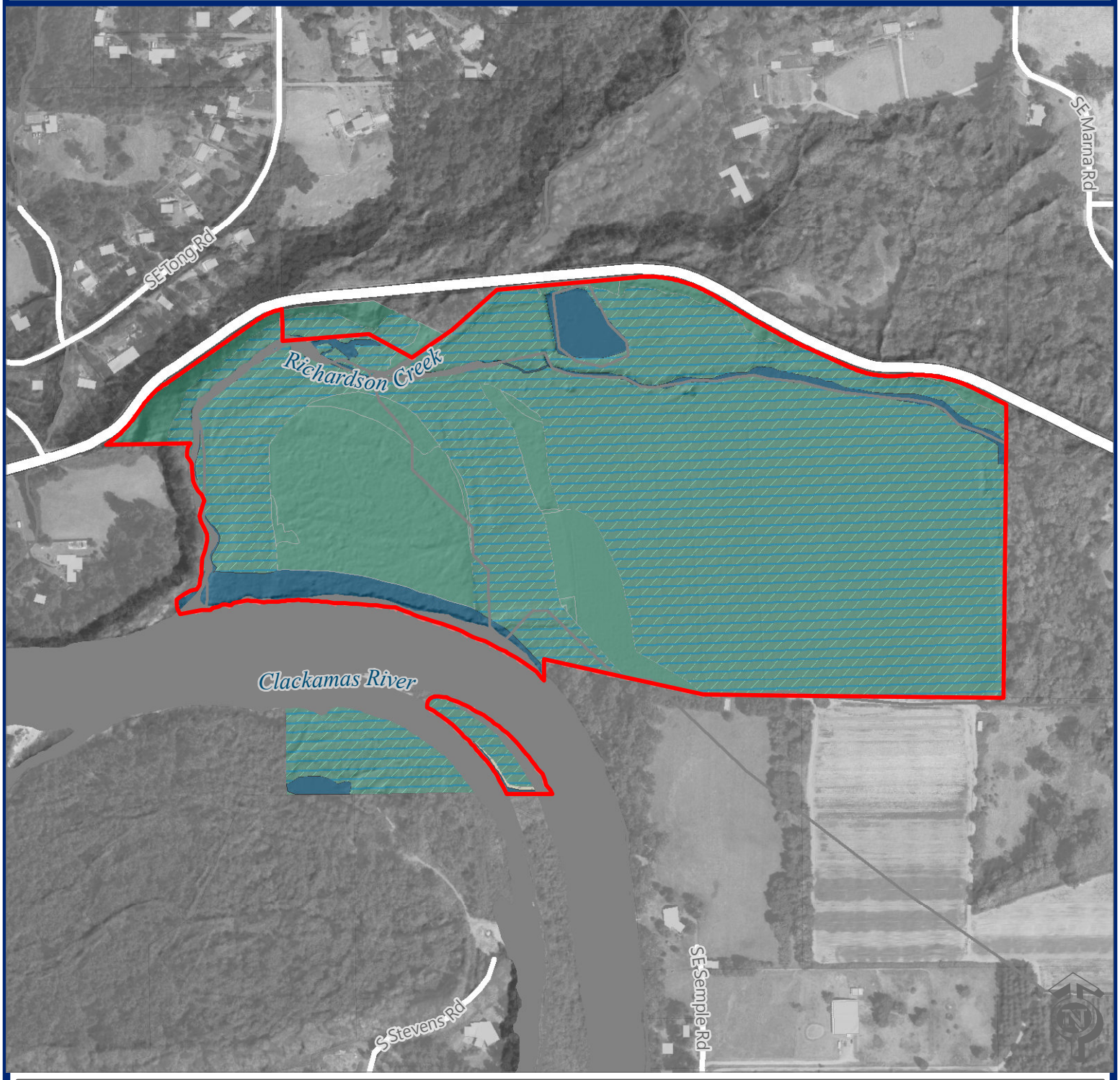
0 620 1,240 Feet

Metro

Richardson Creek Natural Area Site Conservation Plan

map date: 9/17/2015

STEWARDSHIP CLASS



Richardson Creek Natural Area site

Other Metro sites

Stewardship Class

Beaches, bars and mudflats

Riparian forest

Upland forest

Water

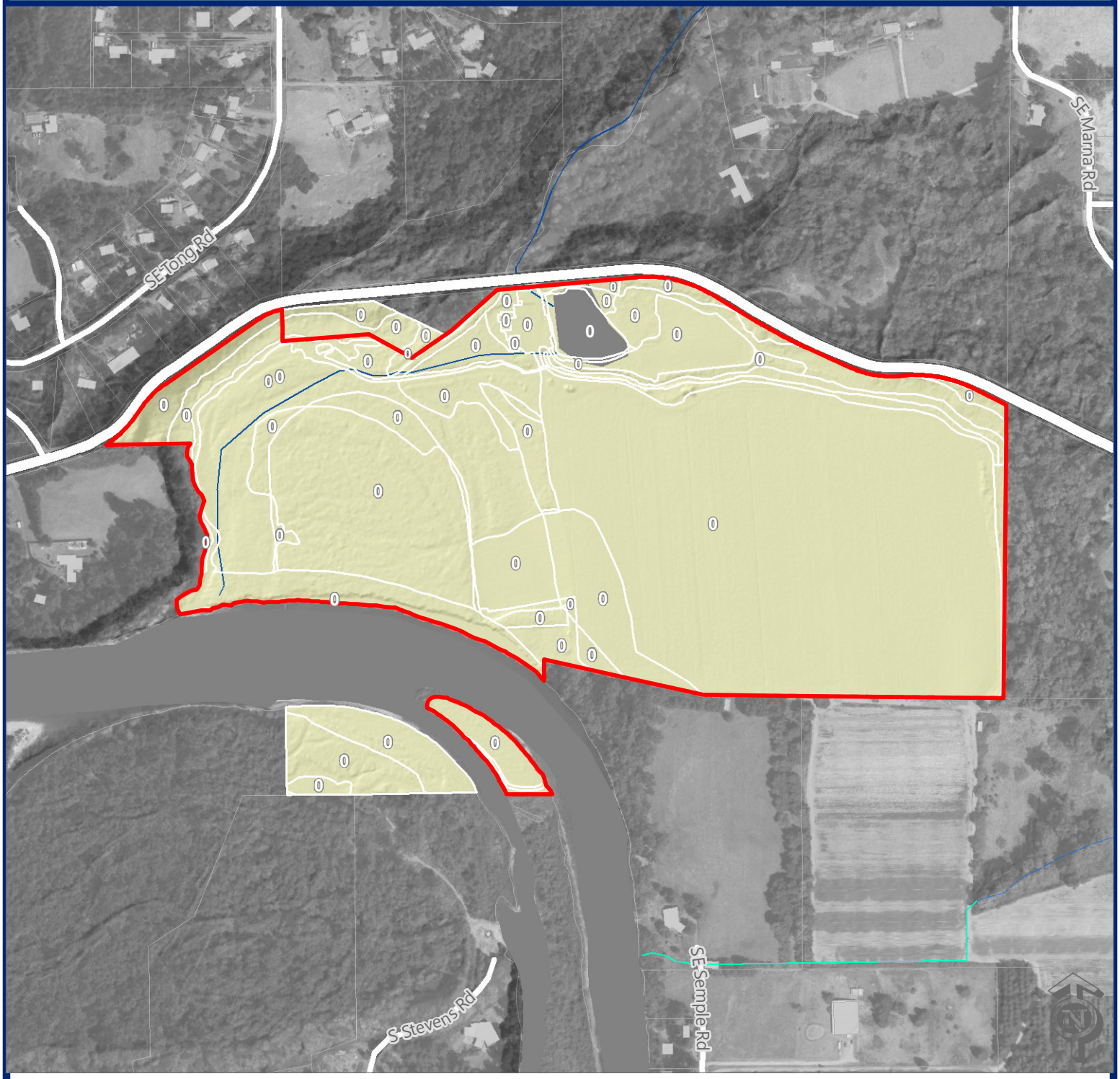
