

University of Oregon Willamette River Natural Area



Landscape Management Plan

Campus Planning and Facilities Management



June 2022

Acknowledgements

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Territorial Acknowledgement (University of Oregon Native American and Indigenous Studies)

The University of Oregon is located on Kalapuya ilahi, the traditional indigenous homeland of the Kalapuya people. Following treaties between 1851 and 1855, Kalapuya people were dispossessed of their indigenous homeland by the United States government and forcibly removed to the Coast Reservation in Western Oregon. Today, Kalapuya descendants are primarily citizens of the Confederated Tribes of Grand Ronde and the Confederated Tribes of Siletz Indians, and they continue to make important contributions to their communities, to the UO, to Oregon, and to the world.

Cover Photo: A portion of the North Campus area looking upriver (source: Jason Chinitz-Mital)

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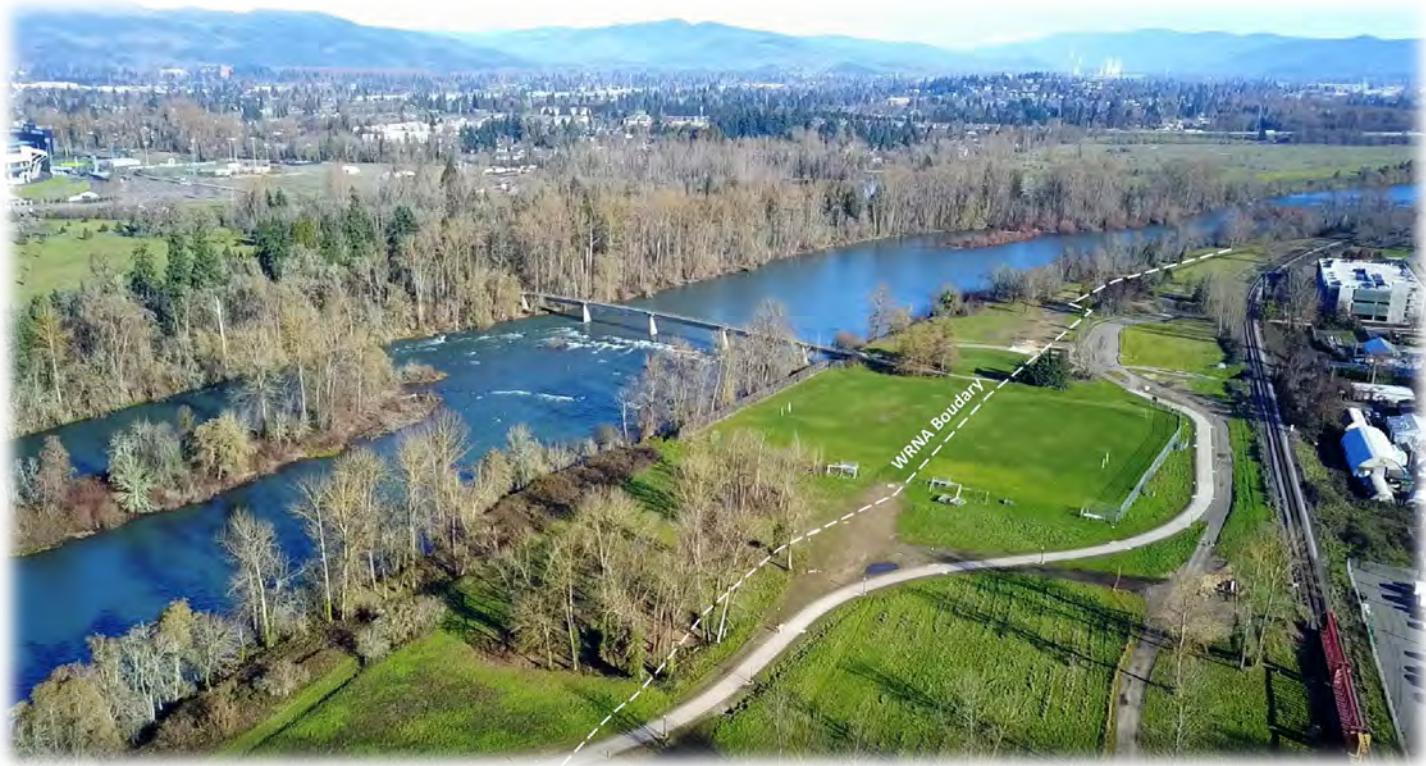
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Section 1: Introduction and Background

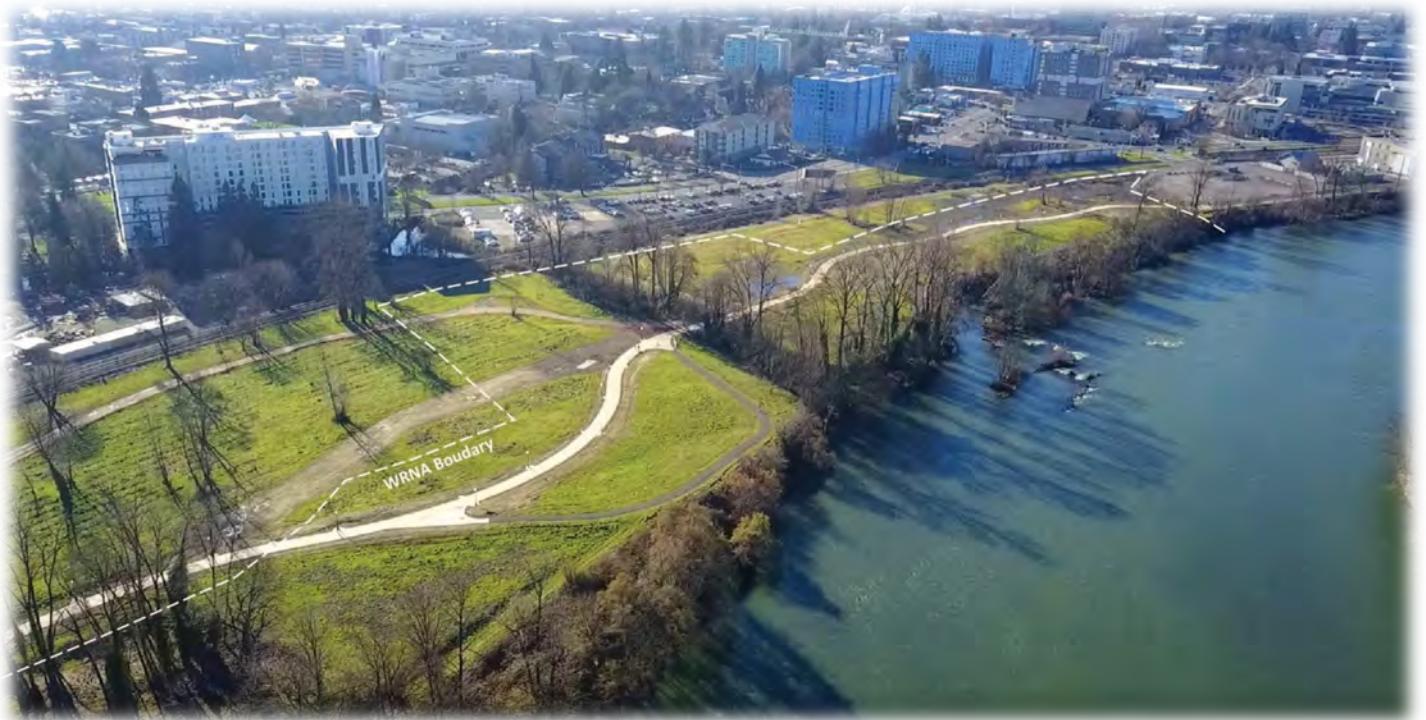
1.1 Introduction and Landscape Management Plan Purpose

The focus of this Landscape Management Plan (LMP) is the 24-acre Willamette River Natural Area (WRNA) designated open-space located on the University of Oregon campus along the Willamette River in Eugene, Oregon. With updates to the University of Oregon Campus Plan recently completed, along with associated City approval of the North Campus Conditional Use & Willamette Greenway Permits, the University has clarity on the long-term priorities and uses within the WRNA and is positioned to begin more detailed site management and habitat restoration planning. The WRNA includes the existing riparian zone on the steep banks of the river and Millrace Outfall channel, plus an additional setback of between 100 and 200 feet from the top of bank. **This area will be managed over the long-term to preserve and improve habitat values while accommodating compatible education, research, and recreation uses as defined by the Campus Plan.** Compatible uses would be those that benefit from proximity to a natural area and that do not negatively impact the natural resource itself. Recommendations from this LMP apply specifically to land within the defined WRNA. Management of land outside of the WRNA will continue to be coordinated by the University and Campus Planning and Facilities Management (CPFM).

The purpose of this Landscape Management Plan is to document historical and existing site conditions, evaluate issues and opportunities related to site management, describe a vision for the desired future condition, and provide direction for short- and long-term management within this defined area. Recommendations are oriented around improving the site's habitat values and ecological function while accommodating compatible recreational and educational uses over a twenty-year time-period (2022-2042). The University will rely on an adaptive management approach and may adjust the proposed management actions and priorities based on results of ongoing monitoring, availability of funding, and emerging threats.



The east end of the Willamette River Natural Area looking upriver, February 2022 (Source: J. Chinitz-Mital.)



The central portion of the Willamette River Natural Area looking downriver, February 2022 (Source: J. Chinitz-Mital)



The west end of the Willamette River Natural Area looking up river, February 2022 (Source: J. Chinitz-Mital).

1.2 Plan Development

This Landscape Management Plan was formulated beginning in December 2021 under the guidance of the University of Oregon Campus Planning and Facilities Management staff team with contracted assistance from Jeff Krueger of JK Environments. To tap local expertise and incorporate interests of key University departments, a ten-person Habitat Advisory Team (HAT) was also formed (see Acknowledgements for list of HAT members). The HAT participated in a series of facilitated site visits during the planning process and provided input on draft LMP content as it was developed. In addition to the HAT, a number of other individuals with topic-specific expertise and site knowledge were engaged.

1.3 Landscape Setting and Site Context

The 24-acre WRNA is a designated open-space within the University of Oregon campus on the south bank of the Willamette River approximately 3.5 miles below the confluences of the Coast Fork and the Middle Fork and approximately 6.5 miles above the confluence with the McKenzie River. Although the site and the surrounding area have been heavily impacted over the past 120 years from industrial land uses such as gravel mining, subsequent fill deposit, and compaction (see Section 2.1), the current undeveloped condition of the site provides habitat conditions that support a wide range of native species and has significant potential for improvement.

It is important to note that the future habitat enhancements proposed for this site are not a standalone effort, but one of many efforts to improve the ecological function of the upper Willamette River and its tributaries (see Figure 1-1: Site Context Map). Several noteworthy habitat restoration efforts implemented along the river in recent years include:

- The 1,100-acre McKenzie River Trust's Green Island floodplain restoration project near the McKenzie River and Willamette River confluence;
- The Nature Conservancy and Friends of Buford Park & Mount Pisgah's 1,400-acre floodplain and habitat restoration project at the confluence of the Coast and Middle Fork of the Willamette River;
- The 150-acre City-owned Delta Ponds floodplain restoration project two miles downstream of the WRNA;
- The major riparian restoration efforts in the City of Eugene and Springfield-owned Whilamut Natural Area just across the river from the WRNA; and
- The recently completed invasive species control and bank planting effort within the City of Eugene's new Riverfront Park immediately adjacent and downriver from the WRNA.

Through these combined regional efforts and acquisition funding through the Oregon Department of Fish and Wildlife (ODFW) [Willamette Wildlife Mitigation Program](#) and the [Willamette River Anchor Habitat Investments](#) Program, the Willamette River system is beginning to see significant and measurable gains in ecological function which will improve over time as the landscape matures. Although the footprint of the WRNA is relatively small when compared to some of these other floodplain restoration efforts, the proposed habitat enhancements still contribute to the overall ecological health of the system and the site presents a valuable opportunity to showcase habitat enhancement efforts in an urban and university setting while providing an outstanding educational resource.

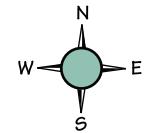
1.4 The Vision for the Willamette River Natural Area

The following vision is derived from the 2021 University of Oregon Campus Plan and other related plans and provides a concise framework for future landscape management and uses within the Willamette River Natural Area.

Natural Areas are a recognized designated open space on the University of Oregon campus “dedicated to preserving and restoring natural habitat and promoting ecological functions, while providing opportunities to learn about and engage with natural systems”. The Willamette River Natural Area offers a unique campus experience to showcase native plants and wildlife while providing outstanding learning and recreational opportunities for students and community members alike.

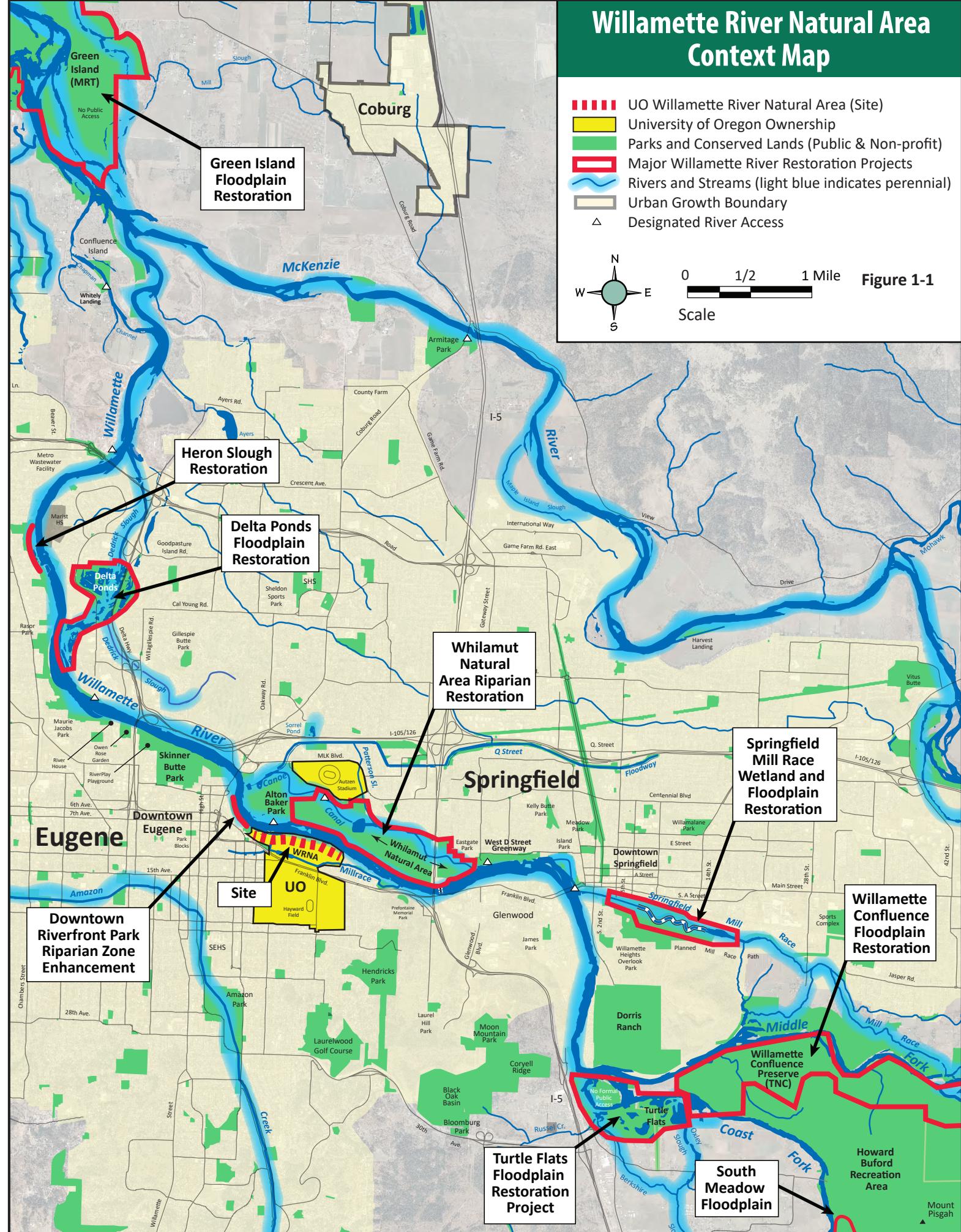
Willamette River Natural Area Context Map

