

Cazadero North Natural Area

Approvals for Site Conservation Plan

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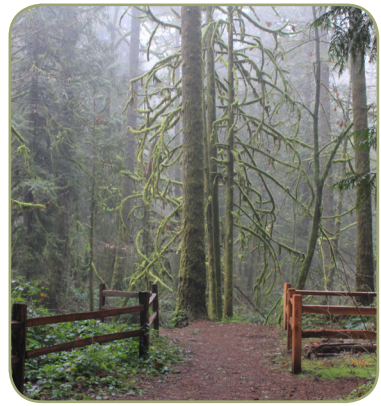
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SITE CONSERVATION PLAN

Cazadero North Natural Area



April 2020



Metro

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TABLE OF CONTENTS

Introduction	1
Planning process summary	3
Existing conditions	4
Conservation	7
Management actions	9
Recreation and access.....	14
Coordination	17

Maps

Map 1	Vicinity map
Map 2	Site map
Map 3	Soils
Map 4	Topography
Map 5	Hydrology
Map 6	Current cover
Map 7	Historical vegetation
Map 8	General Land Office (GLO)
Map 9	Conservation targets

Appendices

Appendix A	Conservation
A.1	Conservation targets
A.2	Key ecological attributes
A.3	Threats and sources
A.4	Invasive species
Appendix B	References and additional resources

SECTION 1: INTRODUCTION

1.1 CONTEXT

Cazadero North Natural Area is located in Boring, Oregon along the banks of North Fork Deep Creek and within an area that likely serves as a principal wildlife corridor connecting the Clackamas River to the East Buttes of Gresham and the Johnson Creek watershed. Adjacent to the Cazadero North Natural Area is the Cazadero State Trail, a multi-use path managed by the Oregon Parks and Recreation Department (OPRD) that is an extension to the 40-mile Springwater Corridor. One hundred years ago, trains utilized the rail line through the corridor for transporting timber from Cascade forests to the Portland riverfront. The rail line, built by the Oregon Water Power and Railway, spurred the development of a new community, Boring Junction, now known as Boring. Remnants of a branch, or spur, of the railway line is found near the site's northernmost property line. This spur line was likely used to transport lumber from one of the first sawmills established in the area in the 1900s, situated just across North Fork Deep Creek. Through the years, mill operations were established across much of the site and it underwent a variety of development including a millpond that was created from a dam built across the creek in the 1940s, a small road and log winch that carried logs throughout the site, a "wigwam burner" that burned wood waste, and a large mill shop. After the last mill and many of its structures were damaged in a fire in the 1960s, the site was purchased and later abandoned by Vanport Manufacturing, who later donated it to the Boring-Damascus Grange. In 2015, Metro purchased the site and designated it the Cazadero North Natural Area as a temporary operational name pending future official naming by the Metro Council.

Prior to the development of the sawmills and the rail line, the area including the roughly 3 acres now referred to as the Cazadero North Natural Area were described as rolling, undeveloped, and forested with a mix of coniferous and deciduous trees including Douglas-fir (*Pseudotsuga menziesii*), bigleaf maple (*Acer macrophyllum*), western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and alders. Today, the Cazadero North Natural Area's forested areas are a mix of Douglas-fir, bigleaf maple, western red cedar, red alders (*Alnus rubra*), Oregon ash (*Fraxinus latifolia*), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), and cascara (*Frangula purshiana*). Other native species present at the site include osoberry (*Oemleria cerasiformis*), Pacific ninebark (*Physocarpus capitatus*), a variety of ferns, lupine (*Lupinus* sp.), common rush (*Juncus effusus*), small-fruited bulrush (*Scirpus microcarpus*), and others.

Metro's ownership in the Deep Creek watershed includes 168 acres over four sites, including the 47-acre North Fork Deep Creek Natural Area, 40-acre North Fork Deep Creek North Natural Area, 78-acre North Fork Deep Creek South Natural Area and the 3-acre Cazadero North Natural Area. This site-based conservation plan will only consider the Cazadero North Natural Area site.

The Cazadero North Natural Area site conservation plan is a tool for protecting and enhancing the unique characteristics of the site and considering appropriate levels for future access. This conservation plan has been developed by Metro and includes an overview of the history, existing conditions, conservation targets, and recreation and access objectives for the site.

1.2 GOALS AND OBJECTIVES OF THE CONSERVATION PLAN

The goal of this site conservation plan is to identify conservation priorities and describe a general course of action that will protect and enhance the area as an environmental resource for Clackamas County and the Portland metropolitan region.

With the potential to serve as a primary corridor for fish and wildlife while also providing riparian benefits including shading and filtration of sediment and nutrients that improve water quality, Cazadero North Natural Area will be managed as a natural area.

To achieve the identified ecological goals, the site conservation plan establishes a series of priority objectives, including:

- Restore and maintain high quality riparian forest and native fish habitat.
- Promote wildlife connectivity.
- Develop appropriate funding strategies to implement strategic restoration and access improvement projects.

Metro's natural areas bond program

During the last 25 years, three voter-approved natural areas bond measures have allowed Metro to protect and manage 17,000 acres across the region. Voters have protected more than 100 miles of river and stream banks, opened four nature parks, and supported hundreds of community projects. Metro continues to protect land in 27 target areas, chosen for their water quality, wildlife habitat, and outdoor recreation opportunities.

Metro's bond for the Cazadero Trail target area has emphasized the idea of public access. The 2006 refinement plan for the Deep Creek target area stated a goal to acquire undeveloped natural areas within the watershed to protect water quality and native fish habitat.

The table below shows the history of the Cazadero North Natural Area purchase.

Table 1: Metro natural area bond purchased land

PROPERTY NAME (PREVIOUS OWNER)	ACRES	BOND YEAR	DATE ACQUIRED	MANAGEMENT
Boring Grange	3.70	2006	2015	Metro

Additional information about parks and nature investments can be found on the Metro web site, www.oregonmetro.gov/naturalareas.

Metro's natural areas and parks levy

By law, capital bond measures must be used for capital investments such as property acquisition and stabilization. In May 2013 and November of 2016, the region's voters approved five-year local option levies to care for Metro's growing portfolio of natural areas and regional parks. About half of the levy funds will go towards natural area restoration and maintenance. The levy is the first of its kind in the U.S. The citizens' investment will raise about \$10 million per year to maintain and improve water quality; preserve regional parks, natural areas and stream frontages; maintain current and implement new restoration projects; and provide new public access opportunities.

The levy will make a difference for most of the 17,000 acres of natural areas that Metro oversees. Some of the strategic restoration actions identified in this plan will be funded with the levy.

SECTION 2: PLANNING PROCESS SUMMARY

2.1 PLANNING AREA

This conservation plan addresses conditions, plans and activities for approximately 3 acres within the Cazadero North Natural Area. Metro ownership and an outline of the planning area are shown on Map 1 and Map 2.

2.2 PLANNING PROCESS

Developing a useful site conservation plan means providing for a site's habitat conservation, enhancement, and management as well as considering the potential opportunities for compatible public access. This plan will build on previous planning, restoration and management efforts while acknowledging that future conservation requires analysis of the site, meaningful engagement of stakeholders, and integration of historic, current, and future needs. This plan includes several important elements; development of conservation targets; access needs; and implementation of projects.

A two-tiered approach is used to improve natural resource conservation and integrate meaningful human experiences through physical and visual access. The plan recognizes that the conservation of species, habitat, and natural features must occur simultaneously with the consideration of provision for human access to these natural systems. Education and exposure are the cornerstones for protecting the natural area for decades to come. This two-tiered approach also recognizes that conservation and access have different stakeholders, different funding sources, and different strategic approaches. Initially, the plan reviewed the overarching project goals and objectives common to both conservation and access. The project team then developed conservation and access strategies independently which are summarized below.

Planning project goals

The planning goals for both the natural resource conservation and access portions of this plan are listed below.

Natural resource conservation

- Map and define major habitat types.
- Establish habitat and species conservation targets.
- Define key ecological attributes and analyze stresses and their sources for the conservation targets.
- Establish strategies and actions to restore habitat.
- Prioritize restoration actions and implement.

Access

- Assess existing and future public use of Cazadero North Natural Area.
- Identify and implement priority access actions.

SECTION 3: EXISTING CONDITIONS

This section of the conservation plan provides background on existing conditions for Cazadero North Natural Area.

3.1 PHYSICAL ENVIRONMENT

The Cazadero North Natural Area lies within a moderately confined reach of the North Fork Deep Creek near the intersection of SE Richey Road and Highway 212 in Boring, Oregon. The site consists of a riparian corridor that is relatively narrow, but in fair condition. The bank exhibits some erosion and varies in floodplain connectivity as one moves downstream from the Richey Road culvert. An upper terrace, west of the creek, abuts the Cazadero State Trail and a Portland General Electric power line transmission corridor, and is a potential vector for noxious weeds, namely Himalayan blackberry (*Rubus armeniacus*) and Scotch broom (*Cytisus scoparius*), and to a lesser extent, Japanese knotweed (*Polygonum cuspidatum*). Industrial debris remains on the site from historic use, namely due to the abandoned railway spur line and prior mill activities. Along the property line that is adjacent to Richey Road, a significant amount of fill comprises much of the floodplain and somewhat constricts the channel. In this area, there is additional evidence of industrial use including a large asphalt concrete pad, rubble, and other debris.

Soils

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 that can grow in them. Information on soils in the soil survey of the Clackamas area (NRCS, 1985; 1998) is published by the USDA Natural Resources Conservation Service (NRCS; formerly the Soil Conservation Service).

Soils present at Cazadero North Natural Area include Borges silty clay loam, a poorly drained soil typically found within rolling uplands and high terraces, and Bornstedt silt loam, a more moderately well-drained soil typically found on similar landforms. These soil types are usually moist to saturated during the wet season but are considerably dry during the summer. Map 3 shows the soils present at the Cazadero North Natural Area.

3.2 STREAMS AND WETLANDS

Approximately 600 linear feet of North Fork Deep Creek flows through the Cazadero North Natural Area, entering the site from the east and then flows towards the south. Additionally, a tributary stream in the northwest corner of the site conveys stormwater from nearby residential areas. Wetlands are present along the banks of North Fork Deep Creek and the tributary. Potential wetland conditions are present on what appears to be compacted fill material of the terrace between Richey Road and North Fork Deep Creek.

North Fork Deep Creek

North Fork Deep Creek is a major tributary to Deep Creek which flows into the Clackamas River about ½ mile below Barton Park. Deep Creek and North Fork Deep Creek streams get their names from the fact that they flow within a deep, narrow canyon that has incised into a broad terrace/plain associated with backwater deposits from the Missoula Flood and Clackamas River. As the much larger Clackamas River incised faster into the Missoula Flood deposits, tributaries along the lower Clackamas River created deeply incised canyons with channels

scoured down to bedrock. Subsequent periods of aggradation and reincision created a series of smaller terrace features. The result is a counter-intuitive valley planform where the headwater channels are low gradient and the higher order channels are higher gradient. This history suggests that the headwater streams are floored in alluvial materials, as opposed to bedrock, since they are flowing over previous aggradational deposits.

North Fork Deep Creek exhibits lower water quality than other Clackamas River tributaries and is considered to be water quality limited for sedimentation, temperature, bacteria, and other parameters. The cause of the degradation is likely nonpoint source pollution, including sediment and nutrients from upstream development and agricultural lands. Directly downstream of Cazadero North Natural Area lies the Boring Water Pollution Control Plant where operations of the facility discharges treated effluent to North Fork Deep Creek.

Map 4 and Map 5 show the details of the topography, streams, documented wetland, and rivers of the Cazadero North Natural Area.

3.2 MAJOR HABITAT TYPES

Cazadero North Natural Area is primarily a riparian conifer-hardwood forest. A large portion of the site is young forest that primarily consists of small- to moderate-sized shrubs and trees. Native fish habitat at the site includes spawning and rearing habitat for coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*). Map 6 shows habitat types present at the site. Map 7 and Map 8 show historical conditions of the area.