0 620 1,240 Feet

Metro

Richardson Creek Natural Area Site Conservation Plan

map date: 9/17/2015

MANAGEMENT STATUS

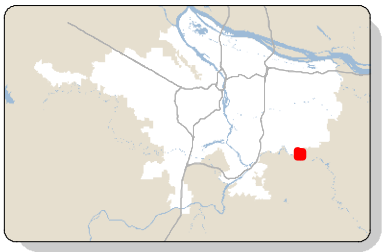


Richardson Creek Natural Area site

Other Metro sites

Management status

0 - Pre-Initiation



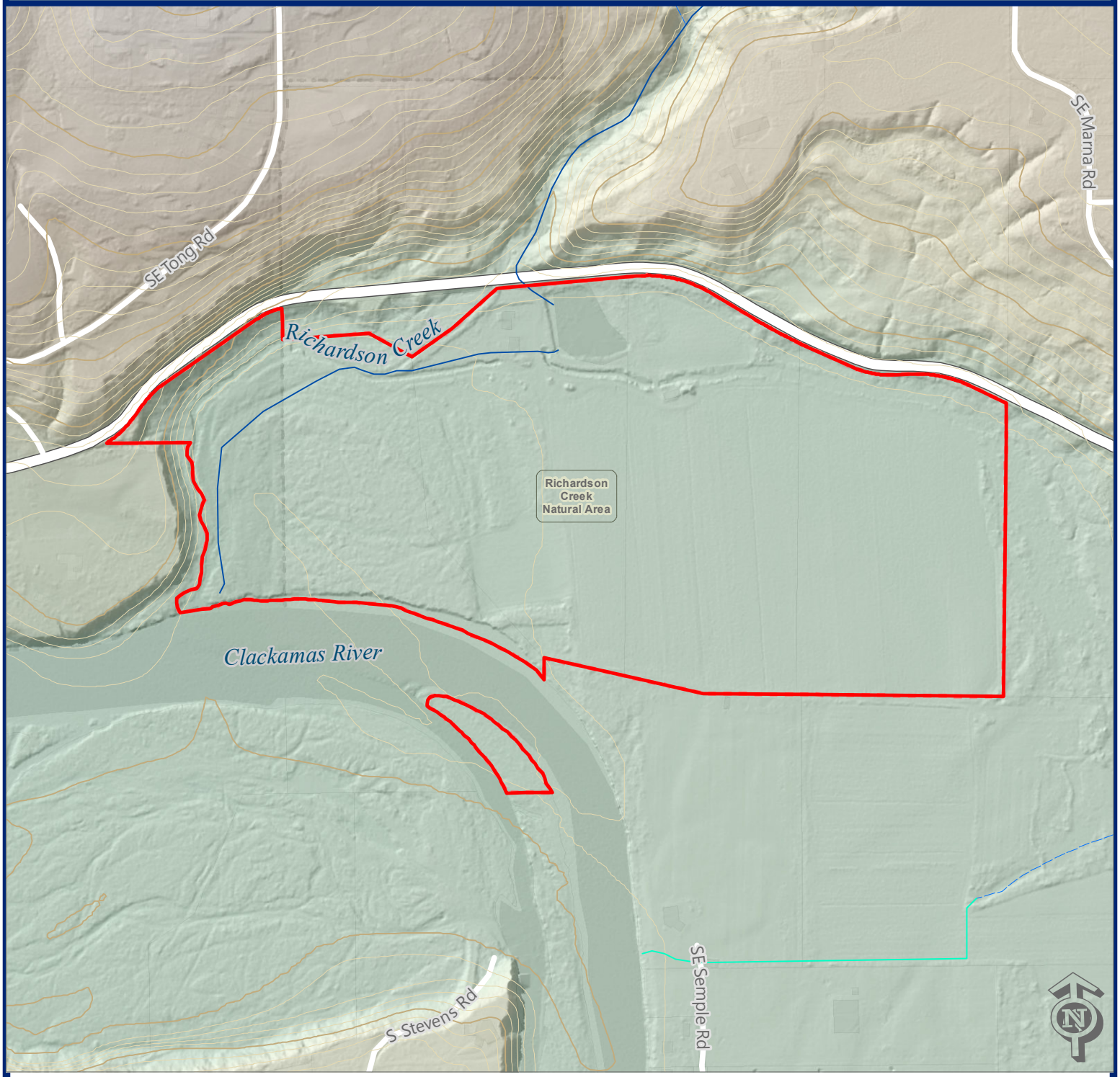
0 620 1,240 Feet

