NATURAL RESOURCE CONSERVATION AND SITE MANAGEMENT PLAN

Canemah Bluff Natural Area

Oregon City, Oregon

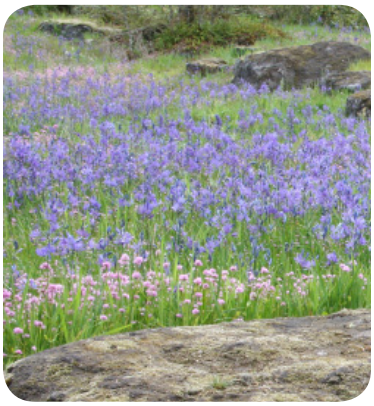

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TABLE OF CONTENTS

1 Introduction 1
1.1 Context 1
1.2 Goals and objectives of the conservation plan 2
1.3 History at the Canemah Bluff Natural Area 2

2 Planning process summary 4
2.1 Planning area 4
2.2 Planning process 4

3 Existing conditions 6
3.1 Physical environment 6
3.2 Streams and wetlands 6
3.3 Natural habitats 6
3.4 Existing trails and use by the public 9

4 Conservation 11
4.1 Conservation targets 12
4.2 Key ecological attributes 12
4.3 Threats and sources 12
4.4 Conservation target goals and strategic restoration actions 13
4.5 Ongoing stewardship and restoration programs 15

5 Recreation and access the next five years 16
5.1 Trails 16
5.2 Programmatic (education and volunteers) 18
5.3 Site management (trails, signs and public use) 20
5.4 Strategic actions (recreation and access) 22
5.5 Beyond five years or as needed 24

6 Coordination 26
6.1 Monitoring framework 26
6.2 Funding 27

Maps
Map 1 – Ownership and planning area
Map 2 – Physical features
Map 3 – Natural habitat types
Map 4 – Access and recreation – strategic actions

Appendices
Appendix A – Historic context

Appendix B – Conservation
- B.1 Conservation targets
- B.2 Key ecological attributes
- B.3 Threats and sources
- B.4 Invasive species

Appendix C – Recreation and access
- C.1 Trail counts
- C.2 Summary of public comments
- C.3 Signage

Appendix D – Monitoring

Appendix E – References and additional resources

SECTION 1: INTRODUCTION

1.1 Context

The Canemah Bluff Natural Area is located adjacent to the Canemah Historic District of Oregon City and includes a diverse history dating back to pre-historic times. The natural area has been protected by Metro through the 1995 and 2006 natural areas bond measures and includes 271 acres. Canemah Bluff is valued for its rich diversity of habitats including conifer forest, ash forested wetland, prairie and Oregon white oak woodland. The location and diversity of habitats provide for a variety of wildlife at the natural area.

The Canemah Bluff Natural Area overlooks the Willamette River approximately 2,300 feet upriver of Willamette Falls, a major traditional fishing and gathering location for Native American populations. Canemah was also an early focus of settlement in the Willamette Valley. The town reached its peak from 1850-1870 and included many buildings and a landing for riverboats. Canemah Bluff offers scenic views to the neighboring city of West Linn and can be seen by travelers on the busy Interstate 205 freeway.

Careful observation in this area offers many clues to the "recent" geological events and human management that helped shape the landscape we see today. Canemah Bluff is part of a rock bench sandwiched between the Willamette River and the higher plateau to the east. The underlying geology of the bench is Columbia River basalt; the top of the bluff is composed of more recent Troutdale formation and Boring Lava deposits. During the Missoula Floods, the steep bluff and bench where the natural area is located today were exposed, scoured and steepened as floodwaters repeatedly spilled into and out of the Willamette Valley. These geological events, plus regular burning by Native Americans until around 1850 have created a mosaic of uncommon habitats at Canemah Bluff. Similar habitats can be found at the Camassia Preserve, Elk Rock Islands and other areas of the Willamette Narrows.

The highlight of this natural area can be found in the wildflowers and associated wildlife in the oak woodland and prairie habitat areas. Camas and *Brodiaea* lilies, white rock larkspur, rosy *Plectritis* and many other native wildflowers can be found in bloom from March to May. Birders can find chipping sparrows, red breasted sapsuckers, white-breasted nuthatches and orange-crowned warblers, as well as hawks and eagles soaring over the river.

The Canemah Bluff Natural Area Natural Resource Conservation and Site Management Plan (Conservation Plan) is a tool for protecting and enhancing the unique characteristics of the site while allowing access by the public. This Conservation Plan has been developed by Metro staff and includes an overview of the history of the site, existing conditions, conservation targets and recreation and access objectives for the site.

1.2 Goal and objectives of the conservation plan

The goal of this Conservation Plan is to describe a course of action that will protect and enhance the area as an environmental and recreational resource for the Oregon City and Portland metropolitan region. With rare and unique habitats, plants and wildlife the Canemah Bluff Natural Area will be preserved as a historical remnant of the Willamette Valley Oregon white oak woodlands and prairie complexes, providing an ecological showcase of native habitats and wildlife. The area will be maintained and enhanced, to the extent possible, in a manner that is faithful to its original natural condition. Only those recreational uses that are compatible with the environmental objectives of the Conservation Plan will be encouraged. Oregon City's Canemah Neighborhood Park will be the principal location for recreational activities and will serve as the gateway into the natural area.

To achieve this goal, the Conservation Plan establishes a series of priority objectives, including:

- Restore and maintain high quality examples of Willamette Valley Oregon white oak woodlands, prairie and wetland habitats.
- Provide access to Canemah Bluff Natural Area that supports appropriate types and levels of recreation.
- Provide opportunities for research and education to local schools.
- Develop appropriate funding strategies to implement environmental and recreational improvement projects.

1.3 History at the Canemah Bluff Natural Area

People have interacted with Canemah Bluff Natural Area in many ways over the years, and there are many stories to tell. It is through these stories that we begin to weave together a rich and dynamic experience, one in which we are connected not only to a complex natural system but to our ancestors.

A detailed account of the history of native people and EuroAmerican use of the site can be found in Appendix A.

Oregon City – Canemah Historic District

In 1978, the Canemah Historic District was listed in the National Register of Historic Places. The Canemah Historic District originally consisted of approximately 90 historic-period residences and other buildings. The southern boundary of the district is generally at Paquet Street, therefore excluding much of the Canemah Bluff Natural Area. Two properties listed as contributing resources in the district – the Shannon and Bowers houses – were located in the Canemah Bluff Natural Area but were demolished in 1998. The Rakel house which was outside of the Canemah Historic District but adjacent to the Bowers and Shannon homes was destroyed in a home fire in July 2002. The foundations from these homes can still be seen in the natural area today. Additional information about the Canemah historic district can be found on the Oregon City web site, www.orcity.org/planning/canemah-national-register-district

Canemah ridge development

In 1996, Cascade Communities, Inc. proposed developing portions of the natural area into the Canemah Ridge housing development. The development included creating 136 lots over 41.6 acres. This development was never completed and the lands were protected by Metro's purchase of the MGD property in 1997.

Metro's natural areas bond acquisition program and Canemah Bluff

During the last 16 years, two voter-approved natural areas bond measures have allowed Metro to protect over 11,000 acres across the region – the equivalent of more than two Forest Parks, or nearly enough land to cover the city of Beaverton. Voters have protected 90 miles of river and stream banks, opened three major nature parks and supported hundreds of community projects. Metro continues to buy land in 27 key target areas, chosen for their water quality, wildlife habitat and outdoor recreation opportunities.

Additional information about the 2006 natural areas bond measure and goals and objectives for the Canemah Bluff and Willamette Narrows target area can be found on the Metro web site, www.oregonmetro.gov/naturalareas.

Since 1996, Metro has acquired 271 acres in the Canemah Bluff area of Oregon City, preserving this area for conservation rather than a housing development. Table 1 below shows the history of purchases and Table 2 shows other noteworthy land ownership adjacent to the Canemah Bluff site. Approximately one acre of land is managed by the City of Oregon City as part of the Canemah City Park. In addition to the Metro purchases, the City of Oregon City has purchased 7.2 acres adjacent to the Canemah Bluff Natural Area as part of the 2006 natural areas bond local share program. This parcel is currently managed by the City of Oregon City.

Table 1: Metro natural area bond purchased land

Property name (previous owner)	Acres	Bond year	Date acquired	Management
Del-mar Investments Inc.	22.59	1996	11/5/1996	Metro
MGD Properties	37.52	1997	10/3/1997	Metro
Richard and Sandra Breunig	0.23	1998	6/30/1998	Oregon City
MGD Properties	0.33	1998	12/10/1998	Metro
State of Oregon	5.45	2004	9/20/2004	Metro
Davis	24.34	2006	3/10/2009	Metro
Reeder	181	2006	6/28/2011	Metro

Table 2: Other noteworthy land ownership adjacent to the Canemah Bluff site

Site name	Landowner	Acres	Noteworthy features
Canemah Cemetery	Canemah Cemetery Association	3.09	Historic cemetery
Old Canemah Park	City of Oregon City	7.50	Developed; includes some natural area
Canemah Neighborhood Park	City of Oregon City	0.35	Developed
Madrona Open Space	City of Oregon City	1.2	Top of bluff in development
City Natural Area	City of Oregon City	7.2	Steep slopes with mature conifer trees

SECTION 2: PLANNING PROCESS SUMMARY

2.1 Planning area

The Canemah Bluff site includes 271 acres of land. This Conservation Plan will consider 120 acres of land including seven parcels owned and managed by Metro (112.8 acres) as well as portions of neighboring City of Oregon City natural area (7.2 acres). The Oregon City land was included in this Conservation Plan to allow for greater flexibility in management of the land for purposes that are complementary between the two public agencies. The 157.5-acre natural area to the east of the Canemah Bluff site will not be evaluated under this Conservation Plan because of the break in ownership. A map showing Metro and City ownership and outline of the planning area can be found as Map 1 later in this document.

2.2 Planning process

Developing a useful site plan means adequately providing for its preservation, enhancement and management. This plan will build on previous restoration and management efforts while acknowledging that evolution of the ecosystem requires analysis of the site, meaningful engagement of stakeholders and integration of historical, current and future needs. Development of this plan includes several important elements: development of conservation targets, public meetings to receive input from local stakeholders 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 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 then developed conservation and access strategies independently. Conservation is discussed in Section 4 of this document. Access is discussed in Section 5.

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 sources for the conservation targets.
- Establish strategies and actions to restore habitat.
- Identify actions and implement.

Access

- Analyze existing public use of Canemah Bluff site.
- Develop a trail and signage plan that provides high-quality experience and preserves sensitive habitats.
- Develop cost estimates.
- Identify actions and implement.

SECTION 3: EXISTING CONDITIONS

This section of the Conservation Plan provides background on existing conditions for the Canemah Bluff site.

3.1 Physical environment

The site is located west of Oregon City and adjacent to the Willamette River at mile 27.5. The site is at elevations of 125 to 450 feet above mean sea level. The area drops abruptly from a high plateau almost 250 feet to a relatively flat area that is sandwiched between the steep bluff face to the southeast and the Willamette River to the northwest. The associated landform is mapped as part of the Miocene Columbia River Basalt Group below the adjacent bluff top that is mapped as Troutdale formation and Boring Lava deposits that date to the Pliocene and early Pleistocene time periods. The Columbia River basalt formation was exposed during the Missoula Floods and can be seen in numerous areas in the prairie. The steep bluffs on the south side of Oregon City and the current project vicinity were scoured and steepened as floodwaters spilled into the Willamette Valley.

The 1851 General Land Office surveyor described the area around Canemah Bluff as broken land descending to the river on which rocks are exposed at the surface. The area south of the project area on the bluff top was noted to be level land with second rate clay loam with fir, oak, hazel and scrub oak.

3.2 Streams and wetlands

Numerous small tributaries begin from springs in the Canemah Bluff site and flow over the steep-sided bluffs directly into the Willamette River. These small streams are a very high gradient and do not contain fish. Two large wetland areas are formed by springs and seeps and have surface water for 6-9 months of the year. A small perennial tributary flows out of the wetland to the east of Fifth Avenue and flows through the Canemah neighborhood to the Willamette River. The lower reaches of this tributary (downstream of Highway 99) is likely used by juvenile salmonids migrating in the Willamette River.

Vernal pools are a rare wetland type that can be found at the Canemah Bluff site. These pools range in size from 30-250 square feet and form on the impervious basalt rock. These pools usually fill with water in the fall or winter and dry up in spring or early summer. They are home to a large variety of plants and animals adapted to these harsh conditions, including some globally rare species.

Map 2 shows details of the topography, stream, wetlands and rivers.

3.3 Natural habitats

The Canemah Bluff site can be characterized by four natural habitat types. The mixed conifer hardwood forest community combines at least three variations of stand types. For the purpose of this Conservation Plan this community has been consolidated to one habitat type.

Oak woodlands

Oak woodlands at Canemah Bluff are characterized by an open canopy and dominated by Oregon white oak trees. Some areas of oak woodlands may have Douglas fir, Pacific yew and Pacific madrones present. In general, the understory is relatively open with shrubs, grasses and wildflowers. The tree canopy of oak woodlands may obscure between 30 percent and 70 percent of the sky.

Current extent and attributes: The site includes approximately 14 acres of oak woodland habitat over three non-contiguous units. Some Oregon white oak trees are growing out of very shallow soils resulting in small stunted trees (under 20 feet tall) which may be over 100 years old. Douglas fir trees are encroaching the Oregon white oak woodland in numerous areas. Vernal wetland pools are found in this habitat type. Large boulders and rocky outcrops exposed by erosion during the Missoula floods are visible throughout.

Key plants: Native forbs found in this habitat may include Leichtlin's camas, fawn lily, Oregon sunshine, white rock larkspur, rosy plectritis, licorice fern, sword fern and alumroot. Native grass species found in this habitat may include Roemer's fescue, California oat grass, blue wildrye and slender hairgrass. Shrubs and trees found in this habitat may include snowberry, poison oak, oceanspray, *spiraea,* western serviceberry, Oregon white oak, Pacific yew and Pacific madrone. White rock larkspur is a state listed species and endemic to the Willamette Narrows area of the Willamette valley.

Key wildlife: Birds utilizing this habitat may include White-breasted nuthatch, Orange-crowned Warbler, Black-capped Chickadee, Olive-sided Flycatcher, House Wren, Black-throated Gray Warbler, Red-breasted Sapsucker and Bushtit. Other wildlife utilizing this habitat may include Pacific tree frogs, common garter snake, rubber boa, Western gray squirrel, butterfly species, black-tailed deer, coyote and fox. White-breasted nuthatches and Western gray squirrels are both special status species for the State of Oregon.

Prairie

Prairie at the Canemah Bluff site is a mosaic of wet and upland prairie. Native herbaceous plant species (grass and wildflower) compose over 90% of the vegetation cover. Scattered Oregon white oak and Douglas fir trees are present in this community

Current extent and attributes: The site includes 6.5 acres of prairie habitat over one large contiguous unit. Soils are poorly drained due to shallow soils and exposed outcroppings of Columbia River basalt can be found in this habitat area. Two old home site foundations from the Rakel and Turner homes of early Canemah can be found near the eastern border of the prairie. Native wildflowers can be found in bloom from March to July

Key plants: Native forbs found in this habitat may include common camas, brodiaea lilly, Oregon sunshine, large rose mallow (Sidalcea), Oregon saxifrage, large leaf lupine, tarweed, collinsia and bracken fern. Native grass species found in this habitat may include Roemer's fescue, California oat

grass, tufted hairgrass, slender hairgrass and blue wildrye. Shrubs found in this habitat may include poison oak, spiraea and tall Oregon grape.

Key wildlife: Birds utilizing this habitat may include White-crowned sparrow, Chipping sparrow, Rufous hummingbird, Western bluebird, Western wood-peewee, Lazuli bunting, Western meadowlark and Red-tailed hawk. Bald eagles, Turkey vultures and Ravens use the snags adjacent to the prairie, along the bluff above the river. Other wildlife utilizing this habitat may include Pacific tree frogs, common garter snake, rubber boa, butterfly species, black-tailed deer, coyote, fox and various native rodents. Western meadowlarks are a special status species for the State of Oregon.

Ash forested wetlands

Ash forested wetland areas at Canemah Bluff Natural Area can be characterized by mature Oregon ash trees and dense shrub understory. Native sedge and rush species as well as forbs cover over 90% of the exposed soil. Some open water persists for most of the year in the larger wetland areas.

Current extent and attributes: The site includes 8 acres of forested wetland habitat over three non-contiguous areas. These forested wetlands are largely fed by springs emerging at the toe of the bluff slopes. During the winter months depths of water may exceed 2 feet.

Key plants: Native forbs found in this habitat may include false lily of the valley, false hellebore, star-flowered Solomon's seal and nodding beggartick. Sedge and rush species found in this habitat may include slough sedge, awl-fruited sedge, dewy sedge, slender rush, common rush, spreading rush and skunk cabbage. Shrubs and trees found in this habitat may include Oregon ash, Pacific ninebark, red-osier dogwood, red elderberry, twinberry and Douglas spiraea.

Key wildlife: Birds utilizing this habitat may include Green heron, Great blue heron, Wilson's warbler, Song sparrow, Cedar waxwing, Bushtit, Black-capped Chickadee, Orange-crowned Warbler and Red-breasted Sapsucker. Other wildlife utilizing this habitat include Pacific tree frog, Northern red-legged frog, common garter snake, black-tailed deer, coyote and fox.