Riparian forest

Riparian forests are forests that border the shores of wetlands, lakes, streams, rivers and other waterbodies. These forests play an important role in preventing runoff of sediment, nutrients and contaminants from upland areas. They filter and clean water, reduce erosion and provide structural elements like trees and sinuosity that allow in-stream habitats to function. Riparian forests provide homes to most species of wildlife at some point in each species' life cycle. Riparian forests throughout the region have been moderately to severely degraded due to resource extraction, development and land use activity.

Key Plants

In general, the riparian habitat at Cazadero North Natural Area is intact and in good condition within a narrow buffer along the banks of North Fork Deep Creek. Consisting mostly of 20–30-year old red alders, other tree and shrub species found at the site include Oregon ash, black cottonwood, bigleaf maple, Scouler's willow (*Salix scouleriana*), tall and dull Oregon grape (*Mahonia aquifolium* and *M. nervosa*), red-osier dogwood (*Cornus sericea*), snowberry (*Symphoricarpos albus*), Douglas spiraea (*Spiraea douglasii*), and native roses (*Rosa* sp.). Other native plants found at the site include western swordfern (*Polystichum munitum*), willowherb (*Epilobium ciliatum*), sedges (*Carex* sp.), Idaho fescue (*Festuca idahoensis*), and other species.

Recent site restoration efforts involved revegetation and planting of species including grand fir, Douglas-fir, and native shrubs. A small patch found downstream along the site's property line consists of shore pine (*Pinus contorta*), Douglas spiraea, and other species. Nonnative plants present at the site include reed canary grass (*Phalaris arundinacea*), bull thistle (*Cirsium vulgare*),

Himalayan blackberry (*Rubus armeniacus*), velvet grass (*Holcus lanatus*), English ivy (*Hedera helix*), and English holly (*Ilex aquifolium*).

Other native forbs typically found in a riparian forest include Pacific waterleaf (*Hydrophyllum tenuipes*), false hellebore (*Veratrum* spp.), nodding beggartick (*Bidens cernua*) and skunk cabbage (*Lysichiton americanus*). Sedge and rush species found in this habitat may include slough sedge (*Carex obnupta*), awl-fruited sedge (*Carex stipata*), taperfruit shortscale sedge (*Carex leptopoda*), slender rush (*Juncus tenuis*), and spreading rush (*Juncus patens*). Shrubs and trees found in this habitat may also include Sitka willow (*Salix sitchensis*) and red elderberry (*Sambucus racemosa*).

Key wildlife

Partners in Flight identifies the following focal species for bottomland shrub and tree habitats: willow flycatcher (*Empidonax traillii*), red-eyed vireo (*Vireo olivaceus*), yellow warbler (*Dendroica petechia*), Swainson's thrush (*Catharus ustulatus*), downy woodpecker (*Dryobates pubescens*), and yellow-billed cuckoo (*Coccyzus americanus*). Other birds utilizing this habitat may include green heron (*Butorides virescens*), great blue heron (*Ardea herodias*), Wilson's (*Cardellina pusilla*) and other warblers, yellow-breasted chat (*Icteria virens*), black-headed grosbeak (*Pheucticus melanocephalus*), common yellowthroat (*Geothlypis trichas*), song sparrow (*Melospiza melodia*), ruby-crowned kinglet (*Regulus calendula*) and red-breasted sapsucker (*Sphyrapicus ruber*). Other wildlife species that regularly use this habitat include Pacific tree frog (*Pseudacris regilla*), northern red-legged frog (*Rana aurora*), various salamanders, common garter snake (*Thamnophis sirtalis*), black-tailed deer (*Odocoileus hemionus*), Roosevelt elk (*Cervus canadensis roosevelti*), coyote (*Canis latrans*) and fox.

Anadromous fish occurring in the Clackamas basin include spring and fall Chinook, coho salmon, winter steelhead, summer steelhead (non-native), migratory cutthroat trout (*Oncorhynchus clarkii*) and Pacific lamprey (Runyon and Salminen 2005). Resident native fish that occur in the Clackamas River include cutthroat trout, rainbow trout (*Oncorhynchus mykiss*) and bull trout (*Salvelinus confluentus*). Bull trout, once extirpated in the basin, have been reintroduced beginning in 2011 and in both 2011 and 2012 the fish were observed spawning (2013 Allen and Koski).

The North Fork Deep Creek provides significant habitat for native salmonids including coho, spring Chinook, cutthroat trout, winter steelhead and native lamprey species including Pacific and western brook (*Lampetra planeri*). Other resident fish potentially occurring in the North Fork Deep Creek include sculpin (*Cottus* spp.), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), shiners, suckers and northern pikeminnow (*Ptychocheilus oregonensis*).

Biodiversity connectivity (corridors)

Native animals and plants require the ability to establish or re-establish local populations in a specific location to persist over time. Ongoing breeding interaction between small populations can create a larger, more genetically robust meta-population. In areas such as the Portland metro area where significant habitat fragmentation has occurred, relatively narrow, linear connections (corridors) can help meet these needs.

In 2010-2011, Metro hosted a series of biodiversity corridor workshops on behalf of The Intertwine Alliance. The results were compiled and made available to participants via a map server. The

workshops gathered the opinions of wildlife and habitat professionals in the region; the results are best professional opinion only, are not meant to be property specific, and make no attempt to prioritize or assess on-the-ground issues such as barriers. Nonetheless, the information can provide valuable insight into existing and potential connectivity from Cazadero North Natural Area to other important habitat areas in the region.

Biodiversity corridors in the area of Cazadero North Natural Area include:

- Southwest and north along the Cazadero State Trail.
- East and southwest along the North Fork Deep Creek riparian corridor.
- And more broadly, north of the Cazadero North Natural Area to the East Buttes and the Johnson Creek watershed.

Climate change adaptation 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).

The Cazadero North Natural Area and other natural areas on Deep Creek provide a steppingstone for plants and organisms that must shift their ranges in response to climate change.

3.3 EXISTING AND FUTURE PUBLIC USE

Currently, there is a very low level of public use of the site immediately adjacent to the Cazadero State Trail. No trails exist on this property but trail patrons occasionally make their way down to North Fork Deep Creek to enjoy nature and cool off during hot summer days.

SECTION 4: CONSERVATION

CONSERVATION TARGETS

Conservation targets are composed of 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). Map 9 shows the conservation targets for Cazadero North Natural Area.

The methodology for determining conservation targets and key ecological attributes is discussed in detail in Appendix A.1, Conservation Targets, and Appendix A.2, Key Ecological Attributes. 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.

The conservation targets for the site include riparian forest and native fish habitat which are two of the region's most important habitats. The site's role in improving both habitat connectivity and water quality in the watershed can help improve spawning and rearing habitat for listed fish species and help support native species that depend on riparian corridors for survival. More detail about each of these conservation targets can be found in Appendix A.1.

KEY ECOLOGICAL ATTRIBUTES

Key ecological attributes (KEAs) are 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.

Appendix A.2 (Key Ecological Attributes) and table 2 below describes the site's KEAs and indicators for each of the four conservation targets in more detail for the conservation targets.

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.

At Cazadero North Natural Area, the following threats are evident:

- Increased competition (invasive species present throughout the site; see Appendix A.4).
- Lack of down and standing wood in the riparian forest and lack of logs and dead wood in the stream channel.
- Prior land use that has resulted in compacted soils and asphalt concrete in previously developed portions of the site.
- Impaired fish passage at nearby culvert at Richey Road.
- Impaired water quality from both upstream and downstream uses including urbanization, agriculture, and water treatment activities.

The methodology for defining threats and sources was established by The Nature Conservancy. It is a well-established, objective methodology with a scientific basis, and is described in more detail in Appendix A.3, Threats and Sources.

Information on Cazadero North Natural Area's conservation targets is summarized in Table 2 below. KEAs, significant threats, and management actions to address those threats are provided in more detail in Appendices A.1, A.2 and A.3. The following section outlines short- and long-term management strategies for conservation targets.

Table 2: Cazadero North Natural Area conservation target

CONSERVATION TARGET	ATTRIBUTES OF HEALTHY HABITAT
Riparian forest	Includes the riparian and floodplain forest along North Fork Deep Creek and its perennial tributaries, as well as associated wetlands. Riparian forests in this case are associated with streams and are relatively linear. Healthy riparian forests are relatively wide (100-200+ feet each side of stream) with few gaps and have a good mix of native trees and shrubs with good native species diversity in all layers. Downed wood and snags are important components. <i>Current cover:</i> Approximately 3 acres.
Native fish habitat	Cazadero North Natural Area provides important habitat to native salmon, steelhead and lamprey species. Native fish require habitat complexity and off-channel areas for rearing at different times of the year, an intact riparian forest provide shade and organic matter and gravel and rocky substrate for spawning. Healthy native fish habitat also includes abundant large wood in the stream. <i>Current cover:</i> Approximately 600 linear feet of stream.

SECTION 5: MANAGEMENT ACTIONS

RESTORATION

This conservation plan outlines and prioritizes strategic actions to be carried out at Cazadero North 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 staff and other stakeholders to address site-specific conditions encountered in the areas targeted for restoration action.

Conservation target: riparian forest

Short-term goals 2020-2024

- Increase cover of native tree and shrub (vegetation structure) and native tree and shrub species richness in riparian habitat areas.
- Increase floodwater access to the floodplain. Floodwaters should inundate large portions of the floodplain during two year or higher flood events in the winter.
- Remove remnants of prior industrial use and replant the area with native trees, shrubs, and herbaceous species.

Long-term goal

The desired future condition is to have all key ecological attributes ranked as good to very good thereby maintaining and restoring habitat suitable for riparian forest-dependent wildlife species.

Summary of riparian forest restoration work completed through 2020

Restoration to date has included planting of grand fir, Douglas-fir, and native shrubs by the Clackamas River Basin Council. Additionally, invasive weed treatments have been completed across the site multiple times since 2015 to reduce the threats of weeds.

Key ecological attributes outside normal range of variation

- *Percent cover of native trees and shrubs:* shrubs and trees are lacking in areas impacted from historic land use and fill activities.
- *Standing and downed dead trees:* lack of intact mature forest has resulted in limited quantities of downed wood on the ground.
- *Floodwater access to the floodplain:* floodwaters only inundate the floodplain during extreme high water events in the winter due to historic channel alterations and floodplain fill.

Critical threats

- *Altered native species composition:* non-native species out-compete native plant species. This is a primary concern due to the site's proximity to the Cazadero State Trail and the adjacent power line transmission corridor which can act as vectors for the spread of invasive plant species.
- *Altered hydrology:* widespread altered hydrology due to increased impermeability surfaces associated with development leads to stream bank erosion, channel damage, loss of gravel and cobble substrate and overall habitat simplification.

Strategic restoration and stewardship actions

- Plant and establish native conifer and hardwood trees, clusters of shrubs, and herbaceous species to increase richness and vegetative structure. Native tree and shrub plantings should be focused in areas that have less than 75 percent canopy cover or are impacted from stream restoration activities.
- Early detection and treatment of invasive species should target high priority species such as Japanese knotweed, garlic mustard, slender false brome, and other EDRR species.
- Coordinate with OPRD to install invasive species boot brush and boot brush signage at the entrance to the Cazadero State Trail.

Conservation target: native fish habitat

Short-term goals 2020-2024

- Increase the number of key large wood pieces in Clear Creek and off channel habitat areas.
- Improve fish low flow fish passage at the Richey Road culvert immediately upstream of the site

Long-term goal

The desired future condition is to have all key ecological attributes ranked as good to very good thereby maintaining and restoring habitat suitable for native fish species.

Summary of native fish habitat completed through 2020

No work at the site has been completed to restore native fish habitat.

Key ecological attributes outside normal range of variation

- *Quality and complexity of mainstem and off-channel habitat:* habitat is lacking diversity, high quality off-channel habitat, and suitable substrate.
- *Key pieces and # of pieces of large wood in wetted areas of the stream and adjacent streambank:* large wood is missing in the stream channel.
- *Fish passage:* passage through the culvert at Richey Road is inadequate at low flows.