- ||||| UO Willamette River Natural Area (Site)
- University of Oregon Ownership
- Parks and Conserved Lands (Public & Non-profit)
- Major Willamette River Restoration Projects
- ~~~~~ Rivers and Streams (light blue indicates perennial)
- Urban Growth Boundary
- △ Designated River Access



0 1/2 1 Mile

Figure 1-1



1.5 Guidance from Related Plans and Studies

Several plans and studies listed below provide important guidance and direction for future uses, management, and enhancement of the WRNA. An expanded table listing key findings from these plans and studies along with key extracts is included in Appendix A.

Figure 1-2: Guidance from Key Plans and Studies

Title and Date	Findings Related to Habitat Management and Restoration
<u>University of Oregon Campus Plan</u> (2021)	The Campus Plan is a University of Oregon document that defines the type and extent of campus development. The 2021 edition of the Campus Plan includes specific recommendations for the “Willamette Design Area” which covers the University-owned lands between the railroad and the river. The Plan specifies that “This area provides an opportunity for the University to showcase sustainability values while accommodating low intensity future development, recreational activities (passive and active), and safe access to the Willamette River.” The plan also defines the 24 acres immediately adjacent to the river and Millrace Outfall as the “Willamette River Natural Area” designated open space which includes the riverbanks and a riparian setback of approximately 200 feet from the top of bank. The defined 24-acre WRNA is the focus of this landscape management planning effort.
<u>University of Oregon North Campus Master Plan Conditional Use & Willamette Greenway Permit</u> (Submitted by UO and approved by the City of Eugene on October 17, 2018)	A 30-year Conditional Use Permit (CUP) for the North Campus area was submitted to the City of Eugene and approved in October 2018. This replaces the previous CUP for the area which was in place from 1988 to 2012. The CUP applies to the 77.4 acres of land located south of the Willamette River and north of Franklin Blvd (referred to as North Campus). The Master Plan submitted for the CUP officially commits the existing riparian area along the riverbank plus a 100- to 200-foot setback area from the top of bank as the “Willamette River natural Area”, to be permanently managed for its habitat values along with accommodation of compatible educational and recreational uses.
Willamette Riverfront Access Study – Final Draft Report (February 2018, City of Eugene)	The Willamette Riverfront Access Study makes recommendations for potential future public access points along the Eugene portion of the river for boating, viewing, wading, and fishing. The report recommends two new access locations within the University riverfront property, both designated for personal paddle craft access. The first is located just above the Frohnmayer Bridge and the second at the Millrace Outfall (see appendix A for details and recommended access locations).
<u>University of Oregon North Campus Conditional Use Permit – Riparian Assessment and Management Report</u> (MB&G for University of Oregon, December 27, 2017)	This riparian assessment of the North Campus area between the river and railroad was prepared to provide information to inform the North Campus master planning process and Conditional Use Permit submitted to the City of Eugene in 2018. This effort included a site assessment to determine and mapped the extent to which the Statewide Planning Goals 5 and 15 conservation setbacks applied; Delineation and mapping of Top of High Bank (TOHB) and Ordinary High-Water Mark (OHWM); Documentation of existing riparian habitat and function; and General riparian management recommendations. This report includes valuable information and direction related to the ongoing landscape management planning effort and key conclusions (see appendix A).
<u>Oregon Conservation Strategy</u> (Oregon Department of Fish and Wildlife, 2016)	The Oregon Conservation Strategy (OCS) was developed in 2006 and updated in 2016 to provide statewide guidance on conservation priorities and values and identifies priority vegetation communities and species referred to as “Strategy Habitats” and “Strategy Species”. The most relevant Strategy Habitat types for the WRNA include: Flowing Water/Riparian; Grasslands (prairie and oak savanna); and Wetlands (including wet prairie). A number of the OCS Strategy Species (fish and wildlife) have potential to thrive in the WRNA in the future with adequate site management and restoration (see Section 3.1 for list of WRNA Strategy Species).



University of Oregon Willamette River Natural Area WRNA Location Map

Legend

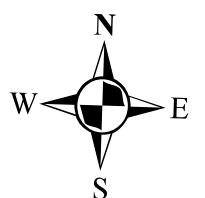
- Willamette River Natural Area (WRNA) Boundary
- Water (Mill Race and Willamette River)
- 100-Foot Regulatory Setback from Top of Bank
- Hard-Surfaced Paths (within WRNA)
- Soft-Surfaced Trails (within WRNA)
- Gravel Roads or Pads (within WRNA)
- Railroad

270

Feet

May 2022
Aerial Photo:Summer 2016
Map Prepared by: JKE

Figure 1-3



Section 2: Site History and Existing Conditions

2.1 Site History

2.1.1 Historical Events Within the Willamette Valley and Willamette River Natural Area

- ~14,000 – 18,000 BP (Before Present): A series of massive Missoula ice dam floods impounded water in the Willamette Valley including much of current day Eugene and deposited dense layers of silt.
- ~13,000 BP to present: Native Americans inhabit the Willamette Valley. Early residents were likely highly mobile hunting and gathering family groups, managing the landscape with fire. Camas ovens, projectile points, milling stones, and vegetation provide evidence of this long habitation. At the time of early Euro-American contact (French or English fur trappers in the 1600 and 1700s) and settlement (mid 1800s), there were known to be over a dozen distinct Kalapuyan dialect groups in the valley.
- 1846: Eugene Skinner files land claim near Skinner Butte. The Kalapuyan people were significantly decimated throughout the valley before this time by diseases first brought in by fur trappers followed by displacement.
- 1851: The Eugene Millrace was completed to produce power for surrounding mills and produced waterpower until around 1928. The Millrace and Outfall Channel remain today, fed by stormwater runoff and periodic pumping from the river.
- 1851-1855: The few remaining Willamette Valley Kalapuyan peoples were forcibly removed from their ancestral homelands by treaty and sent to temporary reserves scattered through the valley, significantly impacting thousands of years of heritage.
- 1850s: The area of the present WRNA was dominated by riparian forest with the main river channel meandering through a large active floodplain with numerous side channels and alcoves. The GLO land survey of the 1850s showed the main river channel at the time located much further to the north (see Figure 2-1: Historical Vegetation Map).
- 1861: The largest recorded Willamette River flood event occurred completely inundating the current WRNA area and much of downtown Eugene.



View of Willamette River in Eugene from Skinner Butte, looking east toward Willamette River during the 1890 flood. Ferry Street covered bridge at center (source: Lane County History Museum).

- 1862: Eugene City was incorporated.
- 1871: The Oregon & California railroad reaches Eugene and initially ran parallel to Franklin Boulevard.
- 1876: University of Oregon founded.
- 1890: Another massive flood event occurred resulting in significant river migration.
- 1900: The Eugene Sand & Gravel Company located on what is now the University of Oregon riverfront property, mining the river and surrounding area and later operating an asphalt and concrete plant in the area south of the railroad near the Millrace Outfall.
- 1906: A coal carbonization plant constructed on the western edge of the property and operated until 1910.
- 1940: The railroad was relocated from the area parallel to Franklin Boulevard to its current location.



Eugene Sand & Gravel operation in 1942 near the current day WRNA (source: Lane County History Museum)

- 1950s: Much of the remaining riparian vegetation was stripped from the property to accommodate quarrying.
- 1950s and 1960s: A total of six large flood control dams were constructed by the U.S. Army Corps of Engineers on the Willamette River system above Eugene, significantly reducing the risk of severe flooding. Winter and spring peak flows are typically now much lower than historical levels and summer and fall flows higher due to highly managed dam releases.
- 1964: Major flooding occurs on the Willamette River.
- 1964: Eugene Sand & Gravel Company begins relocating operations to the confluence of the McKenzie.
- 1965: The Millrace Outfall is present on historical aerial photos in its current location.
- 1968: The University purchases much of the riverfront property from the Eugene Sand & Gravel Company.
- 1970: The current bicycle and pedestrian bridge (now named the Frohnmayer Bridge) was constructed.
- 1972: A railroad underpass for pedestrians was constructed making a direct connection from campus to bridge, path system, and Autzen Stadium.
- 1965-1970s: Fill of unknown origin was placed and graded across much of the former quarry site to prepare the area for future development.
- 1978: North Campus Master Plan approved for construction of playing fields on the riverfront (one completed).

- 1980s: The South Bank Path was constructed.
- 1980s –2000s: EWEB leased the University lands west of the Millrace Outfall for use as a fenced storage yard for utility operations.
- 1985: The Eugene City Council creates the Riverfront Park Special Development District in the north campus area.
- 1989: The UO develops the Riverfront Research Park (RRP) Master Plan. Subsequent RRP development occurred to the south of the railroad, leaving the area between the river and railroad largely undeveloped, with limited changes occurring in this area and minimal landscape management practices.
- 1998: A second railroad underpass was constructed (Riverfront Parkway) to provide vehicular access for planned Riverfront Research Park development. This road is only open to bicycles, pedestrians, and maintenance/public safety vehicles to the north of the railroad.
- 2006: University and EWEB completes various site cleanup activities which were initiated beginning in 1984 on the western portion of the UO-owned property (area leased to EWEB for utility storage) and the Oregon Department of Environmental Quality issues a conditional “No Further Action Recommendation” in 2009 for the work completed.
- 2009: The RRP Conditional Use Permit expires, then extended to 2012 before expiring again.
- 2014: Campus Physical Framework Vision Project completed which assessed potential for campus growth, providing the basis for subsequent land use planning.
- 2018: The City of Eugene approves the UO North Campus Master Plan and Conditional Use Permit which is in effect for 30-years and designates much of the land along the river as open space.
- 2021: The Campus Plan is amended establishing the 24-acre WRNA for its intended use of habitat, recreation, and education.
- 2021: The City of Eugene reconstructs the South Bank Path to current city standards, including the addition of the university’s campus standard for lighting, and relocates a portion of the path to be further from the river.
- 2021: EWEB completes construction of a major water main through the university’s riverfront, a portion of which is under the WRNA.
- 2022: UO develops a 20-year Landscape Management Plan to guide restoration enhancement, landscape management activities, and compatible recreational and educational uses.



Aerial view of the University of Oregon in 1924 with Willamette River and present day WRNA behind the smokestack (source: UO Photo Archives)

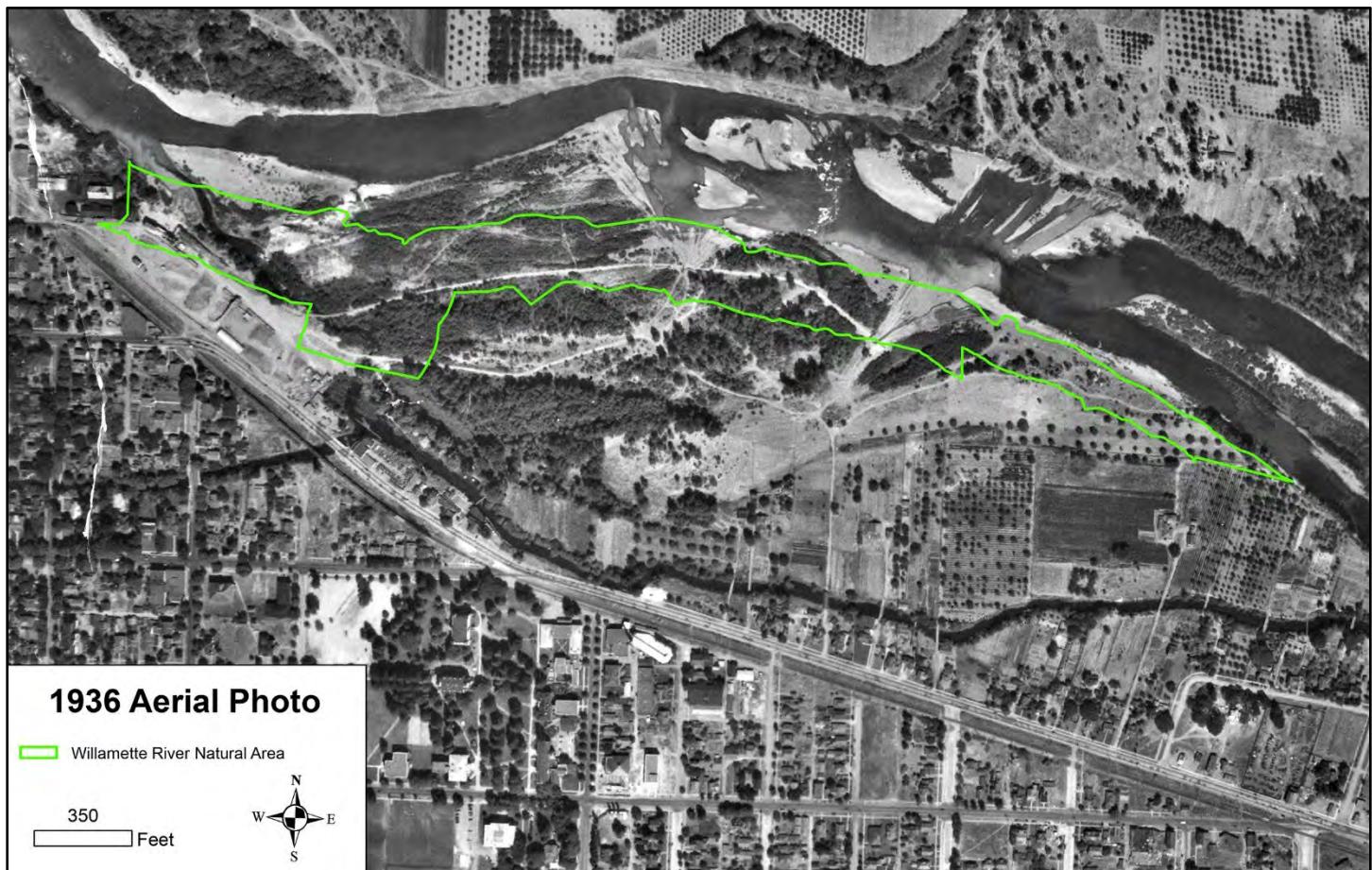
Sources: Archeological Survey of the City of Eugene South Bank Shared Use Path Project (2020), University of Oregon Riverfront Vision Plan (2012), and historical aerial photo interpretation (see Appendix B).

2.1.2 Historical River Conditions and Vegetation Communities

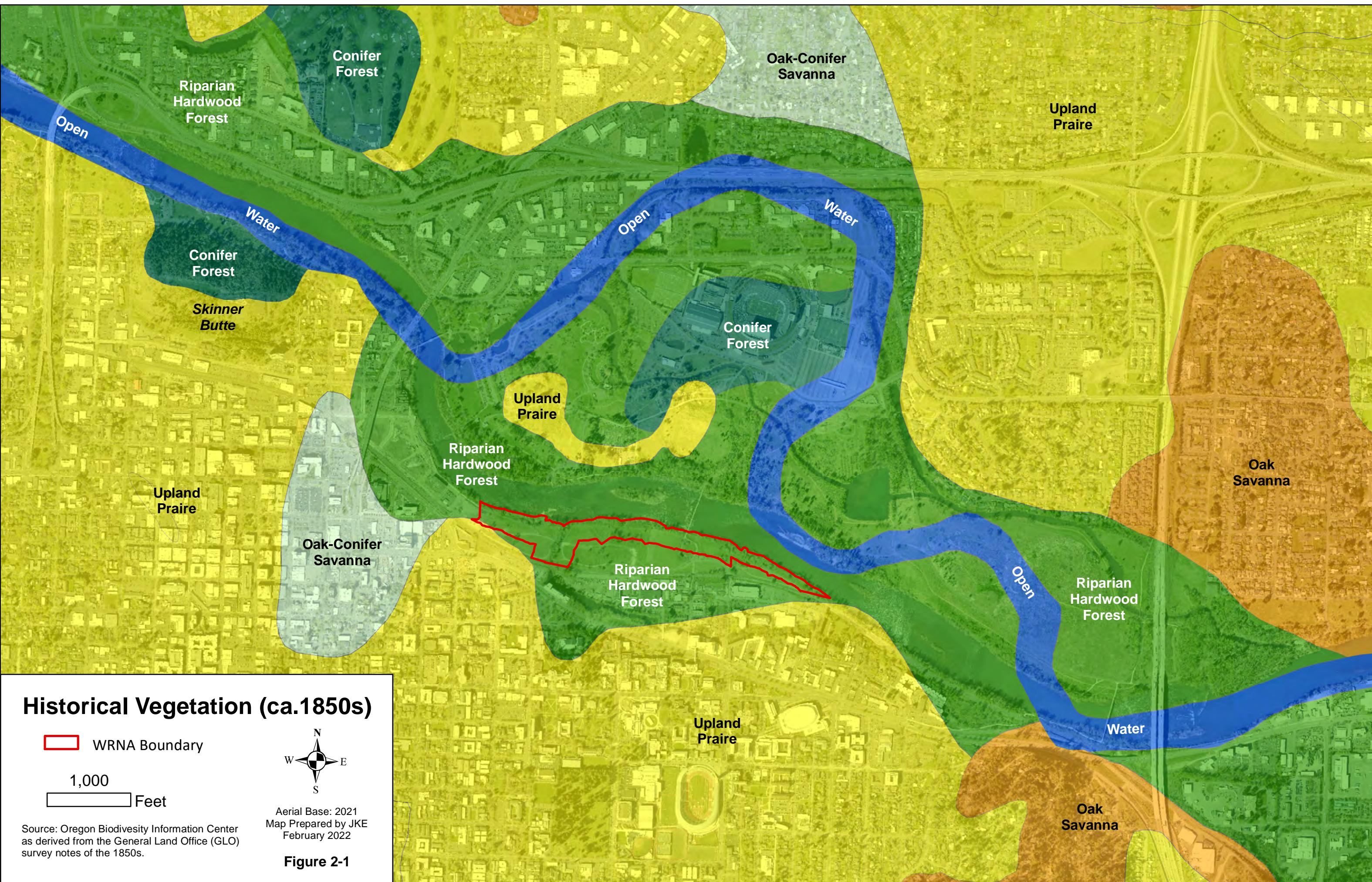
Prior to Euro-American settlement in the mid-1850s, the Willamette River meandered across an extensive floodplain with riparian areas up to several miles in width. The river routinely flooded and migrated, depositing thick layers of sediments and gravels and creating regular disturbance that helped riparian habitats regenerate and thrive. This braided river system with side channel, alcoves, and large woody debris provided ideal conditions for aquatic species including anadromous fish such as Spring Chinook Salmon and Pacific Lamprey. The river, referred to as the Whilamut by the native Kalapuyan people, provided sustenance and aided travel and was most certainly a cultural centerpiece for countless generations.

The General Land Office (GLO) survey notes of the 1850s provide the best available record of the pre-settlement vegetation patterns in the Willamette Valley. The federal government commissioned these surveys which recorded general vegetation communities and other significant features present at the time across much of the west. These maps were translated into digital map format in the 1990s by the Oregon Biodiversity Information Center. At the time of the Willamette Valley GLO surveys, the native plant communities were presumably grazed to some extent by free-ranging livestock brought in by early settlers, but otherwise largely undisturbed through other Euro-American activities such as road building, drainage, tilling, or urban development (Christy et al. 2011).

The GLO survey noted an area of riparian forest almost a mile in width in this section of river including most of the area contained within WRNA. At the time of mapping, the main channel of the river was much further to the north from its current location and flowed in a large meander around to the north of what is the current day Autzen Stadium at the time. Upland prairie with widely scattered oaks were dominant in the adjacent to the Willamette River with some smaller patches of conifer forest found in areas less susceptible to fire such as the shady north side of Skinner Butte (see Figure 2-1: Historical Vegetation Map).



The 1936 aerial photo (earliest for site) shows gravel mining operations along the river and the railroad running parallel to Franklin Blvd. A full set of historical aerial photos is found in Appendix B (Source: UO Map Library).



2.1.3 Land Use History

Beginning in 1900, much of the land that is now contained within the WRNA was utilized by Eugene Sand & Gravel Company for aggregate mining and associated processing operations. Mining and processing continued in the area through the mid-1960s along with operation of an asphalt production facility in the area east of the Millrace Outfall near the railroad. Based on analysis of historical aerial photos, it appears that some sections of the natural riverbank may have been left in place by the Eugene Sand and Gravel Company to serve as a buffer protecting the mining operation from the river and would be consistent with other gravel mining practices of the time. The 1936, 1944, and 1952 aerial photos show evidence of “bar scalping” or use of a dragline and bucket to harvest gravel directly from the river, another common practice of the time. Between the mid-1960s and 1970s, large quantities of fill material were placed graded into the former aggregate extraction areas leaving a generally level upper terrace across much of the property with steep banks down to the river and Millrace Outfall. The origin of fill is unknown but is thought to consist mainly of construction debris such as mixed soils, concrete, and asphalt. The South Bank Path and the UO grass athletic field were subsequently constructed on top of the fill. From the 1980s up until the 2000s, the western portion of the UO property was leased to EWEB and fenced for utility storage. This area has since been cleaned of debris and surface contamination and the fencing was recently removed. In 2018, a Conditional Use Permit (CUP) for the North Campus area was submitted to the City of Eugene and approved to guide the next thirty years of land use in this area and included the designation of the 24-acre WRNA. In 2021, the South Bank Path was relocated to an alignment further back from the river and a large EWEB water main was installed through the area. The area impacted by these activities along with the former EWEB storage yard were hydroseeded in fall of 2021 with a compost and a low-diversity native grass and forb mix for erosion control.

2.2 Existing Landform and Hydrology

2.2.1 Geology, Landform, and soils