Mixed conifer hardwood forest

Mixed conifer hardwood forest at Canemah includes an overstory of deciduous and conifer trees, with shade tolerant shrubs and native herbaceous species in the understory. Stands of forest can be categorized by the age of trees, species and composition of understory species.

Current extent and attributes: The site includes 91.5 acres of upland closed forest habitat. A majority of this habitat type is positioned on steep slopes and is dominated by Douglas fir or Grand fir trees. This habitat type extends east onto City of Oregon City lands and west onto private lands. Areas that have been logged within the last 10 years are dominated by deciduous red alder and big leaf maple trees. Variations of canopy structure in this habitat type include Grand fir/big leaf maple, Douglas fir/big leaf maple/red alder and big leaf maple/Douglas fir community types.

Key plants: Native forbs found in this habitat may include sword fern, licorice fern, false salmons, false lily of the valley, trillium, fairy bells, miners lettuce, pacific water leaf, stinging nettle and heal-

all. Shrubs and trees found in this habitat may include Pacific yew, Pacific madrone, large leaf maple, red alder, Douglas fir, Grand fir, Western red cedar, black hawthorn, service berry, dull Oregon grape, mock orange, red elderberry, salal, red huckleberry, Indian plum and snowberry.

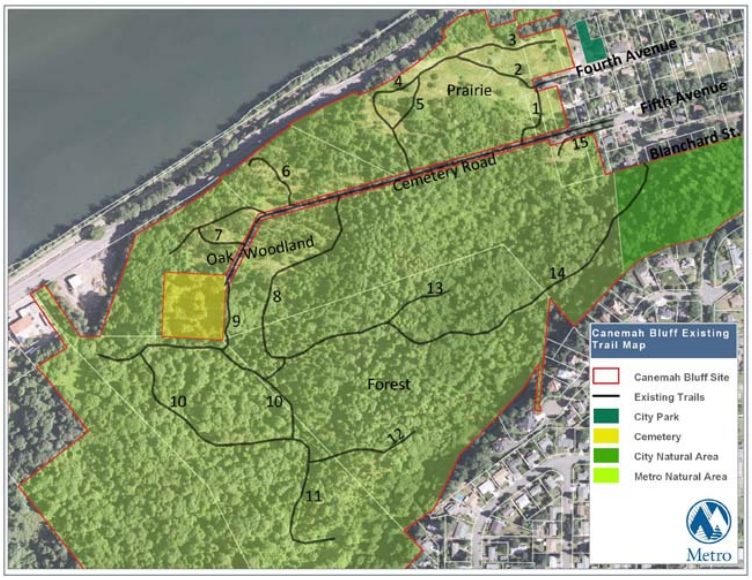
Key wildlife: Birds utilizing this habitat may include Townsend's warbler, Brown-creeper, Swainson's thrush, Anna's hummingbird, Song sparrow, Cedar waxwing, Bushtit, Chestnut-backed Chickadee, Black-capped Chickadee, Pileated woodpecker, Northern flicker, American crow, American robin, Stellar's jay, Pacific wren, Bewick's wren, Ruby-crowned kinglet and Cooper's hawk. Other wildlife utilizing this habitat may include common garter snake, elk, black-tailed deer, mountain lion, coyote and fox. Map 3 shows the natural habitat types.

3.4 Existing trails and use by the public

To date there has been no formal master plan for public use. However, people have been enjoying the Canemah Bluff site and have created their own trails over the years. At this time there is no signage or trail map and use of these trails by people is light. The trails vary in width and are seldom steep, resulting in easy walking conditions. The cemetery road forms the spine of the trail system today with paths wandering from the spine into the oak woodlands, prairie and conifer mixed hardwood forests.

In order to understand trail use, counters were installed at several locations. (See Appendix C.1 for counter locations.) Near Fourth and Fifth Avenues, the trails that lead into the natural area both have counters and are two of the most frequently used entry points. Results from May and June 2011 indicate that a daily average of 19 people passed the counter at the end of Fourth Avenue. At the access point from Fifth Avenue an average of 26 people were counted. If we assume that people are counted as they enter and exit, then approximately 23 people use the trails daily and slightly more on the weekends. While these are the main access points, there are two other access points without counters so this total may be under counted.

One of the characteristics that make Canemah Bluff Natural Area a good place to walk is that you can experience a diversity of habitats in a relatively short walk. The prairie, the overlook to the Willamette River, the rocks and oak woodland and the upland forest are distinct habitats that have trails through them. A walk starting at Fourth Avenue and looping through the prairie and the oak woodland to the cemetery road, then up through the upland forest, exiting at Blanchard, takes between 30 minutes and an hour. (See map, Trails 1, 4, 8 and 14.)



To understand use of the trails, a survey was distributed to the neighborhood. 164 surveys were mailed out and 18 were returned. The results of the survey are summarized in Appendix C.2. In addition, a public meeting and site walk were held. Approximately 12 people joined in to discuss their ideas about the trails.

These discussions and surveys revealed that there are some common ideas and concerns. Generally the people who responded love the trails and the natural area. Many wrote enthusiastically about the prairie, the views of the river and the specialness of the place. Several people expressed a strong desire that the place not change because it is enjoyable as it is. The cemetery and views of the river were cited as special destinations and the overall beauty of the natural area was commented on repeatedly.

The ideas for improvement and concerns were insightful but with little general agreement or patterns. The ideas that were mentioned at least twice include:

- Remove poison oak and blackberries that are out of control.
- Allow dogs.
- Connect the trails, make loops and eliminate abruptly ending trail segments.
- Construct wider and more groomed trails.
- Leave the trails as they are.
- Protect historic and culturally significant sites.
- Make the overlook in the prairie safe.
- Reduce danger of fires started by smokers.

Other comments that were mentioned by one person include:

- Add security to address transients.
- Open up views to the river.
- Add trails for mountain biking.
- Keep the cemetery accessible more often.
- Construct a bridge over the stream on Trail 14.
- Remove poison oak along trails.

The trails are functioning today for a limited number of enthusiastic neighbors. In addition to the ideas and concerns about existing conditions, staff note that trails are often wet with poor drainage and there is no access for people with disabilities.

SECTION 4: CONSERVATION

This section of the Conservation Plan provides a comprehensive framework for the Canemah Bluff site through conservation planning. This framework follows the Conservation Action Planning template (The Nature Conservancy 2007) and includes analyzing the site, establishing conservation targets, evaluating key ecological attributes (KEAs) for each conservation target, analyzing threats affecting conservation targets and developing action plans to abate serious threats.

4.1 Conservation targets

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).

The methodology for determining conservation targets and KEAs is discussed in detail in Appendix B.1, Conservation Targets, and Appendix B.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 targets. These conservation targets are:

- Wet prairie and upland prairie mosaic (habitat target)
- Oregon white oak savannah and woodland mosaic (habitat target)
- *Delphinium leucophaeum* – white rock larkspur (species target)

The habitat conservation targets represent the most regionally rare and threatened major habitat types present at the site. Although Douglas fir forest is a long-term target at the site, it is regionally well represented and presents few management challenges. *Delphinium leucophaeum* was selected as a target species because its conservation would not be captured by habitat level protection.

Historically, the Willamette Valley was dominated by extensive prairie, oak savanna and woodland habitats totaling approximately 2 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.

Oak woodlands provide the best habitat in the Willamette Subbasin for 37 wildlife species and are used regularly by at least 100 other wildlife species (NWPCC 2005, Appendix D, p. 41). Upland prairie, savanna and rock outcrops in the subbasin provide the best reproductive habitat for 22 wildlife species and are regularly used by at least an additional 56 breeding wildlife species. Oak savannas support an additional 50 or more species (NWPCC 2005, Appendix D, p. 60). The Willamette Subbasin Plan identified 19 focal species associated with these habitat types; for all of them, habitat loss was identified as a primary limiting factor (NWPCC 2005, p. 3-558-560).

One species of conservation concern present at Canemah Bluff Natural Area is *Delphinium leucophaeum.* This specie, also known as white rock larkspur, is a perennial herb of the buttercup family (Figure 1). Plants emerge as early as January, with mature plants producing between 10 to 30 white and purple flowers on a single inflorescence in late May or early June. They set seed in July and die back in August, existing only underground contained in a small tuber. *D. leucophaeum* is an Oregon State-listed endangered flower with a range that extends from Northwestern Oregon to Western Washington. They are found in the Willamette Narrows area of the Willamette River on rock (typically basalt) outcroppings and in the unplowed margins between farmland and roads (Leonard 2009).

Figure 1: *Delphinium leucophaeum*
Photo by Jenny Leonard

4.2 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. 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.

KEAs and indicators for each of the three conservation targets are further described in Appendix B.2, Key Ecological Attributes.

4.3 Threats and sources

An effective conservation strategy requires an understanding of threats 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. More specifically, the following threats are evident:

- Altered vegetation structure
- Altered native species composition
- Altered fire regime
- Human disturbance

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 B.3, Threats and Sources.

4.4 Conservation target goals and strategic restoration actions

This Conservation Plan outlines strategic actions to be carried out at the Canemah Bluff site over the next five years. They are based on the short- and long-term goals for the conservation targets and enhancing the visitor experience. The strategic actions described here are general courses of action to achieve these objectives and not highly prescriptive courses of action. Specific prescriptions will be developed by Metro staff to address site-specific conditions encountered in the areas targeted for restoration action.

About 20 acres of habitat are in need of intensive restoration throughout the Canemah Bluff site. This primarily includes restoration of the oak woodland and prairie habitats.

Conservation target: wet prairie upland prairie mosaic

Short-term goal: By 2016, increase presence of native grass and forb species to greater than 20 species in the prairie habitat area. Decrease cover of non-native grass and shrub species. Increase extent of seasonally saturated soils.

Long-term goal: The long-term desired future condition is to have all condition KEAs at good levels and providing suitable habitat for oak dependent wildlife species.

Key ecological attribute outside normal range of variation

- Native grass and forb species richness: Limited number of native plant species is present.
- Canopy cover vegetation structure: Trees and shrubs encroaching into the prairie.

Critical threats very high and high range

- Altered native herbaceous species composition: Non-native species out-compete native grass and forb species.
- Altered fire (disturbance) regime: encroachment of woody shrub and tree vegetation leading to lack of open structure and conversion to shrub.

Strategic restoration actions

- Restoration actions will be initiated to control non-native invasive species and increase the cover of native forb and grass species.
- Ongoing invasive species treatments will be targeted at non-native grass, tansy, thistle and Scots broom.
- Mowing of the prairie will occur annually to prevent woody (shrub and tree) encroachment and to reduce fire danger. Some removal of stumps, remnant home site building materials and filling of unnatural holes may be necessary to promote efficient mowing of the site.
- Restore natural hydrology by filling in man-made ditch near exit of ash forested wetland.
- Planting of high fidelity native forb and grass species in the prairie habitat areas.

Conservation target: Oregon white oak woodland and savannah mosaic

Short-term goal: By 2016, decrease cover of non-native broadleaf weed species to less than 20 percent cover; maintain less than 10% canopy cover over Oregon White Oak trees; and increase native herbaceous species richness by seeding and planting bulbs and plugs.

Long-term goal: The desired future condition is to have all key ecological attributes ranked as good, thereby maintaining and restoring habitat suitable for prairie dependent wildlife species.

Key ecological attribute outside normal range of variation

- Extent of habitat: conifer and maple encroachment (habitat conversion) is reducing the extent (area) of this habitat.
- Native grass and forb species richness: limited numbers of native plant species are present.
- Canopy cover vegetation structure: canopy cover of oaks vs. other trees.

Critical threats very high and high range

- Altered native herbaceous species composition: non-native species out-compete native forb species.
- Altered fire (disturbance) regime: increased cover of trees and woody shrubs.

Strategic restoration actions

- Restoration actions will be concentrated in areas where Oregon white oak woodland habitat has been encroached by Douglas fir, big leaf maple, Oregon ash, Douglas Hawthorne and cherry trees.
- A project will be developed to remove encroaching trees from existing Oregon white oak woodland habitats.
- Annual grass and forb species plantings will be focused in areas of tree removal.
- Ongoing control of invasive species, specifically thistle spp., ivy, clematis and Scots broom.
- Remove patches of poison oak as necessary to open up ground for grass and forb species plantings.

Conservation target: *Delphinium leucophaeum*

Short-term goal: By 2016, maintain current size of population. Add additional patches of plants to Oregon oak woodland habitat as restoration actions occur.

Long-term goal: The long-term desired future condition is to have all KEAs functioning at a good level, thus creating a naturally sustaining population.

Key ecological attribute outside normal range of variation

- Extent of suitable habitat for the species: extent (area) of habitat is being maintained at its current size.

- Number of patches (of the species) greater than one square foot: low number of patches.
- Abundance of species within suitable habitat: low abundance within suitable habitat.

Critical threats very high and high range
- All treats are currently at a low to medium range

Strategic restoration actions
- Restoration actions will be concentrated in areas of existing populations and areas of restored Oregon white oak woodland habitat and include planting of plugs or seeding of *Delphinium leucophaeum* plants.
- Plant additional patches of plants as additional tree removal work occurs.

4.5 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.

Long term stewardship (site maintenance)

Metro's Natural Areas Program is committed to long term stewardship of the Canemah Bluff site. Metro staff will conduct multiple site walks of the site per year to monitor natural resource condition and public use of the natural area. As determined necessary by staff, 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 visits to monitor for illegal use of the site, clean up of illegal dumping, mowing of buffer areas for fire safety, replacing signage and response to complaints.

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 (EDRR) program for invasive species including false brome and garlic mustard which have been documented in the area. EDRR 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 B.4 for a list of invasive species.

SECTION 5: RECREATION AND ACCESS

Next five years

The original goal of Metro's bond acquisition for Canemah Bluff included the idea of access. For Canemah Bluff the goals states, "Acquire property adjacent to existing public holdings that are essential to the establishment and management of a publicly accessible regionally significant natural area." Over the next five years actions will be taken to continue progress toward this goal.

Today people from the neighborhood walk through the natural area. Over the next five years, it is possible that people from further away, Oregon City or beyond, will start coming to Canemah Bluff. There are several reasons to presume this may happen. The new playground and facilities at the Canemah Neighborhood Park may draw additional people to the natural area. Also, the site will be added to the new edition of Wild in the City, available Fall 2011, which will have broad circulation regionally. Finally, the completion of the Trolley Trail, repairs to the old West Linn/Oregon City bridge over the Willamette, and on-street biking facilities in Oregon City may increase the number of bicyclists who find Canemah Bluff an attractive destination.

Over the next five years, improvements to the access system will aim to support both the current level of visitation and also a modest increase. The site will be monitored by staff and counts taken to determine if there is an increase of people using the trails. If that happens, the solitary and peaceful quality of the place may change and adaptive management measures, such as opening or improving more trails, may be needed to maintain a positive visitor experience.

In addition to the potential for more people at Canemah Bluff, the number and diversity of sensitive species may increase due to restoration efforts. The presence of additional threatened or endangered species may also call for rerouting or eliminating trails to protect important habitat.

Access to this regional gem will continue to provide enjoyment, learning and stewardship over the next five years. Based on input from neighbors and staff experience, a series of actions to improve the trail system will be taken. These actions include trail changes, programmatic opportunities including education and volunteer access, and management actions such as signage, maintenance and dog restrictions.

5.1 Trails

Over the next five years physical changes to trails will be subtle and will improve the safety and experience of the natural area. Some new trails are needed, some existing trails need improvements, some trails can be decommissioned, and some trails will remain as they are today. A map of the improvements is shown below and also included as Map 4.

Enhance trails

The basic concept for the trail system is to create two main loops. The first loop is around the prairie. To create this loop trail a new segment is needed, shown in yellow and labeled as #1 on the map. This addition allows for a short walk that includes a visit to the overlook as well as a walk through the prairie, conifer hardwood forest and oak woodland. Enhancement for this loop includes addressing safety at the overlook with a low wall or fence and signage. To cross the seasonally wet area on this loop, a boardwalk will be constructed over the wet area to the south of the overlook. This loop begins and ends at the new parking lot on Fourth Avenue.

The second, larger loop includes the cemetery road, Trail 14, and a walk through the neighborhood to connect Trail 14 with Fifth Avenue. This is a longer walk and includes more conifer hardwood forest. The loop includes an access point at Blanchard Street which will be relocated away from private property. A small bridge will be constructed on Trail 14 at the stream crossing and a new connector trail will link the cemetery trail with Trail 8 so a loop is formed. This forest loop and the prairie loop work well together and are currently the trails most used.

Signage will also be an enhancement to the trail system. Trailhead signage will include basic information about natural area, rules and information about the trail system. Wayfinding throughout the site will be on simple posts and include a small map and directional arrows. The signage approach is to install the least number of signs and still convey needed information; signage should detract as little as possible from the natural scenery. Metro's signage design standards will be used and examples are included in Appendix C.3. One interpretive sign will be located along Trail 3 at the entry to the natural area.

Trail 8 formerly was a road used for logging. This trail will be widened so that it can serve maintenance purposes, including emergency vehicle access in case of fire and for habitat restoration and maintenance. The entry will be off Highway 99W with the road continuing up the north side of Trail 10 and connecting to Trail 8. Some clearing of shrubs and small trees will be needed to reestablish the road at 10' width. Initially the surface will be crushed rock but over time it will fill in with soil and grass, much as the current cemetery road is today.