Critical threats

- *Simplified stream structure lacking diversity and high-quality side channel refugia:* salmonids require off-channel habitat for rearing, riffle-pool habitat for spawning, refugia, prey habitat, and water oxygenation.
- *Altered hydrology:* upstream conditions (e.g., ditches) contribute to high runoff conditions; stormwater outfall onsite contributes to erosion; and significant areas of fill on the floodplain constrict channel.
- *Impaired fish passage:* upstream of the property, the Richey Road culvert is a partial barrier to fish.
- *Impaired water quality:* North Fork Deep Creek suffers from serious water quality impacts from sediments and nutrients from upstream sources and downstream water treatment facility.

Strategic restoration and stewardship actions

Implement a stream restoration project to install large wood pieces within the stream channel and along the banks, stabilize an eroding tributary stream, place cobble and modify the Richey Road culvert and remove legacy debris to restore native fish habitat at the site. This project is planned to be implemented in calendar year 2020 with funding and support from Metro, Clackamas County, US Forest Service, Oregon Watershed Enhancement Board and the Clackamas River Basin Council.

PRIORITIZING STRATEGIC RESTORATION AND STEWARDSHIP ACTIONS

It is important to prioritize restoration and stewardship activities by conservation targets for several reasons. Budgetary or time constraints are likely to limit how much work can be accomplished at a given site during a given time period. Specific actions may rise to the top due to the scarce or unique nature of a habitat type or because abating a certain threat now will save time and money in the future. Table 3 assigns a priority ranking to key actions by conservation target; this does not mean that the other actions are not important, simply that they are not the most important actions within the next 3-5 years.

Table 3: Priority status for Cazadero North Natural Area conservation targets

CONSERVATION TARGET	PRIORITY
Riparian forest	Medium
Native fish habitat	High

ONGOING STEWARDSHIP AND RESTORATION PROGRAMS

The following actions represent ongoing systems or programs that are in place and practices that will be continued and/or enhanced. These actions align with maintaining the conservation targets in good or very good condition.

Stewardship

Metro's Natural Areas Program is committed to long-term stewardship of Cazadero North Natural Area. Metro staff will conduct multiple site walks per year to monitor natural resource condition and public use of the natural area. As determined necessary by staff and consistent with this plan, specific treatments or actions will be implemented to ensure that the health and condition of the natural area is maintained. Some periodic stewardship actions that are implemented by Metro staff include invasive species management, visits to monitor for illegal use of the site, cleanup of illegal dumping, mowing of buffer and trailside areas for fire safety, replacing signage, and response to complaints. Table 4 describes high and medium priority maintenance action at the site. Additional details about the stewardship of the site can be found in the Cazadero Site Stewardship Plan.

Table 4: High and medium priority stewardship actions

ACTIVITY	FREQUENCY/DURATION	PRIORITY
Site walk	1 time per year	High
EDRR (weed invasion treatments)	1-2 times per year	High
Property line encroachments	1 time per year	Medium

Invasive species management

Invasive plant species can impact the habitat values for which land is conserved. Natural lands are not fully protected unless they also are managed for the features that first motivated preservation. Invasive species can change community structure, composition, and ecosystem processes on these lands in ways that may not be anticipated or desirable. Careful management can minimize these negative impacts. Metro has initiated an early detection and rapid response program (EDRR) for invasive species including false brome, meadow knapweed, knotweed, garlic mustard, and spurge laurel which have been documented in the area. Invasive species will be controlled by hand pulling or herbicide application as they are detected in the natural area. Other invasive plant species will be controlled as part of restoration projects or ongoing management of habitat areas. See Appendix A.4 for a list of invasive species.

LONG-TERM STRATEGIES

The following actions may be necessary to achieve the long-term goals of this site conservation plan but are not identified as priority actions during the time period of this plan.

- Work with Clackamas River Invasive Species Partnership (CRISP) and OPRD to manage invasive weeds along the Cazadero State Trail adjacent to Metro lands. Install invasive species boot brushes and signage at the trailhead and public entrance points to the Cazadero State Trail.
- Acquisition of fee title or conservation easements of adjoining private lands downstream on North Fork Deep Creek to connect the four natural areas sites within this target area.

MONITORING PLAN

Monitoring at the Cazadero North Natural Area is an integral part of an adaptive management approach to restoration and stewardship. Based on the monitoring plan developed by Metro, a feedback loop is created between monitoring and management decisions. Monitoring will be done to evaluate habitat, population responses to management action, as well as progress toward achieving habitat and population objectives.

The monitoring strategy is based on threats and key ecological attributes associated with conservation targets. 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.

Monitoring techniques

Some monitoring techniques are used to monitor more than one conservation target. This discussion is intended to provide a general introduction but not detailed methods.

Remote sensing/GIS

Several metrics for health of conservation targets relate to canopy cover and size of a habitat. Where a desired condition is a minimum canopy cover, it can be estimated with GIS software using current aerial photography. Similarly, important connections within the natural area and to off-site habitat can be inspected with aerial photographs.

Transects

These are lines or strips of ground along which measurements are made of plant species presence or absence. Permanent transects can be installed and tracked over the years to track progress toward goals. They are useful in tracking the cover and composition of native plants and invasive species in Oregon white oak savanna and riparian forest habitat areas.

Site walk

Ocular (visual) estimates can be used to determine the presence or absence of a species within a short timeline and at a very low cost. This method of monitoring is typically used to determine intervals for treatments or success of a planting when managing projects.

Photos

Permanent photo points are established to provide long term documentation of changes to habitats over time. Typically, photo points are marked by a permanent landscape feature or metal stakes and photos are taken at a landscape scale over long-term periods of time.

Conservation targets and monitoring techniques

Riparian forest

Annual site walks and photos monitoring of site conditions will be used to monitor this conservation target. When large scale restoration work is implemented, the monitoring actions for this conservation target should be revisited.

Table 5: Habitat monitoring actions

HABITAT	MONITORING ACTIVITY (TECHNIQUES)	FREQUENCY/DURATION	PRIORITY
Riparian forest	Site walk (project management) ¹	1 time per year	High
	Photo points ¹	1 time per year	Medium

Native fish habitat

Annual site walks and photo monitoring of site conditions will be used to monitor this conservation target. As part of grants secured for the stream restoration project, Clackamas River Basin Council will need to monitor instream habitat conditions before and after of the work to document the success of the project work.

Table 6: Habitat monitoring actions

HABITAT	MONITORING ACTIVITY (TECHNIQUES)	FREQUENCY/DURATION	PRIORITY
Native fish habitat	Site walk (project management)	1 time per year	High
	Photo points ¹	Year 0,1 and 3 of stream restoration	Medium
	Remote sensing by drone to quantify before/after conditions from stream restoration ²	Year 0 and 1 of stream restoration	Medium

¹ – Completed by CRBC as part of the OWEB grant for stream restoration

² – Completed by Oregon Department of Fish and Wildlife

SECTION 6: RECREATION AND ACCESS

Presently, public access to Cazadero North Natural Area is neither discouraged nor promoted by Metro. There is moderate level of public use of the northern and western borders of the site due to the Cazadero State Trail.

PUBLIC ACCESS

The Cazadero State Trail, owned by Oregon State Parks, follows the route of the historic Oregon Water Power and Railway Company rail line that connected Portland to the Cazadero Dam on the Clackamas River, two miles from Estacada. From its northern trailhead in Boring, the trail extends from the Springwater Corridor and drops into the lush North Fork Deep Creek canyon, continuing

south towards Barton and Eagle Creek. In the future, the Cazadero State Trail could extend beyond Eagle Creek to Estacada and on up the Clackamas River corridor eventually connecting to Mt. Hood and the Pacific Crest Trail.

If any trailhead improvements to the adjacent segment of the Cazadero State Trail are proposed by OPRD, Metro will participate in the planning process and promote thoughtful consideration for balancing public access and conservation of the natural resource area. Some of the potential opportunities and constraints that will be discussed include the natural area experience, environmental education and stewardship, local recreational demand, resource impacts, patch fragmentation, wildlife corridor disruption, public right-of-way access, land use and development permit requirements, long-term operations and maintenance, as well as capital development and maintenance funding.

PROGRAMMATIC (EDUCATION AND VOLUNTEERS)

In addition to meeting conservation goals, Metro's regional parks and natural areas were created to 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, underserved communities, and the general public to provide nature programs that thoughtfully connect people to Metro's parks and natural areas. Schools and civic groups who are interested in programs contact Metro to request a program. Public walks are advertised in Metro's quarterly "Big Backyard" publication. Information about conservation education programming is also available on Metro's website, www.oregonmetro.gov/parks/nature-education.

Education program

Cazadero North Natural Area is not currently used for education programs that are open to the general public.

Volunteer program

The primary goal of the volunteer program is to provide a variety of high-quality, meaningful volunteer opportunities that help the community build connections to nature, learn about our program and add value and capacity to Metro's work. Through these opportunities, community members can learn about and enjoy Cazadero North Natural Area, work alongside fellow community members, learn new skills or polish existing ones and gain the satisfaction of contributing to the long-term health and livability of their communities.

Wildlife monitoring volunteers

Metro's volunteer wildlife monitoring program provides valuable information about Metro's natural areas while offering a unique and in-depth service opportunity for community members. By focusing on indicator species, such as amphibians and birds, volunteers provide data to help Metro's science and stewardship team can gauge the progress of its restoration efforts and track the effects of public use on wildlife.

SITE MANAGEMENT

Metro's management of the site will include enforcement of the posted rules to provide protection for wildlife and water quality, and to protect the safety and enjoyment of any person visiting these facilities.

Special use permits

Special use permits are required for certain regulated and non-traditional uses of parks and natural areas to ensure public health and safety and to protect natural resources, properties and facilities owned or managed by Metro. Special use permits are required for commercial film, video or photography; educational activities or educational events; festivals and organized sports activities; use of amplified sound; equipment or other elements potentially posing a safety threat or public nuisance; concession services; site restoration or alteration, biological research, scientific collection (soil, wildlife or vegetation disturbance of any kind); any organized activity, event or gathering involving 25 or more people.

Archeological resources

Cazadero North Natural Area is steeped in history and due to its location along the creek likely contained artifacts containing precontact archaeological resources. Before the site had been impacted by industrial uses, it also likely contained evidence of early homesteading, logging, and agriculture. Discovered and documented archaeological resources at the site include a historic-period railroad grade from the Boring-Estacada Rail Line and debris associated with a mill that operated in the 1940s (Dudek 2019). See Appendix B.

If, during any site investigation, alteration or improvement, an additional archaeological resource is discovered, Metro will work with the State Historic Preservation Office to evaluate and document the find. If any damage or unlawful use is identified, Metro would partner with the Clackamas County Sheriff to investigate.

Dogs

One of the most difficult management issues for public access is the introduction of dogs by visitors. Research shows that even if dogs stay on the trails, they are perceived as predators by wildlife. The zone of influence of a dog, even on leash, can be several hundred feet on either side of a trail. Because of the potential disturbance to wildlife and wildlife habitat, dogs are not allowed in the Cazadero North Natural Area, though leashed dogs are allowed within the confines of the Cazadero State Trail that lies along the northern and western edge of the natural area. Educational signage, self-policing, and strict enforcement are all needed to effectively manage this sensitive issue.

Signage

Any future signage developed for the natural area, including potentially one that alerts the public to the level of access provided to the Cazadero North Natural Area, will utilize Metro's current brand and signage standards manual. The manual establishes a graphic standard that will be integrated into the entire signage plan. The manual addresses each of the three types of signs: regulatory, wayfinding and interpretive.

STRATEGIC ACTIONS (ACCESS AND SITE MANAGEMENT)

The following actions describe the proposed access and site management improvements over the life of this plan. The projects were established as part of the development of this plan and should be revisited every two to three years for additions and updates. Cost estimates for these actions are included in the section 5 of this document.