The WRNA is located at the convergence of several mapped geologic surfaces, and although much of the area was disturbed during the aggregate mining operation in the early- to mid-1900s, remnants of these surfaces are still evident and could serve as a valuable educational resource for future field study or research activities. According to the Oregon Department of Geology and Minerals Industry (DOGAMI) data (see Figure 2-3: Geologic Map Units), the majority of the site and the area to the south is mapped as *Fan-delta Alluvium* (Qfd), transitioning to *Meander Belt Alluvium* (Qal) near the current riverbank and into Alton Baker Park. The *Meander Belt Alluvium* was deposited in more recent times with the *Fan-Delta Alluvium* most likely forming from somewhat older river deposits. Areas of *Eugene Formation* (Te), a sandstone formed from marine sediments deposited between 33 and 36 million years, are mapped in two locations including an area near the Frohnmyer Bridge and an area near the Millrace Outfall. The Eugene Formation is visible in areas of exposed bedrock



Shell fossil imprint found near the “Fossil Beach” (Source: B. Newhouse)

which is partially responsible for many of the river rapids in this area. Shell fossil imprints are routinely found in the exposed bank of the river just below the bridge in the area referred to locally as "Fossil Beach". Lastly, a small area mapped as *Tuff of Bond Creek* (Ttb), is located along the river just below the Millrace Outfall. This geologic surface is unique in this area and was formed from compacted volcanic ash deposit that formed between 25 and 33 million years ago. Although some of the steep riverbank segments seems to include portions of natural "cut bank", it is difficult to confirm due to the level of disturbance in the area over the last century and the thick growth of Ivy and Blackberry.

It was the *Fan-delta Alluvium* and *Meander-belt Alluvium* that was mined from this area beginning in 1900. Once aggregate mining was completed in the 1960s, the mined areas were backfilled over time to prepare in anticipation of future development. Based on boring logs from investigations conducted on the western portion of the WRNA (formerly leased to EWEB) along with evaluation of historical and modern contour data, the fill varies likely in depth from four to twelve feet across the site, increasing thickness toward the top of the riverbank. Fill material noted from the boring included silt, sand, gravel, crushed rock, bedrock fragments, and construction debris such as concrete and asphalt. Concrete and asphalt chunks are visible on portions of the riverbank, likely placed over time in an effort to control erosion. Elevations range from about 431 feet in the area closest to the railroad to approximately 405 feet along the river near the western end of the site. Much of the site is relatively flat (5% or less) with the steepest slope found along the river. Much of the slope along the banks of the Millrace Outfall and the river is in excess of 100% (see Figure 2-2: Sectional Elevations of Existing Conditions Map and Figure 2-4: Slope and Topography Map). As a result of the past land uses, much of the natural soil profile in this area has been disturbed. In general, much of the site now appears to contain at least a surface layer of soft loamy soil that would be suitable for supporting future tree and shrub growth with the exception of the area associated with the former EWEB storage yard, the former Eugene Sand & Gravel Company processing plant, and a portion of the eastern end of the site (closer to the railroad) which has a heavily compacted surface area.

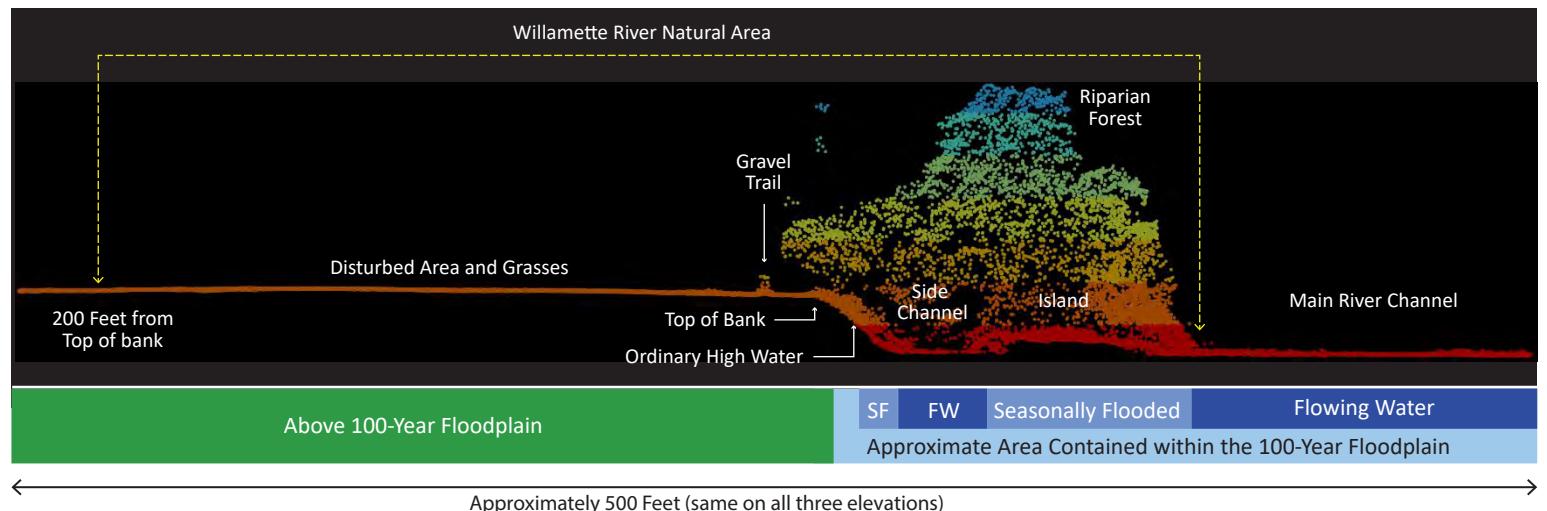


Steep banks and narrow band of riparian forest along the river (Source: J. C-M)

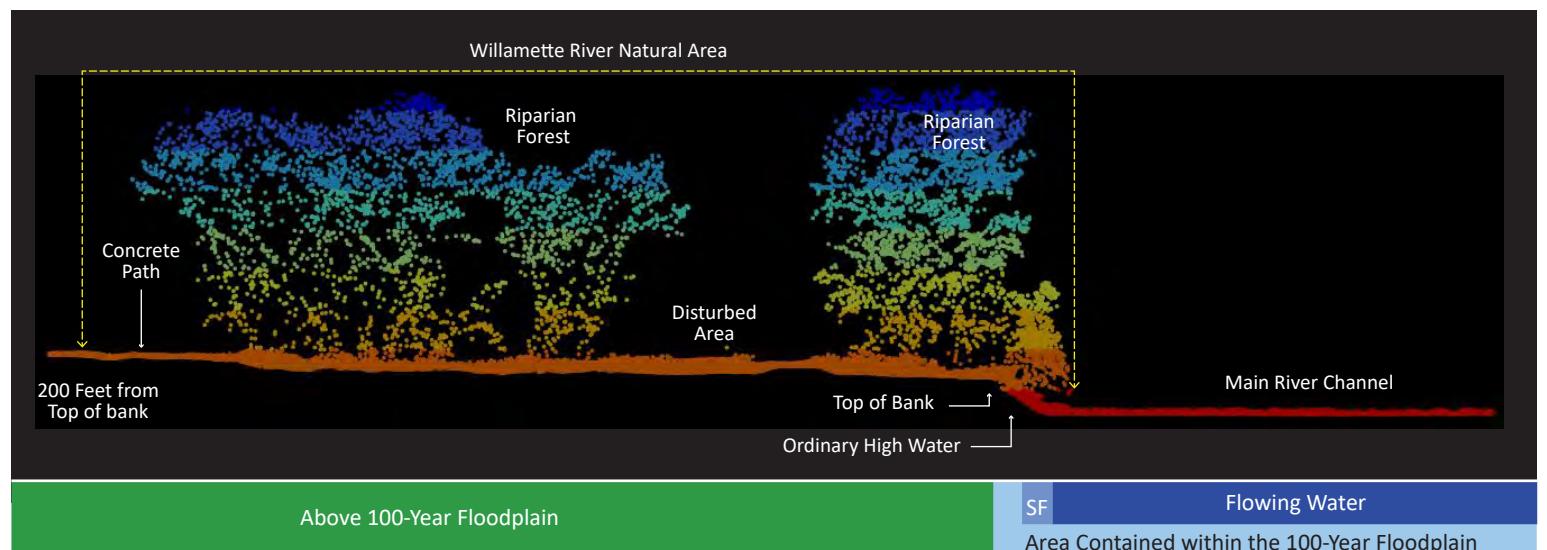


Much of the site is situated on a relatively flat upper terrace (Source: J. Krueger)

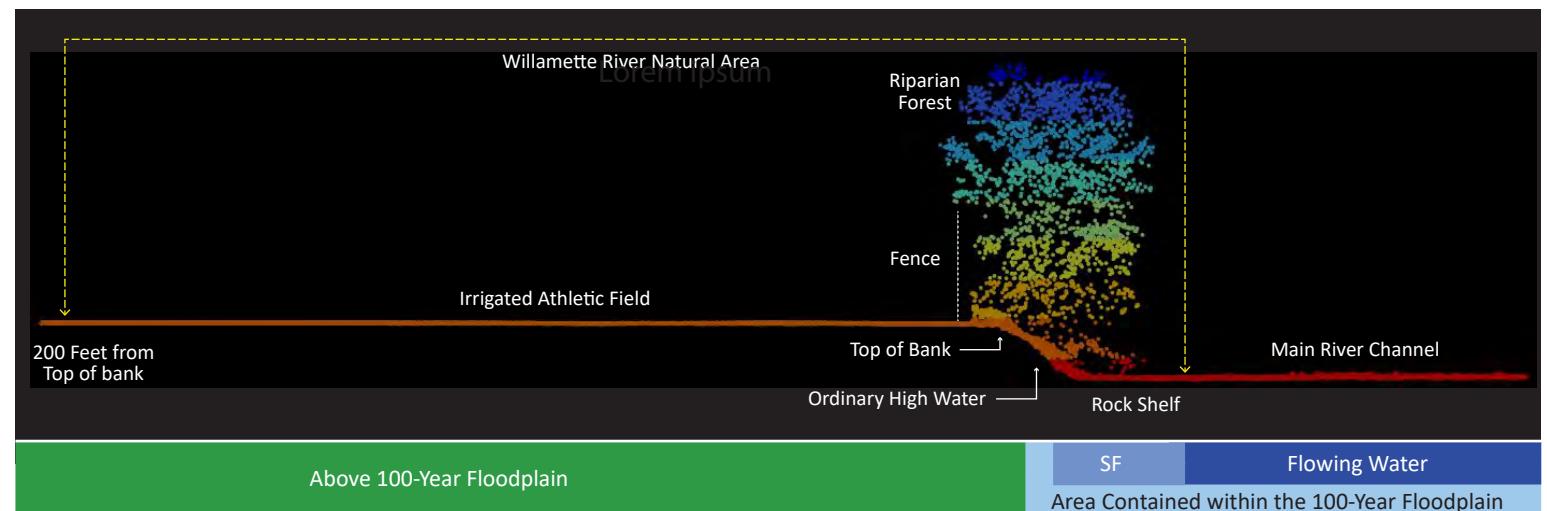
Elevation 1 (looking downriver)



Elevation 2 (looking downriver)



Elevation 3 (looking downriver)



Willamette River Natural Area LiDAR Derived Site Profiles

April 2022 Figure 2-2

Source: Elevations derived from Oregon Department of Geology and Mineral Industries LiDAR topographic data (2019). 100-year floodplain area is estimated based on FEMA Base Flood Elevations and differs from the FEMA floodplain mapping. Prepared by JKE.





University of Oregon Willamette River Natural Area

Geologic Map Units

Legend

- Willamette River Natural Area Boundary
- Meander-belt Alluvium (Qal)
- Fan-delta Alluvium (Qfd)*
- Eugene Formation (Te)
- Tuff of Bond Creek (Ttb)

Data Source: Oregon Department of Geology and Mineral Industries

*Significant quantities of anthropogenic fill have been deposited on top of the Qfd formation within most of the WRNA

270
Feet

May 2022
Aerial Photo:Summer 2016
Map Prepared by: JKE

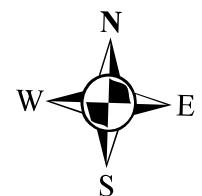


Figure 2-3



**University of Oregon
Willamette River Natural Area**

Slope and Topography Map

Legend

- Willamette River Natural Area Boundary
- 10-Foot Contours (LiDAR Derived)
- Water (Mill Race and Willamette River)

- | |
|---------------|
| 0-5% Slope |
| 5-10% Slope |
| 10-25% Slope |
| 25-50% Slope |
| 50-100% Slope |
| >100% Slope |

270
Feet

Draft: February 2022
Aerial Photo: Spring 2021; Map Prepared by: JKE

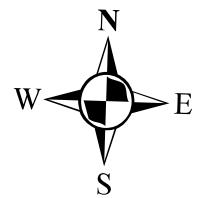


Figure 2-4

2.2.2 Surface Hydrology and Wetlands

Willamette River and Associated Floodplain

The WRNA contains 4,500 linear feet (nearly one mile) of riverbank. Although most of the bank in this area is relatively steep, “cut banks” (naturally occurring steep banks) are not an uncommon feature on the Willamette River system and the 2017 riparian assessment conducted by MB&G noted that many of the morphological components necessary for a healthy river ecosystem were present along the river’s edge. These included:

- Pools and riffles,
- gravel bars,
- seasonally exposed vegetated benches,
- large woody debris,
- mud flats,
- fringe wetlands,
- boulder clusters, and
- backwater and side channel habitat.

The assessment report goes on to conclude that based on the habitat features currently present, the aquatic habitat within in the WRNA appears to provide a range of conditions that are suitable for all native fish species life stages expected to occur in the river. The report makes several recommendations on potential habitat enhancements that could be implemented to improve current conditions including removal of refuse and encampments, invasive species control, increased native vegetation including

large shade producing trees, and removal of concrete debris on the shoreline which is contributing to erosion. The report did not recommend bank modification as a tool for improving aquatic or riparian functions on the site (see Appendix A for a full list of MB&G recommendations).



River side channel just below the Millrace outfall (Source: J. Krueger)

The FEMA mapped 100-year floodplain covers approximately 14.5 acres (60%) of the WRNA, but the extent of regular seasonal flooding is fairly limited in area due to the general steepness of the banks and the accuracy of the current floodplain map data is questionable. Many of the islands and exposed bedrock areas within the river channel are seasonally inundated during winter flows. Based on readings from the USGS Eugene river gauge, flows in this stretch of the river range from 1,800 cfs during the summer months with peak winter flows typically ranging up to 20,000 cfs. The upriver dams significantly dampen natural flood events by design. The Corps of Engineers is experimenting with modified flow to benefit habitat, but protection of property is a primary driver of dam operations and it is unlikely that large flood events like those that occurred prior to the mid-1960s will be seen in the foreseeable future.

Millrace Outfall

The Millrace Outfall channel enters the WRNA from the south through a concrete box culvert. A water control structure near the railroad tracks splits the Millrace flow so that a portion goes toward the river, with the rest moving further

down the Millrace toward downtown and into the river at the outfall in Riverfront Park. The water in the Millrace is a mix of stormwater runoff and water pumped directly from the Willamette River at the Millrace head near the I-5 bridge. The Millrace Outfall channel bottom varies from 10 to 30 feet in width as it flows north for 500 feet before entering the river. The water flows under a small concrete bridge near the railroad and then through a 50-foot long, 48-inch circular culvert located underneath the South Bank Path and the gravel-surfaced access road. The culvert under the bike path is constricted on the south side and partially obstructed by a heavy accumulation of sediment and debris backing up water in that area. In its current condition, the entire Millrace Outfall corridor provides habitat for amphibians, reptiles, small mammals, fish, and birds to forage, migrate, and reproduce. The area below the 48-inch culvert also functions as backwater refugia for fish during high flows in the river (see Section 2.3.3).



Millrace Outfall just above the confluence (Source: J. Krueger)

Wetlands and Pools

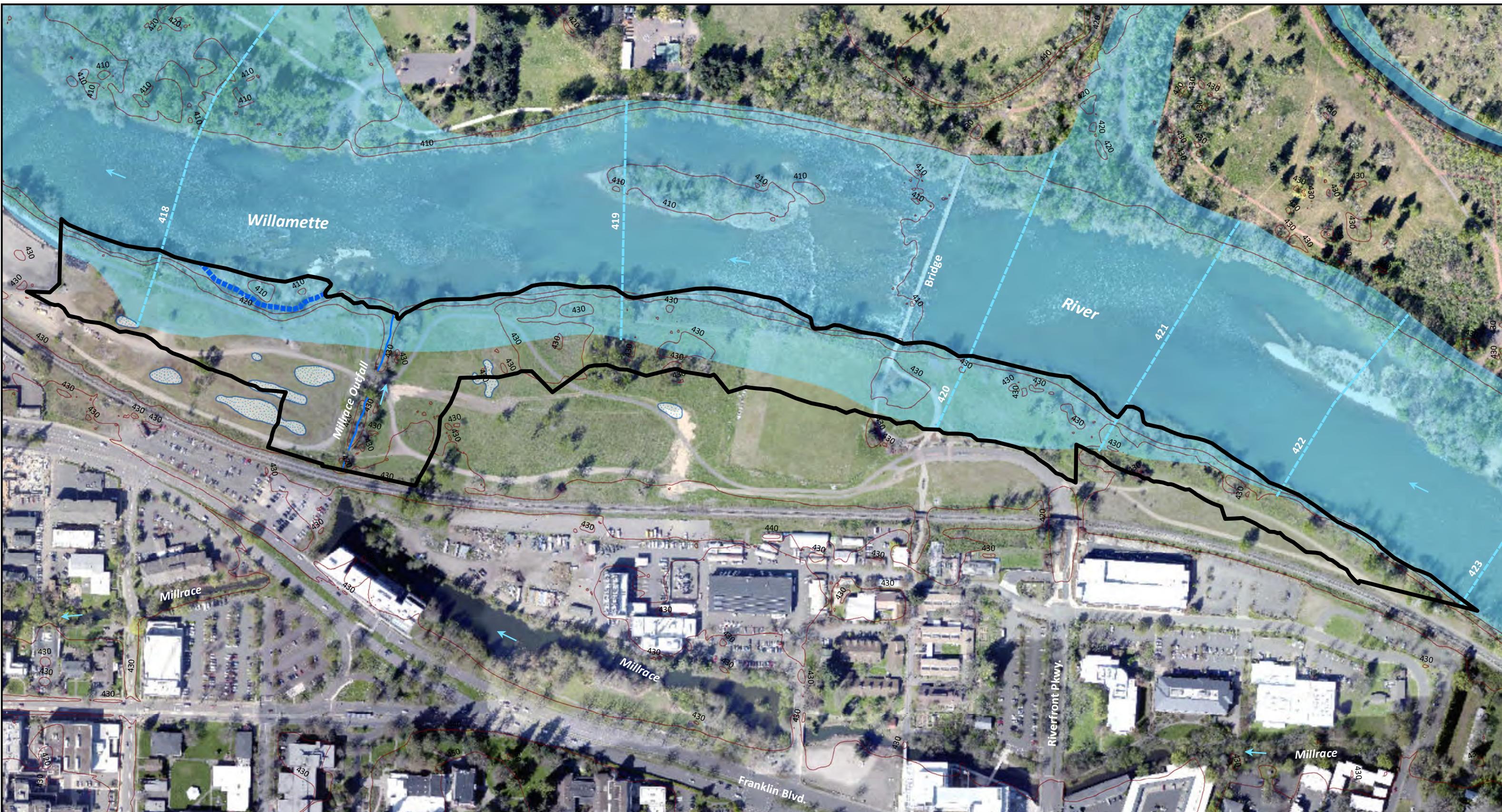
In addition to the wetted banks along the river and the Millrace Outfall, there are several small wetland areas and other seasonal pools within the WRNA totaling approximately a third of an acre. These are mainly in the area just to the west of the Millrace Outfall and along the newly constructed path. Some additional delineated wetlands are found just outside of the designated WRNA boundary to the west of the Millrace Outfall (see Existing Surface Hydrology Map). All of these wetlands and pooled areas likely formed due to the combination of flat terrain and heavily compacted soils resulting in a perched water table that remains inundated during the winter months. Many of these wetlands have been monitored for plant composition by Professor Emerita Bitty Roy and her students.



One of several small areas with wetland hydrology perched on top of compacted soils (Source: J. Krueger)

2.2.3 Infrastructure and Utilities

An array of underground utilities are found within the WRNA including electrical, telecommunication, and irrigation lines, stormwater culverts, and a large Eugene Water & Electric Board (EWEB) water main that was installed in 2021 (see Existing Infrastructure and Utilities Map). There are no overhead utilities present. A standard pre-project utility locate is highly recommended prior to any future earth disturbing activities in the WRNA including tree and shrub planting.



University of Oregon Willamette River Natural Area

Existing Surface Hydrology

Legend

- Willamette River Natural Area Boundary
- Water (Mill Race and Willamette River)
- Mapped 100-Year Floodplain (FEMA)
- Seasonal Wetlands or Mapped Pools
- 10-Foot Contour

- Existing River Side Channel
- ← Direction of Flow
- Base Flood Elevation (FEMA)

270

Feet

Draft: February 2022
Aerial Photo: Spring 2021
Map Prepared by: JKE

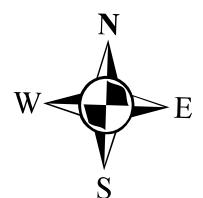
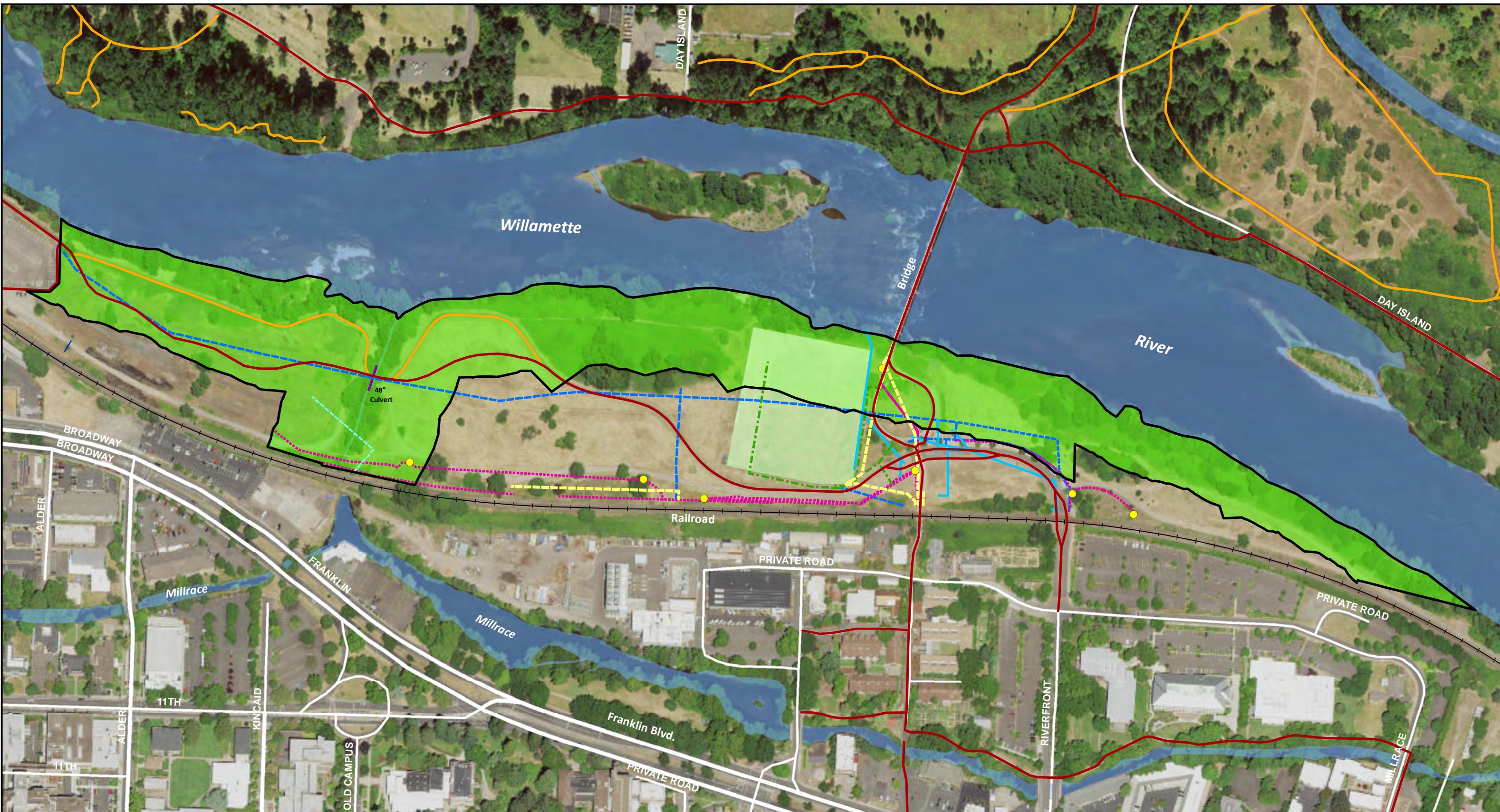


Figure 2-5



**University of Oregon
Willamette River Natural Area**
Existing Infrastructure and Utilities Map

- Legend**
- Willamette River Natural Area Boundary
 - UO Property Boundary (north of campus)
 - Hard-Surfaced Path or Designated Bikeway
 - Soft-Surfaced Trail
 - Athletic Surfaces

- Roads**
- EWEB Water Main (north of railroad)
 - EWEB Service Lateral (north of railroad)
 - Underground Electrical (north of railroad)
 - Telecommunication Lines (north of railroad)
 - Irrigation Lines (north of railroad)
 - Major Culvert

270
Feet

Draft: February 2022
Aerial Photo: Summer 2016
Map Prepared by: JKE

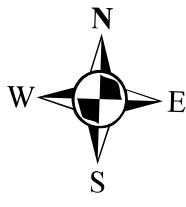


Figure 2-6

2.3 Existing Vegetation and Wildlife

No formal botanical surveys have been conducted on the site. However, the University of Oregon tree inventory provides spatial data showing location, species, and size of many of the trees in the area (see Existing Conditions Maps with tree data in Appendix C). Additionally, Professor Emerita Bitty Roy from the University of Oregon Institute of Ecology and Evolution has documented the presence of over 200 plant species within the general riverfront area since 2012 with the assistance of numerous students. Of the plant species documented, approximately 70 are native. No State or Federally listed (threatened or endangered) plant species have been documented or are known to exist on the site.

2.3.1 Existing Vegetation and Cover

A mix of vegetation communities and cover types are found on the site. Mapping of the general cover types found in the WRNA was completed in January 2022 based on field observations and aerial photo interpretation with input from HAT members on cover classifications (see Figure 2-8: Existing Vegetation and Cover Map). This data reflects the most recent alignments of the constructed paths and trails as well as disturbances from the path construction and water main installation, both completed in late 2021. A total of 23.0 acres (93.5% of the WRNA) is mapped as vegetated with the remaining 1.6 acres (6.5% of the WRNA) mapped as unvegetated surfaces such as paths, trails, roads, and pads.

Figure 2-7: Vegetation Communities (2021 Condition)

Cover Types	Acres	Canopy Cover	Description and Notes
Vegetated			
Riparian Forest	5.8	70-100%	Hardwood forest on banks of river and the Millrace including some flowing water. Generally native tree cover with some limited native understory.
Upper-terrace Mixed Woodland	1.1	31-70%	Mixed forest on upper terrace with low quality understory.
Grassland	2.8	0%	Grassy areas with minimal shrub cover (blackberry, etc.).
Disturbed	8.9	Mixed	Areas of uneven topography and concentrations of non-native shrubs (i.e., blackberry), pasture grasses, and forbs (i.e., poison hemlock).
Recently Disturbed and Seeded*	2.3	0%	Areas that were disturbed in 2021 to install the re-located path or the EWEB water main. Overseeded with a native seed mix.
Irrigated Turf	2.0	0%	Mowed and irrigated natural turf athletic fields and circular area near the bridge.
Ornamental Planting Beds	0.1	Mixed	Small beds near the bridge with a mix of native and non-native trees and shrubs.
Sub Total (Vegetated):	23.0		
Non-Vegetated			
Hard-Surfaced Path	0.8	0%	Concrete (12' width)
Soft-Surfaced Trail	0.4	0%	Compacted gravel (6' width)
Gravel Road or Pad	0.3	0%	Compacted gravel (16' width)
Concrete Pad or Asphalt	0.1	0%	Remnants of former building floors or paths
Sub Total (Non-Vegetated):	1.6		
Grand Total:	24.6		

* Seeded with *Bromus sitchensis*, *Epilobium densiflorum*, *Festuca roemeri*, *Prunella vulgaris*, var. *lanceolata*, and *Elymus glaucus* (November 2021)

Photo examples of existing land cover and vegetation types:

*Flowing water and riparian forest just below the bridge
(Source: J. Krueger)*



Riparian area along the river in the area just east of the Millrace Outfall (Source: B. Roy)



*Upper-terrace mixed woodland (left) with disturbed area (middle) and riparian forest (right) in the area east of the Millrace Outfall
(Source: J. Krueger)*



Narrow band of riparian forest at the confluence of the river and Millrace Outfall, at the start of the river side channel with perched wetland hydrology in the background (Source: J. Chinitz-Mital)



Recently disturbed area (water main installation) east of the bridge that was overseeded with low diversity native mix in fall 2021 (Source: J. Krueger)



Irrigated turf athletic field and bridge approach looking east (Source: J. Chinitz-Mital)



*Relocated South Bank Path
with overseeded edges and
upper-terrace mixed woodland*
(Source: J. Krueger)

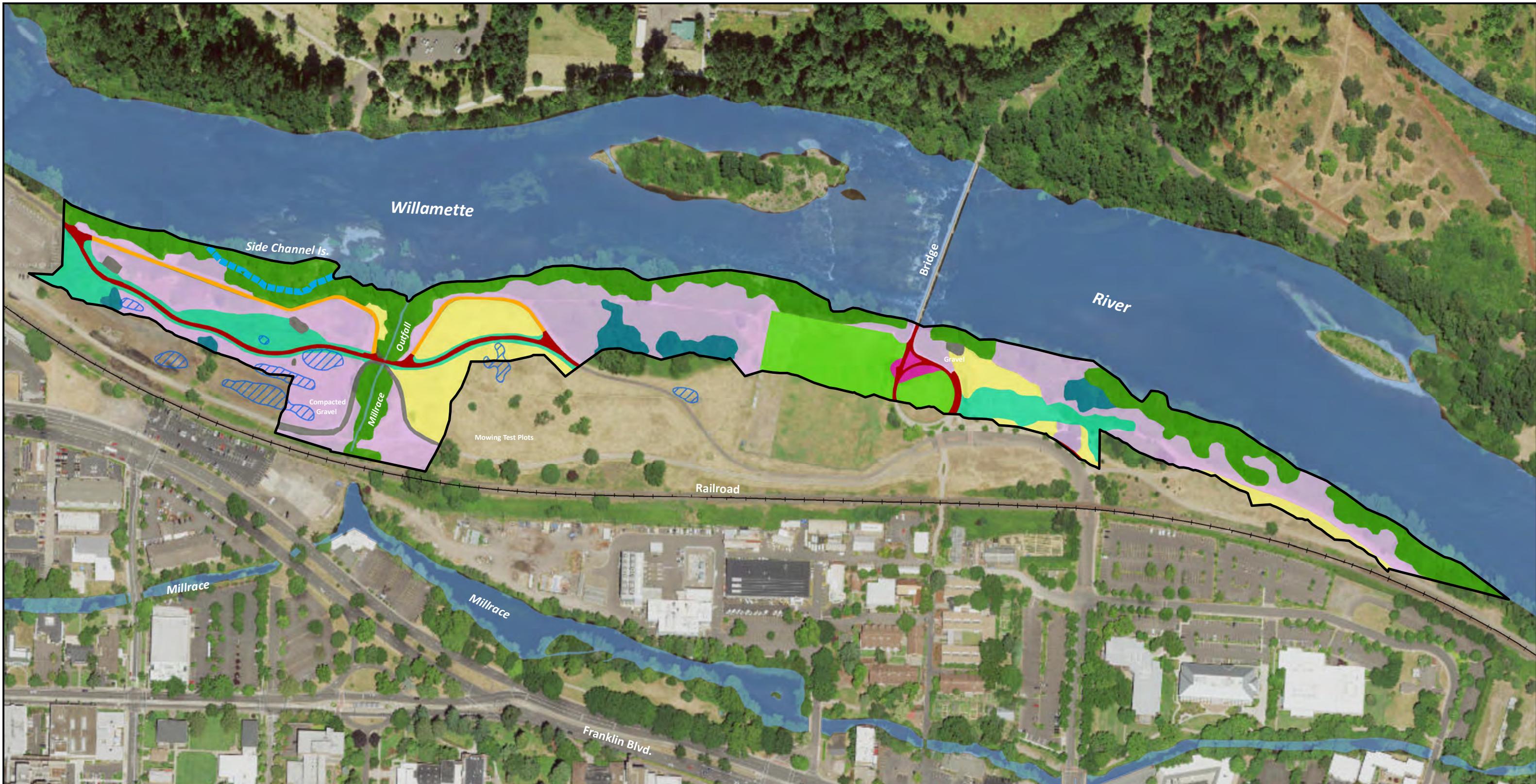


*Soft-surface gravel trail with
the Millrace Outfall riparian
forest in the background*
(Source: J. Krueger)



*Concrete remnant from former
building floor with relocated
South Bank Path on the right*
(Source: J. Krueger)





**University of Oregon
Willamette River Natural Area**

Existing Vegetation and Cover Map

- Willamette River Natural Area Boundary
- Water (Mill Race and Willamette River)
- Seasonal Wetland or Mapped Pools
- Hard-Surfaced Paths (concrete)
- Soft-Surfaced Trails (gravel)
- Gravel Road or Pad
- Concrete (remnant building pads)
- Native Trees (UO inventory)
- Non-Native Trees (UO inventory)

- Vegetation and Cover Type:**
- Riparian Forest
 - Upper-terrace Mixed Forest
 - Grassland (non-native grasses, no shrubs)
 - Recently Disturbed and Seeded (path/utility work)
 - Disturbed (uneven, blackberry, or compacted)
 - Irrigated Turf Fields
 - Ornamental Shrub Beds

Draft: February 2022
Aerial Photo: Summer 2016
Map Prepared by: JKE

270
Feet

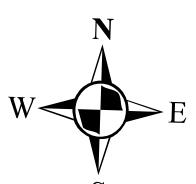


Figure 2-8

2.3.2 Non-native Vegetation

Just over 130 non-native plant species are known to exist within the WRNA, although many of those are not considered invasive – species which would pose a significant threat to the site's ecological function. The Emerald Chapter, Native Plant Society of Oregon (NPSO) maintains a list of invasive species thought to be of the highest threat or priority for control in our region. Relevant species in the High or Medium threat categories have been listed below, and the list is adapted here for purposes of this document and site. Not all High or Medium threat species listed below are known to currently be present on the site but may have potential for future invasion in the WRNA due to proximity to established populations nearby.

Emerald Chapter NPSO Invasive Species Rank Key:

- **High (H):** These species repeatedly have been observed to be very invasive locally in native, wildland areas. They often form near-monocultures, becoming the only dominant member of a plant community. They often severely modify native habitats, likely causing local plant extirpations and significantly alter ecological functions and processes.
- **Medium (M):** These species are moderately invasive but may not disperse widely from a source (e.g., planting or dumping/disposal site). May form small near-monocultures or be one of two or more dominant members of a plant community. They moderately impact native habitats, likely not causing native plant or invertebrate extirpations.

Figure 2-9: High and Medium Impact Non-Native Invasive Plan Species

Scientific Name	Common Name	Presence	Rank*	Summary of NPSO Notes (WRNA notes added here)
Invasive Known to be Present on Site				
<i>Arum italicum</i>	Italian Lords and Ladies	Yes	-	Present at the WRNA in isolated patches. Very difficult to control once established.
<i>Brachypodium sylvaticum</i>	False Brome	Yes	H	Highly invasive shade-tolerant grass expanding rapidly in forests. It can drastically change forest understories. Present in several locations on river shoreline.
<i>Conium maculatum</i>	Poison Hemlock	Yes	-	Not on NPSO list, but a concern on site. Forms some large patches and is highly poisonous. Generally found in disturbed areas and is difficult to control once established.
<i>Crataegus monogyna</i>	English Hawthorn	Yes	H	Dominates wetland and upland prairies, savannas, and understories in woodland and forest areas.
<i>Cytisus scoparius</i>	Scotch Broom	Yes	H	Found in prairies and disturbed areas throughout the valley.
<i>Digitalis purpurea</i>	Foxglove	Yes	M	Forms large stands, particularly along roadsides and meadows.
<i>Geranium lucidum</i>	Shining Geranium	Yes	H	Has become dominant in forest and oak woodland understories throughout the valley over the decade. Dominating herbaceous layer in several locations in the WRNA riparian forest.
<i>Geranium robertianum</i>	Herb Robert	Yes	H	Dominates forest understories throughout the valley.
<i>Hedera Hibernica</i> and <i>Hedera helix</i>	Atlantic/English and Irish Ivy	Yes	H	Forms near-monocultures in forest understory and can climb into canopy causing dense shade and weight stress.
<i>Hypericum perforatum</i>	Saint John's Wort	Yes	M	Planted for medicinal use but has spread widely into meadows and roadsides in the Valley and Cascades.
<i>Iris pseudacorus</i>	Yellow Flag Iris	Yes	H	Forms near-monocultures in wetlands and along riverbanks.

Scientific Name	Common Name	Presence	Rank*	Summary of NPSO Notes (WRNA notes added here)
<i>Lathyrus latifolius</i>	Perennial Pea	Yes	M	Found in disturbed areas and hedgerows.
<i>Leucanthemum vulgare</i>	Oxeye Daisy	Yes	H	Widely escaped in upland prairies, along roadsides.
<i>Melissa officinalis</i>	Lemon Balm	Yes	M	Widespread weed in wetlands and along trails in woodlands. Greatly expanded in Eugene over past decade.
<i>Mentha pulegium</i>	Pennyroyal	Yes	H	Widespread in emergent wetlands in west Eugene wetlands and elsewhere.
<i>Prunus lusitanica</i>	Portugal Laurel	Yes	M	Appears occasionally to regularly along WRNA riverfront in riparian forest.
<i>Prunus laurocerasus</i>	English Laurel	Yes	M	Appears occasionally along WRNA riverfront .
<i>Robinia pseudoacacia</i>	Black Locust	Yes	H	Naturalized invasive tree that can form woodland monocultures found in numerous areas in the WRNA.
<i>Rosa eglanteria</i>	Sweetbriar Rose	Yes	M	Invades native upland prairies.
<i>Rubus bifrons or armeniacus</i>	Armenian or Himalayan Blackberry	Yes	H	Very invasive and widespread in the valley in disturbed areas and riverbanks.
<i>Rubus laciniatus</i>	Cutleaf Blackberry	Yes	M	Not as invasive as <i>R. armeniacus/bifrons</i> , but can form dense patches.
<i>Solanum dulcamara</i>	Bittersweet Nightshade	Yes	M	Widespread in many wetlands and riparian areas. Can smother other vegetation.
<i>Silybum marianum</i>	Milk Thistle	Yes	-	Present in isolated patches across the WRNA. Classified as a noxious weed by Oregon State Weed Board.
<i>Vinca major</i>	Periwinkle	Yes	M	Capable of dominating understories. Present in a few large patches.
Invasives Not Currently known to be On Site (common in the region)				
<i>Buddleja davidii</i>	Butterfly Bush	No	H	Found in riparian areas throughout the valley. Not known to exist within the WRNA but should be watched for.
<i>Fallopia spp.</i>	Knotweed	No	H	Form monocultures in riparian or other moist habitats. Not known to exist within the WRNA but present elsewhere along the river and should be monitored.
<i>Ludwigia hexapetala</i>	Water Primrose	No	H	Aquarium plant that forms dense monoculture in river side channels and ponds. Is found in the Willamette River system as far upstream as Delta Ponds. Not known to exist within the WRNA side channel but should be watched for.
<i>Lythrum salicaria</i>	Purple Loosestrife	No	H	Forms near monocultures in wetlands and along rivers. Immense problem across the country. Not known to be present in the WRNA but should be watched for.
<i>Prunus avium</i>	Sweet Cherry	Likely	H	Common in the valley. Shades out forest understory.
<i>Rubus vestitus</i>	European Blackberry	No	H	Very invasive and widespread mostly in coniferous forest understories.

2.3.3 Observed Wildlife

Formal or systematic fish or wildlife surveys have not been conducted within the WRNA, but a number of reliable sources of wildlife data exist for the area on and around the site. Professor Emerita Bitty Roy from the University of Oregon Institute of Ecology and Evolution, Professor Michael Geffel from the Department of Landscape Architecture, Professor Peg Boulay from the Environmental Leadership Program, and many others have documented wildlife observations on and around the site over the past number of years. Additionally, iNaturalist and eBird reports provide supplemental wildlife reporting. Species list have been combined below and include a total of 10 mammal, 71 bird, 2 reptile, 2 amphibian, 1 mollusk, and 17 fish species. Additional observation and formal inventories in the future will undoubtedly record numerous more species, particularly reptiles, amphibians, and insects and confirm presence of fish species. There is significant potential to incorporate these future surveys into University curriculum and research projects.

Mammals:

- Long-tailed Weasel
- American Beaver
- River Otter
- Townsend's Mole (mounds)
- Racoon
- Coyote
- Red Fox
- Gray Fox
- Eastern Fox Squirrel (non-native)
- Nutria (non-native)

Fish:

Native fish species include:

- Pacific Lamprey*
- Spring Chinook Salmon
- Three-spine Stickleback*
- Speckled Dace*
- Sandroller*
- Northern Pikeminnow*
- Rainbow Trout
- Redside Shiner*
- Torrent Sculpin

* Indicates fish species identified in the Millrace Outfall channel during the April 2022 ODFW fish survey (see next page for details)



Fresh beaver work in the WRNA (Source: J. Krueger)



River Otter (Source: Columbia Land Trust)



Speckled Dace (Source: ODFW)

Other non-native fish species likely found on this reach based on ODFW fish survey conducted near Delta Ponds:

- Bluegill
- Pumpkinseed (found in Millrace Outfall)*
- Largemouth Bass
- White Crappie
- Western Mosquito Fish
- Yellow Perch
- Brown Bullhead
- Common Carp



Pacific Lamprey (Source: ODFW)

2022 Millrace Outfall Fish Survey

On request of the Habitat Advisory Team and the University of Oregon, ODFW conducted a fish survey in the Millrace Outfall channel on April 8, 2022 to determine fish use and inform the management planning process. ODFW fisheries biologist Jeff Ziller coordinated the survey with the assistance of approximately twenty University students. The survey found a significant number of fish in the channel including five native and one non-native species with a 95% occurrence of natives. Natives included Pacific Lamprey, Three-spine Stickleback, Speckle Dace, Sandroller, Northern Pikeminnow, and Redside Shiner. Only one non-native fish species, the Pumpkinseed, was found in the channel. The results indicate significant use of the channel by native fish species and the importance of this area for the lifecycle of these species. This area is also likely to provide important backwater refugia during high-flow periods in the river (see related [AroundtheO](#) article).



ODFW Fisheries Biologist Jeff Ziller samples fish populations in the Millrace Outfall, assisted by University students (Source: University of Oregon)

Birds:

- Double-crested Cormorant
- Great Blue Heron
- Great Egret
- Green Heron
- Cackling Goose
- Canada Goose
- Barnyard Goose
- Hybrid Goose
- Wood Duck
- Mallard
- American Wigeon
- Ring-necked Duck
- Lesser Scaup
- Bufflehead
- Hooded Merganser
- Common Merganser
- Turkey Vulture
- Osprey
- Bald Eagle
- Red-tailed Hawk
- American Kestrel
- Ring-necked Pheasant (non-native)
- California Quail
- Wild Turkey (non-native)
- American Coot
- Killdeer
- Spotted Sandpiper
- Dunlin
- Ring-billed Gull
- Western Gull hybrid
- Eurasian Collared-Dove
- Rock Pigeon
- Vaux's Swift
- Anna's Hummingbird
- Belted Kingfisher
- Downy Woodpecker
- Hairy Woodpecker
- Pileated Woodpecker
- Northern Flicker
- Black Phoebe
- Olive-sided Flycatcher
- Western Wood-peewee
- Tree Swallow
- Violet Green Swallow
- Cliff Swallow
- Steller's Jay
- California Scrub-jay
- American Crow
- Black-capped Chickadee



Bald Eagle in nest on Skinner Butte (Source: C. Kerst)



Green Heron (Source: C. Kerst)



Black Phoebe (Source: C. Kerst)

- Bushtit
- Brown Creeper
- Bewick's Wren
- Olive-sided Flycatcher
- Ruby-crowned Kinglet
- American Robin
- Cedar Waxwing
- European Starling (non-native)
- Wilson's Warbler
- Yellow-rumped Warbler
- Western Tanager
- Black-headed Grosbeak
- Spotted Towhee
- Song Sparrow
- Golden-crowned Sparrow
- White-crowned Sparrow
- Dark-eyed Junco
- House Finch
- Pine Siskin
- Lesser Goldfinch
- American Goldfinch
- Evening Grosbeak



Anna's Hummingbird (Source: C. Kerst)



Pacific Tree Frog (Source: K. McAllister)

Freshwater Mollusks:

- Western Pearlshell Mussel



Western Pearlshell Mussel shell collected from the river within the WRNA (Source: J. Krueger)

2.4 Current Human Uses

Due to its urban setting and proximity to the University, the WRNA sees significant structured and unstructured human use as described in the section below and in Figure 2-10: Current Human Use Map.

2.4.1 Outdoor Instruction, Research, and Recreation

This area is currently utilized by the University for outdoor instruction, active and passive recreation, and various student and faculty research activities. Although no formal classroom space exists, students from a wide range of departments utilize this area for academic study each year. Community recreational use of this area is also high and includes walking, running, and biking on the South Bank Path which extends through the WRNA and is also a popular location for nature study such as birding. Currently a portion of the natural turf athletic field is located within the WRNA and is designated as an Outdoor Classroom in the Campus Plan. The athletic field is used primarily by students in club sports and intramurals. Based on the Campus Plan, it is intended that a future project will relocate the athletic field so this portion of the WRNA can establish uses consistent with the Natural Area designation. Current UO research efforts at the WRNA include the Fuller Land Lab mowing and prairie restoration plots and an experimental grazing study sponsored by the UO Student Chapter of the Society for Ecological Restoration that is evaluating how goats could be used to help control invasive species (see related [AroundtheO](#) article).



University field study by the river in the WRNA (Source: B. Roy)



Fuller Land Lab adaptive mowing plots near the WRNA (Source: M. Geffel)

2.4.2 Paths and Trails

The South Bank Path and the Frohnmayer Bike and Pedestrian Bridge receive consistently high use from the UO and the broader community. Based on bicycle and pedestrian counts collected by Lane Council of Governments in 2019, the average number of daily [bicycle crossings](#) on the

Frohnmayer Bridge are 822 during the week and 579 per weekends and average [pedestrian crossings](#) are 3,674 during the week and 3,871 on weekends, with spikes in usage occurring during home football games. That equates to approximately 1.6 million combined bicycle and pedestrian crossings of the bridge per year. In 2021, the City of Eugene in conjunction with the University, relocated a portion of the South Bank path further from the edge of the river and installed ornamental lighting along the route. Lower-light than UO standard bulbs were specified to reduce light

pollution and the University will continue to assess light levels in the future. The alignment of the previous path was converted to a 6-foot gravel walking trail. In addition to the formal trails and paths, an extensive network of unofficial “user trails” are found across the WRNA (see Figure 2-10: Current Human Uses Map).

2.4.3 River Access

Due to the general steepness of the banks and presence of blackberry thickets, river access is quite limited across the WRNA and there is currently no formalized access to the water’s edge for academic or recreational use. The two most popular unimproved river access spots are to a “beach” area just downstream of the Millrace Outfall that is accessed via a steep user trail and to the exposed bedrock shelf area just downstream of the Frohnmayr Bridge, often referred to as “Fossil Beach” (photo right). Fossil Beach is accessed via a steep and sometimes slick user-built stairway located behind the athletic field fence. Providing safe, clean access to the river is a goal stated in the Campus Plan. The entire stretch of river through the UO campus is popular for boating, floating, and general frolicking during the summer months.



Field study in the “Fossil Beach” area (Source: B. Roy)

2.4.4 Unauthorized Camping

Unauthorized camping has long been an issue along the Willamette River corridor in the Eugene and Springfield area and the WRNA is no exception. Active and abandoned camps are found in various locations in the WRNA, primarily adjacent to the river and Millrace Outfall. These camps result in significant issues with water quality, litter, and concern for public safety and this issue has been noted as a deterrent for academic or recreational use of the river. In addition, a major unauthorized encampment is situated on the railroad owned property just upriver and the WRNA often is used as an access route to and from this large camp.

2.5 Current Site Management Practices

Until recently, uncertainty about future land uses along the river corridor prevented the University from making major improvements to this area and maintenance practices were limited to occasional trash removal, camp cleanup, and rough mowing. Mowing is contracted and occurs two to three times per year beginning in June where access permits to control blackberry growth and reduce threat of wildfire. More regular mowing occurs on and around the irrigated athletic fields. The City of Eugene has been and will continue to be responsible for maintaining the South Bank Path itself. Trash pick-up within the WRNA is scheduled at least once per year and is also completed on a response basis.

2.6 Issues and Opportunities

A number of issues and opportunities related to the WRNA’s envisioned ecological function and related academic and recreation uses have been identified by the Habitat Advisory Team and captured on the Issues and Opportunities Map (Figure 2-11). The documentation of site-specific issues and opportunities, along with the plan and policy direction from the Campus Plan, North Campus Conditional Use Permit, and other related guidance have been used as a basis to formulate content of this Landscape Management Plan.



**University of Oregon
Willamette River Natural Area
Current Human Uses Map**
(Research, Recreation, Academic, and Non-Sanctioned)

Legend

- Willamette River Natural Area Boundary
- Gravel Maintenance Roads
- Hard-Surfaced Paths
- Soft-Surfaced Trails
- Paved Roads

- Maintained Athletic Fields/Outdoor Classroom
- User Trails (unofficial)
- Active Research Plots (approximate locations)
- Common Educational Use Area
- Popular River Access Point
- Non-Sanctioned Camping (noted 12/21)

270
Feet

Draft: May 2022
Aerial Photo: Summer 2016
Map Prepared by: JKE

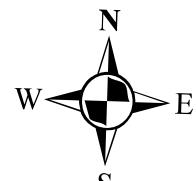


Figure 2-10



Willamette River Natural Area Issues and Opportunities Map

Legend

- Willamette River Natural Area Boundary
- Flowing Water (River and Millrace)
- Existing Hard-surfaced Paths
- Existing Soft-surfaced Trails
- 10-foot Contours

0 150 300
Scale
Feet

Prepared by JKE
May 2022
Aerial Base: Summer 2016



Issues

- Unmanaged access (user trails)
- Unsanctioned camping (common locations)
- Areas of heavily compacted soils (also an opp.)
- Concrete or asphalt surface (remnants of past uses)
- Unattractive industrial buildings (highly visible)

General Site-wide Issues:

- Non-native invasive plants (abundant and widespread)
- Inadequate river shading due to narrowness of riparian forest
- Significant areas of fill of unknown origin (high cost to remove)
- Steep banks (mechanical maintenance and access limitations)
- Concrete and asphalt rubble in areas along base of riverbank