Decommission trails

Trails will be decommissioned that are dead ends, redundant with other trails, or pass through very sensitive habitat. Trail segments that will be decommissioned include Trails 2 and 5 in the prairie. Trail 2 will be replaced with a new trail to the northeast that starts at the parking lot. This trail will angle over to the bluff trail, in a similar direction to the existing trail. Decommissioning and replacement of Trail 2 allows the prairie to be more continuous, providing better habitat for wildlife. Trail 5 travels through a wet area and is redundant with Trail 4.

Trail 6 leads to a second overlook where the bluff is wrapped with wire fencing to reduce rocks falling on Highway 99E. The reason to decommission is this trail is two-fold. The overlook is unsafe with a very abrupt drop to the highway below and the trail passes through a sensitive area with vernal pools and shallow soils that host rare plants and animals.

Currently Trail 9 skirts the cemetery right beside the fence. It will become redundant when the new connector is built between the cemetery road and Trail 8. The new connector will make a more direct connection and also will have a more interesting path that allows views through to the adjacent oak woodland.

Trails 12 and 13 currently dead end in the forest and will be decommissioned at this time. There is future potential to connect Trail 11 with Trail 14 for an additional loop. There is also future potential to extend Trail 13 into the ash forest wetland with a boardwalk and viewing platform. Both of these future opportunities may become important if more people are using the site.

Trails to remain the same

Trail 7 is a very lightly used trail today that goes from the cemetery road to a rock outcrop area in the oak woodland. This is sensitive habitat where additional *Delphinium leucophaeum* plants become established. It is also a special place where people can enjoy the rocks and oak woodland at a more intimate scale than the cemetery road. The trail leads up and over the rocks, with an interesting and filtered view of the river and the banks and trees beyond. Few people use this trail today and those who do have spoken about its merits. As a result, it will remain open but not improved. If use increases and more demand trails are created in this vicinity, it would be appropriate to formalize this trail to control impacts. Immediate action will be to place a sign requesting that people stay on the trail.

Trail 10 is a loop that used to be a road and has become overgrown. It encircles an ash forest wetland that has seasonal interest as the area fills up with water. The northern part of the loop will become part of the maintenance road. The rest of the trail will remain as is with periodic maintenance to keep the pathway clear.

5.2 Programmatic (education and volunteers)

Metro's regional parks and natural areas were created to intentionally give residents within our region opportunities to enjoy, experience participate in and understand the natural world. Conservation education staff at Metro work with schools, civic organizations and the general public

to provide nature programs that 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 "GreenScene" publication. Information about conservation education programming is also available on Metro's website, www.oregonmetro.gov.

Education program

Currently the Canemah Bluff site is utilized three to five times per year for nature walks that are open to the public. The themes that have encompassed these programs have included the geology of Oregon, Mother's Day birds and blooms walks, bird identification, oak woodland and prairie ecology and open house tours to showcase Metro's natural areas program. From an education perspective, Canemah Bluff's unique natural and cultural history holds strong potential for education programming. Schools and civic organizations have yet to request or inquire about program opportunities on this site, and at present Metro has no plans for significant expansion of Canemah as an educational site beyond its current usage.

Volunteer program

The primary goal of the volunteer program is to provide a variety of high-quality, meaningful volunteer opportunities that add value and capacity to Metro's work. Through these opportunities, community members are able to learn about and enjoy the Canemah Bluff 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 gauge the progress of its restoration efforts and track the effects of public use on wildlife.

Native Plant Center volunteers: Metro's Native Plant Center, located near Wanker's Corner in Tualatin, provides an important supply of rare locally adapted native seeds and plant stock to support Metro's natural area restoration projects. Staff and volunteers collect, grow and distribute native species for planting at restoration sites throughout the region. The Canemah Bluff site is the focus of collections for rare *Delphinium leocophaeum*, camas and other forb species in the prairie and Oregon white oak woodland habitats. Each year these plant species are re-seeded back into the Canemah Bluff Natural Area as well as other natural areas across the region.

Restoration volunteers: The restoration volunteer program focuses on providing groups of all kinds the opportunity to contribute to the health and vitality of our parks, natural areas and cemeteries. Primarily involving a short-term commitment of one day, restoration volunteers experience an engaging, hands-on learning opportunity with immediate, tangible results. As the restoration program evolves Metro hopes to foster a corps of partners for a more long-term commitment geared toward ongoing education and stewardship.

Volunteer site stewards: The natural area site steward volunteer program enhances Metro's parks and natural areas for community members and creates healthy habitat for fish and wildlife through active monitoring of site conditions and use by both people and wildlife, and personal and group restoration, maintenance and educational activities. The steward program provides opportunities for committed volunteers to take an active, leadership role in Metro's natural areas. The steward engages in hands-on small restoration projects for the site as well as monthly monitoring. Stewards can take on crew leader roles with volunteer groups for restoration educational projects at the site.

5.3 Site management (trails, signs and public use)

Metro's management of the site will include enforcement of the posted rules to provide protection for wildlife, water quality, archeological sites 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 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

The Canemah Bluff site is steeped in history and contains a number of archeological resources. Metro has actively surveyed the site to identify the locations of the archaeological resources and Metro staff walk the site quarterly to inspect for damage to or looting of archeological sites. If any damage or unlawful use is identified Metro will work with the State Historic Preservation Office to address and, if possible, repair the damage. Metro also partners with the Clackamas County Sheriff and the Oregon City Police to investigate damage to Metro property.

Dogs

One of the most difficult management issues and detrimental impacts to Canemah Bluff Natural Area is the introduction of dogs by visitors. Research shows that even if dogs stay on the trails, they are perceived as predators by wildlife and their zone of influence 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 within the Canemah Bluff Natural Area. Signage, self-policing and enforcement are all needed to effectively manage people with dogs.

Signage

As part of the integration of people into the system the need for regulatory, wayfinding and interpretive signage becomes necessary. The development of this signage system will be addressed over the next five years. As other physical aspects of the system, such as trails, overlooks and viewing platforms, are implemented the signage can be added on a project-by-project basis. It is critical that the system remain simple and to the extent possible subtle. Without proper planning it is possible for the landscape to become cluttered with redundant or unnecessary information. It should be the goal of the system to be beneficial and informative to the visitor but not dominate the visual experience.

Prior to integration of the signage two critical steps must be accomplished: the graphic standard must be chosen for the signage and the content of each sign type must be articulated. Metro's Signage Standards Manual establishes a graphic standard that will be integrated into the entire system based on three different types of signs: regulatory, wayfinding and interpretive. The name of the facility, the key agency, contact numbers and hours of operation will also be standardized.

Trail maintenance

All facilities and furnishings, including recreation trails and shared-use paths and interpretive signage require regular maintenance to reduce the damage caused over time by the effects of weather and use. Many maintenance issues can be reduced if properly addressed in the planning and design phases before construction even begins. Properly constructed trails generally provide adequate water drainage; however, unique situations will require careful planning and design to handle the damage that can be done by water or repetitive use. Adequate subgrade preparation and thickness, as well as the width of the trail or shared-use path surface, are important in reducing future repairs. Considering the types, sizes, and weights of vehicles that may need access to the trail for maintenance or emergencies will be helpful in reducing the damage that may occur to the trail.

Basic trail maintenance activities include a number of preventative and corrective actions:

- Checking the structural integrity of all built trail features such as bridges, steps and railings and recording any repairs required.
- Keeping the tread surface free of obstacles or hazards, such as downed trees and landslides. Removing loosened rocks and earth in a disturbed area and restoring the trail tread to its intended state.
- Clearing and maintaining drainage features to minimize trail erosion and environmental damage and using drainage methods causing the least impact on the natural environment. These methods include clearing channels, maintaining an outslope on the trail bed, cleaning drainage dips or water bars, clearing parallel ditches and cleaning culverts through or beneath the trail.
- Cutting brush to define the established trail and/or protect adjacent resources.
- Maintaining the tread in a condition that can be negotiated by trail users by restoring sloped or crowned surfaces to facilitate drainage and extending the trail back to its original width.
- Filling ruts and holes and restoring raised approaches to bridges.

5.4 Strategic actions (recreation and access)

The following actions describe the proposed improvements over the life of this plan. The projects were established as part of this Conservation Plan development and should be revisited every two to three years for additions and updates. Cost estimates for these actions are included in section 6.3 of this document. Coordination with the City of Oregon City and the cemetery association will be required to implement some of these actions.

Construct new trails

- Create a connector trail between the cemetery road and the Canemah Neighborhood Park parking lot. This trail will be approximately 350' feet long, aligned to avoid the wetland and maintain an appropriate distance from the nearby house. The trail will be 3' wide with natural surface. Construction will include base rock with top dressing of ¼" minus rock.
- Create a connector trail between the cemetery road and Trail 8. This trail will be approximately 235' long and 3' wide with natural earth surface. The alignment will wind through the low rocks in this area and construction will include a 2'-3' wide natural surface with no rock.

Improve existing trails

- Improve the trail surface on Trail 14 in selected locations. The surface will continue to be natural earth but will be smoothed out where the trail winds through prominent tree roots and over large rocks. Trail will be maintained as a 2'-3' wide natural surface.
- Improve trailhead at Blanchard Street by relocating trail back from the existing home site and connecting to Trail 14. Coordination with the city will be required for this action. Trail will be built to match trail surface of Trail 14.

- Improve trail from the Canemah Neighborhood Park to the overlook so it is accessible for many people with disabilities. The trail will be 3' wide with natural surface. Construction will include base rock with top dressing of ¼" minus rock. Trail will be built to match the new soft surface path in the Canemah Neighborhood Park.
- Cemetery road has seasonal drainage problems. For approximately 1,905' add ¾" minus rock to improve surface. Coordination with the cemetary association is required for this action.

Decommission trails

- Decommission Trails 2 through 5 in the prairie by adding top soil and over seeding with native grass and forb species. Add temporary signage to inform visitors of this change.
- Decommission Trail 9 (adjacent to the cemetery fence) as new connector trail is built from the cemetery road to Trail 8.
- Decommission dead end trails including Trails 12 and 13 by conditioning the compacted soil and adding brushy material and native seed.
- Decommission Trail 6 by adding top soil and over seeding with native grass and forb species.
- Decommission Trail 15 (driveway to old home site) to natural surface and plant woody shrubs and trees to stabilize. Non-natural pavement, concrete and other debris will be hauled off site and disposed.

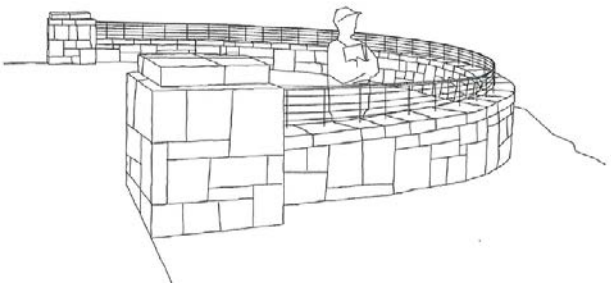
Install new signage

- Install trailhead signage at the Canemah Neighborhood Park and Paquet Street entry points. Coordinate with the cemetery association to install trailhead signage at the start of the cemetery road or along the road as trails enter the natural area.
- Install wayfinding signs at major intersections to inform visitors of their location and directions to connecting loops and entry points.
- Install regulatory and information signs including natural area rules, maintenance road/fire lane identification, sensitive habitat, hazardous cliff and additional signs as needed. Signs will be placed at strategic locations throughout the natural area.

Bridges and boardwalks

- Construct a new bridge on the upper segment of Trail 14. Construction to be 3’ wide by 12’ long and made of wood with handrails on the downhill side.
- Construct two segments of boardwalk on Trail 4 connecting the Canemah Neighborhood Park to the cemetery road. Boardwalks shall be constructed of wood and be designed to minimize impact of the prairie habitat.

Overlook



- Construct either a wood fence or rock wall at the overlook in the prairie. One idea of the treatment is illustrated here by landscape architect Kurt Lango.
- The design should blend in with the rock ledge and be as unobtrusive as possible while providing a safe overlook.
- Make the route from the parking lot to the overlook accessible for people with disabilities. It will be paved up to the Metro property as part of the Canemah Neighborhood Park project. From that point, the path can be modified to be 3' wide and free of ledge rock. The surface at the overlook could be earth or compacted ¼ minus gravel, the guiding principles being that the surface be firm, stable and slip-free.

Maintenance road

- Connect the existing maintenance road that enters off Highway 99 to the cemetery road. Existing or historic road alignments will be used and approximately 500' of road will require a moderate level of vegetation removal and some grading. The roadway will provide an access point away from the neighborhood and will be used for land management and habitat restoration activates as well as serve as a primary entry point for fire crews. The roadway will also serve as a trail where it matches with trail alignments mentioned above and as a fire break in case of wildfire. Road surface will include base rock and ¾" minus top dressing to 10' wide.

5.5 Beyond five years or as needed

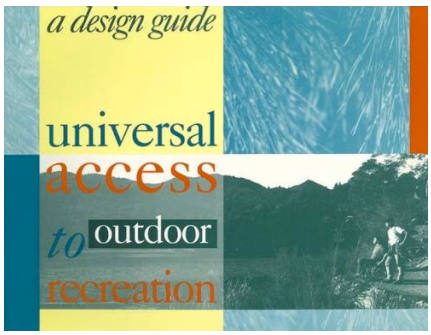
In the future there may be more people walking the trails at Canemah Bluff. With increased use there are several areas where adjustments to the trail system will help accommodate people gracefully. The general idea is to add trail length and options to disperse the people.

The Trail 7 loop could be validated with trail construction of 3' in width. This loop serves as an additional destination to the cemetery. There is a good vantage point on top of the rocks, with filtered views of the river and west hills.

An additional trail can be added by connecting Trail 11 with Trail 14. Today this trail is barely visible and generally is uphill and parallel with Trail 8. Making this connection provides additional trail capacity and also adds a longer walk, using the cemetery road, Trails 8 and 10 then 11 and 14.

Finally, an additional opportunity is presented by Trail 13. This trail segment is short and ends abruptly at an area of ash forest wetland. This is a future opportunity to construct a boardwalk and viewing platform across the wetland.

Access for people with disabilities



The Prairie Loop, Trails 3, 4 and 1, has the potential for a higher level of accessibility. This is not to suggest that the trail be an "accessible route" as defined by the ADA Accessibility Guidelines, but rather that it have a level of accessibility that would be comfortable for and usable by many people with disabilities. This approach and the associated principles are described in Universal Access to Outdoor Recreation: A Design Guide [USDA Forest Service].

The loop would be consistently 3' in width with a surface that is firm, stable and slip-resistant. Where conditions permit, wider areas that can offer passing areas and places to rest would be provided

In order to avoid the uneven rocky surface that is present along much of this trail, the height of the trail would be raised slightly so that the surface is smooth, or the alignment adjusted to avoid rocks. On both sides of the trail, shrubs and limbs would be trimmed to a width of 5' clear at eye height, whether standing or in a wheelchair.

The slope of the trail would need adjustment at Trails 4 and 1. Because these are relatively short runs of steeper slopes, with some adjustment they are manageable for many wheelchair users, as long as flat, resting places are provided at the top and bottom of the slopes.

This loop has a number of advantages for people with disabilities. The start of the loop includes accessible parking, restrooms and water in the neighborhood park. The viewpoint is a close but noteworthy destination. For a longer trail experience, the cemetery road is also accessible to many people with wheelchairs.

Regional trail

The Oregon City Loop Trail has a conceptual alignment through the Canemah Bluff area. The bluff presents a formidable barrier to the trail. At this time, Oregon City is planning to make the loop with on-street facilities at the top of the bluff, rather than through the natural area.

Potential for future regionally accessible natural area

At the time of this writing, the Canemah Bluff Natural Area includes 120 acres contiguous with the neighborhood park and 161 acres to the south. In the future if access is secured through the intervening parcels, the size and diversity of Canemah Bluff Natural Area presents the opportunity for a regional destination. In this case, a second parking area would need to be located at the southern end and trails laid out that provide diverse experiences and link the north and south properties.

SECTION 6: COORDINATION

The Conservation Plan has laid out the history and context of the Canemah Bluff site, along with the conservation and recreation 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 the visitor experience 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 to implement projects.
- Funding to realize the priorities of this Conservation Plan.

With these tools, the priorities established by this Conservation Plan will be realized.

6.1 Monitoring framework

Monitoring at the Canemah Bluff site is an integral part of an adaptive management approach to restoration and maintenance. 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 and 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. Generally, the greatest threats to Canemah Bluff Natural Area are traced to:

- Altered native herbaceous species composition: largely by invasive plant species.
- Altered fire (disturbance) regime: encroachment of woody vegetation (trees and shrubs) in the oak woodland and prairie habitats.
- Human disturbance (demand trails, fires, camping, dogs).

The monitoring plan 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. The monitoring plan is likely to change over time; however, this is a worthwhile starting point and a useful tool for focusing Metro staff efforts. More detailed information is located in Appendix D

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 abundance and composition of native plants and invasive species.

Avian point counts: Avian (bird) surveys during breeding season follow an established and widely used protocol that allows data sharing with other scientists. By tracking changes in the bird community, Metro can detect changes in habitat function as restoration projects mature. The species present can indicate if a suitable habitat for sensitive species is present.