Signage

Regulatory and information signs will be installed, including natural area rules, maintenance road/fire lane identification and sensitive habitat signs. Signs will be placed at strategic locations throughout the natural area.

BEYOND FIVE YEARS OR AS NEEDED

In the future there may be increased demand to access and recreate at Cazadero North Natural Area. Future access improvements will need a more in-depth analysis of opportunities and constraints for trails and public access, including meetings with partners, neighbors and the public and developing a detailed master plan.

SECTION 7: COORDINATION

The conservation plan has laid out the history and context of Cazadero North Natural Area, along with the conservation, management, and public access projects for the next five years. For those projects to be realized, coordination will be needed on a number of fronts. Important coordination points include:

- Balancing future public access with natural resource (habitat) improvements.
- Monitoring restoration efforts to track effectiveness and make changes to the priorities and goals as needed.
- Coordinating with neighbors and local stakeholders like Cazadero State Trail managers to implement projects.
- Funding to realize the strategic restoration and access actions identified in this plan.

FUNDING

Costs in Tables 7 and 8 are general estimates for the purpose of understanding the magnitude of costs to implement strategic actions at the site. The figures below are estimates of what it would cost for contractors to complete the work. In addition to these project implementation costs, we have included staff time and annual stewardship costs for Cazadero North Natural Area in Table 9.

Table 7: Access and recreation strategic action cost estimates

STRATEGIC ACTION	COST
Signs (regulatory sign)	\$1,000
Total	\$1,000

Table 8: Conservation target strategic restoration action cost estimates

STRATEGIC ACTION	COST
Riparian forest Invasive species treatments + additional tree and shrub plantings	\$50,000
Native fish habitat Wood placement, removal of debris and asphalt, improve fish passage Richey Road Culvert.	\$350,000
Total	\$400,000

Table 9: Annual stewardship cost estimates

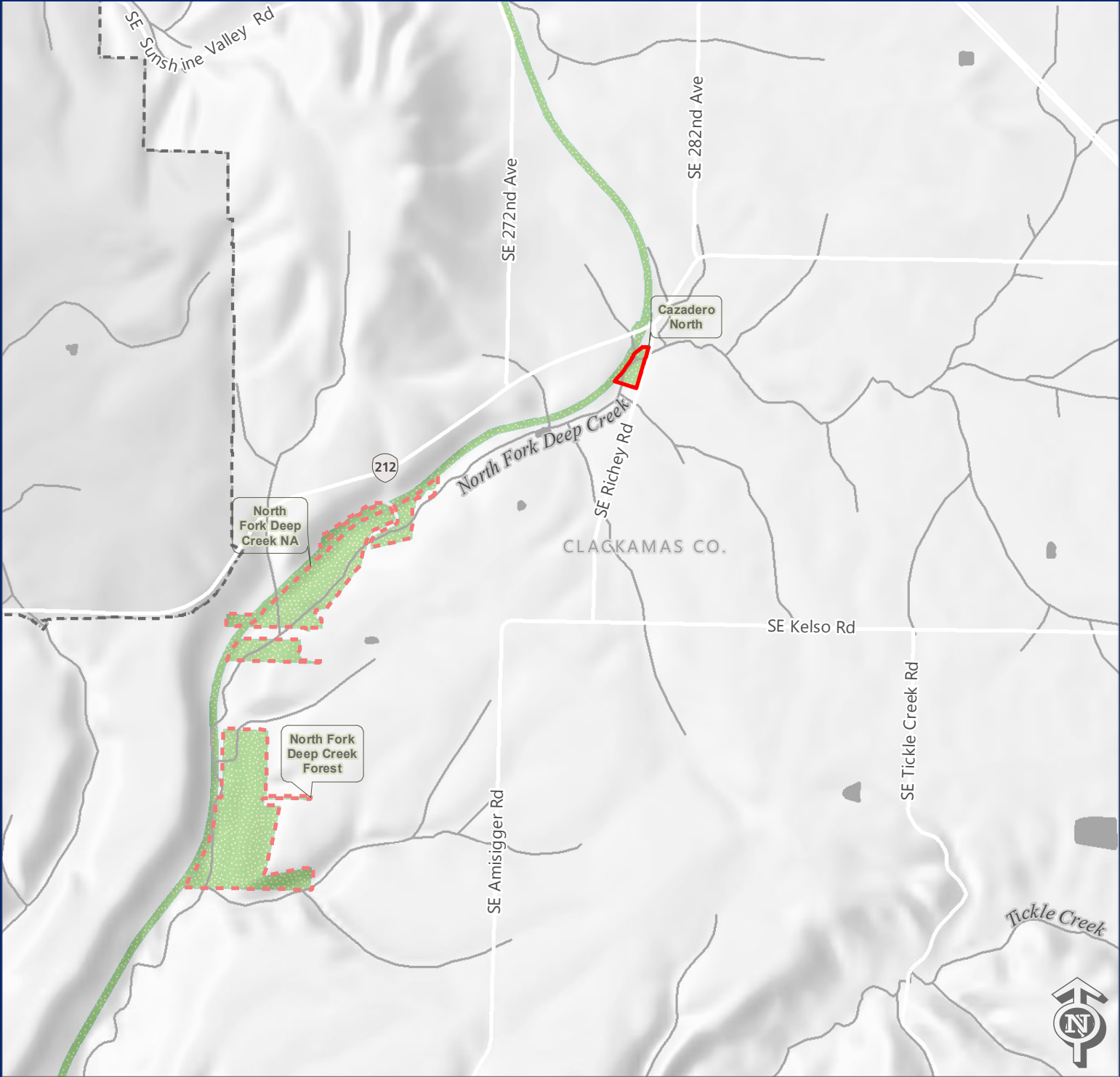
ANNUAL STEWARDSHIP*	COST
EDRR surveys and invasive weed treatments (entire site)	\$1,000
Total (per year cost)	\$1,000

* Stewardship actions and costs are described in more detail in the Cazadero Stewardship Plan

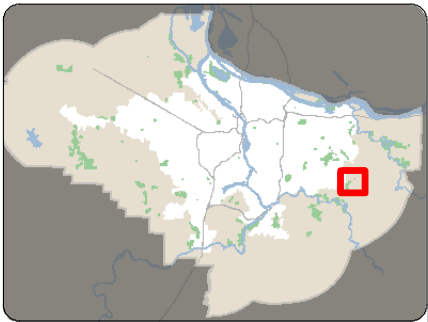
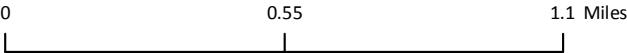
PUBLIC INVOLVEMENT

As projects are developed, Metro will provide local stakeholders and residents near Cazadero North Natural Area with pertinent information about the work before it is implemented. Project information may include background on the project, timing, cost, materials types, and other information as necessary for interested parties.

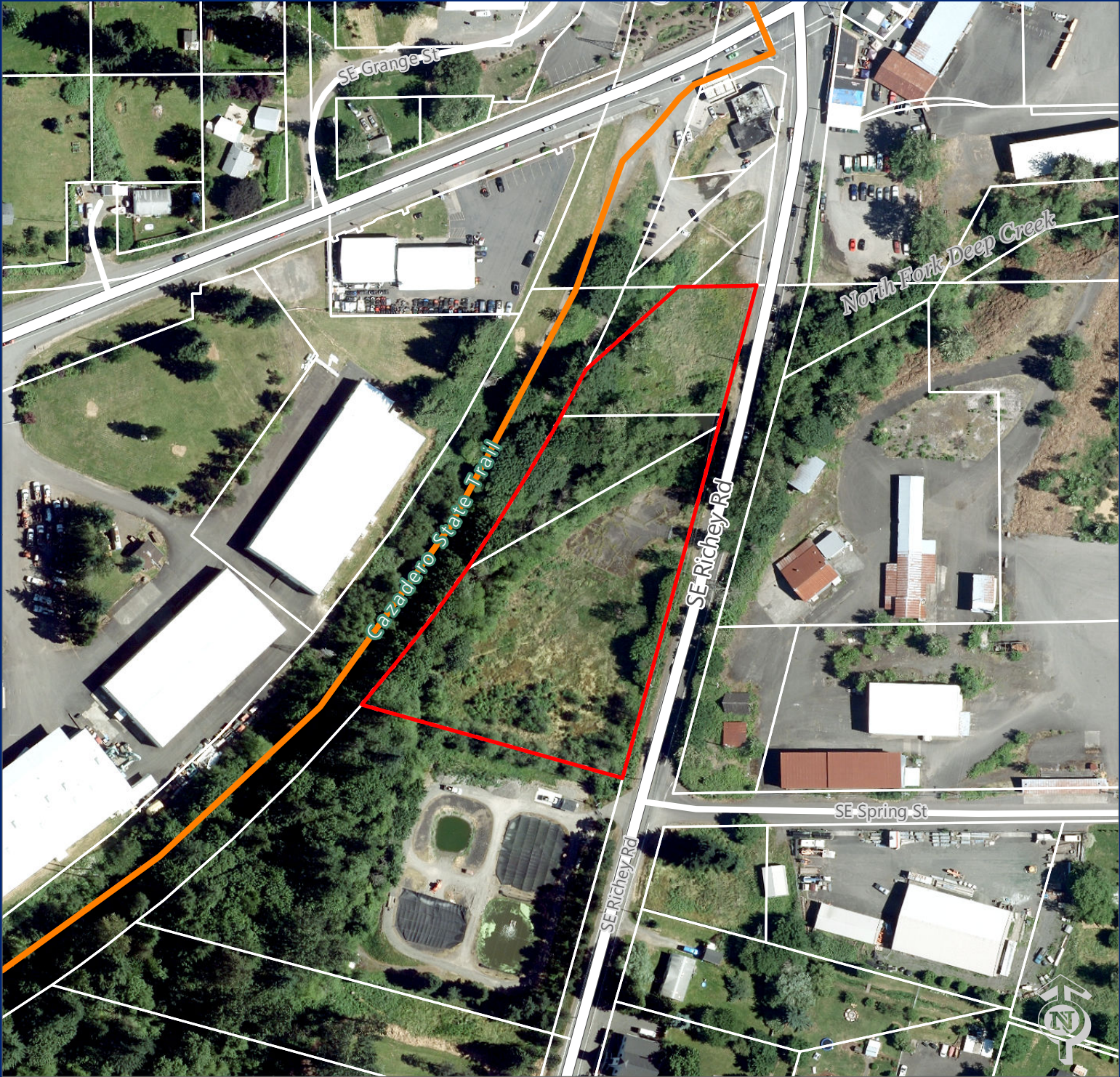
VICINITY MAP



-  Cazadero North site
-  Other Metro sites
-  Parks and/or Natural Areas
-  ugb



SITE MAP



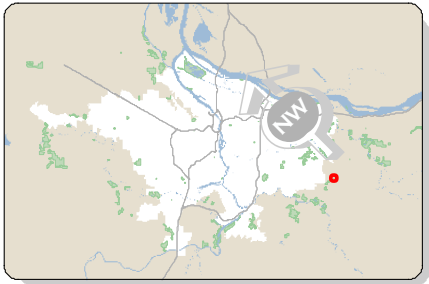
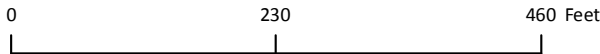
Cazadero North site