Metro

Richardson Creek Natural Area Site Conservation Plan

map date: 9/17/2015

TOPOGRAPHY



Richardson Creek Natural Area site

Other Metro sites

NHDplusStrmFlowline

Intermittent stream

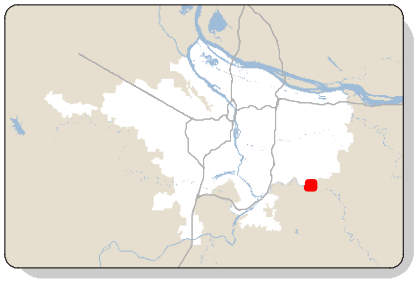
Perennial stream

Canal

10 ft contour

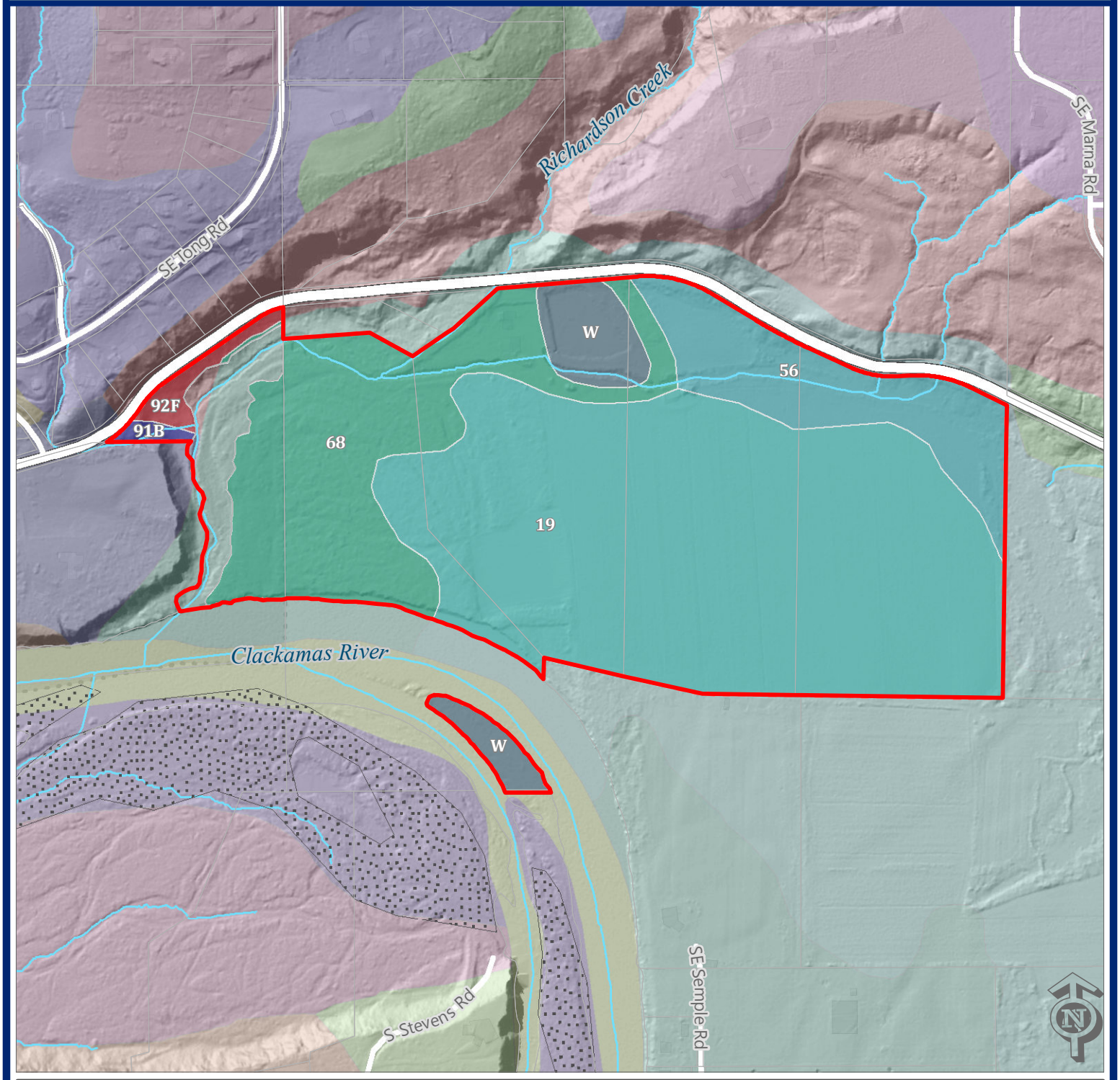
50 ft contour