Ocular estimates: 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.

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.

Conservation targets and monitoring techniques

Wet prairie, dry prairie mosaic: A combination of transects, existing point counts and GIS work will be used to monitor key ecological attributes of this conservation target.

Oregon white oak woodland and savannah mosaic: Existing avian point counts and a combination of photo points, transects, GIS work and ocular estimates of plant and wildlife species will be used to monitor key ecological attributes of this conservation target.

Delphinium leucophaeum: Ocular estimates of numbers of plants and clumps will be used to monitor the condition of key ecological attributes of this conservation target.

6.2 Funding

Costs in Tables 3 and 4 are general estimates for the purpose of understanding the magnitude of costs to implement the structural elements of the plan, as described in Sections 4 and 5. The costs are estimated on hiring contractors to complete the work and include a construction contingency for time and materials. In addition to these project implementation costs we have included annual maintenance costs for the Canemah Bluff site in Table 5.

Table 3: Access and recreation strategic action cost estimates

Strategic action	Cost
Construct new trails	$4,300
Decommission trails	$7,050
Improve existing trails	$5,500
Overlook	$20,000
Bridge and boardwalks	$17,000
Maintenance road improvements	$29,500
Decommission road	$6,500
Signs (regulatory, entry, way finding)	$22,350
Total	**$112,200**

Table 4: Conservation target cost estimates

Strategic action	Cost
Wet prairie upland prairie mosaic restoration	$26,000
Oregon white oak woodland and savannah mosaic restoration	$72,500
Delphinium leucophaeum restoration	$7,500
Invasive species treatments in all habitat areas	$12,500
Total	**$118,500**

Table 5 – Annual maintenance cost estimates

Annual maintenance	Cost
Maintenance mowing in prairie	$2,500
EDRR invasive weed treatments	$1,000
Trail maintenance	$2,537
Total	**$6,037**

6.3 Public involvement

As projects are developed Metro will provide local stakeholders and residents of Canemah 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 the public to be aware of the project and its implications.

MAPS

Map 1 – Ownership and planning area

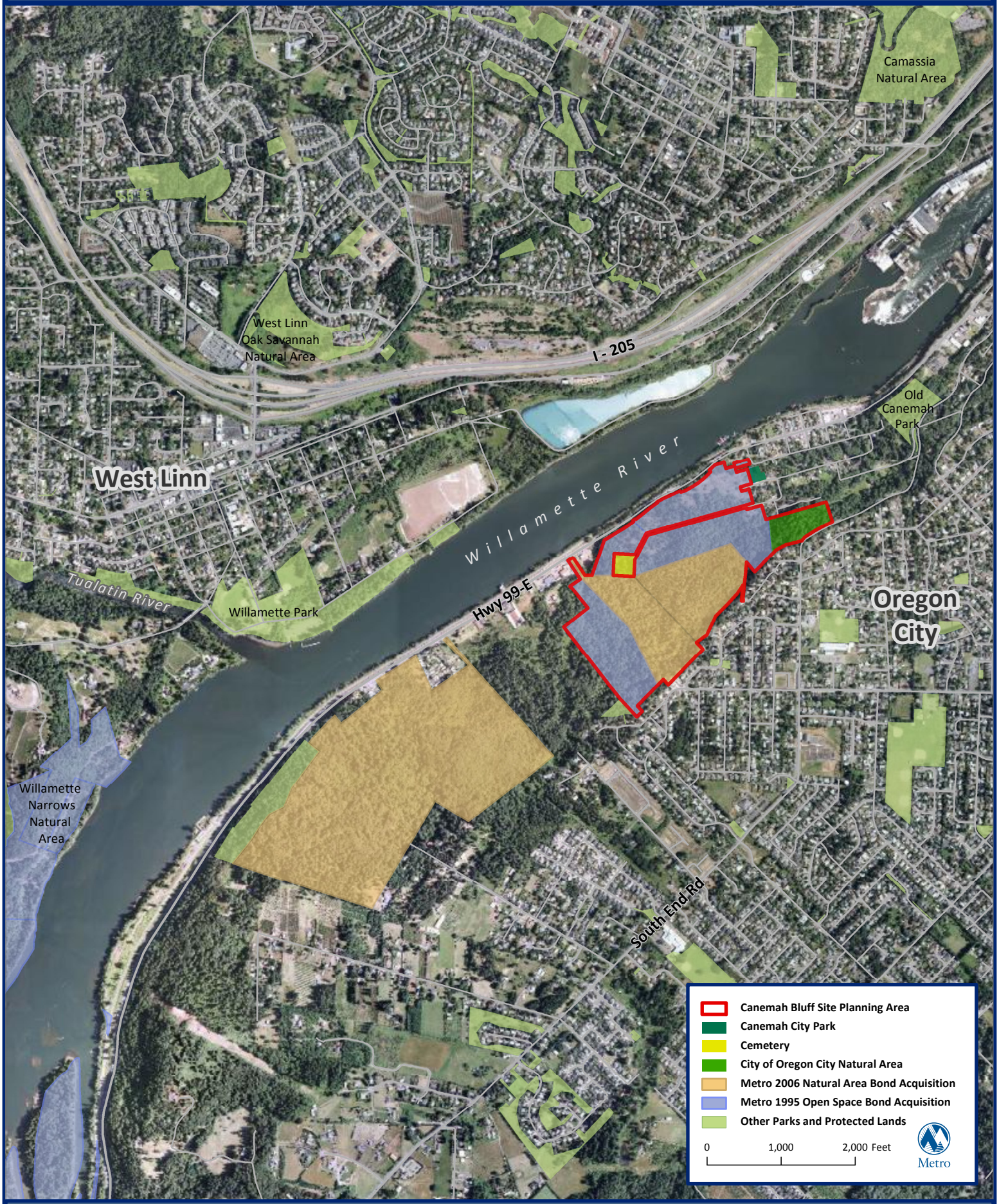
Map 2 – Physical features

Map 3 – Natural habitat types

Map 4 – Access and recreation – strategic actions

Map 1

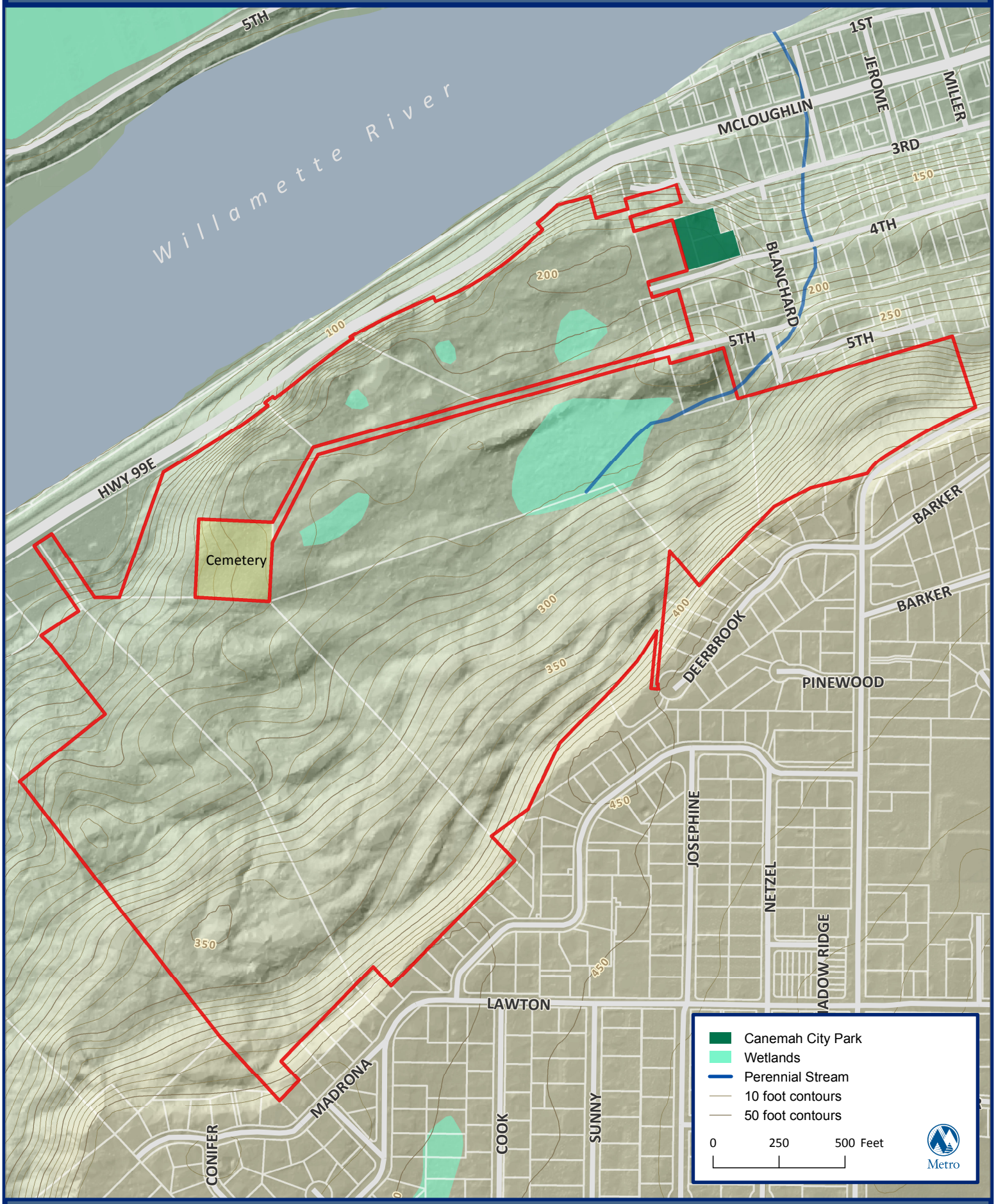
Ownership and Planning Area



Canemah Bluff Site Conservation and Management Plan

Map 2

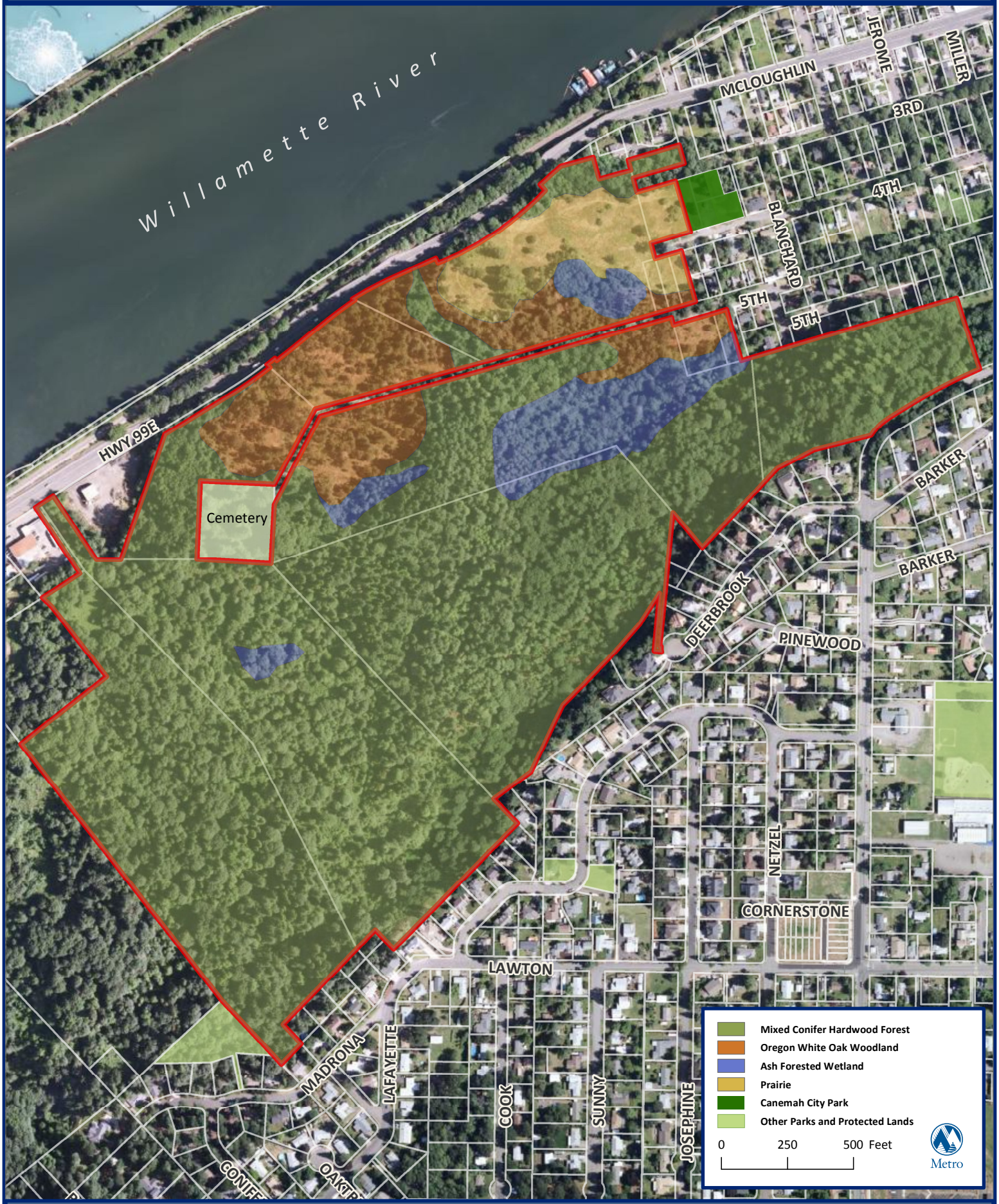
Physical Conditions



Canemah Bluff Site Conservation and Management Plan

Map 3

Natural Habitat Types



Canemah Bluff Site Conservation and Management Plan

Map 4

Access and Recreation - Strategic Actions

Canemah Bluff Site Conservation and Management Plan

APPENDICES

Appendix A – Historic context

Appendix B – Conservation

B.1 Conservation targets

B.2 Key ecological attributes

B.3 Threats and sources

B.4 Invasive species

Appendix C – Recreation and access

C.1 Trail counts

C.2 Summary of public comments

C.3 Signage

Appendix D – Monitoring

Appendix E – References and additional resources

APPENDIX A

Historic context

The following excerpt is from the Canemah Bluff Archeological Survey which was completed for Metro by Willamette Cultural Resource Associates in March 2010.

Native people

From historical accounts and ethnographic data, anthropologists have reconstructed that the lower Willamette River from its mouth to Willamette Falls lies within the traditional homeland of the Chinookan peoples. At the time of EuroAmerican contact various Chinookan-speaking groups occupied the Columbia River valley from The Dalles area to the Pacific Ocean. Ethnographers today differentiate the Chinookans primarily on linguistic variation. Speakers of the Lower Chinookan language included the Clatsop and Chinook proper, who lived around the mouth of the Columbia River. Upper Chinookan speakers occupied the upriver areas. Upper Chinookans in the Portland area consisted of two groups, the Multnomah and the Clackamas. Multnomah villages were concentrated on Sauvie Island, along the Multnomah Channel, and along the northern bank of the Columbia River downstream of the mouth of the Willamette. The Clackamas were found primarily on the river of that name, at Willamette Falls, and along the lower Willamette River (French and French 1998:360-363; Silverstein 1990:533-535).

Upper Chinookan can be considered a chain of related languages, with the Multnomah and Clackamas thought to have spoken different languages (very little information is known about the Multnomah language). The Clackamas spoke Kiksht, a language they shared with the Chinookans who lived in the western Columbia River Gorge (French and French 1998:360, Figure 1; Silverstein 1990:534-535). There were close ties between the Clackamas and the groups of the Columbia River Gorge (now designated the Cascades Indians). These relationships, the independence of individual Chinookan villages, and the mobility of both individuals and groups in the lower Columbia River valley can make it difficult at times to clearly establish who was where and when. EuroAmerican concepts of territoriality and land and resource ownership are rarely applicable to the present study area. Ties of kinship through "blood" and marriage usually defined where individuals lived and rights of access to resource locations. As individuals often married outside their home villages, most families had networks of relationships that crossed both linguistic and cultural boundaries.

The complex nature of pre-contact relationships among Native populations is very evident in the Willamette Falls vicinity, including the Canemah area. Although Chinookans were the dominant group at Willamette Falls, the falls were a fishing location of such regional importance (especially for Pacific lamprey [Lampetra tridentata]) that many other groups regularly visited the falls area. The most frequent visitors were probably northern Kalapuyans, who occupied much of the northern Willamette Valley, and Molalas, whose homeland was primarily the eastern edge of the Willamette Valley and the western slopes of the Cascade Range. Jacobs (1959:526-527), for example, recounts a Clackamas Indian story of hosting and entertaining a group of Kalapuyan visitors at Willamette Falls.