Other Metro sites



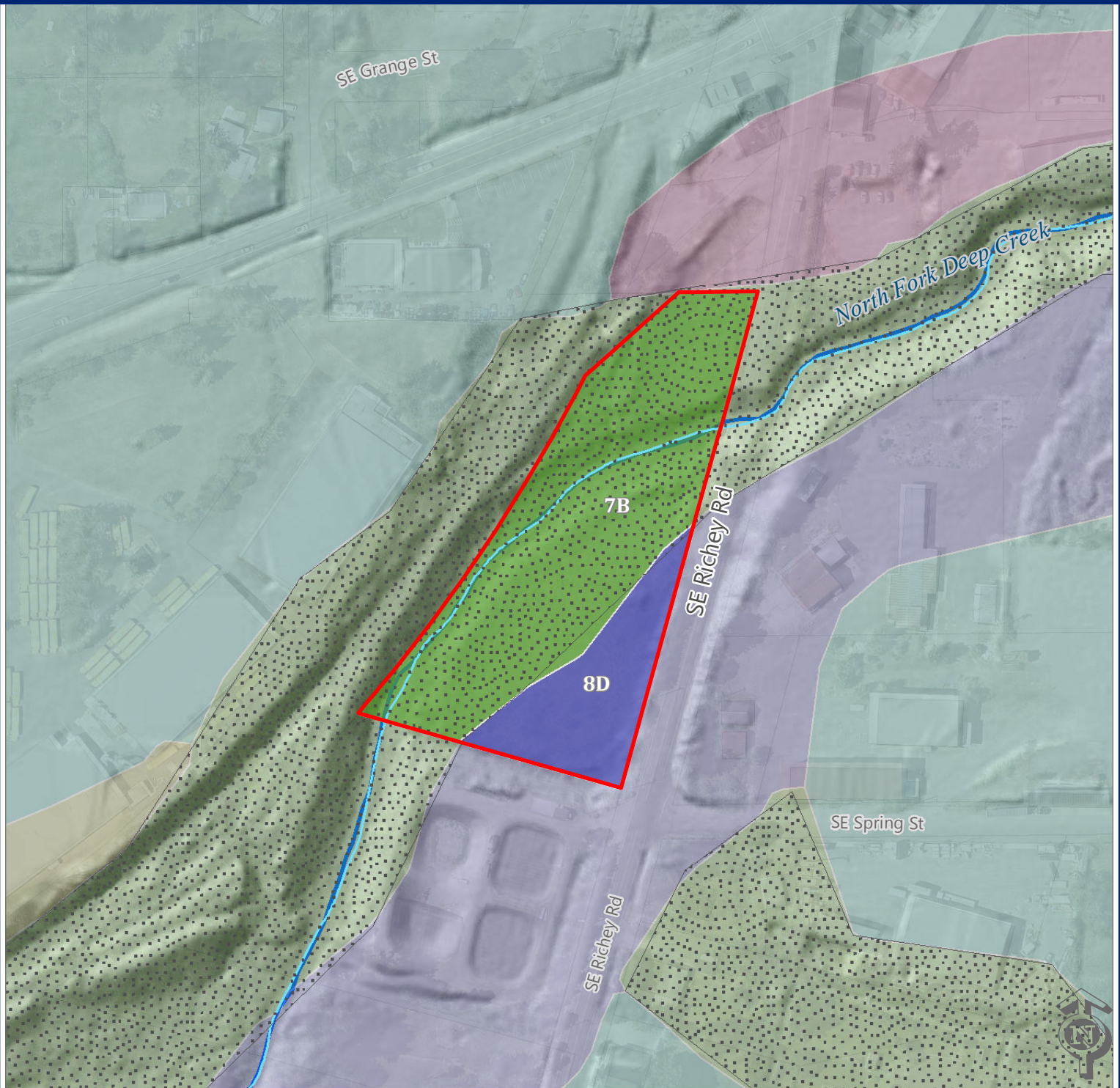
Existing Regional Multi-use Trail



SOILS



Metro



Cazadero North site



Hydric soils



7B - Borges silty clay loam, 0 to 8 percent slopes



8D - Bornstedt silt loam, 15 to 30 percent slopes

0

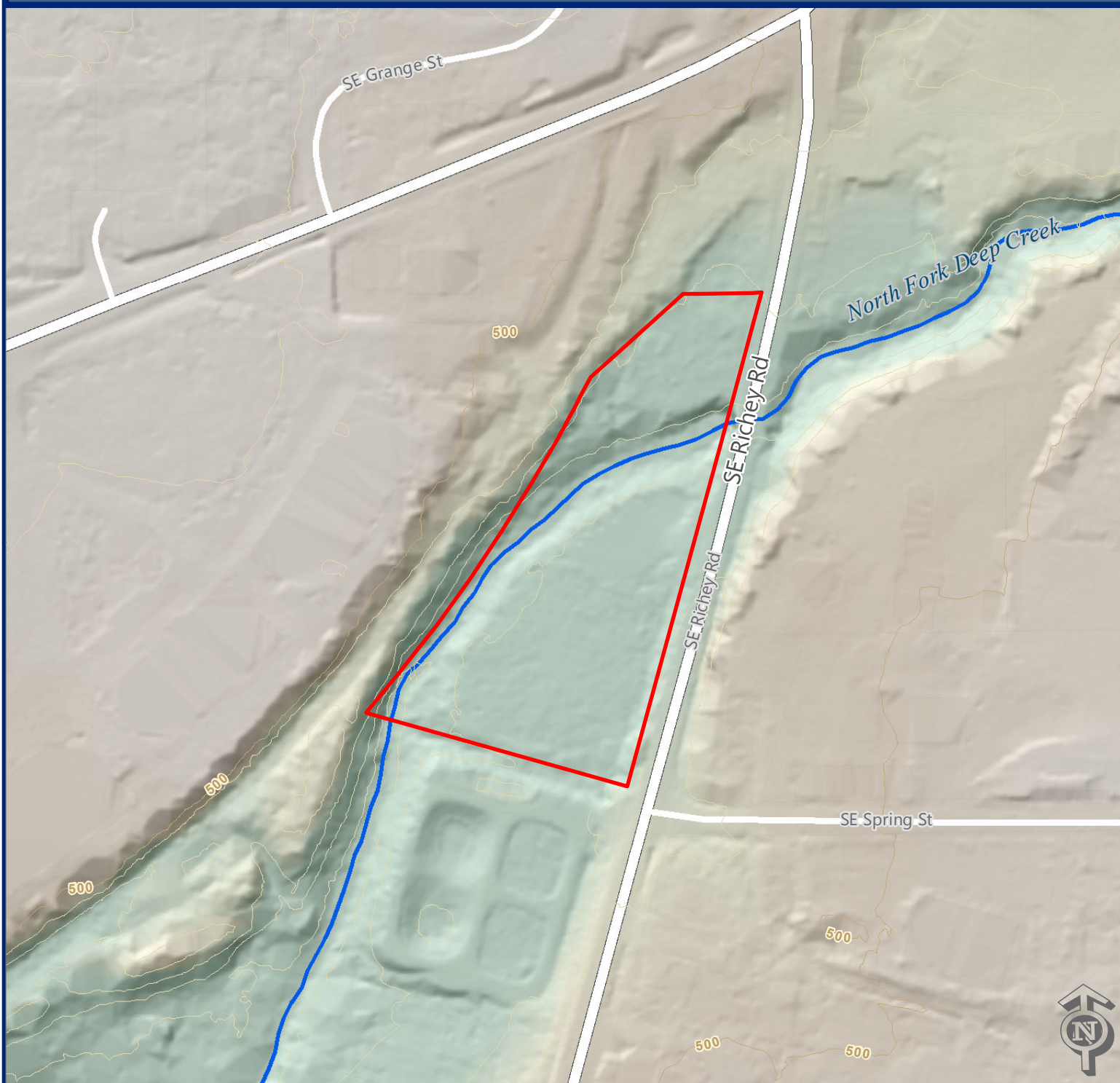
210

420 Feet

TOPOGRAPHY



Metro



Cazadero North site

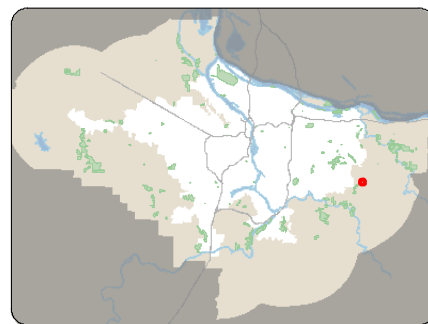
10 ft contour

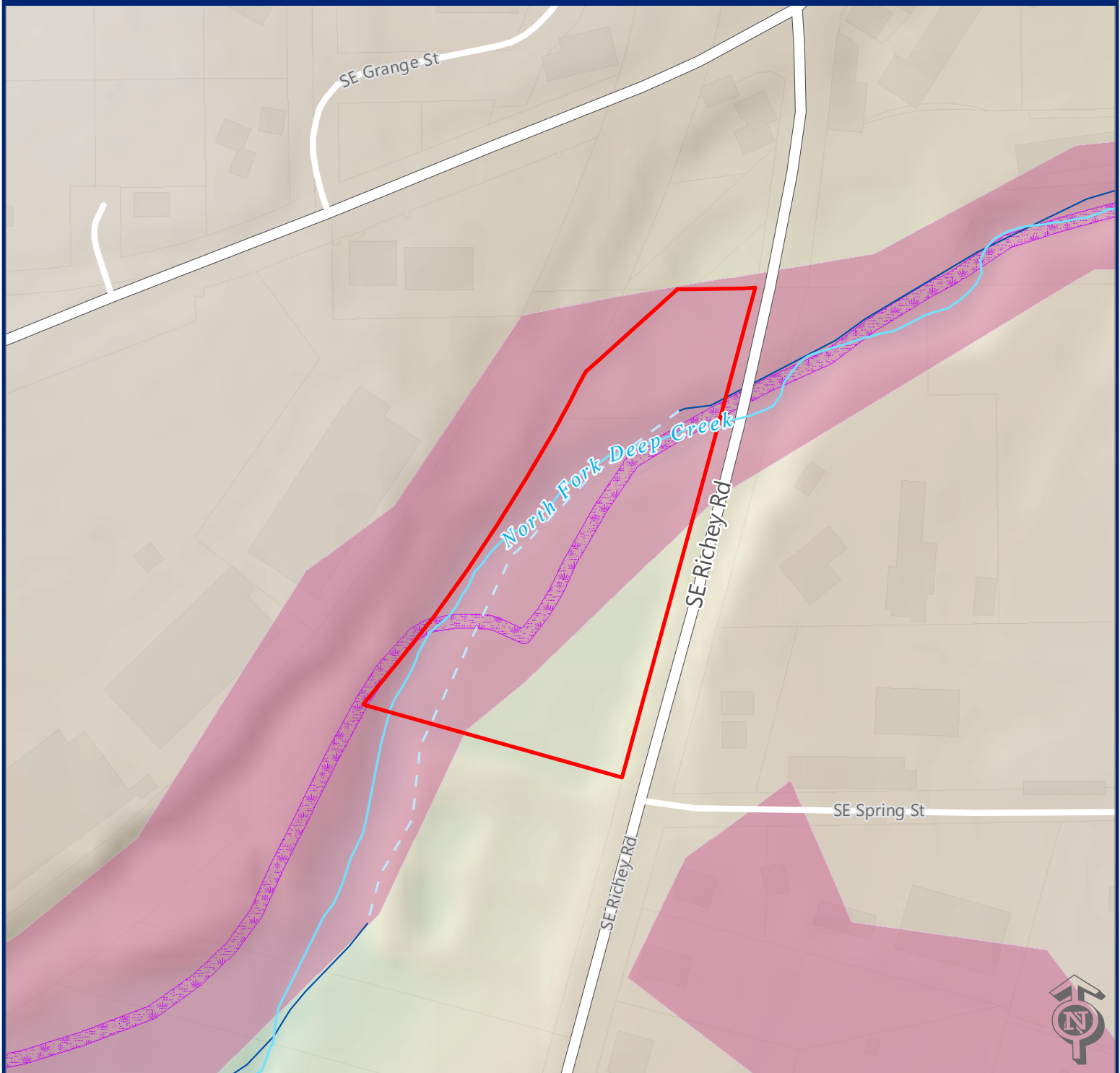
50 ft contour

0

240

480 Feet





-  Cazadero North site
-  Wetlands (Wetlands Conservancy data)
-  Hydric soils

0 230 460 Feet

CURRENT COVER



Metro



Cazadero North site



Developed - (impervious)