- Limited user facilities (e.g., bike parking, trash receptacles)
- Heavy trash buildup, especially along the riverbanks
- Underground utilities
- Significant **noise** from trains and UO Central Power Station

Opportunities

- Wetland hydrology (restoration/enhancement opportunity)
- Potential desirable river access points
- Areas with existing mature native trees (mapped forest)
- Existing side channels or alcove (backwater refugia)
- Areas of compacted soils (may favor native forbs)
- Other nearby conserved parks or natural areas (habitat connectivity)
- Locations with existing or potential river views

General Site-wide Opportunities:

- Convenient proximity for academic uses (with improved access)
- Extensive opportunities for ecological research/monitoring

Figure 2-11

Section 3: Conservation Targets and Desired Future Conditions

3.1 Desired Future Condition Habitats and Target Species

The University of Oregon's intent is to conserve, enhance, and restore regionally important habitat within the Willamette River Natural Area to support a diversity of native plant and wildlife species while providing outstanding learning and recreational opportunities for students and community members alike.

3.1.1 Target Habitats and Species

The proposed conservation targets and desired future conditions listed below are based on guidance from the 2016 ODFW Oregon Conservation Strategy (OCS), direction from key related plans (see Section 1.4 and Appendix A), and the opportunities found on the 24-acre site. The term “target habitat” is used to describe a set of vegetation communities or ecological systems that have been chosen as priorities for conservation and restoration within a site. Target habitats specific to the Willamette River Natural Area include *Flowing Water and Riparian Forest; Upper-terrace Mixed Woodland; and Grassland* (a mixture of upland and wetland prairie with an oak component). The term “nested target” denotes individual plant or animal species of conservation value (or high public awareness) that could reasonably be found on the site in the future under improved conditions. The plants and animals listed below are intended to be representative of a range of species that would be present under desired conditions and are not all-inclusive.

Reference photos of sites with conditions similar to the vegetation types that are proposed for the Willamette River Natural Area are shown below:

Reference Photos



Riparian forest and side channel at Green Island near the Willamette-McKenzie Confluence (Source: J. Krueger)



Riparian Forest in Alton Baker Park immediate across the river from the WRNA (Source: J. Krueger)



Grassland and Vernal Pool

Vernal pool and prairie at Coyote Prairie to the west of Eugene in late spring (Source: J. Krueger)



Grassland with Oaks

Grasslands with oaks at Howard Buford Recreation Area (Source: E. Alverson)



Mixed Woodland/Oak Savanna

Mixed woodland/Oak Savanna at Howard Buford Recreation Area (Source: J. Krueger)



Riparian Forest with Oaks

Mixed forest transitioning to oaks and mowed grass in West D Street Greenway in Springfield (Source: J. Krueger)

3.1.2 Desired Future Conditions for Vegetation Communities

The Desired Future Conditions (DFCs) for the site's vegetation communities presented in the tables below describe desired characteristics of habitat within the Willamette River Natural Area at the end of the 20-year term of this Landscape Management Plan (2042). DFCs provide a descriptive long-term vision and foundation for the condition of the site and its target habitats and species. These DFCs should be referenced when developing restoration projects and prescriptions to ensure consistency with the vision for the site and to support improvements of target systems and species (see tables below). DFCs are intended to be used as guidelines and should be applied with flexibility within an adaptive management framework (see Section 4.2). The DFCs presented below correspond and are supported by the management goals, objectives, and actions listed in Section 4.

Figure 3-1: System Targets, Nested Targets, and Desired Future Condition

System Targets	Desired Future Conditions	Nested Targets*	
		(Oregon Conservation Strategy species priorities in bold)	
Animals	Plants		
Flowing Water and Riparian Forest (7.1 acres) OCS Strategy Habitat 	<ul style="list-style-type: none"> Riparian tree canopy cover will be 90-100 % and provide abundant shade and filtration. Riparian forest will be maintained to limit colonization by habitat-altering invasive species such as English Ivy, English Hawthorn, Scotch Broom, and Blackberry. Areas at or below the ordinary high-water mark will contain dense native vegetation such as Willow and Slough Sedge able to withstand high-water flows and protect the banks. Upper- and middle- bank habitat will be planted with multi-layered native species that provide shade and cover and food value for native birds and pollinators. Exposed concrete and asphalt construction debris will be evaluated and removed from the area below the ordinary high-water mark where feasible to improve aquatic habitat, water quality, aesthetics, and safety. Special habitat features such as snags, large woody debris, leaf litter, and backwater microhabitats will provide beneficial conditions for native species. 	<u>Known or observed:</u> Spring Chinook Salmon, Pacific Lamprey, Western Pearlshell Mussel, Pacific Tree Frog, American Beaver, North American River Otter, Long-tailed Weasel, Red Fox, Bald Eagle, Osprey, Belted Kingfisher, Green Heron, Great Blue Heron, Willow flycatcher (migration stopover) <u>Presently unknown on site but observed** in the area:</u> Mink, Oregon Chub, Northern Red-legged Frog, Clouded Salamander, Townsend's Big-eared Bat, Yellow-breasted Chat, Yellow Warbler (migration stopover), Olive-sided Flycatcher (migration stopover), Red-breasted Sapsucker, Great Horned Owl, and native pollinators (diverse range of bees, flies, butterflies, etc.) <i>**Know to be present in the Willamette Corridor in Eugene.</i>	<u>Known or observed:</u> Black Cottonwood, Bigleaf Maple, Pacific Willow, Sitka Willow, White Alder, Pacific Ninebark, Red-osier Dogwood, Tall Oregon Grape, Douglas' Spiraea, Common Snowberry, Osoberry, Western Sword Fern, Red Flowering Currant, Large False Solomon's Seal, Starry False Solomon's Seal, Stinging Nettle, Slough Sedge <u>Presently unknown on site but observed** in the area:</u> Nootka Rose, Red Elderberry, Riverbank Lupine, Bleeding Heart, Tall Larkspur, Orange-flowered Honeysuckle, Mock Orange, Western Trillium, Western Waterleaf, Pacific Waterleaf

*Nested targets listed are intended to be representative of desired future conditions and are not all inclusive.

System Targets	Desired Future Conditions	Nested Targets*	(Oregon Conservation Strategy species priorities in bold)
Upper-terrace Mixed Woodland (9.9 acres) Not an OCS Strategy Habitat, but provides important habitat and water quality functions 	<ul style="list-style-type: none"> Target tree canopy cover will be 30-70 % with the densest canopy closer to the river, transitioning to lower density canopy on the south edge of the WRNA with oaks. Colonization by habitat-altering invasive species such as English Ivy, English Hawthorn, Sweet Cherry, Scotch Broom, and Blackberry will be limited. Special habitat features such as snags, downed wood (nursery logs), and leaf litter will provide beneficial conditions for native species and improve soils. The shrub and herbaceous layer will be enhanced over time to increase cover and diversity of nectar producing forbs to benefit native pollinator and will be concentrated in defined "shrub islands" with an open grass understory elsewhere that will be maintained through periodic mowing. 	<u>Known or observed:</u> Western Gray Squirrel, Western Bluebird, Red-breasted Sapsucker, Cooper's Hawk, Bald Eagle, Osprey <u>Unknown on site but observed** in the area:</u> Northern Red-legged Frog, Western Screech-owl, Great Horned Owl <i>**Know to be present in the Willamette Corridor in Eugene</i>	<u>Known or observed:</u> Oregon Oak, Douglas-fir, California Hazel, Incense-cedar, Bigleaf Maple, Western Sword Fern, Common Snowberry, Leichtlin's camas <u>Unknown on site but observed** in the area:</u> Ponderosa Pine, Oceanspray, Osoberry, Red Flowering Currant, Tall Oregon Grape, Thimbleberry, Nootka Rose, Pacific Hound's Tongue, Rosy Checkermallow, Tall Larkspur, Red Columbine
Grasslands (upland prairie, wetland prairie, and oak savanna) (5.7 acres) OCS Strategy Habitat 	<ul style="list-style-type: none"> Target tree canopy cover in these areas will be between 0-30 %. Understory will be maintained through periodic mowing to limit colonization by woody vegetation. The herbaceous layer will be enhanced over time to increase cover and diversity of native grasses and forbs, with special attention given to increasing nectar producing forbs to benefit native pollinators. Scattered Oregon oaks and Valley Ponderosa Pine will be incorporated into designated areas of the grasslands at a low density (savanna density). Wetland prairie and vernal pools will be enhanced where existing wetland hydrology exists to increase native cover and integrate downed wood (logs to enhance conditions for amphibians, reptiles, and insects). Vernal pools will be deepened (12"-18") and enlarged and include large log placement to benefit amphibians and insects. 	<u>Known or observed:</u> Gopher Snake, Pacific Tree Frog (wetland), Western Bluebird, Killdeer, Anna's Hummingbird <u>Presently unknown on site but observed** in the area:</u> Camas Pocket Gopher, Wilson's Snipe, Rufous Hummingbird, Monarch Butterfly, Western Bumblebee , and other native pollinators (diverse suite of bees, flies, butterflies, etc.) <i>**Know to be present in the Willamette Corridor in Eugene</i>	<u>Known or observed:</u> Oregon White Oak (savanna), Roemer's Fescue, Blue Wildrye, California Brome, Leichtlin's Camas, Denseflower Spike Primrose, Common Selfheal, Showy Tarweed <u>Presently unknown on site but observed** in the area:</u> California Oatgrass, Tufted Hairgrass (wetland), Common Camas, Narrow-leaf Mule's Ear, Yarrow, Narrow-leaf Onion, Fragrant Popcorn Flower (vernal pools), Downingia (vernal pools), Coyote Thistle (vernal pools), Willamette Valley Gumweed (wetland or slightly damp), Elegant Oregon Sunshine, Wyethia, Bigleaf Lupine, Shooting Star, Rosy Plectritis, Farewell-to-Spring, Showy Milkweed, Rose Checkermallow



University of Oregon Willamette River Natural Area

Desired Future Conditions Vegetation

- Willamette River Natural Area Boundary
- Seasonal Wetland or Mapped Pools
- Hard-Surfaced Paths (concrete)
- Soft-Surfaced Trails (universal access gravel)
- Relocated Gravel Road (proposed location)
- Existing Native Trees (retain)
- Existing Side Channel
- Proposed Visual Screen
- Approximate Extent of Area to be Regraged

Vegetation and Cover Type:

- | |
|--|
| Existing Riparian Forest (enhanced) |
| New Riparian Forest |
| Existing Upper-Terrace Mixed Forest (enhanced) |
| New Upper-Terrace Mixed Forest |
| Grassland (upland/wetland prairie) |
| Grassland with Oak (savanna) |
| Special Botanical Area with Ephemeral Art |
| Conifer Buffer |

270 Feet
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W E
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May 2022
Aerial Photo: Summer 2016
Map Prepared by: JKE

Figure 3-2

Figure 3-3: Change Over Time: Comparison of Existing Vegetation and Cover with Desired Future Conditions

Cover Types	Existing Condition (acres)	Proposed Desired Future Condition (acres)
Vegetated		
Riparian Forest	5.8	7.1
Upper-terrace Mixed Woodland	1.1	9.9
Grassland (upland and wet prairie)	2.8	1.9
Grassland (scattered oaks)	0.0	3.8
Disturbed	8.9	0.0
Recently Disturbed and Seeded*	2.3	0.0
Irrigated Turf	2.0	0.0
Specialized Planting Beds	0.1	0.5
Sub Total (Vegetated):	23.0	23.2
Non-Vegetated		
Hard-Surfaced Path	0.8	0.8
Soft-Surfaced Trail	0.4	0.5
Gravel Road or Pad	0.3	0.1
Concrete Pad or Asphalt	0.1	0.0
Sub Total (Non-Vegetated):	1.6	1.4
Grand Total:	24.6	24.6

3.2 Desired Future Conditions for Education, Research, and Recreation

Figure 3-4: Desired Future Conditions for Recreation and Academic Uses

Facilities	Desired Future Condition
Trails and Paths	<ul style="list-style-type: none"> A shared-use path (South Bank Path) will provide public access along the length of the WRNA for regional transportation, recreation, and to provide access for educational resources within the WRNA. This path was relocated in 2021 to pull it away from the river corridor. Approximately 1,700 linear feet of this path is currently within the WRNA plus the approach to the Frohnmayer Bridge. If the existing athletic field is relocated, it is anticipated the portion of the path south of the athletic field may be realigned to be near the edge of the WRNA. Approximately 4,350 linear feet of soft-surface universally accessible trail (compacted gravel surface, minimum width of 48", with running grades of 5% or less) will provide recreational and educational access along the length of the WRNA. This includes 1,700 linear feet of existing trail that was installed in 2021 on the former route of the South Bank Path plus an additional 2,650 linear feet of new universally accessible trail. New segments will extend parallel to the river from the existing universal access trail near the Millrace Outfall to the eastern edge of the site and will include four short spur trails to river viewpoints. Incorporating formal universal access trails along the river will promote legitimate use and have positive public safety, resource protection, recreational, and educational benefits and will provide access to all users to the greatest

	<p>extent possible without separate or segregated access for people with disabilities.</p> <ul style="list-style-type: none"> Reconstructed trails will lead to Fossil Beach and to the Millrace Outfall. These trails will follow general alignments of existing user trails and will include improved surfacing for safer access. The trail to Fossil Beach will include a short segment of stone steps. Due to the steepness of the banks, these trails will not be universally accessible. Undesignated user trails will be removed (obliterated) where possible to reduce habitat impacts and to clarify desired access routes.
Visual and Physical Access to the River	<ul style="list-style-type: none"> The bank of the river in the area just upriver from the Frohnmyer Bridge will be regraded to improve access to the river for academics and recreation (in addition to riparian restoration and bank stabilization). Careful evaluation of potential impacts to bridge abutments will be conducted prior to this work. Four universally accessible viewpoints will be established at key points along the river. Stone steps will be constructed to provide safer access to Fossil Beach for academic and recreational use. The design will consider using native basalt steps similar in style to the basalt steps recently installed near the summit of Spencer Butte. Improved trail access will be provided to river beach/bedrock terrace near the Millrace Outfall for academic and recreational use.
Research, Monitoring, and Field Experiments	<ul style="list-style-type: none"> University sponsored research and field experiments will continue to utilize the WRNA to inform management efforts at the WRNA and elsewhere. A list of research questions and monitoring opportunities will be maintained to help encourage and provide direction for faculty and student research efforts in the WRNA.
Designated Educational Spaces	<ul style="list-style-type: none"> Improved access to the river at the Millrace Outfall, Fossil Beach, and the recontoured bank area upstream of the Frohnmyer Bridge will provide safe and convenient access to the river's edge. A covered outdoor space (pavilion) may be considered in the future to enhance all-season academic use of the area. This would likely be located just outside of the WRNA boundary near the path leading from campus to the bridge. A special botanical demonstration area could be designed and constructed in the highly visible circular area near the bridge approach. This area would include interpretive information about the Willamette River ecosystems, wildlife, vegetation, and history as well as art installations.
User Amenities and Signage	<ul style="list-style-type: none"> In coordination with the City of Eugene, user amenities such as bicycle parking, benches, trash receptacles, wayfinding signage, map panels, interpretive displays, and temporary art exhibits could be incorporated into the WRNA. Gateway signage could be added to the area adjacent to the bridge and on the South Bank Path on the west end of the WRNA to welcome visitors to campus and highlight the University's contributions to regional habitat management efforts.



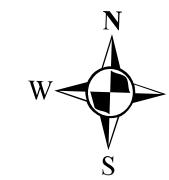
Willamette River Natural Area Action Plan Map

Legend

- Willamette River Natural Area Boundary
- Wetlands (Outside of WRNA)
- Existing Hard-surfaced Paths
- Existing Soft-surfaced Trails
- 10-foot Contours
- Adjacent City Parks

0 150 300
Scale
Feet

Prepared by JKE
June 2022
Aerial Base: Summer 2016



Proposed Site Improvements