The importance of Willamette Falls is evident in the number of traditional Indian stories associated with the falls (e.g., Clark 1953:99-100; Jacobs 1958:67-75, 273-274, 1959:458-466, 643-644; Lyman 1900:184-187; Lynch 1973:46-48). Willamette Falls was noted by Lewis and Clark, although the expedition never actually visited the falls. The members of the expedition had missed the entrance of the Willamette River due to islands at its mouth that obscured the river. While camped at the mouth of the Washougal River in April 1806, they were visited by a group of Indian men, two of whom "were Cash-hooks and resided at the falls of a large river which discharges itself into the Columbia on it's [sic] South side some miles below this" (Moulton 1991:54). This information was the first Lewis and Clark learned of the existence of the Willamette River and Willamette Falls. While visiting a nearby Indian village a few days later, Clark asked an old man "to draw me a Sketch of the Multnomar [Willamette] River and give me the names of the nations resideing [sic] on it." The old man told Clark there were four groups on the lower "Multnomar:" the "Clark a-mus" on the Clackamas River; the "Cush-hooks, who reside on the N.E. Side below the falls;" the "Char-cowah who reside above the Falls on the S.W. Side;" and the Cal-lar-po-e-wah, who lived above the falls (Moulton 1991:66 [italics in original]).

There are no later EuroAmerican references to these villages at the locations given by Lewis and Clark, but "Cush-hooks" was probably just above the falls and Char-cowah was just below the falls. "Cush-hooks" – also often spelled "Cashhooks" – is probably derived from qʹacūxcĭx, the Clackamas Indian name for a village just above Willamette Falls that may have been at the present location of Canemah (Philip Drucker, Clackamas Notes, 1934, Mss. 4516[78], Archives of the Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.). John Wacheno, the Clackamas Indian interviewed by Drucker in the 1930s, also reported a village knīma at Canemah, although it isn't clear if this name is truly Chinookan or is just the Chinookan form of the historical name of the community. (Zenk [2008:27] questions whether "Canemah" is derived from a Chinookan word or name.)

The Lewis and Clark Expedition was a transient EuroAmerican presence in the region. A more permanent presence was established in 1811, when the Pacific Fur Company developed a trading post at the mouth of the Columbia River named "Astoria." Auxiliary posts were operated in the Willamette Valley from 1812 to 1814. The initial fur-trading expeditions up the Willamette River provided the first direct EuroAmerican contacts with Willamette Falls. Unfortunately, few of the first fur traders up the Willamette are known to have kept any written records of their experiences.

The first detailed EuroAmerican description of the Willamette Falls area is provided in January 1814 by Alexander Henry of the North West Company (which had acquired the Pacific Fur Company in 1813). Henry (Gough 1992:657-659, 664) camped just below Willamette Falls near a large Indian village of "Clow e walla Indians." The next day, Henry reported seeing the remains of an abandoned village just above the falls at which "the remains of their dead are still seen there. This spot is bound in the rear by a high range of perpendicular rocks over which rushes a considerable stream of water forming now a pleasant fall of water after the late heavy rains" (Gough 1992:658-659).

The abandoned village above Willamette Falls largely disappears from later EuroAmerican accounts but the Clowewalla village or another Indian settlement was present on the west side of the river into the early 1850s. The only possible reference to the village above the falls was an account of Catholic missionary Modeste Demers, who reported in 1841 that "above and below the falls are seen the sites of large villages which the fevers of 1830 entirely depopulated" (Landerholm 1956:80). Although Henry's account indicated the upriver village was abandoned well before the "fevers of 1830" (the malaria epidemic of 1830-1834, described below), Demers could have assumed that all abandoned settlements were due to the devastating malaria epidemic.

Fur traders became more of a presence at Willamette Falls in the late 1820s, after Hudson's Bay Company (HBC), the successor of the North West Company, established Fort Vancouver near the mouth of the Willamette River in 1825. In the late 1820s and early 1830s, Dr. John McLoughlin, the chief factor at Fort Vancouver, planned to construct several facilities at Willamette Falls, including a gristmill and sawmill. The HBC constructed a few houses and a granary at the falls in the 1830s but the mills were not constructed until the early 1840s. In 1830, McLoughlin claimed the land on the east side of the falls and Abernethy Island for the HBC, although this claim was later considered a personal claim. In 1842, McLoughlin platted the town of Oregon City on his claim. Unfortunately for McLoughlin, there was no legal mechanism at the time to establish the claim. As a result of a dispute with a Methodist missionary who settled with McLoughlin's permission on the claim, Congress denied the McLoughlin claim in the Donation Land Act of 1850 (Rich 1944:xl-li, lxii).

The appearance of the HBC at the falls in the late 1820s was a harbinger of a growing EuroAmerican presence in the area. Retired employees of the HBC began settling in the French Prairie area of the northern Willamette Valley in the early 1830s. In 1834, a Methodist mission was founded at French Prairie. The mission was increasingly focused at Willamette Falls beginning in 1840 to 1841 (Jetté 2007; Johansen and Gates 1957:163; Lee and Frost 1968:194, 248 [1844]).

The growing number of EuroAmericans in the lower Columbia region in the early 1800s had severe consequences for native populations. A smallpox epidemic of uncertain origin struck native populations in the Pacific Northwest in the 1770s and another outbreak of smallpox occurred in the first decade of the 1800s. For Native groups in the lower Columbia region, the greatest disaster was the malaria epidemic of 1830 to 1834. EuroAmericans with the disease exposed local populations to malaria in 1829. In October 1830, McLoughlin reported that the "Intermitting Fever . . . has appeared at this place [Fort Vancouver] and carried off three fourths of the Indn. Population in our vicinity" (Rich 1941:88). By the time the epidemic ended, approximately 98 percent of the Native peoples of the region had died. There were approximately 2,000 to 2,500 Clackamas in circa 1800 to 1810; by 1855, there were fewer than 80 (Boyd 1999: Tables 16 and 17).

As the Indian villages at Willamette Falls were decimated by disease, the vacuum was partially filled by Indians from other areas who had suffered less from the epidemic. In 1835, naturalist John Townsend visited a village of Klickitat Indians two miles below Willamette Falls (Townsend 1978:192 [1839]). Gibbs (1877:170) reported that "after the depopulation of the Columbia tribes by congestive fever . . . many of that tribe [Klickitat] made their way down the Kathlapūtl (Lewis River), and a part of them settled along the course of that river, while others crossed the Columbia and overran the Willamette Valley." Gibbs's reference to "Klickitats" probably included other Sahaptin-speaking groups.

The Indians continued to have a strong presence at Willamette Falls through the 1840s. But the Indian population was increasingly diverse, with Kalapuyas, Molalas, and Klamaths living at settlements at or near the falls, as well as Klickitats (Hajda et al. 2004:37). EuroAmerican settlers in the early 1840s also reported that Nez Perce and Flathead "always" came to Willamette Falls to trade for salmon (Sidney Moss Papers, 1878, Mss. 1067, Oregon Historical Society Regional Research Library, Portland), and Dr. William Tolmie of the HBC encountered a group of Indians on the Cowlitz River in 1833 "bound for the Wallamette [sic] to procure salmon" (Tolmie 1963:186).

Further altering the situation at the falls was the flood of American settlement that began in 1843. In 1842, the nascent Oregon City had 15 EuroAmerican inhabitants; four years later it had an estimated population of 600. The surging EuroAmerican population at the falls displaced Indians from their traditional settlements. The Clowewalla village on the west side of the falls had shrunk to six or fewer houses by the 1840s, and the entire village was reportedly burned by American settlers in the late 1840s (Dye 1911:663; Landerholm 1956:80; Palmer 1983:76 [1847]; Sidney Moss Papers, 1878, Mss. 1067, Oregon Historical Society Regional Research Library, Portland; Stanley 1852:61-62).

By the late 1840s, Oregon City had become the largest EuroAmerican settlement in the Pacific Northwest. It therefore had become a center of trade in goods and services for both EuroAmericans and Indians. Catholic Church baptismal records for Oregon City for the period 1846 to 1850 (Munnick 1984:2-12) document the presence of Spokane, Cascades, Wasco, Walla Walla and Yakama Indians, with Spokanes referenced most often. These church records are unlikely to represent all the Indians living in or visiting Oregon City in those years, and the presence of some of these groups is likely to reflect pre-contact patterns of seasonal visits to Willamette Falls as a regional trading center.

The rapid American settlement of western Oregon eventually led to the need to clear Indian title to the land to provide a legal basis for the land claims of American settlers. In 1851, a series of treaty negotiations were conducted with Native groups in western Oregon. Separate treaties were signed with five bands of Kalapuyans, the Molala and the Clackamas. The treaty with the Clackamas ceded lands bounded by the Cascade Range on the east, the Columbia River on the north, the Willamette River on the west, and south to lands ceded by the Molala (Oregon Spectator 1851; the actual text of the treaty has been lost). The 1851 treaty with the "Principal Band of the Moo-lal-le Tribe of Indians" included cessions of lands in the Willamette Valley on the east side of the Willamette River from Abernethy Creek south to the vicinity of Champoeg (University of Wisconsin 2010). The present Canemah location would thus have been ceded under this latter treaty. The 1851 treaties were never ratified by Congress, however, due to opposition by American settlers to the provisions of some of the treaties that would have created reservations in the Willamette Valley.

Treaties signed during a second round of negotiations in 1854 and 1855 were ratified. One of these treaties included the Kalapuyan peoples of the Willamette Valley and Chinookan groups of the Clackamas and lower Willamette river drainages, including the Clackamas and the "Clow-we-wal-la or Willamette Tum-water band." All of the lands in the Willamette Valley were ceded under this treaty (Beckham 1990; Kappler 1904:II:665). No reservations were formally defined in the treaties with the tribes of western Oregon, but two reservations (Siletz and Grand Ronde) were established

by executive order shortly after the treaties were ratified. With creation of the reservations, federal troops began the process of relocating the Willamette Valley groups to the reservations. Some of the Chinookans of the Clackamas and lower Willamette river areas moved to the Warm Springs and Yakama reservations where they could be with their upriver relatives. Recent research for the Willamette Falls area (Hajda et al. 2004) indicates that there was regular movement of Indian people with ties to the Willamette Falls area between the Grand Ronde, Siletz, Warm Springs and Yakama reservations.

The federal government intended the reservations to serve as a land base for transforming Indians into farmers. Neither the Grand Ronde nor the Siletz reservations offered much arable land, however, and the Indian agents on the reservations lacked the resources to provide for the new reservation populations. As a result, many Indians moved off the reservations during the warm season to visit traditional resource locations or work for white farmers. Agents reluctantly acknowledged that survival depended on this off-reservation subsistence and either tacitly or explicitly approved the off-reservation travel. This travel included regular visits to Willamette Falls through the 1850s and 1860s and into the early 1870s. By the later 1870s, Indian agents had become more insistent that Indians remain on the reservations, and some agents began removing Indians from official lists who remained too long off the reservations (Hajda et al. 2004:49-51).

There were also a number of Indians who either eluded relocation or returned to their traditional homes after being placed on a reservation. Indians continued to have a presence at Willamette Falls through the late 1800s but a presence that was slowly waning. Dye (1911:672) wrote that as white settlement at Oregon City grew, "the Indians moved their camps to the first bench, the second, and finally to the third" up the bluffs at Oregon City. As industrial development of the falls grew during the late 1800s and early 1900s, the falls became less accessible for fishing and Indian visits to the area dwindled.

At Canemah, the active Indian presence also diminished through the late nineteenth century. Lynch (1973:49) notes that "children of Canemah pioneers remember the huts of a few Indian families who lived on the hilltop overlooking the little settlement." Lynch (1973:50) also mentions "Indian Mollie Clark," who lived with her husband at the northern edge of Canemah, overlooking Willamette Falls. Dye (1911:672) reported that "twenty feet of the Canemah bluff cut off by the railroad [the Oregon Central Railroad, constructed 1869-1871] was an Indian burial ground." Although the location of the higher ground referenced in these accounts is uncertain, it is more likely to have been the area immediately east of the Willamette Falls given proximity to the falls and greater ease of access.

Despite difficult access, Indians continued to come to Willamette Falls to fish and gather lamprey through the twentieth century, although much of that knowledge is presently reflected in oral traditions rather than written records. Willamette Falls continues to be an important Indian fishing location, and is probably more important as one of the remaining traditional locations at which there is still a good run of lampreys (Hajda et al. 2004:63-65).

EuroAmerican history

The earliest historic account of the area around Willamette Falls came from Lt. Clark. He recorded an account from an aged informant that the "Cush-hooks" and the "Charcowah" resided at Willamette Falls. The "Cal-lar-pe-ewah" (Kalapuya) were very numerous and inhabited the country above the falls (Moulton 1991:66). A sketch map was made by two Indian informants in a Columbia River camp on April 2, 1806. The map was copied by Meriwether Lewis and became an official part of the report on the geography and Indian tribes of the Northwest.

The McKenzie Expeditions ascended the Willamette River in April of 1812. On this journey, the fishery at Willamette Falls was described to a trapper in his party by the name of Robert Stuart. Stuart asserted that "salmon and sturgeon ascend no further than the foot of the falls" (Stuart 1935:32).

The Ross Expedition encountered resistance from the tribes above Willamette Falls in 1816 because the EuroAmericans were outfitted to trap as they entered Indian lands. As they began paddling up the Willamette River above the falls, both shores were lined with Indians in threatening stances near trees and bushes. The natives requested "instant payment, by way of tribute" to "suffer them to hunt on their lands." The expedition naively took this as a bluff, and they were turned around quickly when a rain of arrows met their advance into the territory. One EuroAmerican was injured, and one Indian was killed in the brief conflict. Later that year, Ross negotiated with the tribe and paid for their dead which opened the Willamette to white endeavors again (Ross 1956:77). There were accounts of cedar longhouses and villages above and below the falls as late as 1845. It was reported that year that the Hudson's Bay Company was trading for fish and beaver furs with the Indians at Willamette Falls (John Woodward & Associates 1987).

Absalom Font Hedges settled in the project vicinity in 1844, claiming land on the Willamette River shoreline and adjacent bluff top south of Oregon City. Hedges founded the town of Canemah in 1849 and this town became prominent as a boat building/steamboat/portage community (Erigero 1986). Hedges was born in Ohio in 1817, married Elizabeth Jane Barlow in Oregon City in 1847, and died in Yakima in 1890 (Genealogical Forum of Portland 1957-1975).

The 1852 General Land Office (GLO) maps of the project vicinity show developments at Canemah (a platted townsite), along the Willamette River both above and below Willamette Falls, and on the adjacent bluff top above the project area. These 1852 maps show a steam sawmill on the river shoreline below the current project area and a road along the southeast side of the river. The "Pomeroy" house and agricultural field were located in the river bottom to the southwest of the project area (GLO 1852a) (Figure 2). Samuel D. Pomeroy was born in Ohio in 1822 and married his wife Margery in Oregon City in 1845 (Genealogical Forum of Portland 1957-1975). The survey notes for the eastern boundary of the Section 1, Township 3 South, Range 1 East describe a wagon road along the river shoreline, a vacant house (the most northern in Canemah), and a second house along the section boundary (Ives 1851).

Developments on the adjacent bluff top consisted of scattered homesteads and associated fields and the “Road from Salem to Oregon City” approximately 0.8 km (0.5 mi) southeast of the project area (GLO 1852b). The townsite of Canemah was shown only within Township 2 South, Range 1 East on the 1852 map (GLO 1852c), the heart of the community center of Canemah and outside the current project area. Oregon City was well established by 1852, as shown by the extensive townsite with mills at the base of Willamette Falls, a courthouse and “Female Seminary” (GLO 1852d).

The 1860 map of Donation Land Claims in the project vicinity shows the Absalom Hedges claim (DLC #40) encompassing all of the current project area. Samuel Pomeroy had a claim (DLC #39) to the southwest of the project area in the area where his house and home are shown on the earlier 1852 map. The Hedges house is not shown on any of the GLO maps. Both of these land claims extended from the Willamette River shoreline, up the steep bluffs, to the flat land on the bluff top and edge to the southeast of the project area (GLO 1860).

According to an early plat map in the collection of the Clackamas County Historical Society, there was no development on top of the bluff area of Canemah natural area in the early history of the township except for the cemetery (Keeler 1996). The cemetery was developed in 1864 when Absalom Hedges deeded 1.91 acres of his claim (recorded Feb. 20, 1865) for use as a burial ground to the Canemah Cemetery Association, a group that continues to oversee the cemetery grounds today. The exact date of construction of Cemetery Road is unknown but it is speculated that it was sometime in the late 1860s (Fagan et al. 1999).

By 1849, Hedges had opened up a tannery and laid out a townsite at Canemah, which he called "Falls City.” With his brother-in-law William Barrow, Hedges set up a sawmill and opened a store. The name "Falls City” never caught on and the place continued to be called “Canemah” which was purportedly the old Chinookan word meaning “the canoe place.” As river traffic increased, Hedges and some partners decided to put a steamboat on the Willamette above the falls. Hedges gathered up several thousand dollars in gold, and made a trip to the eastern United States to buy the machinery for the vessel. He bought two engines which were shipped around Cape Horn to Oregon while Hedges and his partners returned overland (Corning 1977). Steamboat captains and boat-builders made Canemah their home in the latter half of the nineteenth century. Between 1851 and 1857, 12 steam-powered paddle boats had been constructed and launched onto the upper Willamette River from Canemah (Affleck 2000; Corning 1977).

The town of Canemah was wiped out by a flood in 1861, but it was rebuilt almost immediately after the flood. Despite this setback, ten more steamboats were built and launched to serve the upper Willamette River between 1860 and 1868 (Affleck 2000; Corning 1977). In 1870, the Oregon State Legislature allocated funds to build locks on the west side of the Willamette River to connect the route from Portland to Corvallis. By 1873, the locks had been completed. This led to the demise of portage towns like Canemah. By 1892, the name “Canemah” had almost been forgotten, and the community was simply considered another part of Oregon City.