Riparian forest

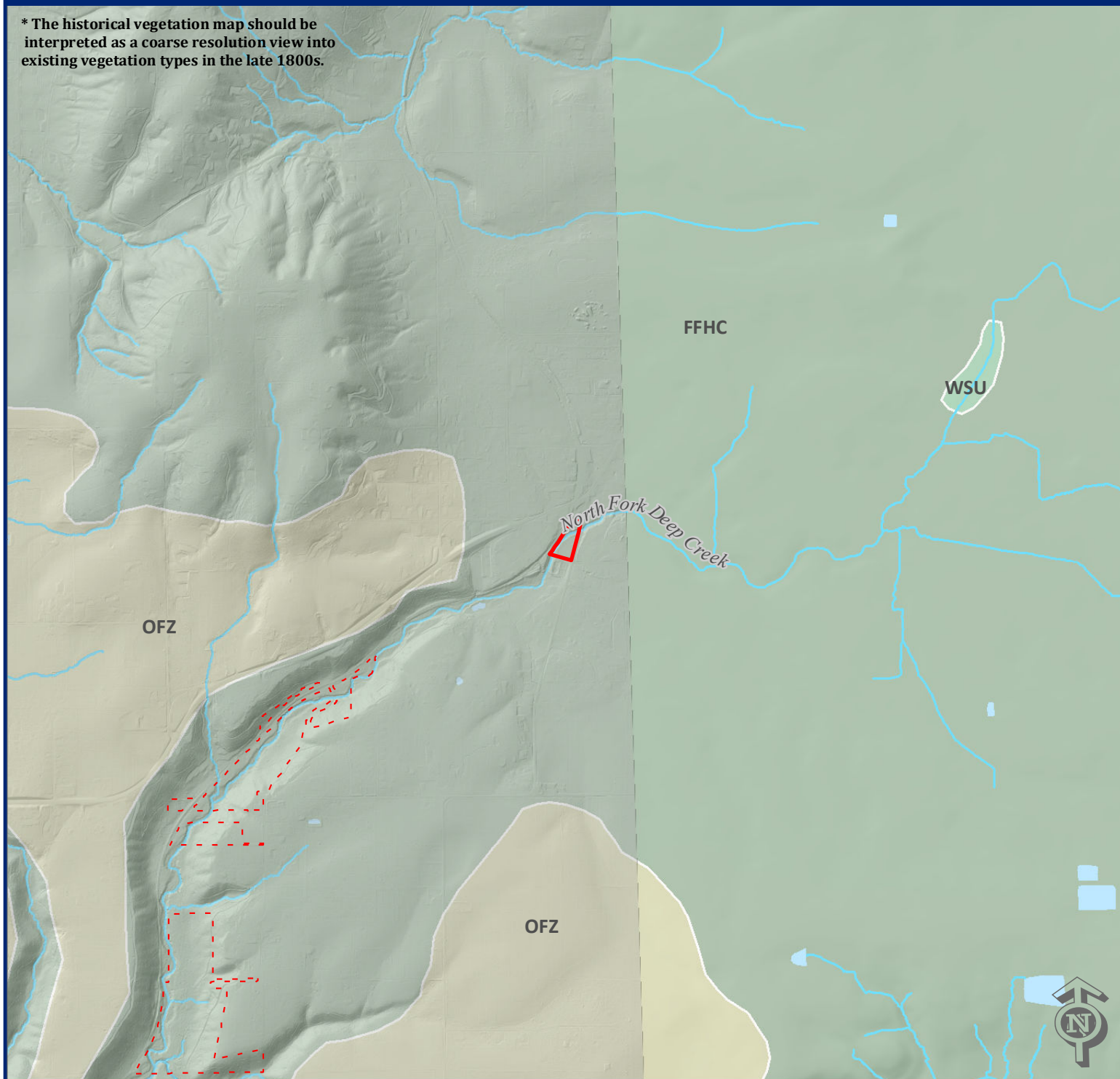
0

210

420 Feet

HISTORICAL VEGETATION

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



- Cazadero North site
- Other Metro sites

Historical vegetation

- FFHC - Closed forest; Upland
- OFZ - Woodland
- WSU - Emergent wetlands

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

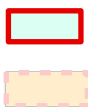
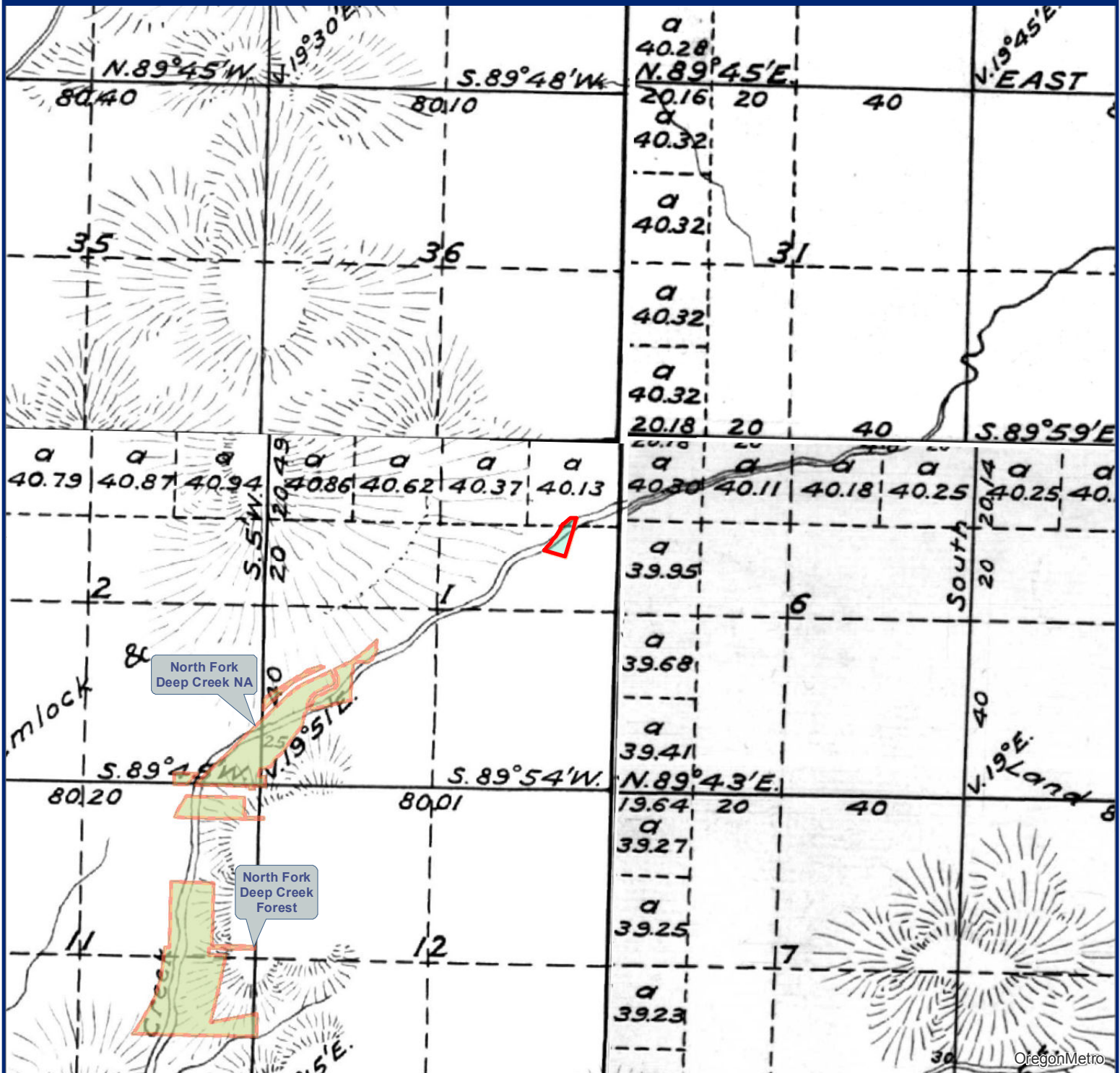
0 2,000 4,000 Feet

GENERAL LAND OFFICE (GLO) MAP

This map is the 1852 public land survey of the Portland, OR region.



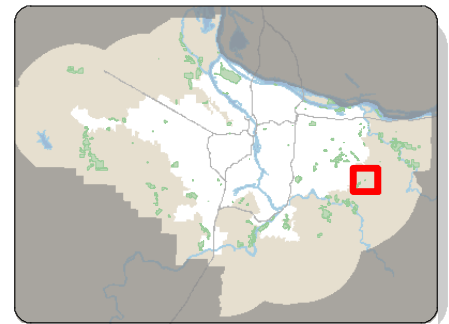
Metro



Cazadero North site

Other Metro site

0 0.6 1.2 Miles



CONSERVATION TARGETS



Metro



Cazadero North site



Riparian forest

0 210 420 Feet

APPENDIX A-1 | CONSERVATION TARGETS

INTRODUCTION

Conservation targets are composed of a suite 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). Priority conservation targets represent species or habitats that are the conservation focus for a given area or management unit.

Conservation targets establish the basis for setting goals, carrying out conservation actions, and measuring conservation effectiveness. They are the foundation of conservation planning. Key ecological attributes (KEAs) for each conservation target will be evaluated. KEAs are 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). Viability of the conservation target is inferred by the condition of the KEAs. Analysis of threats affecting conservation targets inform the development of action plans to abate serious threats and monitoring plans to gauge success of the action plans. Conservation targets then should consist of species or communities that will provide the focus of management actions and monitoring. Species or communities that for whatever reason are too expensive to manage or monitor are not good candidates for conservation targets.

BACKGROUND

Historically, the Willamette Valley was dominated by extensive prairie, oak savanna and woodland habitats totaling approximately two million acres that supported a wide diversity of plant and animal species, including several endemic to the Willamette Basin (Floburg et al 2004). These habitats were primarily maintained by Native American-ignited fires. Agricultural and residential development in the Willamette Subbasin and the cessation of widespread prescribed fires has resulted in a substantial loss of native habitat especially at the lowest elevations, leaving less than two percent of all historic prairies and seven percent of oak habitat extant today.

METHODS

Regional conservation plans were referenced to align the conservation goals of the Cazadero North Natural Area Site Conservation Plan (see Table 1). These plans included the Oregon Department of Fish and Wildlife's Oregon Conservation Strategy (ODFW 2006), The Nature Conservancy's Ecoregional Assessment of the Willamette Valley – Puget Trough-Georgia Basin (Floburg et al 2004), the Northwest Power and Conservation Council's Willamette Subbasin Plan (NWPCC 2005), and Partners in Flight's Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington (Altman 2000). These plans identify both focal habitats and focal species as conservation targets.

RESULTS

Using onsite habitat types and regional conservation planning efforts as guides, conservation targets were selected that encompass the site's most threatened biodiversity values as well as regional conservation targets (Table 1). The site's conservation target is represented in the regional conservation plans listed in Table 1.

Table 1: Cazadero North Natural Area site conservation target and relationships to other conservation strategies

CAZADERO NORTH NATURAL AREA CONSERVATION TARGET	OREGON CONSERVATION STRATEGY (ODFW 2006)	WILLAMETTE BASIN SUBBASIN PLAN (PRIMOZICH 2004)	LANDBIRD CONSERVATION STRATEGY (ALTMAN 1999, 2000)	ECOREGIONAL ASSESSMENT (FLOBURG ET AL 2004)
Riparian forest	Freshwater aquatic, riparian, and wetland habitats are priorities for the Willamette Valley.	Basin-wide priority	Riparian	Riparian forests and shrublands
Native fish habitat	All are strategy species in the Willamette Valley ecoregion.	Anadromous fish species and their habitats are basin-wide priorities.	N/A	Ecoregional target species

Some of Cazadero North Natural Area species with special state or federal status are listed in Table 2.