- New soft-surfaced universal access trail (gravel, < 5% grade)
- Other new soft-surfaced trail (non-universal access)
- Re-contoured bank for improved access and expanded floodplain
- Areas to be used as outdoor classroom space and field study
- New bicycle/pedestrian bridge (replaces culvert)
- New University of Oregon welcome signage
- New bicycle parking
- Concrete and gravel pads to be removed and re-vegetated
- ◆ Osprey nesting platform and perch (approximate location)
- ◆ Habitat snag installation (approximate location)
- Fencing to be removed and area regraded to meet top of bank
- Native habitat demonstration/interpretation/art display area
- ★ Designated river viewpoints (universally accessible)
- ★ Designated river access point

Proposed Vegetation Communities

The underlying aerial photo has been modified to show desired future vegetation types (see Desired Future Conditions Map for a detailed breakdown). The following vegetation communities are proposed for the WRNA:

- **Riparian Forest:** Located along the banks of the river and Millrace Outfall, these areas will be enhanced over time through invasive species control and supplementation planting of native trees, shrubs, and forbs.
- **Upper-Terrace Mixed Woodland:** Found in small patches on the site today, this vegetation community will be expanded significantly and include a tree canopy of between 30 and 70 percent with density decreasing further from the river. Native forbs and islands of shrubs will be established over time to increase diversity and improved habitat conditions (see target species list).
- **Grassland:** Found primarily in the areas furthest from the river, grasslands will include a mix of upland prairie, wet prairie, vernal pools, and savanna with widely scattered oaks. Grasslands will be enhanced to increase diversity of native grasses and forbs to provide habitat for target species such as pollinators.

Figure 3-5

Section 4: Management Goals, Objectives, and Actions

4.1 Overview and Organization

The purpose of this section is to provide direction for the short- and long-term management and enhancement of the vegetation and facilities within the WRNA in a manner that is consistent with the *Vision* (see Section 1.4), *Conservation Targets* and *Desired Future Conditions* (see Section 3) and is consistent with the planning framework provided by the 2021 Campus Plan and 2018 North Campus Conditional Use Permit.

Goals: Management goals are broad statements which reflect the transition from the site's current condition to its desired future condition and ongoing management practices. The five goal categories include:

- Goal 1: Preservation, Restoration, and Management of Target Habitats
- Goal 2: General Wildlife Habitat Enhancements
- Goal 3: Ongoing Maintenance and Management
- Goal 4: Visitor Experience, Academic Uses, and Access
- Goal 5: Monitoring and Research

Objectives: Each management goal includes a set of supporting objectives which direct implementation of specific site activities over the next twenty years and are measurable (2022-2042).

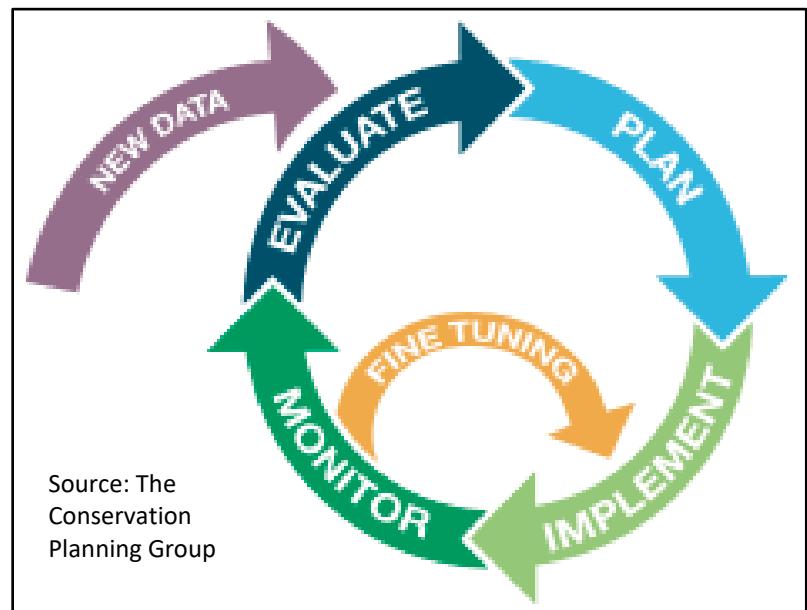
Actions: Each objective includes a set of recommended actions that specify how the objective will be achieved. Each action is prioritized to assist in management timing and implementation.

4.2 Adaptive Management Approach

The University of Oregon will utilize an adaptive management model for the WRNA to gauge the success and effectiveness of restoration and management activities. Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of on-the-ground efforts. In an adaptive management approach, management actions are documented as they occur and then monitored over time. The interpretation of monitoring results is then used to modify and improve management practices and techniques, and to identify unforeseen problems that need to be addressed. The diagram (right) shows the cycle that is typical of an adaptive management approach.

To support using an adaptive management approach at the WRNA, the University will document restoration and enhancement activities as they occur (see Goal 5). This will include mapping the geographic extent of activities using Geographic Information Systems (GIS) including the specific management and enhancement activities such as tree removal, invasive species control, species planted, and seeding rates used. Periodic assessment efforts may be used to help analyze the relative success of various restoration and management efforts over time. In addition, the University will track and document general academic and recreational use of the site over time and any issues related to unauthorized uses.

Figure 4-1: Adaptive Management Diagram



4.3 Prioritization of Actions

Landscape management within the WRNA will be a long-term commitment and proposed actions must balance the desire to accommodate conservation values, public safety, and academic and recreational uses. The prioritization categories listed below are intended to guide implementation sequencing for proposed management actions based on the need for immediate action versus actions which could occur in the longer-term. Actions and priorities may change over time based on input from the adaptive management process, funding availability, issues and opportunities, and emerging threats.

Prioritization of Proposed Actions

The following categories have been selected to indicate overall implementation priorities:

- I Short Range (highest priority): Will be undertaken as soon as possible (1-5 years).
- II Medium Range: Less pressing or requires completion of short range actions before implemented can occur (6-10 years).
- III Long Range: Will be implemented over a longer period of time due to the complexity or cost of the task or is dependent on other actions being completed first (11-20 years).
- O Ongoing or Regular Management Activity: Management or maintenance activities or tasks performed on an annual or biennial basis or is otherwise an ongoing activity.
- Vol Volunteer Opportunity: Activity that could be undertaken by volunteers from the University or community at large (with adequate coordination).
- Ac Academic: Could be performed by University faculty and students in conjunction with Department learning and research objectives (with adequate coordination with CPFM).

4.4 Goals, Objectives, and Prioritized Actions

Under the University's adaptive management approach (see Section 4.2), all management and restoration actions will be evaluated as implementation occurs and future actions and priorities may be adjusted accordingly to improve future success and address emerging threats or opportunities. The geographic extent and location of many of the objectives and actions below are reflected on the *Desired Future Conditions* and *Action Plan Maps*. Note: All proposed actions will be consistent with the City of Eugene water conservation overlay zone ([/WR Water Resources](#)).

Management Goals and Objectives	Priority	Notes
Goal 1: Preservation, Restoration, and Management of Target Habitats Preserve, restore, and manage target habitats within the WRNA to benefit target plant and wildlife, academic uses, and other ecosystem services such as water quality protection, carbon sequestration, shading, and public appreciation. Target habitats within the WRNA include Riparian Forest/Flowing Water; Upper-Terrace Mixed Woodland; and Grasslands (prairie and oak savanna).		
Objective 1a. Enhance Existing Riparian Forest and Upper-Terrace Mixed Woodland Habitats: Enhance approximately 6.9 acres of existing riparian forest and upper-terrace mixed woodland through vegetation management, supplemental planting, and debris removal.		
<u>Action</u> : Control habitat altering invasive species in the forest understory with special attention on Blackberry, English Ivy, Poison Hemlock, False Brome, Yellow Flag Iris, and Scotch Broom.	I, O	This step should be completed prior to re-planting with native trees and shrubs. Shining geranium is another habitat-altering species, however, no current control methods are known to be effective.
<u>Action</u> : Remove non-native trees over time as native replacement trees are established. Focus on removing most invasive trees such as Black Locust, Cherry, and English Hawthorn in the near term to avoid further spread and gradually eliminate other species over time.	I-II, O	Consider girdling trees and leaving trunks as dead standing habitat snags where feasible.

Management Goals and Objectives	Priority	Notes
<u>Action:</u> Plant a mix of native trees, shrubs, and forbs to create a diverse multi-storied forest, increasing diversity over time. In the upper-terrace mixed woodland area, shrubs and forb plantings should be concentrated in designated “shrub islands” to aid with site maintenance and limit potential public safety issues.	I-III	See Plant Palette in section 4.5 for species and zones. Initial supplemental plantings will focus on enhancing existing riparian forest area and establishing “shrub islands” in the existing upper-terrace mixed woodland areas (see Existing Vegetation Map) in conjunction with invasive species control. Opportunities for shrub island placement will be identified in the field but should be 250 square feet or larger to ensure more meaningful ecological benefit.
Objective 1b. Establish New Riparian Forest: Establish approximately 1.3 acres of new Riparian Forest including the riverbank area proposed for recontouring (just above the Frohnmayer Bridge – see Objective 1c), along the Millrace Outfall (the banks around where the culvert is proposed for removal – see Objective 2b), and other designated areas of bare bank (see DFC Vegetation Map).		
<u>Action:</u> Revegetate the areas of bare bank along the riparian area (see DFC Vegetation Map)	I-II	Establish riparian trees (Priority I) followed by shrubs and forbs (Priority II).
<u>Action:</u> Establish riparian vegetation in the area proposed for recontouring (see Objective 1c).	II-III	Follow recommendations from the planting palette (Section 4.5).
<u>Action:</u> Establish riparian vegetation in the area along the Millrace Outfall proposed for culvert removal (see Objective 2b).	II-III	Follow recommendations from the planting palette (Section 4.5).
<u>Action:</u> Irrigate new trees and shrubs until established.	O	A minimum of 3 years of irrigation recommended following planting. This will most likely be achieved by irrigation truck with options for temporary irrigation lines to be installed in some area. Access for water trucks should be considered during development of planting plans.
Objective 1c. Recontour the Riverbank: Recontour approximately one acre of the riverbank just above the Frohnmayer Bridge to improve access, increase the floodplain, and restore riparian vegetation and function.		
<u>Action:</u> Seek funding and develop a detailed plan and construction details for the area proposed for bank modification.	I	Planning will include hydrologic modeling, grading, planting, access details, permitting, and cost estimation. Consider partnering on design development with the City of Eugene who is in the process of planning for a bank stabilization project in this same area above the bridge.
<u>Action:</u> Recontour the area to create a broader floodplain, improved access, and bank stability above the bridge.	II-II	Consider partnering with the City of Eugene on implementation.
<u>Action:</u> Establish a diverse riparian forest on the recontoured bank.	II-III	Vegetation community will be specified based on hydrological conditions along the bank and to maintain a visual sight line from the path to the river.
Objective 1d. Establish New Upper-Terrace Mixed Woodland Habitat: Establish approximately 8.8 acres of new Upper-Terrace Mixed Woodland for habitat and water quality function (shading and filtration).		
<u>Action:</u> Prepare the area for planting by first controlling habitat altering invasive species with special attention on Blackberry, English Ivy, Poison Hemlock, Milk Thistle, and	I-II	Site prep methods could include repeat mowing, hand removal, spot herbicide application, and shade cloth. Overseed

Management Goals and Objectives	Priority	Notes
Scotch Broom.		disturbed areas with native grass/forb mix to prevent erosion and limit further invasion.
<u>Action:</u> Plant a diverse mix of native trees (see plant palette) with the densest canopy closer to the river, transitioning to more open canopy cover with oaks on the south edge.	I-III	Establish trees before incorporating shrub and forb layer. Sun tolerant trees such as Cottonwood, Bigleaf Maple, Douglas' Hawthorn, Incense-cedar, and Oak should be established initially (this could take many years) with more tree diversity added once initial plantings area established.
<u>Action:</u> Continue to control habitat altering invasive species in the forest understory.	O	Special attention on habitat altering invasive species such as Blackberry, English Ivy, False Brome, Black Locust, English Hawthorn, Cherry, etc.
<u>Action:</u> Once tree cover is established, plant a diverse understory including native shrubs in designated "shrub islands" and increase diversity over time (see plant palette).	II-III	Concentrating shrubs will help simplify maintenance and maintain sight lines for public safety. Incorporate nectar producing shrubs and forbs to benefit pollinators.
<u>Action:</u> Irrigate new trees and shrubs until established.	O	A minimum of 3 years of irrigation recommended following planting. This will most likely be achieved by irrigation truck with options for temporary irrigation lines to be installed in some area. Access for water trucks should be considered during development of planting plans.
Objective 1e. Establish and Enhance Grassland Habitat: Establish and enhance approximately 5.7 acres of grassland including 3.4 acres of upland prairie, 0.4 acres of wetland prairie (including vernal pools), and 3.8 acres of oak savanna.		
<u>Action:</u> Conduct site preparation to suppress non-native vegetation including introduced pasture grasses and invasive weeds.	I-II	Site preparation will be conducted in phases and could include repeat mowing, hand removal, spot herbicide application, solarization, grazing, or shade cloth with the goal of creating bare soil for planting.
<u>Action:</u> Regrade and deepen existing wetland areas to create ideal hydrology for vernal pools (approx. 0.5 acres)	I-II	Install one or two large logs within the vernal pools to enhance habitat conditions for amphibians.
<u>Action:</u> Plant widely spaced Oregon White Oak and Valley Ponderosa Pine in areas proposed as savanna.	I	Irrigate trees for a minimum of three years. Total mature tree cover in savanna areas should be between 5 and 30 percent.
<u>Action:</u> Plant a diverse mix of native grasses and forbs by broadcast seeding, bulb planting (e.g., camas) and plug installation (e.g., sedges and rushes).	I-II	Planting mix will be customized based on surface hydrology and soil conditions. Planting will occur in phases following adequate site preparation.
<u>Action:</u> Maintain grassland areas through annual mowing to prevent woody encroachment.	O	Grazing, haying, thermal treatments, and other techniques could be tested on an experimental basis. Avoid mowing between March 15 and July 15 (or later if feasible) to protect native vegetation and ground-nesting birds (e.g., Killdeer, Snipe, Canada Geese, Savanna Sparrow).

Management Goals and Objectives	Priority	Notes
<u>Action:</u> Consider periodic artificial disturbance to create patches of bare soil areas to support re-establishing native forbs. Seeding with a diverse mix of native grasses and forbs is recommended following disturbance.	O	Native prairie is a disturbance-dependent habitat and was historically managed by native people using fire. Prescribed fire may not be suitable for this urban setting, so replicating disturbance with shade cloth, tilling, or hand-held torch burning may be a substitute. Flowering forbs will decline over time in a prairie system without disturbance as grasses and invasive plants become dominant.
Objective 1f. Remove Unwanted Surfaces and Debris: Remove unwanted concrete, gravel, and asphalt debris and surfaces (concrete and gravel pads) where exposed. This debris interferes with establishment of vegetation and may cause erosion when located below the ordinary high-water mark.		
<u>Action:</u> Remove concrete and gravel pads that are remnants of past structures and storage.	I	Seed all disturbed areas with native grasses and forbs after removal (seeding in fall or winter) to limit invasive species colonization.
<u>Action:</u> Remove the broken asphalt path remnants in the area to the west of the athletic fields.	I	This will be replaced with a permeable gravel universal access trail in approximately the same location (see Goal 4).
<u>Action:</u> Evaluate and remove exposed and visible concrete and asphalt debris as feasible from the forested areas including the riverbanks and the active floodplain below the ordinary high-water mark.	I	Field-locate and mark location of removable debris. Consider using a long-reach excavator to remove debris (will provide extensive reach without directly impacting forest habitat). <u>Note:</u> Federal permitting will likely be required for work below the ordinary high-water mark.