After the demise of steamboats, Canemah became a residential community that housed mill workers from Oregon City. There were numerous saw, grist, woolen and paper mills in Oregon City in the latter half of the nineteenth century. The paper mill that stayed and became the modern Blue

Heron Paper Company was established in 1909. In 1916, the Oregon City woolen mill employed 400 people, and it was the west's largest woolen mill (Blue Heron Paper Company 2010). However, the woolen mill closed in 1932 during the Great Depression. A 1921 map showing the project vicinity depicts Cemetery Road, two buildings on either side of Cemetery Road in the vicinity of the eastern boundary of the natural area, and three structures near the bluff edge in the eastern portion of the natural area (Kocher et al. 1926). At least portions of the natural area were owned by the Rakel family by the early 1900s, then later by Wallace R. Turner, and after 1994 by Turner's daughter, Bonnie Bell, prior to being acquired by Metro. Polk City Directories for Oregon City dating to 1953 and 1986 indicate that the natural area contained three residential addresses (Hahn and Associates, Inc. 1997).

A 1997 map of existing conditions for a then-proposed housing development show several structures in the current project area. The existing Bowers house, Rakel historic house, and existing barn are all located northwest of the end of 4th Avenue. Two sheds and an existing house were located southwest of the end of this road. In addition to these structures on the flat near the bluff edge, this 1997 map shows the existing Shannon House on the south side of 5th Avenue/Cemetery Road at the eastern edge of the current project area (Cascade Communities, Inc. 1997).

APPENDIX B-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 be viable or at least feasibly restorable (TNC 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 (TNC 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.

Methods

Regional conservation plans were referenced to align the conservation goals of the Canemah Bluff Site Conservation and Management Plan. 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.

With the exception of a single species level target, onsite habitats as mapped by Metro staff were used as the foundation for selecting conservation targets, under the assumption that KEAs for the selected habitats would align well with KEAs of the sensitive wildlife species associated with that habitat.

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 and regional conservation targets. These are:

Habitat conservation targets

- Wet prairie and upland prairie mosaic
- Oregon white oak savannah and woodland mosaic

Species conservation targets

- *Delphinium leucophaeum*

The habitat conservation targets represent the most regionally rare and threatened major habitat types present at the site. Although Douglas fir forest is a long-term target at the site, it is regionally well represented and presents few management challenges. *Delphinium leucophaeum* was selected as a target species because its conservation would not be captured by habitat level protection.

Background

Historically, the Willamette Valley was dominated by extensive prairie, oak savanna and woodland habitats totaling approximately 2 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.

Oak woodlands provide the best habitat in the Willamette Subbasin for 37 wildlife species and are used regularly by at least 100 other wildlife species (NWPCC 2005, Appendix D, p. 41). Upland prairie, savanna and rock outcrops in the subbasin provide the best reproductive habitat for 22 wildlife species and are regularly used by at least an additional 56 breeding wildlife species. Oak savannas support an additional 50 or more species (NWPCC 2005, Appendix D, p. 60). The Willamette Subbasin Plan identified 19 focal species associated with these habitat types; for all of them, habitat loss was identified as a primary limiting factor (NWPCC 2005, p. 3-558-560).

One species of conservation concern present at Canemah Bluff natural area is *Delphinium leucophaeum.* This species, also known as white rock larkspur, is a perennial herb of the buttercup family. Plants emerge as early as January, with mature plants producing 10-30 white-and-purple flowers on a single inflorescence in late May or early June. They set seed in July and die back in August, existing only underground contained in a small tuber. *D. leucophaeum* is an Oregon State-listed endanger flower with a range that extends from Northwestern Oregon to Western Washington. They are found in the Willamette Narrows area of the Willamette River on rock (typically basalt) outcroppings and in the unplowed margins between farmland and roads. (Leonard 2009)

Discussion

These conservation targets reflect local and regional conservation goals. Each of the conservation targets are represented in one or more of the regional conservation plans listed above. Table 1 relates the conservation targets to focal species and habitats as identified in regional conservation plans.

Table 1: Comparison of conservation targets

Canemah Bluff Natural Area conservation targets	Oregon Conservation Strategy (ODFW 2006)	Willamette Basin Subbasin Plan (NWPCC 2005)	Landbird Conservation Strategy (Altman 2000)	Ecoregional Assessment (Floburg et al 2004)
Wet prairie and upland prairie mosaic	Grasslands are priority habitat for the Willamette Valley	Upland and wet prairie	Grassland	Upland and wet prairie
Oregon white oak savannah and woodland mosaic	Oak woodlands, (savannah) are a priority habitat for the Willamette Valley	Savannah	Savannah	Savannah
Delphinium leucophaeum	State listed endangered species and federal SOC	Included		Was an ecoregional target

APPENDIX B-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 (The Nature Conservancy 2007):

- ***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 rang 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 categorizes 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 the Canemah Bluff conservation targets are provided in the following tables.

Table 1: Wet prairie and upland prairie mosaic KEA

			---------- Indicator rating ----------				Current	Desired	
Type	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**	**rating**	**rating**	**Comments**
Size	Extent of habitat	Acres of habitat	Continued loss	Reduced due to habitat conversion	Maintained at current size	Increased extent.	Fair	Good	Acreage is limited to extent of existing habitat.
Condition	Native grass and forb presence	Native species richness (for the mosaic)	<20 native herbaceous plant species with high fidelity to the system types present within the patch	20-39 native herbaceous plant species with high fidelity to the system types present at the patch	40-59 native herbaceous plant species with high fidelity to the system types present at the patch	> 60 native herbaceous plant species with high fidelity to the system types present at the patch	Poor	Good	Fidelity is a term that describes the degree to which a native plant species is dependent upon prairie or oak systems; high fidelity species are always or almost always found in prairie or oak habitats in the Willamette Valley ecoregion. This KEA would be used mostly for initial assessments and ongoing assessments of the habitat at the site.
Condition	Vegetation structure	Canopy cover of woody tree and shrub vegetation	Woody vegetation is invading prairie habitat and total native woody tree and shrub vegetation cover is greater than 30%	Woody vegetation is invading prairie habitat and total native woody tree and shrub vegetation cover is between 10-30%	Woody vegetation is invading prairie habitat and total native woody tree and shrub vegetation cover is between 5-10%	Woody vegetation is invading prairie habitat and total native woody tree and shrub vegetation cover is less than or equal to 5%	Fair	Good	Canopy cover would be measured by estimating cover from aerial photography taken when all trees are leafed out.

			---------- Indicator rating ----------				Current	Desired	
Type	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**	**rating**	**rating**	**Comments**
Landscape context	Proximity (distance) to other target habitat patches	Number of habitat patches of equal or greater acreage within 2km	No patches within 2km	1 patch within 2km	2 patches within 2km	At least 3 patches within 2km	Good	Good	This KEA covers the issue of meta-populations and value of having other patches of target habitat within dispersal/pollinator distance. The 2km distance may be greater than dispersal of many prairie species.

Table 2: Oregon white oak savannah and woodland mosaic KEA

			---------- Indicator rating ----------				Current	Desired	
Category	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**	**rating**	**rating**	**Comments**
Size	Extent of habitat	Acres of habitat	Continued loss	Reduced due to habitat conversion	Maintained at current size	Increased extent	Fair	Good	Acreage is limited to extent of existing habitat.
Condition	Native grass and forb presence	Native species richness (for the mosaic)	<20 native herbaceous plant species with high and moderate fidelity to oak woodland occur within the patch	20 -39 native herbaceous plant species with high and moderate fidelity to oak woodland occur within the patch	40 -59 native herbaceous plant species with high and moderate fidelity to oak woodland occur within the patch	>60 native herbaceous plant species with high and moderate fidelity to the system types present within the patch	Poor	Good	Fidelity is a term that describes the degree to which a native plant species is dependent upon prairie or oak systems; high fidelity species are always or almost always found in prairie or oak habitats in the Willamette Valley ecoregion. This KEA would be used mostly for initial assessments and ongoing assessments of the habitat at the site.
Condition	Vegetation structure	Canopy cover of oak vs. other trees	Canopy cover of trees other than Oregon white oaks is greater than 30%	Canopy cover trees other than Oregon white oaks is between 10 - 30%	Canopy cover of trees other than Oregon white oaks is between 5-10%	Canopy cover of trees other than Oregon white oaks is less than or equal to 5%	Poor	Good	Tree species of concern in regard to invasion include: Pseudotsuga menziesii, Acer macrophyllum, Fraxinus latifolia, Prunus avium, Crataegus monogyna. Non-oak individuals in the subcanopy do not represent a substantial risk to appropriate oak canopy cover.

			---------- Indicator rating ----------				Current	Desired	
Category	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**	**rating**	**rating**	**Comments**
Landscape context	Proximity (distance) to other target habitat patches	Number of habitat patches ≥ 40 acres within 2km	no patches within 2km	1 patch within 2km	2 patches within 2km	At least 3 patches within 2 km	Fair	Fair	This KEA covers the issue of meta-populations and value of having other patches of target habitat within dispersal / pollinator distance.

Table 3: *Delphinium leucophaeum* KEA

			---------- Indicator rating ----------				Current	Desired	
Category	**(KEA)**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**	**Rating**	**Rating**	**Comments**
Size	Extent of suitable habitat for the species	Acres of habitat	Continued loss	Maintained at current size	Increased extent	Increased extent and in new habitat area	Fair	Good	*Delphinium leucophaeum* habitat is synonymous with Oregon white oak woodlands and savannah habitats.
Condition	Number of patches greater than 1 sq.ft.	Each	1 to 6 patches	6-12 patches	12 - 24 patches	24 or greater dense patches	Fair	Good	KEA was developed based on observation of naturally occurring populations at The Nature Conservancy's Camassia preserve and the Willamette Narrows Site.
Condition	Abundance of species within suitable habitat	Cover of species	< 1% cover within suitable habitat	>1% cover within suitable habitat	3-5% cover within suitable habitat	>5% cover within suitable habitat	Fair	Good	Cover will be measured based on ocular estimates.

APPENDIX B-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 bald eagle. 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 Canemah Bluff 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.

Threats and source analysis for the Canemah Bluff Natural Area

Threats for the Canemah Bluff Natural Area conservation targets are listed in Tables 1, 2 and 3 below.

Table 1: Wet prairie and upland prairie mosaic

Stress	Stress rank	Source of stress	Source rank	Threat rank	Comments
Altered native herbaceous species composition	High	Extensive non-native grasses and broadleaf weeds	High	High	Non-native species out-compete native grass and forb species. Stress is tied to both native species abundance and richness condition key ecological attributes.
Altered fire (disturbance) regime	High	Lack of regular fires	High	High	Stress is tied to both native species abundance and richness condition key ecological attributes. A build up of fuels increase the risk of a high intensity fire.
Altered hydrology	Medium	Ditching, colonization by shrub and tree species	Medium	Medium	Ditching and encroachment of ash trees has substantially dried out the seasonal wetlands.
Human disturbance	Medium	Demand trails, fires, camping, dogs	Low	Low	Stress to wildlife species utilizing this habitat. Demand trail users trample herbaceous vegetation and spread non-native weed seeds.

Table 2: Oregon white oak savannah and woodland mosaic

Stress	Stress rank	Source of stress	Source rank	Threat rank	Comments
Altered vegetation structure in tree canopy	High	Encroachment of Douglas fir trees	High	High	Oak trees are shade intolerant. Stress is tied to both size and condition key ecological attributes.
Altered native herbaceous species composition	High	Non-native broadleaf weeds including black-berry, Scots broom, ivy, thistle spp., and foxglove	High	High	Invasive species out-compete native herbaceous species. Stress is tied to both native species abundance and richness condition key ecological attributes.
Human disturbance	Medium	Demand trails, fires, camping, dogs	Low	Low	Stress to wildlife species utilizing this habitat. Potential loss of habitat and vegetation structure by escaped fire.

Table 3: *Delphinium leucophaeum* (white rock larkspur)

Stress	Stress rank	Source	Source rank	Threat rank	Comments
Altered native herbaceous species composition	Medium	Encroachment of non-native invasive species	Medium	Medium	Prevalence of Scots broom and non-native grass species. Shading from Douglas fir trees.
Human disturbance	Medium	Demand trails, fires, camping	Low	Low	The species likes to grow along trails and is at a high risk of being trampled or destroyed by trampling.
Lack of pollination	Low	Limited number of patches	Low	Low	

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 are 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 4: Stress ranking

	SCOPE			
Severity	**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 (The Nature Conservancy 2007):

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 5, resulting in a source of stress rank for each contribution/ irreversibility combination (The Nature Conservancy 2007).

Table 5: Source ranking

	---------- CONTRIBUTION ----------			
Irreversibility	**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 6).

Table 6: Threat ranking

	---------- CONTRIBUTION ----------			
Stress	**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 (The Nature Conservancy 2000) as follows:

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

Table 7 illustrates the threat-to-system ranking:

Table 7: 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 Table4

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 8: Overall threat rank

	Target 1	Target 2	Target 3	Overall threat rank
Threat A	*High**	Very high	High	High
Threat B	*Medium***	Medium	High	Medium
Threat C	N/A	Medium	Low	Low

*, ** - from Tables 5,6

APPENDIX B-4

Invasive species

The table below summarizes a preliminary list of invasive plants requiring control in all or parts of Canemah Bluff 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: www.oregon.gov/ODA/PLANT/WEEDS/statelist2.shtml.

Table 1: Working list of priority non-native species for control at Canemah Bluff site (EDRR species common names are bolded in red)

Genus	Species	Common name	Focus area for detection/control	Control timing
Allarium	*petiolata*	**Garlic Mustard**	All	Spring
Brachypodium	*sylvaticum*	**False Brome**	All	Spring/Fall
Centaurea	*pratensis*	**Meadow knapweed**	Prairie	Summer
Cirsium	*arvense*	Canada thistle	Prairie, Oak Woodland	Spring
Clematis	*vitalba*	Old man's beard	Forest	Spring/Fall
Conium	*maculatum*	Poison hemlock	Prairie	Spring
Crataegus	*monogyna*	Common hawthorn	Prairie	Fall
Cytisus	*scoparius*	Scotch broom	Prairie, Oak Woodland	Fall
Daphne	*laureola*	**Spurge Laurel**	All	Spring/Fall
Dipsacus	*fullonum*	Teasel	All	Spring
Hedera	*Helix*	English Ivy	All	Winter
Hypericum	*perforatum*	St John's wort	Prairie	Spring
Ilex	*aquifolium*	Holly	Forest	Fall
Iris	*pseudacorus*	Yellow iris	Ash Forested Wetland	Fall
Lunaria	*Annua*	Money Plant	Prairie, oak Woodland	Spring
Lythrum	*salicaria*	**Purple loosestrife**	Ash Forested Wetland	Summer
Mentha	*pulegium*	Pennyroyal	Prairie	Summer
Phalaris	*arundinacea*	Reed canarygrass	Ash Forested Wetland, prairie	Fall
Polygonum	*cuspidatum*	Japanese knotweed	All	Summer
Robinia	*pseudoacacia*	Black locust	Prairie	Fall
Rubus	*armenianus*	Himalayan blackberry	All	Fall
Solanum	*dulcamara*	Bittersweet nightshade	All	Spring

Photo 1: Garlic mustard

Images courtesy of Glenn Miller, Oregon Dept. of Agriculture

Photo 2: False brome

Images courtesy of Glenn Miller, Oregon Dept. of Agriculture

Photo 3: Meadow knapweed

Images courtesy of Dan Sharratt, Oregon Department of Agriculture

Photo 4: Purple Loosestrife

Images courtesy of Bonnie Rasmussen (left) and Eric Coombs (right), Oregon Dept. of Agriculture

Photo 5: Spurge Laurel

Images courtesy of *Randy Westbrooks* (left) and King County noxious weed program (right)

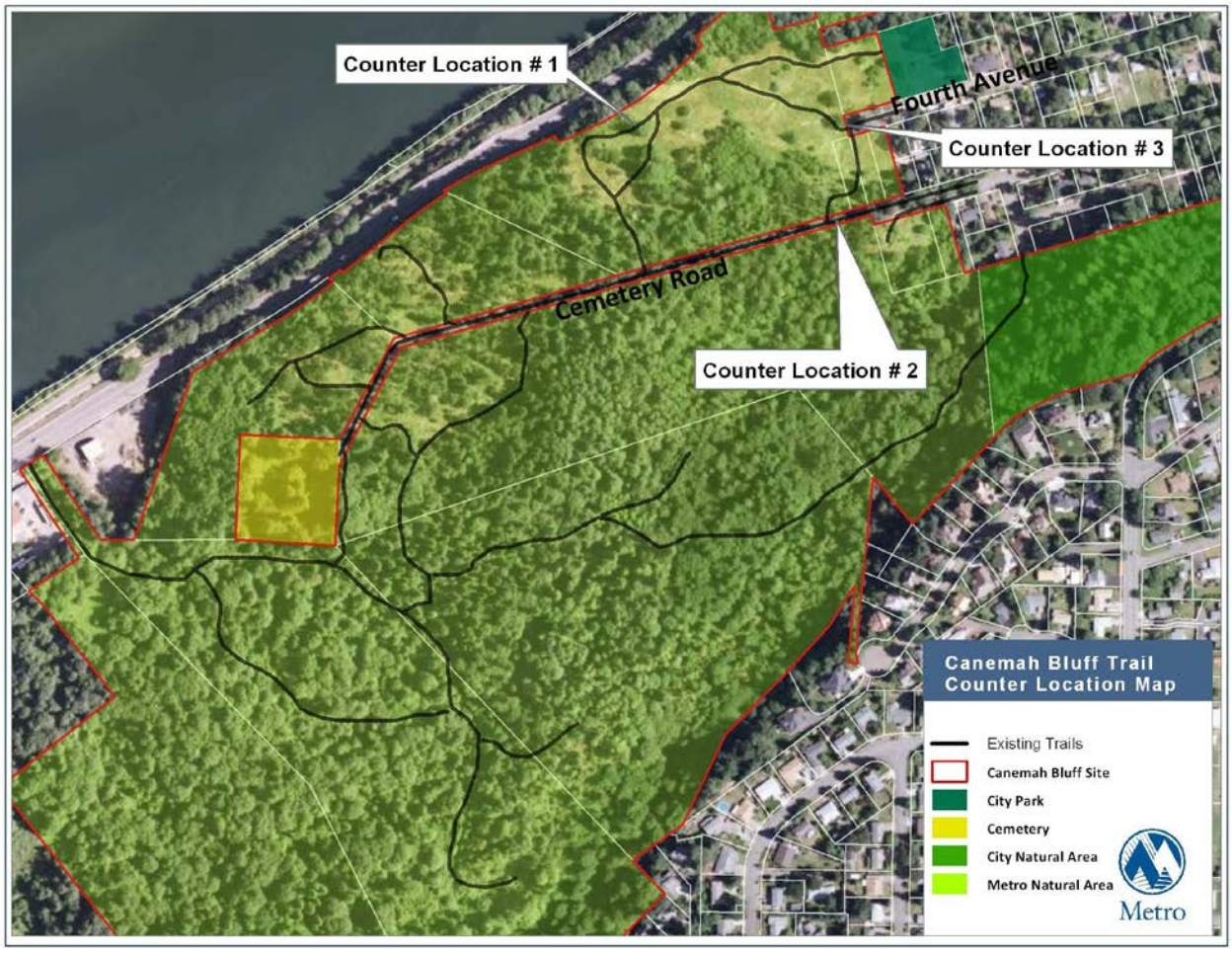
APPENDIX C-1

Trail counts

In order to understand trail use, counters were installed at several locations at Canemah Bluff site.