Table 2: Federal and state status for species of conservation interest at Cazadero North Natural Area

SPECIES OF CONSERVATION INTEREST	FEDERAL STATUS	STATE STATUS	OREGON CONSERVATION STATUS SPECIES?	NOTES
Coho, Lower Columbia River ESU	Threatened	Endangered	Yes	
Steelhead, Lower Columbia ESU	Threatened	Sensitive-Critical	Yes	Winter runs
Chinook, Lower Columbia River ESU	Threatened	Sensitive-Critical	Yes	Fall and Spring runs
Coastal cutthroat trout, SW QA / Columbia R. ESU	Species of Concern	Sensitive-Vulnerable	Yes	
Pacific lamprey	Species of Concern	Sensitive-Vulnerable	Yes	Clackamas River and its tributaries may also have western brook lamprey.
Northern red-legged frog	Species of Concern	Sensitive	Yes	
Olive-sided flycatcher	Species of Concern	Sensitive	Yes	

APPENDIX A-2 | KEY ECOLOGICAL ATTRIBUTES

Key ecological attributes (KEAs) are 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. For each KEA, one or more indicators were selected to assess the health of the KEA.

Indicators are measurable entities related to the condition of the KEA (The Nature Conservancy 2007). A good indicator should be:

- **Biologically relevant:** The indicator should represent an accurate assessment of target health.
- **Sensitive to anthropogenic stress:** The indicator should be reflective of changes in stress.
- **Measurable:** The indicator should be capable of being measured using standard procedures.
- **Cost-effective:** The indicator should be inexpensive to measure using standard procedures.
- **Anticipatory:** The indicator should indicate degradation before serious harm has occurred.
- **Socially relevant:** The indicator's value should be easily recognizable by stakeholders.

KEA indicators were categorized by type: size, condition or landscape context:

- **Size:** A measure of the area or abundance of the conservation target's occurrence.
- **Condition:** A measure of the biological composition, structure and biotic interactions that characterize the occurrence.
- **Landscape context:** An assessment of the target's environment including ecological processes and regimes that maintain the target occurrence such as flooding, fire regimes and many other kinds of natural disturbance, and connectivity such as species targets having access to habitats and resources or the ability to respond to environmental change through dispersal or migration.

The status of an indicator will vary over time either within an acceptable range of variation that sustains the conservation target or beyond a critical threshold that threatens the viability of the conservation target. The range is described as very good, good, fair or poor. The very good and good ratings mean that the indicator is functioning within its acceptable range of variation. Fair and poor ratings mean an indicator is outside its acceptable range of variation. When information was lacking to define all four categories then only a subset of the four categories was defined.

Definitions for the four categories follow those used by The Nature Conservancy:

- **Very Good:** The indicator is functioning within an ecologically desirable status, requiring little human intervention for maintenance within the natural range of variation (i.e., is as close to "natural" as possible and has little chance of being degraded by some random event).
- **Good:** The indicator is functioning within its range of acceptable variation, although it may require some human intervention for maintenance.
- **Fair:** The indicator lies outside of its range of acceptable variation and requires human intervention for maintenance. If unchecked, the target will be vulnerable to serious degradation.

- **Poor:** Allowing the indicator to remain in this condition for an extended period will make restoration or prevention of extirpation of the target practically impossible (e.g., too complicated, costly and/or uncertain to reverse the alteration).

KEAs and their indicators for Cazadero North Natural Area's conservation targets are provided in the following tables.

Table 1: Key ecological attributes for riparian forests – Cazadero North 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	Avg. 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	Total width, both sides of stream. Estimate using GIS. Riparian forest width positively correlates with water and wildlife habitat quality, including biodiversity corridors. Width includes both sides of the stream or one side for larger rivers (effective wildlife movement corridor). Title 13 Class I riparian, which accounts for 5 primary ecological functions, is typically within 30–61 m (100–200 ft) on either side of the stream; steep slopes are encompassed in the wider distances. Optimum width won’t always be achievable – e.g., could interact with other priority habitats such as prairie. (Environmental Law Institute 2003; Metro’s <i>Technical Report for Fish and Wildlife Habitat</i> , 2005; Hennings and Soll 2010; Shandas and Alberti 2009; Cole and Hennings 2006)
Condition	Vegetative structure: shrub layer	% native shrub cover	< 10% cover	10–25% cover	25–50% cover	> 50% cover	Fair	Good	Very Good	Estimate via site walk. Indicator categories based on data from local study at 54 riparian study sites. Abundance and species richness of many bird and mammal species is associated with native shrub cover and woody vegetation volume. Puget Sound studies suggest that the fragmentation of upland vegetation and the total amount of riparian vegetation explain the greatest amount of variability in riparian bird communities. (Carey and Johnson 1995; Hennings 2001; Hagar 2003; Shandas and Alberti 2009; Hagar 2011)
Condition	Vegetative structure: tree layer.	% native tree cover	< 20% cover	20–30% cover	30–40% cover	> 40% cover	Good	Good	Very Good	Estimate via site walk. Based on data from local study at 54 riparian study sites. In these sites, the best mix of native tree and shrub cover occurred when both were in the 40-60% range. Tree cover in this tended to support healthy shrub communities and helped control European starlings. Note that some species, such as yellow-breasted chat, rely on native shrub habitat rather than forest, therefore if specific species are involved separate KEAs should be developed. (Hennings 2001)
Condition	Native herbaceous layer richness.	# native species of grasses, herbs, forbs, and ferns at least of which are riparian associated, per 0.4 ha (1 ac).	< 5 species	6–12 species	12–18 species	> 18 species	Fair	Good	Very Good	Estimate via site walk. Species numbers based on field experience of Marsha Holt-Kingsley and Lori Hennings; currently using species list from McCain and Christy 2005, Technical Paper R6-NR-ECOL-TP-01-05.
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	Very Good	Very Good	Very Good	Estimate via site walk. Some studies show that native wildlife species diversity (particularly Neotropical migratory songbirds) is associated with native deciduous shrub diversity. (Muir et al. 2002; Hagar 2003; Hagar 2011)
Condition	Riparian habitat continuity.	Gaps in woody vegetation.	> 2 gaps > 50 m (55 yards) OR > 3 or more 25–50 m (27–55 yards) gaps	1 or 2 gaps > 50 m (54 yards) OR 2 or more gaps between 15–25 m (16–27 yards)	1, 25–50 m (27–55 yards) gap OR 2 or more gaps between 15–25 m (16–27 yards)	0 or 1, 15–25 m (16-27 yards) gap	Fair	Good	Good	Estimate via GIS, per km stream length. Riparian contiguity for water quality and wildlife. Allows for continuity and also some mosaic for wildlife that need (or create, such as beaver) openings. Puget Sound studies suggest that the fragmentation of upland vegetation and the total amount of riparian vegetation explain the greatest amount of variation in aquatic conditions. Studies document that some birds and small mammals are unwilling to cross vegetation gaps, with the most typical threshold being 50 m (164 ft) Hennings and Soll 2010).

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT STATUS	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	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	Poor to Fair	Very Good	Estimate via site walk. Rankings distilled from multiple references and particularly from <i>Habitat Conservation for Landbirds in Lowlands and Valleys of Western Oregon and Washington</i> (Altman and Alexander 2012) and DecAID results for species’ use of dead wood in Westside Lowland Conifer-hardwood forests.
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).	Fair	Good	Very Good	Measure based on field walk, aerials. Adapted from Washington DNR’s <i>Ecological Integrity Assessment for North Pacific Lowland Riparian Forest and Shrubland</i> , "Hydrologic Connectivity (Riverine)." Added channel incision. Not appropriate for higher gradient streams. (Stanford et al. 1996; Rocchio 2011).
Landscape context	Offsite riparian habitat condition.	% rating at least "fair" for both width and gaps (see above), within 2.5 km (1.6 mi) up- and down-stream of property.	0–25%	25–50%	50–75%	75–100%	Good	Good	Good	Measure using aerial photos for 2.5 km (1.6 mi) stream length, up- and downstream. Several studies suggest the importance of riparian buffer contiguity to water quality, fish and benthic organisms. A 2006 study in and near Damascus, OR found that benthic biotic integrity was significantly correlated with % forested area for 1,500 m (1,640 ft) upstream at 50, 100, and 200 m (55, 109, and 219 ft) wide. Ontario researchers found that the combination of % of forested stream bank and forest width within 2.5 km (1.6 mi) upstream of a site accounted for 90% of the observed variation in water temperatures. (Barton et al. 1985; Wang et al. 2001; Cole and Hennings 2006; Freeman et al. 2007; Olsen et al. 2007).

*Desired future condition.

Table 2: Key ecological attributes for native fish habitat – Cazadero North Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT STATUS	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Complexity of mainstem habitat.	# of different stream habitat units per 1-mile reach.	Less than 5 habitat units.	Between 5–10 habitat units.	Between 10–20 habitat units.	Greater than 20 habitat units.	Fair	Good	Good	The number of different habitat units indicates the complexity of the stream reach. Complex stream reaches provide high quality habitat for all life stages of native fish. Habitat units may include glides, riffles, runs, pools, step pools, alcoves, side channels, etc. (<i>Independent Multidisciplinary Science Team, 2002</i>).
Condition	Off-channel habitat.	Presence and abundance of off-channel habitat per reach.	Few or no backwaters, no off-channel ponds.	Some backwaters and high energy side channels. OR Backwaters with cover and low energy off-channel areas that are not accessible during biologically important times of year.	Backwaters with cover and low energy off-channel areas (ponds, oxbows, etc.).		Fair	Very Good	Very Good	Active off-channel habitat (e.g., side channels, backwaters, alcoves) provide diverse slow-water habitat for salmonids. They provide multiple benefits including, feeding areas, refuge from high flows, overwintering, hiding areas from predation. See <i>Independent Multidisciplinary Science Team, 2002</i> , and <i>National Marine Fisheries Service, 1996</i> . This KEA is only relevant to unconfined reaches where off-channel habitats can form. In ranking this indicator, it will be useful to compare your reach of interest to a reference reach or to the historical condition of the site to ensure this is applicable.
Condition	Key pieces and # of pieces of large wood in wetted areas of the stream and adjacent streambank.	Number of key pieces and large wood pieces per 100 m.	Less than 1 key piece, less than 50 pieces large wood.	1–2 key pieces, 50–100 pieces large wood.	3 key pieces, 100–200 pieces large wood.	4 or more key pieces, 200 or more pieces large wood.	Poor	Good	Very Good	Values are relevant to channels with bank-full width (BFW) of 50m or more. Key pieces are defined as logs with a minimum volume of 10.75 m³ (for example a length of 10m and diameter of 0.68 m) and that have a rootwad. Large wood is defined as logs greater than 2 m (6.5 ft) in length 10 cm (4 inch) diameter. Key pieces resist downstream transport as well as anchor and retain other pieces of large wood. Large wood pieces influence geomorphic processes important to salmonid survival including sediment and organic matter distribution and pool development, often racking together. See <i>Fox and Bolton 2007</i> .
Condition	Substrate in wetted areas of the stream.	% area of fines and gravel substrate within riffles per 1-mile 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.	Fair	Good	Good	Visually assess for a stream reach(s) of interest or for entire stream on site. If preferred, measure quantitatively using cross sections ODFW methods. Fines are defined as sand, silt or organics. Gravels are defined as particles that range in size from a small pea to roughly baseball sized substrate. Derived from ODFW 2001.
Landscape Context	Fish passage.	Fish able to move to and from mainstem and tributaries.	Passage not possible at a range of flows.	Passage not possible at base/low flows.		Passage open year-round.	Fair	Very Good	Very Good	In this context passage barriers are only considered if they are “man-made”. See off channel habitat condition KEA for passage to floodplain habitats which may also be seasonal. See <i>National Marine Fisheries Service, 1996</i> .

*Desired future condition.

APPENDIX A-3 | THREATS AND SOURCES

INTRODUCTION

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 (KEA) 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 in a way that results in stress. Put together, stresses and their sources constitute a threat.