Goal 2: General Wildlife Habitat Enhancements Provide additional habitat features and implement species-specific management actions to benefit target native wildlife where appropriate across the site (in addition to habitat restoration and management actions proposed in Goal 1).		
Objective 2a. Special Habitat Features: Provide additional habitat features and implement species-specific management actions to benefit native species across the WRNA.		
<u>Action:</u> Leave downed trees and dead standing snags in place throughout the forested areas where they do not pose a public safety threat or block trails or maintenance access. Where hazard trees must be removed, consider creating habitat snags as an alternative to complete removal.	O	Optimal snag height is between 15-35 feet, with several branches between 1-3 feet in length retained. Snags provide habitat for cavity nesting species and provides food for a wide range of birds including owls, bats, and woodpeckers. Fallen trees also provide excellent habitat for a variety of reptiles and insects.
<u>Action:</u> Enhance the habitat function of the vernal pool areas to the west of the Millrace Outfall by deepening and expanding their footprint, supplemental planting, and placement of logs.	I	Vernal pools are ideally 6-18 inches in depth, seasonally inundated (through late spring), and contain specialized native forbs (e.g., Fragrant Popcorn Flower and Elegant Downingia) and 1 or 2 large logs to benefit amphibians.

Management Goals and Objectives	Priority	Notes
Action: Install an Osprey nesting platform and perch in an area that is visible, but not directly over paths or trails.	I-II	The nest platform will also serve as a point of interest and an educational resource. The Center for Conservation Biology provides detailed guidance on Osprey platforms .
Action: Install two habitat snags in the grassland area near the Millrace Outfall.	II	Habitat snags could include large limbs and pre-drilled nesting cavities (see photo example in Appendix E) and installed like a utility pole.
Action: Improve habitat conditions for pollinators such as native bees, butterflies, and hummingbirds across the entire WRNA.	I-II, O	Utilize a diverse mix of nectar producing trees, shrubs, and forbs across that are best suited for the various habitats (see Planting Palette in Section 4.5).
Action: Consider placement of large woody debris in the side channel area and the Millrace Outfall channel to improve habitat for fish and other aquatic species.	II	Consult ODFW or other local partners on placement.
Action: Improve habitat conditions for native bats by installing bat boxes and roosts. Place in locations that allow good visual access for education and monitoring.	Vol Ac	Boxes should be placed high on trees, posts, or structures and have good exposure to the sun. Specifications can be found at www.batcon.org .
Action: Build and install bird boxes for species such as Western Bluebird (grassland areas) and western Screech Owl (woodland).	Vol Ac	The Audubon Society recommends The Definitive Guide to Building Your Own Birdhouses .
Objective 2b. Daylight Culverted Portion of the Millrace Outfall: Replace existing 48" culvert with a bridge and relocate or eliminate the gravel access road crossing to improve aquatic connection to create approximately 250 linear feet of new backwater habitat with an open connection to the river.		
Action: In the short-term clear debris from the existing 48" culvert as needed to maintain flow.	I, O	Ongoing until culvert is replaced with bridge.
Action: Conduct feasibility study and engineering for culvert removal and road relocation and seek funding.	II	Collaborate with City of Eugene and other partners on bridge design and specifications.
Action: Implement the culvert removal, bridge installation, and road relocation project.	II-III	The long-range need for the gravel haul road will be evaluated.
Action: Restore riparian forest in the daylighted area.	II-III	Replant banks after culvert removal.

Goal 3: Ongoing Maintenance and Management Maintain the site's vegetation and manage public use to protect conservation values, maintain public safety, and provide an outstanding environment for academic and recreational uses.		
Objective 3a. Access Management: Limit unauthorized activities and access to protect sensitive habitats and reduce public safety concerns.		
Action: Eliminate unauthorized camping within the WRNA through regular enforcement and placement of "no camping" signage.	O	Coordinate with local social service organizations to relocate campers to more suitable alternative locations in the area with regular services, restrooms, and assistance programs. UO staff charged with enforcement should receive specialized training in this area.
Action: Install access control (gates or bollards) to prevent unauthorized vehicle access into the WRNA.	I	Uncontrolled access is regularly occurring from the west end of the WRNA near the Riverfront Park.

Management Goals and Objectives	Priority	Notes
Action: Obliterate/remove undesired “user trails” where they exist (priority I) to reduce impacts to habitat and monitor for formation of new user trails (ongoing).	I, O	Obliterate/remove trails through placement of bush and revegetation with shrubs and other native vegetation.
Action: Install informational and wayfinding signage that explains the reasoning and importance of staying on the designated trails and paths within the WRNA.	I	Signage could be placed at the west end of the WRNA near the Riverfront Park, at the Frohnmayer bridge, and at the railroad underpasses.
Objective 3b. Proactive Invasive Species Control: Prevent establishment or spread of highly invasive species in the WRNA where feasible using an Early Detection, Rapid Response (EDDR) approach (also, see Goal 5: Monitoring).		
Action: Coordinate with the Oregon State Weed Board, Upper Willamette Cooperative Weed Board, ODFW, Oregon Department of Agriculture, Long Tom Watershed Council, and the Native Plant Society of Oregon – Emerald Chapter on identifying emerging invasive species threats.	O	The Early Detection and Rapid Response (EDRR) process for plants could be a useful tool and provides excellent materials such as invasive species identification keys and photos.
Action: Target emerging and isolated populations of invasive non-native species that are currently present at very low levels but have potential to expand rapidly without intervention. Many of these species could be fully eradicated at current levels with concerted effort.	O, Ac	At the WRNA, Scotch Broom, Yellow Flag, Foxglove, Lemon Balm, Milk Thistle, Italian Lords & Ladies, and Vinca are all present in small quantities and should be targeted for control immediately. Butterfly Bush, Knotweed, Water Primrose, Purple Loosestrife, and European Blackberry are not currently known to be present but have high potential for rapid spread if they emerge.
Action: Use a standard protocol for preventing transport of weed seed during maintenance activities including installing boot cleaning stations and regularly cleaning maintenance equipment.	O	Consult other local partners for best practices and integrate into the WRNA-specific Integrated Pest Management Plan.
Objective 3c. Ongoing Vegetation Management: Maintain the site’s vegetation to control invasive species, reduce risk of wildfire, and protect public safety.		
Action: Rough-mow grassy areas (prairie/savanna) as needed (generally once annually) to control invasive shrubs such as Blackberry and reduce the threat of wildfire.	O	Seasonal mowing should not occur between March 15 and July 15 (at the earliest) to protect ground nesting birds and native vegetation except for the areas immediately adjacent to paths and trails.
Action: Maintain the South Bank Path through regular sweeping and leaf removal and mow a minimum 3-foot horizontal clearance area along both sides of the path.	O	City of Eugene maintenance responsibility.
Action: Maintain the existing gravel trails by blowing or raking leaves, grass, and duff from the surface in the fall and maintain a minimum 2-foot horizontal clearance area along both sides of the trail (mow or weed whack).	O	Leaf and duff removal is important for maintaining good universal access surfaces over time. Removal would primarily be necessary between September and February.
Action: Develop (priority I) and apply (ongoing) an Integrated Pest Management (IPM) approach specific to the WRNA to guide methods used to control of invasive non-native vegetation.	I, O	IPM is the careful consideration of all available pest (weed) control techniques and subsequent integration of appropriate measures based on assessment of effectiveness, cost, and impacts to the environment. The UO’s current IPM manual does not specifically address natural area

Management Goals and Objectives	Priority	Notes
		management. The City of Eugene's established IPM Manual for natural areas could provide a useful template for natural area management at the WRNA. IPM Manual should address best practices for preventing weed seed transport by staff and equipment.
<u>Action:</u> Conduct tree care practices (e.g., pruning, snagging, thinning, removal, replacement) as needed to address issues identified in during regular tree health monitoring.	O	See tree health monitoring protocol under Objective 5a.
Objective 3d. Provide Adequate Staffing: Adequately staff the North Campus zone to oversee implementation site enhancements and perform ongoing management of the WRNA.		
<u>Action:</u> Develop a detailed work/staffing plan using the WRNA Landscape Management Plan to determine realistic staffing needs.	I	Consult with UO Grounds Maintenance staff and local land management and community safety partners to help estimate realistic staffing needs.
<u>Action:</u> Add additional UO staff position(s) to adequately implement the proposed actions in the WRNA and to conduct ongoing site management and coordination activities.	I	In addition to site maintenance, staffing would be required to coordinate proposed restoration actions, write grants, coordinate volunteer and academic activities, and conduct ongoing monitoring.
<u>Action:</u> Consider the potential of establishing maintenance or equipment sharing agreements with local partners with special expertise in habitat restoration and management.	I	Would potentially supplement UO staffing and provide access to specialized equipment (e.g., masticator, seed drill, propane burner)

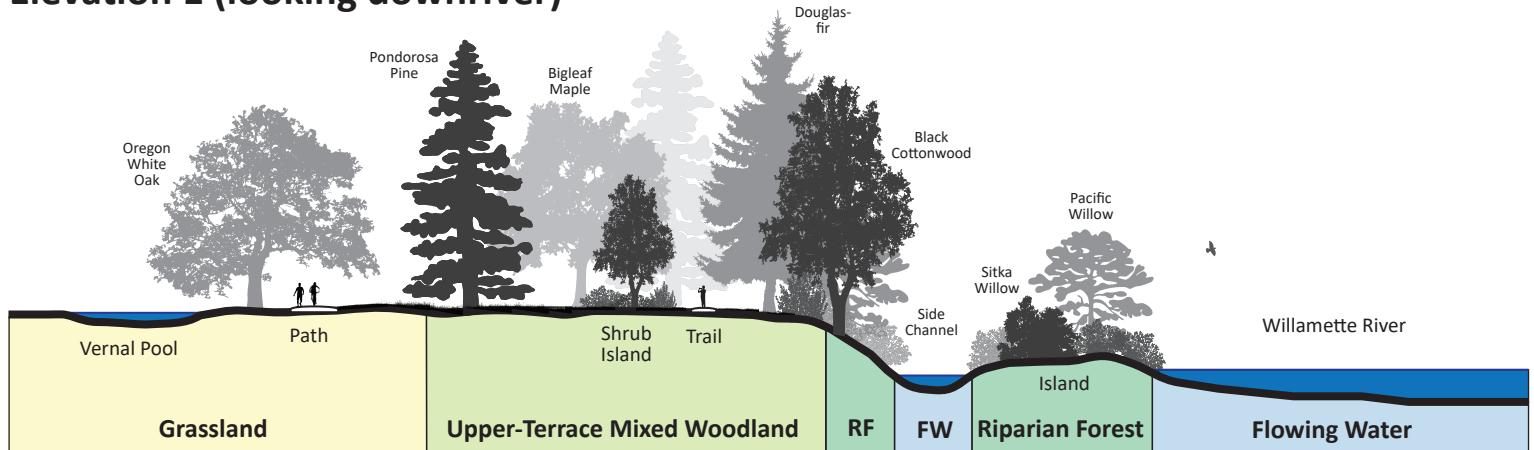
Goal 4: Visitor Experience, Academic Uses, and Access Provide adequate facilities and access to support an outstanding learning environment and a recreational amenity for UO students and community members.		
Objective 4a. Trails and Paths: Provide adequate access to key points of interest across the WRNA, using a universal access standard trails wherever possible. <u>Definition:</u> Universal Access trails are designed to be usable by all people to the greatest extent possible, without separate or segregated access for people with disabilities. Universal access trails are surfaced with highly compacted gravels, a minimum of 48 inches in width, and have a maximum running grade of 5%.		
<u>Action:</u> Construct 2,650 linear feet of new universal access trail as shown on the Action Plan Map to provide formal access parallel to the river from the Frohnmyer Bridge to the existing universal access trail. This will include short spur trails to designated river viewpoints.	II	Proposed alignments may be adjusted based on further evaluation. Vegetation may be managed to retain views to the river at the designated viewpoints.
<u>Action:</u> Assess the newly installed lighting along the South Bank Path in the WRNA and adjust as necessary to ensure a balance between illumination for public safety and limiting wildlife habitat impacts.	I	Consider shielding the river facing side of some lights to reduce light pollution in those areas if deemed necessary. Consider limiting hours of operation, especially during peak bird migration.
Objective 4b. River Access: Provide physical access to the river's edge at key locations for academic and recreational use. <u>Note:</u> Formal access to the water's edge does not currently exist anywhere in the WRNA.		
<u>Action:</u> Construct a stone stairway to provide safe access to the rock shelf at "fossil beach". <u>Note:</u> this will not be universal access due to the steepness of the bank.	I-II	This is already a popular academic and recreational destination. Stairway could be modeled after the recently installed basalt

Management Goals and Objectives	Priority	Notes
		stairs on the Spencer Butte summit or treated timber stairs on Skinner Butte.
<u>Action:</u> Re-construct the existing user trail that accesses the river just downstream of the Millrace Outfall to improve grade and surfacing.	I-II	The current user trail is steep and slippery.
<u>Action:</u> In conjunction with habitat and bank stabilization efforts, recontour the riverbank just above the bridge to provide improved access to the water's edge for academic and recreational uses and install a universal access trail (approximately 150 linear feet).	II-III	Recommended bank slope of 5:1 (20%) maximum with a gravel universal access trail of 20:1 (5%) maximum running grade.
Objective 4c. Facilities and User Amenities		
<u>Action:</u> Consider converting the circular grass area adjacent to the Frohnmyer Bridge to a "gateway" to the Willamette River with a botanical demonstration, ephemeral (rotating) art installations, interpretation, and wayfinding signage. Design (priority I) and construct (priority II).	I-II, Ac	Design could be developed in conjunction with the Departments of Landscape Architecture, Biology, Environmental Science, and others.
<u>Action:</u> Install "University of Oregon" signage on the west side of the WRNA and at the foot of the Frohnmyer Bridge to announce the entry to the University campus.	I	Use standard University signage.
<u>Action:</u> Install standard park amenities such as bicycle parking, trash receptacles, and benches.	I	This is currently underway.
<u>Action:</u> Install map stations at the west end of the site adjacent to the Riverfront Park and near the Frohnmyer Bridge.	I	The map stations could double as a gateway treatment and signage, welcoming visitor to the University and WRNA. Note: a map station was installed on near the bridge in spring 2022.
<u>Action:</u> Consider installing an emergency call box or boxes along the South Bank Path in consultation with campus security.	I-II	Solar powered or direct wire options are available.
<u>Action:</u> Consider installing publicly accessible web cameras focused on interesting natural features within the WRNA such as the river, Osprey nesting platform, or habitat snags.	II-III	These could be similar to the popular web camera at the UO Law School osprey perch .
Objective 4e. Honor and Interpret the Natural and Human History of the Site.		
<u>Action:</u> Develop interpretive themes and methods to help interpret the sites natural and human history including Kalapuyan land management practices, river uses, and past industrial uses along with the ongoing habitat management activities.	I-II, Ac	Coordinate with the UO Museum of Natural History and the Tribes, on developing interpretive themes and methods. Consider utilizing QR codes with links to multi-lingual interpretive information.
<u>Action:</u> Develop and install ephemeral art exhibits that celebrate the natural and human history of the site.	Ac	Exhibits could be sited along the trail and path network or within the native plant demonstration area at the foot of the Frohnmyer Bridge (along with the planned permanent art installation in this area)

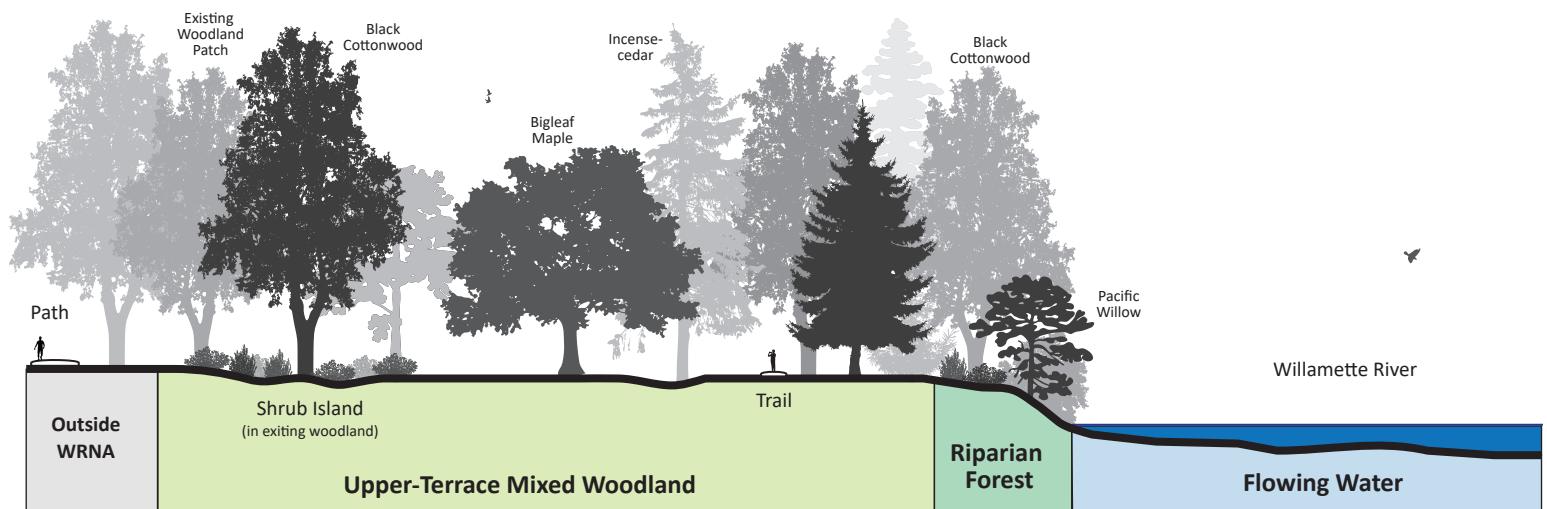
Management Goals and Objectives	Priority	Notes
Goal 5: Monitoring and Research		
Provide adequate baseline and post-project data on site vegetation and wildlife to inform management decisions and track change over time, while using the WRNA as a site for ongoing University research related to habitat management, wildlife, and restoration approaches. <u>Note:</u> A portion of the site monitoring could be conducted by University faculty or trained volunteers with student assistance.		
Objective 5a. Baseline Vegetation Data: Collect baseline vegetation data on existing vegetation and invasive species to inform site management and the adaptive management approach.		
Action: Establish photo-points (priority I) at key locations around the park and take photos as needed to track general changes in vegetation communities over time. Collect photos a minimum of once per year and ideally four times per year to show seasonal change.	I, O, Ac	Consider adding aerial (drone) photo points in addition to standard ground level to monitor changes in woody vegetation cover.
Action: Record and map populations of emerging non-native invasive plant species that have potential to rapidly spread across the site along with large concentrations of established invasive species such as Blackberry, English Ivy, False Brome, and Poison Hemlock.	I, O, Ac	Weed mapping is critical for detecting emerging threats and tracking control efforts and to inform the Early Detection, Rapid Response weed management actions (see Objective 3b).