Trail counter locations

Trail counter locations included the entry points on Fourth and Fifth Avenues as well as in the middle of the existing loop trail in the prairie.



Results

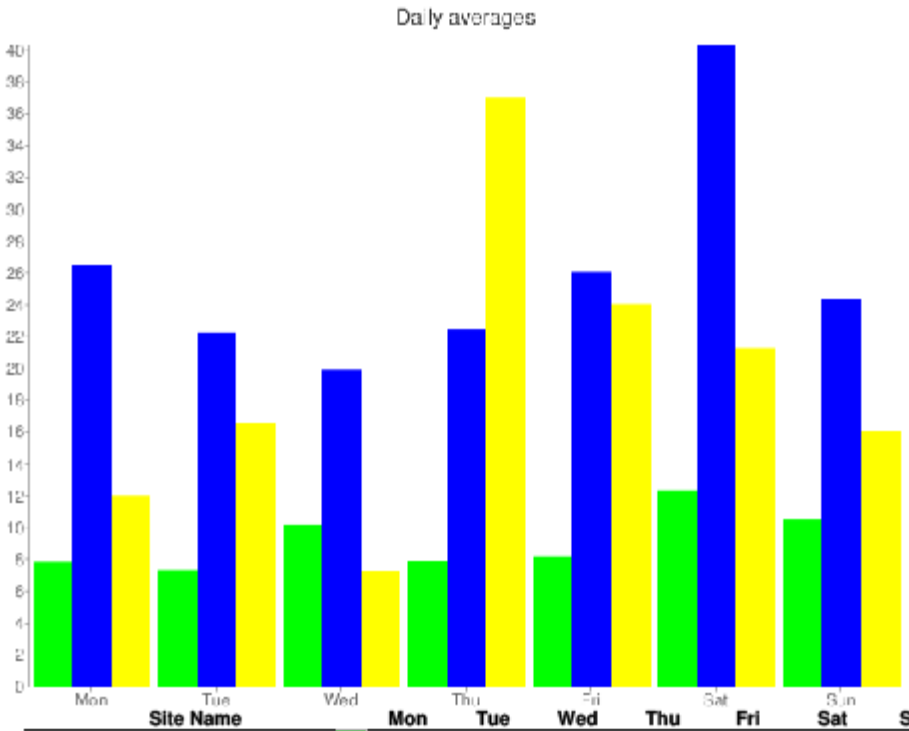
Results from May and June 2011 indicate that a daily average of 19 people passed the counter at the end of Fourth Avenue. At the access point from Fifth Avenue an average of 26 people were counted. If we assume that people are counted as they enter and exit, then approximately 23 people use the trails daily and slightly more on the weekends.

Days of the week

From 2011-05-16 to 2011-06-30

Report generated on 2011-07-01 16:29:58 (UTC -06:00) by robert.spurlock@oregonmetro.gov

TRAFx DataNet (http://www.trafx.net/)



Site Name	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Canemah 1	7.8	7.3	10.1	7.9	8.2	12.3	10.5
Canemah 2	26.5	22.2	19.9	22.4	26.0	40.3	24.3
Canemah 3	12.0	16.5	7.2	37.0	24.0	21.3	16.0
Daily Averages	15	15	12	22	19	25	17

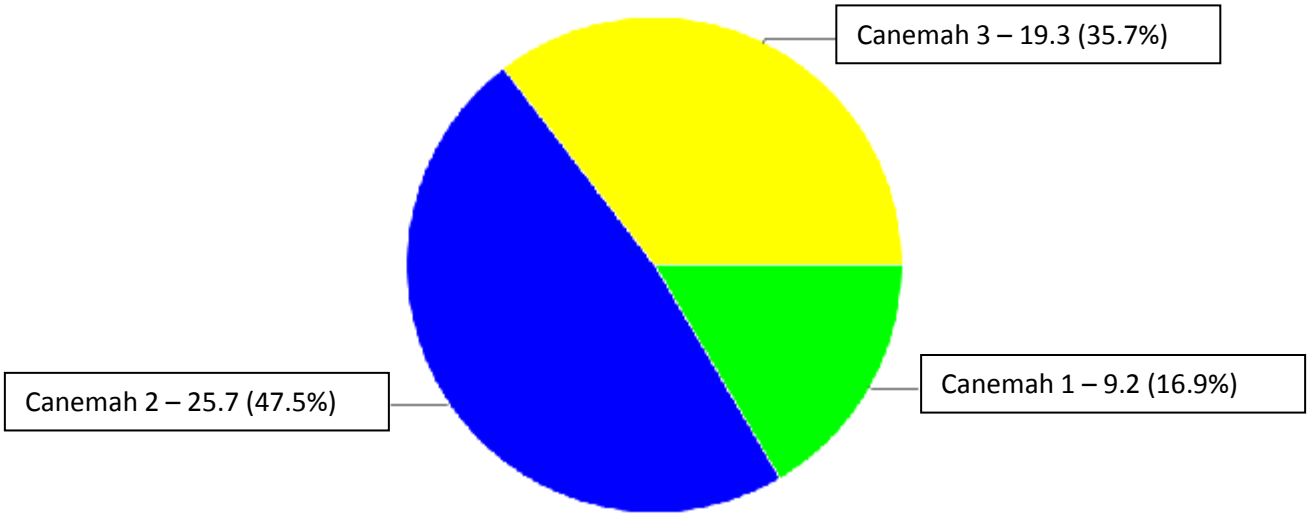
A = adjustment applied, D = divide by 2 applied, F = filtering applied

Compare sites

Data from 2011-05-16 to 2011-06-30

Report generated on 2011-07-01 16:32:38 (UTC -06:00) by robert.spurlock@oregonmetro.gov

TRAFx DataNet (http://www.trafx.net/)



Site Name	Daily Average
Canemah 1	9.2 (16.9%)
Canemah 2	25.7 (47.5%)
Canemah 3	19.3 (35.7%)

A = adjustment applied, D = divide by 2 applied, F = filtering applied

APPENDIX C-2

Summary of public comments

Metro received 16 surveys, eight written and eight online. In addition to the surveys, several informal interviews were held with neighbors and local stakeholders. The interview results were consistent with the survey results.

Trail survey

How often do you use the Canemah trails?
Once a day or more (II)
A few times a week/month (III) (*a few times a week had 62.5% from online responses)*
A few times a year (III)
Note: Daily counts show 12-25 people as the daily average in May and June.

Where do you like to walk?
Everywhere (II)
Prairie, to and from cemetery and the short loop around the woods (II)
Cemetery road, 4, 8 and 14 (10, 11 12 are too overgrown now)

- I like to mt bike through all of the trails.
- I usually enter after parking at the end of 4th Ave. I walk different routes each time. I have used most of the trails, but some end abruptly, or become overgrown. Today I took 2, 4, 9, 10, and 11 until it got pretty weird, then doubled back down 10. 12 is nice but ends in a field of ferns and oaks I think.
- Fifth Avenue to Cemetery Road, down to the Cemetery, back down Cemetery Road, onto Prairie trail 4, onto Prairie trail 3.
- Have used them all, mostly Cemetery Road out and then back to Prarie (4, 5, and 1, 2, or 3).
- Prairie trails 1-5 weekly Main walk daily Prarire trails 1,2,4 back down Cemetery Rd.
- 4th Avenue and 5th Avenue.
- I love to walk this loop: start at the park, walk along the edge of the bluff (trails 3 & 4), meet up with the Cemetery Rd and follow it until trail 8, which I take all the way out to trail 14 then Blanchard St. I LOVE IT!!! I have also occasionally explored trails 9, 10, 11, & 12 and enjoyed them very much. At one point, I found what appeared to be an old road/trail (not on your trail map) connecting the terminus of trail 12 to trail 14. I heartily suggest that trail be developed further! Thank you so much for asking for input!!! I have enjoyed these trails for the past 4 years and am deeply grateful to see them enjoyed by others as well, leading to clearer trails and less poison ivy!

Where do you enter?
Cemetery road (IIII)
Through city park (III)
End of Fourth (IIII) *(75% from online responses)*
Note: Approximately twice as many people are counted at the cemetery road entrance than at the city park entrance.

Where do you exit?
Cemetery road (IIII)
Through city park (III)
End of Fourth (IIII) *(62% from online responses)*

What do you enjoy?
Everything except jogging and biking (V)
Everything except views of the river (I)
Everything (I)
Natural scenery, walking in a peaceful environment, views of the river

5. What do you enjoy about the trails you walk on? (Check all that apply.) Create Chart Download

	Response Percent	Response Count
Walking in a peaceful environment	75.0%	6
Jogging	50.0%	4
Biking	25.0%	2
Bird watching	37.5%	3
Wildflowers	62.5%	5
Natural scenery	62.5%	5
Views of the river	50.0%	4
Wildlife	50.0%	4
Plants	37.5%	3
	answered question	8

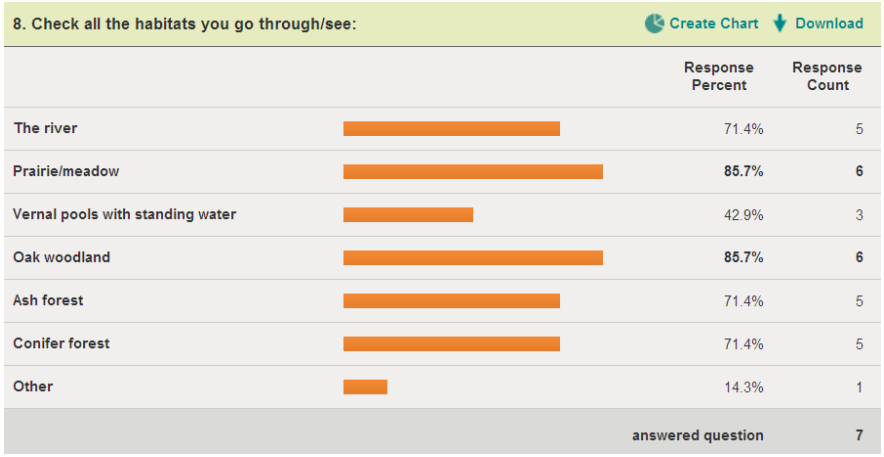
On trails by yourself or with other?
By myself (*50% from online responses)*
With another person (II) *(50% from online responses)*
All options (I)
With my dog (II) *(37% from online responses)*
By myself and with another person (II)
Group of three or more (I)

Special destination?

- I really like the viewing the cemetery and the Madrona trees.
- I think the cemetery is beautiful but I truly enjoy all the beauty the area has to offer.
- The cemetery and the river.
- I really enjoy the prairie area and would like to see it enhanced. I also enjoy the wet area to look at the rare wetland plants located there. This area should be highly protected.
- No special destination, like to walk for the exercise, dog and quiet/peacefulness.
- View of the river area.
- The cemetery is cool, but if I were buried there I'd be pissed because of the barbed wire and the whole sense of being in a forgotten place. It needs upkeep and if it's historic, it should provide access to the public...maybe supervised by volunteers or docents to tell stories of people buried there. It would need to have supervision while open due to the local vermin who spray paint everything. The prairie is also beautiful.
- I like to stop at the couple of bluff areas that have a view of the river.
- The view of the river, the cemetery when open and then just a walk around the forest at different times of the year
- River view, wildflowers, general all around beauty. The area changes weekly.
- Love the view if the river, but also love the deep forest where trail 8 splits into the side trail toward trail 10 and the trail toward 13 & 14. It's a nice low point where it is good for looking up into the trees.

Habitats

Did not check ash forest or conifer forest (III)
Did not check ash forest or conifer forest or vernal pools (I)
Checked all (II)
All but river (I)



8. Check all the habitats you go through/see:	Create Chart	Download
	Response Percent	Response Count
The river	71.4%	5
Prairie/meadow	85.7%	6
Vernal pools with standing water	42.9%	3
Oak woodland	85.7%	6
Ash forest	71.4%	5
Conifer forest	71.4%	5
Other	14.3%	1
	answered question	7

Write in comments:

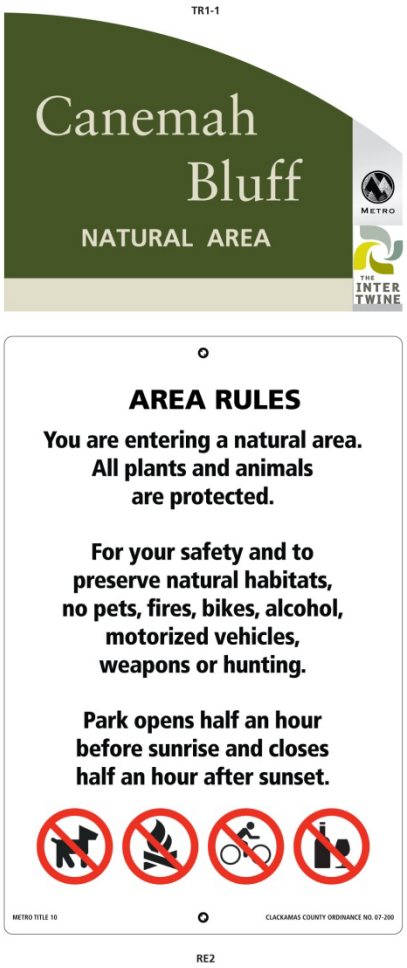
- I wish the poison oak could be taken away.
- Please put up more signs with the trail numbers.
- If we kept being able to walk our dogs, that would be fantastic. I think it is cool what you're doing and stuff, but I think that most people around the area would prefer that you just left the area alone. I am hoping that if you change anything just at least have pets allowed (by pets I mean dogs).
- Keeping the prairie mowed and the cemetery accessible more often (would be better).
- Keep them (the trails) open and no construction work.
- I would like to see the trails connected to make more loops. This ___ prevents backtracking and make a short hike more enjoyable. I also worry about the exposed Cliffside. The view is stunning, but I do worry about small children near the edge along trail 4. A natural looking fence or rail at the viewpoint would help.
- What would make the trail better for you? Knowing I'm not stepping in poison oak and just wider, more groomed trails
- More trails for mt biking.
- 11 needs to loop around and connect to 12 and 12 needs to continue on and connect to 14. Loops would provide safer access, similar to the Tryon Creek plan. The blackberries taste good but are a nuisance with prickers. Leave everything else alone, and do not put down wood chips. Also, call me if you need support, I have Summers off because I teach, and I get pretty bored come August, but I love to help, and I'm quite a photographer...if you'd like someone to take pictures in the park....purple thistles, prairie, ferns, wildlife....etc.
- Woodchip trail through the prairie (to level out the walking surface for joggers and walkers). Trails trimmed wide enough for two people to walk down side-by-side. Dogs permitted to walk on trails. Trim back some of the trees/brush on the bluffs to open up the view to the river.
- Longer trails, connect to the recently purchased land to the southeast of the current area.
- As dogs are no longer allowed, and we understand the reasons, being able to take them on a leash would be nice.
- The natural trails are perfect as they are.
- Some security. There are people camping illegally in the area. Firepits can be seen off the trails. Beer cans can be found. Off trail erosion can be seen.
- A sturdy bridge on trail 14 over the seasonal stream would be nice. Thanks!