Analysis of threats to conservation targets at Cazadero North Natural Area involves three parts:

- Identify stresses and apply stress-rating criteria.
- Identify sources of stress, rank and assign threat-to-system rank.
- Assign overall threat rank.

BACKGROUND ON METHODS

Identify stresses and apply stress-rating criteria

In identifying stresses, we applied the concept that a stress is any alteration of a KEA that can result or has resulted in a KEA declining below a “good” rating. For each conservation target, KEA indicators with ratings of “poor” or “fair” were analyzed by asking the question “*What types of destruction, degradation or impairment are responsible for the ‘poor’ or ‘fair’ rating?*” We also considered those KEA indicators with “good” and “very good” ratings but likely to degrade to “poor” or “fair” if no management actions are taken.

Stresses are ranked according to two criteria: **severity** and **scope** of the anticipated damage.

Severity

The level of damage to the conservation target that can reasonably be expected within 10 years under current circumstances (i.e., given the continuation of the existing situation).

- **Very high:** The threat is likely to destroy or eliminate the conservation target over some portion of the target’s occurrence at the site.
- **High:** The threat is likely to seriously degrade the conservation target over some portion of the target's occurrence at the site.
- **Medium:** The threat is likely to moderately degrade the conservation target over some portion of the target's occurrence at the site.
- **Low:** The threat is likely to only slightly impair the conservation target over some portion of the target's occurrence at the site.

Scope

The geographic extent of impact on the conservation target at the site that can reasonably be expected within 10 years under current circumstances (i.e., given the continuation of the existing situation).

- **Very high:** The threat is likely to be widespread or pervasive in its scope and affect the conservation target throughout the target's occurrences at the site.
- **High:** The threat is likely to be widespread in its scope and affect the conservation target at many of its locations at the site.
- **Medium:** The threat is likely to be localized in its scope and affect the conservation target at some of the target's locations at the site.
- **Low:** The threat is likely to be very localized in its scope and affect the conservation target at a limited portion of the target's location at the site.

Once severity and scope ratings are determined, they are combined to develop a stress ranking using the following stress ranking table (The Nature Conservancy 2007).

Table 1: Stress ranking

SEVERITY	SCOPE			
	VERY HIGH	HIGH	MEDIUM	LOW
Very high	Very high	High	Medium	Low
High	High	High	Medium	Low
Medium	Medium	Medium	Medium	Low
Low	Low	Low	Low	Low

Identify sources of stress and apply threat to system rank

Sources of stresses are the proximate cause of the stress. A source of stress may be either human activities or biological (e.g., non-native species). Sources of the stress are rated in terms of **contribution** and **irreversibility** as defined below:

CONTRIBUTION

The expected contribution of the source, acting alone, under current circumstances (i.e., given the continuation of the existing management/conservation situation).

- **Very high:** The source is a very large contributor of the particular stress.
- **High:** The source is a large contributor of the particular stress.
- **Medium:** The source is a moderate contributor of the particular stress.
- **Low:** The source is a low contributor of the particular stress.

IRREVERSIBILITY

The degree to which the effects of a source of stress can be restored.

- **Very high:** The source produces a stress that is irreversible (e.g., wetlands converted to a shopping center).

- **High:** The source produces a stress that is reversible, but not practically affordable (e.g., wetland converted to agriculture).
- **Medium:** The source produces a stress that is reversible with a reasonable commitment of resources (e.g., ditching and draining of wetland).
- **Low:** The source produces a stress that is easily reversible at relatively low cost (e.g., off-road vehicles trespassing in wetland).

The contribution and irreversibility of each source across all the stresses to each conservation target is ranked using Table 2, resulting in a source of stress rank for each contribution/irreversibility combination.

Table 2: Source ranking

IRREVERSIBILITY	CONTRIBUTION			
	VERY HIGH	HIGH	MEDIUM	LOW
Very high	Very high	High	High	Medium
High	Very high	High	Medium	Medium
Medium	High	Medium	Medium	Low
Low	High	Medium	Low	Low

In a similar fashion stress and source rankings are combined to develop a threat ranking specific to that conservation target (Table 3).

Table 3: Threat ranking

STRESS	CONTRIBUTION			
	VERY HIGH	HIGH	MEDIUM	LOW
Very high	Very high	Very high	High	Medium
High	High	High	Medium	Low
Medium	Medium	Medium	Low	Low
Low	Low	Low	Low	low

THREAT-TO-SYSTEM RANK

A threat-to-system rank is a summary ranking for all threats associated with a particular source of stress to a conservation target. Where multiple threats related to the same source of stress occurred, the threat-to-system rank is adjusted by using the “3-5-7” rule as follows:

- Three high rankings equal a very high.
- Five medium rankings equal a high.
- Seven low rankings equal a medium.

Table 4 illustrates the threat-to-system ranking.

Table 4: Conservation target A

	STRESS 1	STRESS 2	STRESS 3	THREAT TO SYSTEM RANK
Stress rank	High	Medium	Medium	
Source A rank	High	Medium	N/A	High*
Source B rank	Low	N/A	Medium	Medium**

N/A = Not applicable: stress/source combination does not affect conservation target

*, ** - See Table 4

OVERALL THREAT RANK

The last step in the process is to summarize threats across the system and apply an overall threat rank to each threat (source/stress combination). Overall threat ranks are determined by combining threat-to-system ranks across all system/targets affected by that threat. For each threat, DEA will combine the threat-to-system ranks across all conservation targets into an overall threat rank of very high, high, medium or low as determined by the “2 Prime” rule which is as follows:

- Two very high threat rankings yield an overall threat rank of very high.
- One very high or two high threat rankings yield an overall threat rank of high.
- One high or two medium threat rankings yield an overall threat rank of medium.
- Less than two medium threat rankings yield an overall threat rank of low.

The overall threat rank represents the degree to which a particular source causes stress to the conservation target.

Table 5: Overall threat rank

	TARGET 1	TARGET 2	TARGET 3	OVERALL THREAT RANK
Threat A	<i>High*</i>	Very high	High	High
Threat B	<i>Medium**</i>	Medium	High	Medium
Threat C	N/A	Medium	Low	Low

**, ** from Tables 5,6*

Threats and source analysis for the Cazadero North Natural Area

Threats for the Cazadero North Natural Area conservation targets are listed in Table 6 and Table 7 below.

Table 6: Summary of threats to riparian forest at Cazadero North Natural Area

STRESS	STRESS RANK	SOURCE	SOURCE RANK	THREAT RANK	COMMENTS
Increased competition from invasive species.	High	Encroachment of non-native invasive species.	High	High	The site contains extensive invasive grasses and broadleaf weeds, esp. reed canary grass, Canada thistle, teasel, and shiny geranium and invasive shrubs such as Scotch broom and Himalayan blackberry. Tied to native species KEAs.
Lack of down and standing wood.	Medium	Historical land use.	Medium	Low	While one bank of the site consists of bigleaf maple, red alder, and cottonwood trees, the opposite bank has limited mature trees and shrubs. Tied to dead wood KEAs.
Human disturbance (recreational activities).	Medium	Demand trails, camping, and dogs.	Medium	Low	Stress to wildlife species utilizing this habitat. Potential loss of habitat and vegetation structure by escaped fire. Signs of disturbance (e.g., concrete pad on the left bank) reduces habitat value. Tied to structure/patch size (interior habitat) KEAs.

Table 7: Summary of threats to native fish habitat at Cazadero North Natural Area

STRESS	STRESS RANK	SOURCE	SOURCE RANK	THREAT RANK	COMMENTS
Simplified stream structure, sparse side channel refugia, and riffle-pool sequences.	High	Altered hydrology, channel morphology due to previous practices and upstream development, deforestation and disturbance.	High	High	Salmon require off-channel habitat for rearing. Adult salmon need riffle-pool habitat for spawning, refugia, prey habitat, and water oxygenation. Tied to all KEAs.
Lack of logs and dead wood in streams.	Medium	Previous forest and land management practices; narrow or missing buffer in some areas.	Medium	Medium	Large logs provide critical habitat for juvenile fish and form the matrix of large wood jams and structure that provides complexity in the stream. Tied to habitat complexity and large wood KEAs.
Impaired fish passage.	High	Manmade structures that block fish migration including dams, weirs, and culverts.	Medium	Medium	Upstream of the property, the Richey Road culvert is a partial barrier to fish.
Impaired water quality.	High	Upstream land management; downstream water quality treatment facility.	Medium	Medium	The North Fork Deep Creek suffers from serious water quality impacts from sediments and nutrients from upstream sources and downstream water treatment facility.

APPENDIX A-4 | INVASIVE SPECIES

The table below summarizes a preliminary list of invasive plants requiring control in all or parts of Cazadero North Natural Area, including focus areas and timing for control. Invasive species, with the exception of Early Detection Rapid Response (EDRR) species, will be controlled as part of restoration projects or ongoing management of habitat areas. Photos of EDRR species for identification are listed below. A list of noxious weeds for Oregon, including descriptions and photos, can be found at: <https://www.oregon.gov/ODA/programs/Weeds/Pages/AboutWeeds.aspx>.

Table 1: Working list of priority non-native species for control at Cazadero North Natural Area (EDRR species common names are bolded in red).

GENUS	SPECIES	COMMON NAME	FOCUS AREA FOR DETECTION/CONTROL	CONTROL TIMING
<i>Alliaria</i>	<i>petiolata</i>	Garlic mustard	All	Spring
<i>Brachypodium</i>	<i>sylvaticum</i>	False brome	All	Spring/Fall
<i>Centaurea</i>	<i>pratensis</i>	Meadow knapweed*	All	Summer
<i>Cirsium</i>	<i>arvense</i>	Canada thistle*	All	Spring
<i>Cirsium</i>	<i>vulgare</i>	Bull thistle*	All	Spring
<i>Clematis</i>	<i>vitalba</i>	Old man's beard	Riparian forest	Spring/Fall
<i>Conium</i>	<i>maculatum</i>	Poison hemlock*	Riparian forest, site edges	Spring
<i>Crataegus</i>	<i>monogyna</i>	Common hawthorn	Riparian forest, site edges	Fall
<i>Cytisus</i>	<i>scoparius</i>	Scotch broom*	Riparian forest, site edges	Fall
<i>Daphne</i>	<i>laureola</i>	Spurge laurel	All	Spring/Fall
<i>Dipsacus</i>	<i>fullonum</i>	Teasel*	All	Spring
<i>Geranium</i>	<i>lucidum</i>	Shiny geranium*	All	Spring
<i>Geranium</i>	<i>robertianum</i>	Herb Robert*	All	Spring
<i>Hedera</i>	<i>Helix</i>	English ivy*	All	Winter
<i>Hypericum</i>	<i>perforatum</i>	St. John's Wort*	All	Spring
<i>Ilex</i>	<i>aquifolium</i>	Holly*	Riparian forest	Fall
<i>Iris</i>	<i>pseudocorus</i>	Yellow flag iris*	Riparian	Summer/Fall
<i>Impatiens</i>	<i>glandulifera</i>	Policemen's helmet	All	
<i>Lunaria</i>	<i>annua</i>	Money plant	Riparian forest	Spring
<i>Lythrum</i>	<i>salicaria</i>	Purple loosestrife	All	
<i>Phalaris</i>	<i>arundinacea</i>	Reed canarygrass*	All	Fall
<i>Phytolacca</i>	<i>americana</i>	Pokeweed*	Riparian	Summer
<i>Polygonum</i>	<i>cuspidatum</i>	Japanese knotweed	All	Summer
<i>Polygonum</i>	<i>sachalinense</i>	Giant knotweed	All	Summer
<i>Robinia</i>	<i>pseudoacacia</i>	Black locust	Riparian forest	Fall
<i>Rubus</i>	<i>armeniacus</i>	Himalayan blackberry*	All	Fall
<i>Solanum</i>	<i>dulcamara</i>	Bittersweet nightshade	All	Spring

* Detected onsite

APPENDIX B | REFERENCES AND ADDITIONAL RESOURCES

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