0 710 1,420 Feet



Metro

SOILS



Richardson Creek Natural Area site

Other Metro sites

Hydric soils

NRCS soils on Site

Cloquato silt loam

McBee silty clay loam

Newberg loam

Water

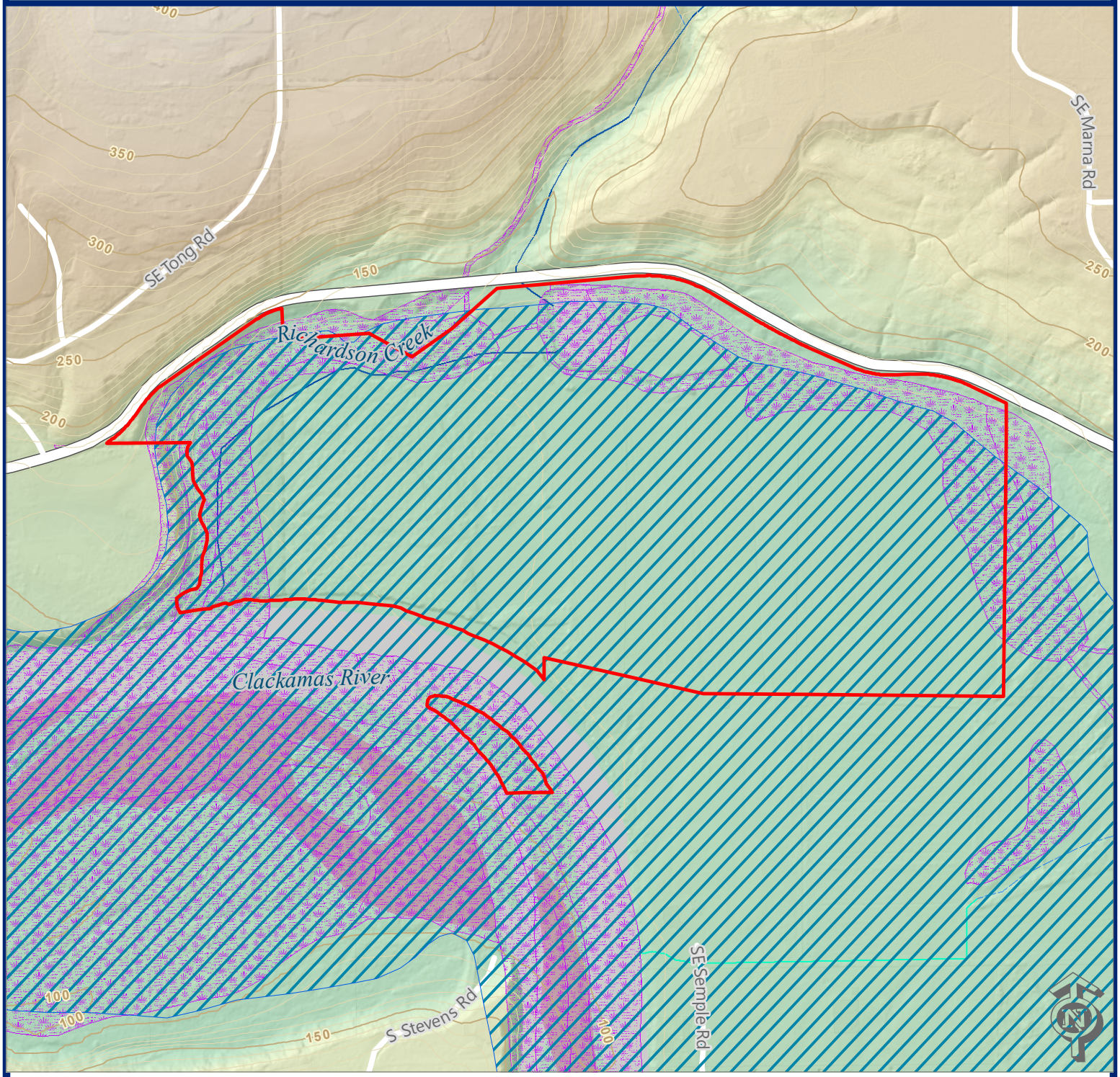
Woodburn silt loam, 3 to 8 percent slopes

Xerochrepts and Haploxerolls, very steep

0 625 1,250 Feet

Metro

HYDROLOGY



Richardson Creek Natural Area site

Other Metro sites

100 year floodplain

Wetlands (Wetlands Conservancy data)

NHD Flowlines

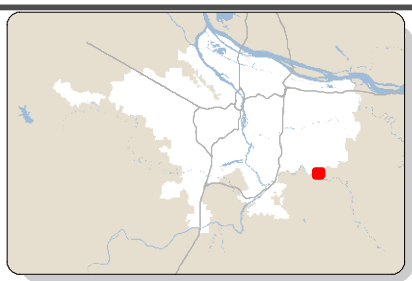
Intermittent stream

Perennial stream

Canal

Hydric soils

0 690 1,380 Feet



Metro

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