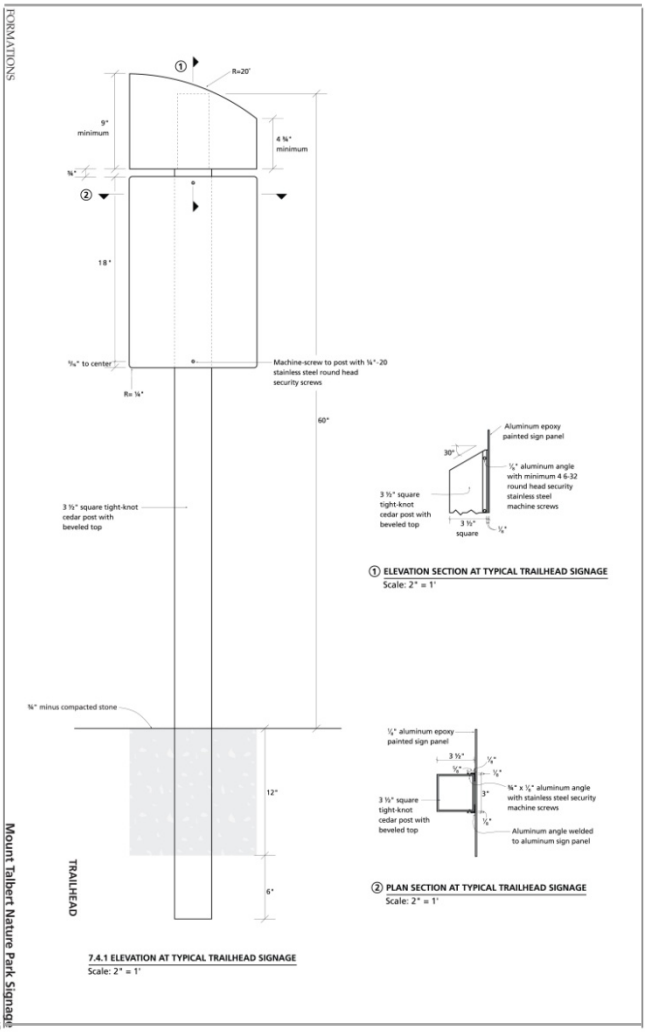
APPENDIX C-3

Signage

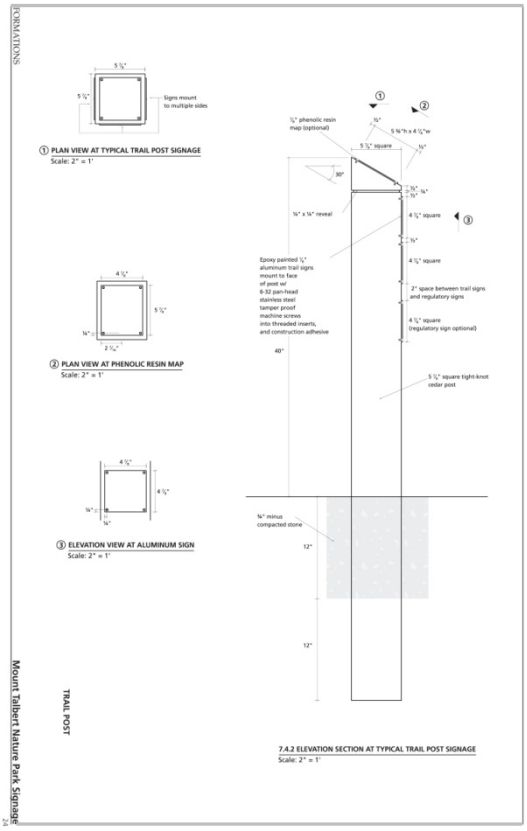
Signage for Canemah Bluff will be designed using Metro's signage design standards. Below are examples of how trailhead, wayfinding, regulatory and informational signs may look for the Canemah Bluff Site.

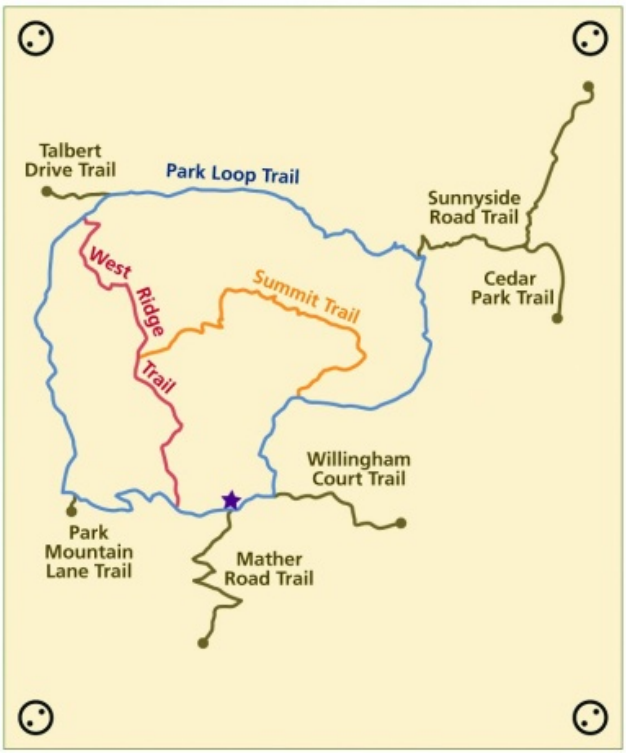
Trailhead signs



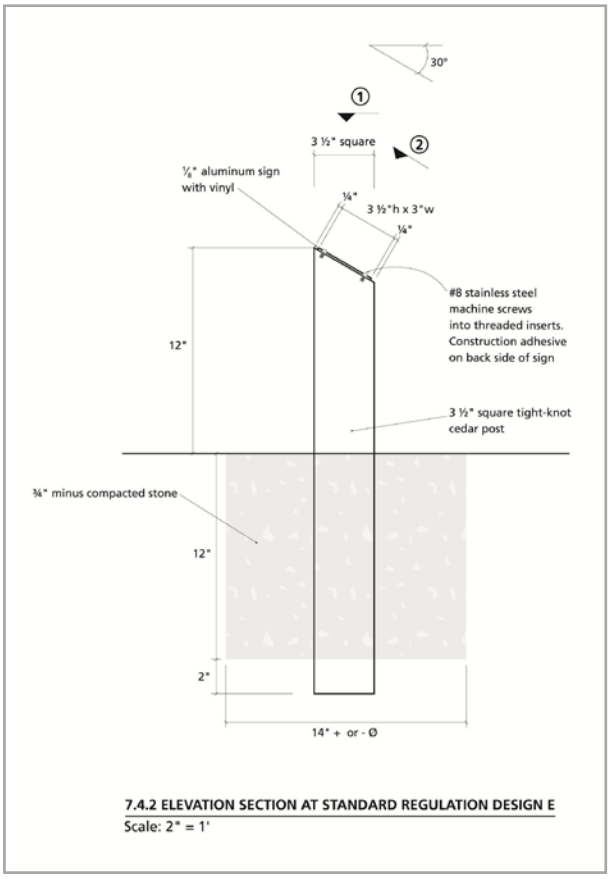


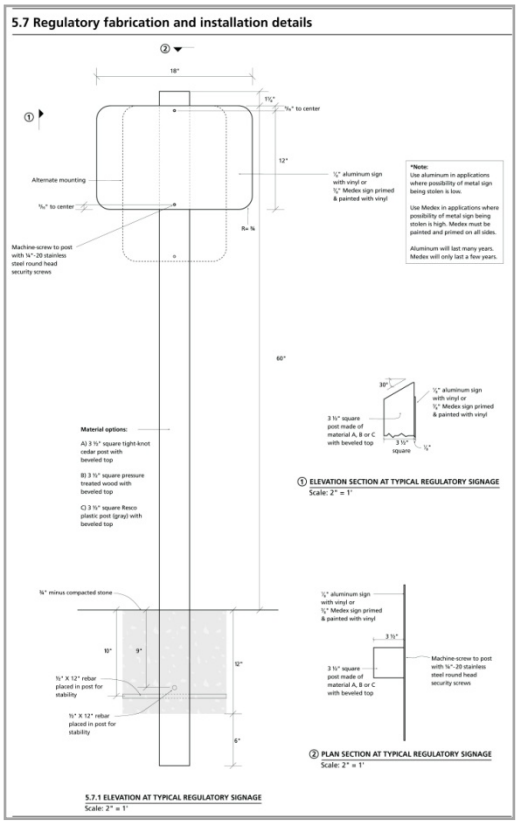
B. Wayfinding signs





Regulatory and information signs





APPENDIX D

Monitoring

Monitoring at the Canemah Bluff site is an integral part of an adaptive management approach to restoration and maintenance. 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 and 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. Generally, the greatest threats to Canemah Bluff Natural Area are traced to:

- Altered native herbaceous species composition, largely by invasive plant species.
- Altered fire (disturbance) regime: encroachment of woody vegetation (trees and shrubs) in the oak woodland and prairie habitats.
- Human disturbance (demand trails, fires, camping, dogs).

The monitoring plan 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. The monitoring plan is likely to change over time; however this is a worthwhile starting point and a useful tool for focusing Metro staff efforts.

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 abundance and composition of native plants and invasive species.

Avian point counts: Avian (bird) surveys during breeding season follow an established and widely used protocol that allows data sharing with other scientists. By tracking changes in the bird community, Metro can detect changes in habitat function as restoration projects mature. The species present can indicate if a suitable habitat for sensitive species is present.

Ocular Estimates: 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.

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.

Conservation targets and monitoring techniques

Wet prairie, dry prairie mosaic: A combination of transects, existing avian point counts and GIS work will be used to monitor key ecological attributes (KEAs) of this conservation target.

Oregon white oak woodland and savannah mosaic: Existing avian point counts and a combination of photo points, transects, GIS work and ocular estimates of plant and wildlife species will be used to monitor key ecological attributes of this conservation target.

Delphinium leucophaeum: Ocular estimates of numbers of plants and clumps will be used to monitor the condition of key ecological attributes of this conservation target.

Table 1: Wet prairie and upland prairie mosaic monitoring techniques

Conservation target	Type	KEA	Indicator	Method	Frequency	Comments
Wet prairie and upland prairie mosaic	Size	Extent of habitat	Acres of habitat	Estimate from aerial photograph in GIS	5-year interval	
Wet prairie and upland prairie mosaic	Condition	Native grass and forb presence	Native species richness (for the mosaic)	Transects with line intersect method	3-year interval	Will change most quickly as planting projects are completed.
Wet prairie and upland prairie mosaic	Condition	Vegetation structure	Canopy cover of woody tree and shrub vegetation	Estimate from aerial photograph in GIS	5-year interval	May adjust to less frequent monitoring.
Wet prairie and upland prairie mosaic	Landscape context	Proximity (distance) to other target habitat patches	Number of habitat patches of equal or greater acreage within 2 km	Evaluate via aerial photographs and track land use actions on surrounding landscape	Ongoing	

Table 2: Oregon white oak savannah and woodland mosaic monitoring techniques

Conservation target	Type	KEA	Indicator	Method	Frequency	Comments
Oregon white oak savannah and woodland mosaic	Size	Extent of habitat	Acres of habitat	Estimate from aerial photograph in GIS	5-year interval	
Oregon white oak savannah and woodland mosaic	Condition	Native grass and forb presence	Native species richness (for the mosaic)	Transects with line intersect method	3-year interval	Will change most quickly as planting projects are completed.
Oregon white oak savannah and woodland mosaic	Condition	Vegetation structure	Canopy cover of oak vs. other trees	Estimate from aerial photograph in GIS	5-year interval	May adjust to less frequent monitoring as encroaching woody vegetation is removed
Oregon white oak savannah and woodland mosaic	Landscape context	Proximity (distance) to other target habitat patches	Number of habitat patches $\geq$ 40 acres within 2 km	Evaluate via aerial photo-graphs and track land use actions on surrounding landscape	Ongoing	

Table 3: *Delphinium leucophaeum* monitoring techniques

Conservation target	Type	KEA	Indicator	Method	Frequency	Comments
Delphinium leucophaeum	Size	Extent of suitable habitat for the species	Acres of habitat	Estimate from aerial photograph in GIS	5-year interval	Will change as strategic restoration actions are implemented.
Delphinium Leucophaeum	Condition	Number of patches greater than 1 square foot	Each	Visual inspection on site visit	3-year interval	
Delphinium Leucophaeum	Condition	Abundance of species within suitable habitat	Cover of species	Visual inspection of cover on site visit	3-year interval	

APPENDIX E

References and additional resources

Altman, B. 2000. Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington. Prepared for: Oregon-Washington Partners in Flight.

Alverson, E.R. 2006. Use of prescribed fire in Willamette Valley native prairies. The Nature Conservancy. Portland, OR.

Boyer, L. 2009. Native Willamette Valley prairie and oak habitat restoration site preparation and seeding information. Heritage Seedlings Inc., Salem, OR.

Campbell, B. 2004. Restoring rare native habitats in the Willamette Valley: A Landowner's guide for restoring oak woodlands, wetlands, prairies, and bottomland hardwood and riparian forests. Defenders of Wildlife. West Linn, OR.

Floberg, J., M. Goering, G. Wilhere, C. MacDonald, C. Chappell, C. Rumsey, Z. Ferdana, A. Holt, P. Skidmore, T. Horsman, E. Alverson, C. Tanner, M. Bryer, P. Iachetti, A. Harcombe, B. McDonald, T. Cook, M. Summers, D. Rolph. 2004. *Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment, Volume One: Report.* Prepared by The Nature Conservancy with support from the Nature Conservancy of Canada, Washington Department of Fish and Wildlife, Washington Department of Natural Resources (Natural Heritage and Nearshore Habitat programs), Oregon State Natural Heritage Information Center and the British Columbia Conservation Data Centre.

Leonard, Jenny. 2009 Introduction of several populations of a species of the endangered wildflower *Delphinium leucophaeum* into two different parks in the northern Willamette Valley, Oregon. Portland State University. Portland Oregon. 50pp.

O'Connor, Jim E., Andrei Sarna-Wojcicki, Karl C. Wozniak, Danial J. Polette, and Robert J. Fleck 2001 Origin, Extent, and Thickness of Quaternary Geologic Units in the Willamette Valley, Oregon. U.S. Geologic Survey, Professional Paper 1620. U.S. Geologic Survey and Oregon Water Resources Department, Reston, Virginia.

Ogle Todd B., Ellis David V., Fortier Brad. 2010. Archaeological Survey of the Canemah Bluffs Location Canemah, Oregon. Metro. Portland, Oregon.

Oregon Department of Fish and Wildlife (ODFW). 2006. The Oregon Conservation Strategy. Oregon Department of Fish and Wildlife, Salem, Oregon.

Oregon Department of Fish and Wildlife (ODFW). 2008. Oregon Department of Fish and Wildlife Sensitive Species: Frequently Asked Questions and Sensitive Species List.

Stanley, A. G., T. N. Kaye, P. W. Dunwiddie. 2010. Regional strategies for restoring invaded prairies, final technical report. Institute for Applied Ecology, Corvallis, Oregon, and The Nature Conservancy, Seattle, Washington.

The Nature Conservancy. 2009. Synthesis of Willamette Valley Habitat Plans. Unpublished report for The Willamette Partnership. Portland, OR.

The Nature Conservancy (TNC). 2007. Conservation Action Planning Handbook: Developing Strategies, Taking Action and Measuring Success at Any Scale. The Nature Conservancy, Arlington, VA.

The Nature Conservancy (TNC). 2000. The 5-S Framework for Site Conservation. Appendices, Volume II, Second Edition, June 2000. The Nature Conservancy, Arlington, VA.

The Northwest Power and Conservation Council (NWPCC). 2005. Willamette Subbasin Plan. Prepared by the Willamette Restoration Initiative.

U.S. Fish and Wildlife Service. 2010. Recovery plan for the prairie species of western Oregon and southwestern Washington. U.S. Fish and Wildlife Service, Portland, OR.

Vesely, D. and D. Rosenberg. 2010. Wildlife Conservation in the Willamette Valley's Remnant Prairies and Oak Habitats: A Research Synthesis. Oregon Wildlife Institute, Corvallis, OR.

Vesely, D. and G. Tucker. 2004. A landowner's guide for restoring and managing Oregon white oak habitats. U.S. Dept. of Interior, Bureau of Land Management. Salem District, Salem, OR.

Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.

Oregon Conservation Strategy:
http://www.dfw.state.or.us/conservationstrategy/

A landowner's guide for restoring and managing Oregon white oak habitats:
http://www.oregonoaks.org/documents/landguide.pdf

Restoring rare native habitats in the Willamette Valley: A Landowner's guide for restoring oak woodlands, wetlands, prairies, and bottomland hardwood and riparian forests:
http://www.ser.org/sernw/pdf/DefOWild_willamette_hab_restore_manual.pdf

Delphinium leucophaeum facts on Oregon Department of Agriculture web page:
http://www.oregon.gov/ODA/PLANT/CONSERVATION/profile_dele.shtml

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