Action: Update and refine the University tree inventory for the area contained within the WRNA.	I, O, Ac	Add additional species and verify current data.
Action: Collect baseline data on tree health and monitor on a regular basis to inform tree maintenance actions.	I, O, Ac	Create a tree health database that expands on existing UO tree inventory data. Consider having the regular tree health monitoring be conducted by students with guidance from academic advisors and/or Facility Services staff.
Objective 5b. Wildlife Surveys: Conduct formal wildlife surveys on a range of existing and potential species.		
Action: Develop a list of target wildlife species to be monitored, frequency and types of surveys needed, data analysis procedures, etc.	I, Ac	Ensure data is stored in a format and location that is readily available.
Action: Conduct wildlife surveys so on-site populations can be gauged over time. This could include formal breeding bird surveys, herptile (amphibian and reptile) surveys, and pollinator surveys.	O, Ac	These could potentially be conducted by University faculty or trained volunteers with student assistance.
Action: Record significant mammal sightings as they are reported including date, location, and time.	O, Ac	Consider placing wildlife cameras to provide additional documentation including nocturnal use. Elevating cameras will limit risk of vandalism or theft.
Objective 5c. Project-Specific Monitoring Program: Implement a cost-effective monitoring program to document major restoration and enhancement projects within the WRNA.		
Action: Develop a set of vegetation and wildlife monitoring goals and protocols for the overall site that is both cost effective and effective for assessing change over time.	I, Ac	Consult the City of Eugene and other local partners on standard protocols. Opportunities for UO faculty to develop monitoring goals and protocols in conjunction with research or course work.
Action: Develop specific vegetation and wildlife monitoring goals for major restoration and enhancement projects (i.e., bank recontouring project) prior to implementation and collect baseline data. The monitoring approach must	I-III	Establish new photo-points as needed to adequately monitor pre- and post-project conditions.

Management Goals and Objectives	Priority	Notes
be cost effective, while providing adequate information to allow managers to evaluate project success.		
<u>Action:</u> Conduct adequate post-project monitoring to gauge success and inform the adaptive management process as feasible.	O, Ac	
Objective 5d. Research: Provide research and monitoring opportunities at the WRNA for University faculty, students, and other interested partners, with an emphasis on activities that assist the University with monitoring and management needs such as tracking plant and wildlife populations, vegetation, and habitat management actions.		
<u>Action:</u> Develop a list of potential research questions and monitoring opportunities that could help improve understanding of the natural resources within the WRNA and help guide future management decisions. Research and monitoring topics could include study of wildlife use, tracking rare plant populations, weed mapping, tracking public use, etc.	I, Ac	Coordinate with key University departments including Landscape Architecture, Environmental Science, Biology, and others.
<u>Action:</u> Utilize iNaturalist and eBird as a way encourage members of the public to report plant and wildlife observations at the WRNA.	Ac, Vol	iNaturalist and eBird are web-based crowd source database for plant and wildlife observations. A WRNA iNaturalist page has been created.
<u>Action:</u> Coordinate with local non-profit organizations such as the Native Plant Society of Oregon – Emerald Chapter, Lane County Audubon, the North American Butterfly Association, and other interested citizens to conduct plant and wildlife inventories that will assist the University with ongoing monitoring activities.	Vol	Encourage these groups to maintain records and inventories using a consistent protocol.
<u>Action:</u> Utilize the WRNA to study climate resiliency and shifting plant species composition.	Ac	See the plant palette in Section 4.5 for suggested species to study climate resiliency.
<u>Action:</u> Continue to allow and encourage University research and monitoring efforts at the WRNA, especially those that support and inform ongoing efforts to restore and manage habitat at the WRNA.	O	Proposed research projects, academic uses, and recreational activities that result in modification to the site's vegetation and soils should be submitted to CPFM for formal approval.

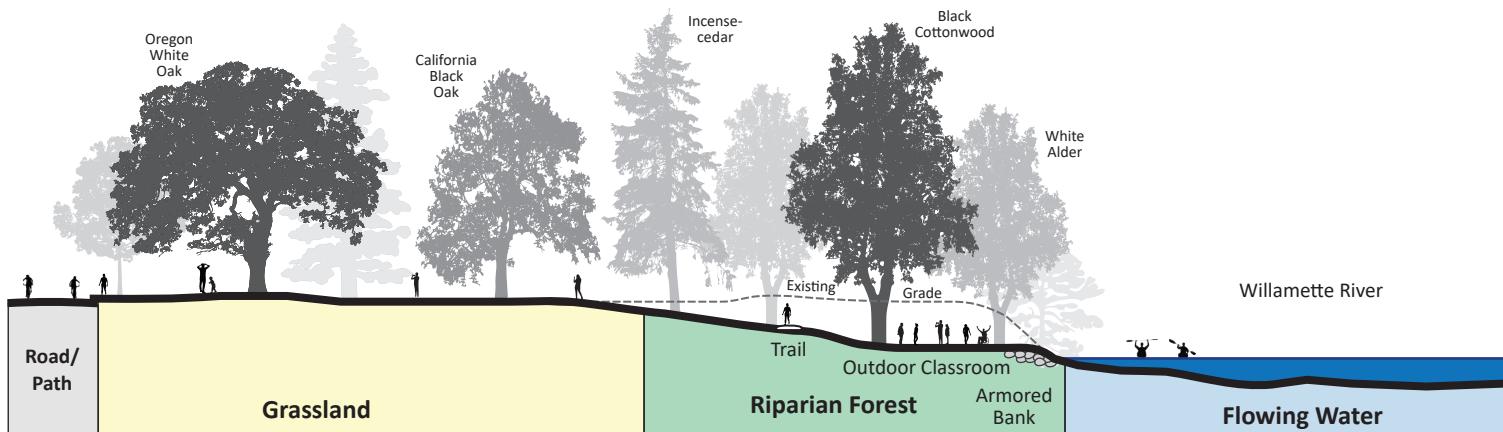
Elevation 1 (looking downriver)



Elevation 2 (looking downriver)



Elevation 3 (looking downriver)



Willamette River Natural Area Desired Future Conditions Profiles

100 Feet

Approximate Scale

Prepared by JKE
Draft: April 2022

Figure 4-4



4.5 Recommended Plants by DFC Vegetation Community

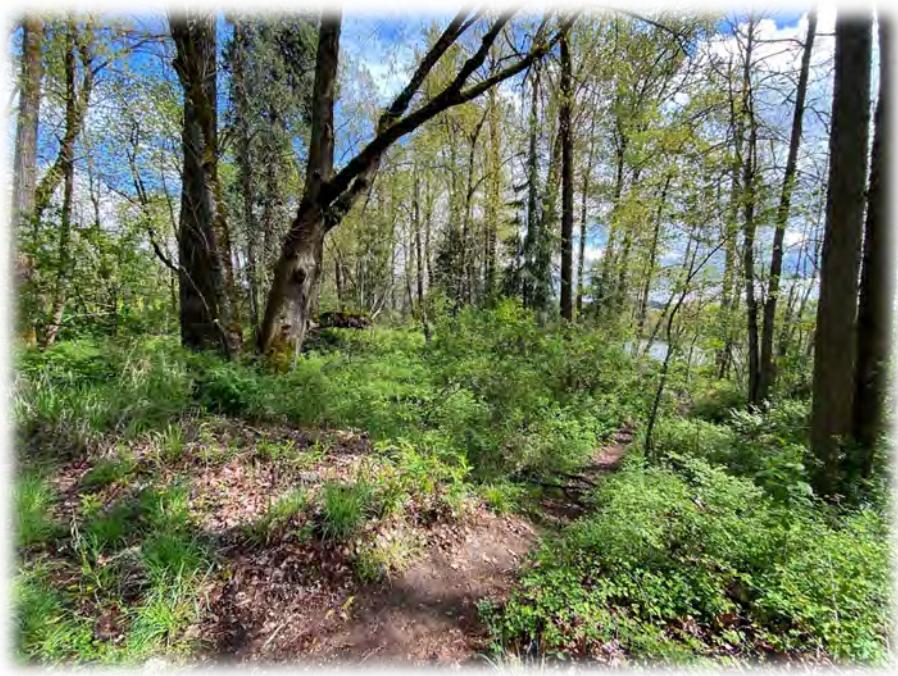
The following list includes native plant species suitable and recommended for planting within the WRNA. The lists are sorted by the WRNA Desired Future Vegetation categories and some plants are suitable in multiple zones. As the Management Plan is implemented in phases, final plant selection and planting densities will be finalized and should be made in consultation with local botanical experts with experience with native habitat restoration. The list is not intended to be all inclusive and additional plants may be specified. With the exception of CPFM-approved climate-related research projects, it is recommended that trees and shrubs be sourced from within the Willamette Valley Ecoregion and that grass and forb seed be sourced specifically from the southern Willamette Valley Ecoregion where feasible to limit genetic variations. Local [Rivers to Ridges](#) Partnership organizations often collaborate on plant acquisition and could be a valuable resource when purchasing native plant materials and seed.

Riparian Forest/Flowing Water

This category includes flowing water in the river and the Millrace Outfall channel, and the associated riparian zone along the banks. The riparian zone is the interface between land and water where the plant community is influenced by proximity to water and is often disturbed during flooding. Within the WRNA, the riparian zone includes the area below ordinary high-water mark which is seasonally inundated most years, and the area along the banks that is flooded on a less frequent basis. Due to the steepness of the banks within most of the WRNA, the riparian zone found in a fairly narrow band. Because much of this area has established vegetation, management actions will focus on controlling non-native invasive species and adding native diversity.

Inundation key:

- (1) = Able to withstand periodic inundation during the winter flows (suitable for areas below the ordinary high-water mark).
- (2) = At or above ordinary high water. Able to withstand only limited inundation and not suitable for planting in the area below the ordinary high-water mark.



Mature riparian forest in Alton Baker Park directly across the river from the WRNA (Source: J. Krueger)

Trees:

- Bigleaf Maple (*Acer macrophyllum*) (2)
- White Alder (*Alnus rhombifolia*) (1, 2)
- Incense-cedar (*Calocedrus decurrens*) (2)
- Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) (2)
- Black Cottonwood (*Populus trichocarpa*) (1, 2)
- Pacific Willow (*Salix lasiandra* var. *lasiandra*) (1, 2 close to 1)
- Pacific Yew (*Taxus brevifolia*) (2)

Shrubs:

- Pacific Serviceberry (*Amelanchier alnifolia*) (2)
- Tall Oregon Grape (*Berberis aquifolium*) (2)
- Red-osier Dogwood (*Cornus sericea*) (1, 2)
- Osoberry (*Oemleria cerasiformis*) (2)
- Lewis' Mockorange (*Philadelphus lewisii*) (2; sunny spots)
- Pacific Ninebark (*Physocarpus capitatus*) (2)
- Red Flowering Currant (*Ribes sanguineum*) (2)
- Nootka Rose (*Rosa nutkana* var. *nutkana*) (2)
- Thimbleberry (*Rubus parviflorus* = *nutkanus*) (2)
- Hooker's Willow (*Salix hookeriana*) (1)
- Sitka Willow (*Salix sitchensis*) (1)
- Red Elderberry (*Sambucus racemosa* var. *arborescens*) (2)
- Common Snowberry (*Symphoricarpos albus* var. *laevigatus*) (2)

Forbs

- Slough Sedge (*Carex obnupta*) (1)
- Slender-foot Sedge (*Carex leptopoda*) (2)
- Tall Larkspur (*Delphinium trolliifolium*) (2)
- Bleeding Heart (*Dicentra formosa*) (2)
- Pacific Waterleaf (*Hydrophyllum tenuipes*) (2)
- Large False Solomon's Seal (*Maianthemum canadense* spp. *amplexicaule*) (2)
- Starry False Solomon's Seal (*Maianthemum stellatum*) (2)
- Sword Fern (*Polystichum munitum*) (2)
- Giant Trillium (*Trillium albidum* ssp. *albidum*)
- Stream Violet (*Viola glabella*) (2)

Upper-Terrace Mixed Woodland

This vegetation community is situated on the upper-terrace and is not subject to regular flooding. Much of the WRNA proposed for this vegetation community is currently in a disturbed condition, vegetated with non-native grasses and non-native invasive shrubs such as blackberry. Trees cover will be established first in these areas in conjunction with invasive species control. Target tree cover will be from 50 -70 percent (when trees are mature), with the denser canopy located closer to the river. Oaks, pine, and other sun dependent species will be located on the southern edge of this zone. Shrubs and forbs will be selectively planted over time in defined "shrub islands" to allow ease of site maintenance and ensure public safety (maintaining sight lines) while still providing diversity and pollinator services.

Trees:

- Pacific Madrone (*Arbutus menziesii*) – difficult to establish and disease issue (try in small quantities)
- Bigleaf Maple (*Acer macrophyllum*)
- Incense-cedar (*Calocedrus decurrens*)
- California Hazel (*Corylus cornuta* var. *californica*)
- Suksdorf's Hawthorn (*Crataegus gaylussacia*)
- Willamette Valley Ponderosa Pine (*Pinus ponderosa* var. *benthamiana*) – mostly on south edge in sun
- Black Cottonwood (*Populus trichocarpa*) – mostly in north portion
- Douglas-Fir (*Pseudotsuga menziesii* var. *menziesii*)
- Canyon live oak (*Quercus chrysolepis*) – north of native range (try in small quantities on experimental basis; propagate from seed to avoid pathogen transport)

- Oregon White Oak (*Quercus garryana* var. *garryana*) – south edge in sun
- California Black Oak (*Quercus kelloggii*) – south edge in sun
- California Laurel (*Umbellularia californica*) – north of native range (try in small quantities on an experimental basis)

Shrubs (planted in clusters or “shrub islands”):

- Pacific Serviceberry (*Amelanchier alnifolia* var. *semiintegifolia*)
- Bristly Manzanita (*Arctostaphylos columbiana*) – try in small quantities on experimental basis
- Tall Oregon Grape (*Berberis aquifolium*)
- Buckbrush (*Ceanothus cuneatus*) – along sunny edges
- Oceanspray (*Holodiscus discolor*)
- Osoberry (*Oemleria cerasiformis*)
- Red Flowering Currant (*Ribes sanguineum*)
- Nootka Rose (*Rosa nutkana* var. *nutkana*)
- Common Snowberry (*Symphoricarpos albus* var. *laevigatus*)

Grasses

- Sitka Brome (*Bromus sitchensis* aka *Bromus sitchensis*)
- California Oatgrass (*Danthonia californica*) – likely to drop out once shade is established
- Blue Wildrye (*Elymus glaucus*)
- Columbia Brome (*Bromus vulgaris*)
- Roemer's Fescue (*Festuca Roemeri*) roemeri var. roemeri – will phase out once shade is established

Forbs

Same forbs listed in Riparian Zone, plus:

- Red Columbine (*Aquilegia formosa*) – along sunny edges
- Pacific Hound's tongue (*Adelinia grandis*)
- Leichtlin's Camas (*Camassia leichtlinii* ssp. *suksdorfii*)
- Sword Fern (*Polystichum munitum*)
- Oregon Iris (*Iris tenax* ssp. *tenax*) – along sunny edges and small gaps



Mixed woodland under establishment in Alton Baker Park adjacent to established riparian forest in the background (Source: J. Krueger)



Mixed woodland at the Buford Recreation Area (Source: E. Alverson)

Grassland (Upland Prairie, Oak Savanna, Vernal Pools)

This vegetation community is also situated on the upper-terrace of the site, generally located in the areas furthest from the river and in areas where soil conditions are less supportive of the establishment of forest or woodland. The grasslands will include a range of sub-categories including upland prairie, vernal pools (wetlands), and oak savanna (upland prairie with scattered oaks).

Trees (Widely scattered):

- Willamette Valley Ponderosa Pine (*Pinus ponderosa* var. *benthamiana*)
- Oregon Oak (*Quercus garryana* var. *garryana*)



Restored upland prairie near Salem (Source: L. Boyer)

Shrubs (Widely scattered, patches):

- Chaparral Broom (*Baccharis pilularis* var. *consanguinea*) – in patches with male and female plants in each patch.
- Tall Oregongrape (*Berberis aquifolium*) - under edges of oaks
- Buckbrush (*Ceanothus cuneatus* var. *cuneatus*) A few patches.

Grasses:

- California Brome (*Bromus sitchensis* var. *carinatus* aka *B. carinatus*)
- California Oatgrass (*Danthonia californica*)
- Tufted Hairgrass (*Deschampsia cespitosa*) – wetter areas
- Slender Wheatgrass (*Elymus trachycaulus*)
- Roemer's Fescue (*Festuca roemeri* var. *roemeri*)
- Prairie Junegrass (*Koeleria macrantha*)

Forbs:

- Yarrow (*Achillea millefolium*)
- Narrow-leaf Onion (*Allium amplectens*)
- Showy Milkweed (*Asclepias speciosa*)
- Harvest Brodiaea (*Brodiaea elegans* ssp. *hooveri*) – use sparingly
- Cat's Ear (*Calochortus tolmiei*)
- Common Camas (*Camassia quamash* var. *maxima*)
- Leichtlin's Camas (*Camassia leichtlinii* var. *suksdorfii*)
- Slender Paintbrush (*Castilleja tenuis*)
- Farewell-to-spring (*Clarkia amoena*)
- Ookow (*Dichelostemma congestum*)
- Shooting Star (*Dodecatheon hendersonii*)
- Elegant Downingia (*Downingia elegans*) – vernal pools
- Denseflower Spikeprimrose (*Epilobium densiflorum*) – vernal pools



Oak savanna and prairie at Gillespie Butte Park in Eugene (Source: City of Eugene)



Vernal pool in Amazon Park in Eugene (Source: J. Krueger)

- Oregon Sunshine (*Eriophyllum lanatum*)
- Coyotethistle (*Eryngium petiolatum*) – Vernal pools
- Broadpetal Strawberry (*Fragaria virginiana* var. *platypetala*)
- Blue Gilia (*Gilia capitata*)
- Willamette Valley Gumweed (*Grindelia integrifolia*)
- Fernleaf Lomatium (*Lomatium dissectum* var. *dissectum*)
- Barestem Lomatium (*Lomatium nudicaule*)
- Spurred Lupine (*Lupinus arbustus*)
- Showy Tarweed (*Madia elegans*)
- Rosy Owl Clover (*Orthocarpus bracteosus*)
- Fragrant Popcorn Flower (*Plagiobothrys figuratus*) – Vernal pools
- Rosy Plectritis (*Plectritis congesta*)
- Native Self Heal (*Prunella vulgaris* var. *lanceolata*)
- Western Buttercup (*Ranunculus occidentalis* var. *occidentalis*)
- Meadow Checkermallow (*Sidalcea campestris*) - keep the two checkermallow species far apart
- Rosy Checkermallow (*Sidalcea malviflora* ssp. *virgata*) – best in partial shade on meadow edges
- Narrow Goldenrod (*Solidago elongata*)
- Douglas Aster (*Symphyotrichum subspicatum*)
- Woolly-head Clover (*Trifolium eriocephalum* ssp. *eriocephalum*)
- Narrow-leaf Mule's Ears (*Wyethia angustifolium*)

4.6 Recommended Guidance for Adjacent University-Owned Land

Although outside of the designated WRNA, the long-term management and use of the adjacent University-owned lands that lie between the WRNA and the railroad will undoubtedly impact the ecological health and function of the entire area. The following set of recommendations have developed for consideration for the area adjacent to the WRNA:

- Mowing: Rough mow the grassy areas to control invasion by woody vegetation such as Blackberry and reduce the risk of wildfire. Mowing should be avoided between March 15 and July 15 to protect ground-nesting birds and to promote native plant species.
- Native Vegetation: Utilize a native plant palette when landscaping future development in this area and consider these plantings an extension of the vegetation communities within the WRNA.
- University Sponsored Research: Continue to utilize this area for short-term research efforts such that will help inform management of the WRNA and inform management efforts elsewhere.
- Visual screening: Consider planting a vegetated buffer parallel to the railroad to screen views of the back side of the University central power station and other nearby buildings (Incense-cedar and Douglas-fir are recommended). Coordinate with the railroad to ensure plantings and setbacks are compatible.
- Sound buffering: Consider options such as berms or sound walls to buffer the area from loud noises associated with the railroad and University power station.
- Lighting: Limit light levels associated with future development as feasible to minimize impacts that light pollution may have on area wildlife and reduce or turn-off outdoor lighting during peak bird migration periods.
- Associated Facilities: Consider siting facilities in this area that contribute to academic and recreational uses of WRNA such as:
 - Covered pavilion for academic use and staging recreational activities (possible combined equipment storage for WRNA site management, outdoor program, etc.); and
 - Urban agriculture extension to expand upon the Urban Farm with orchards, edible landscapes, and applied habitat restoration (possible native plant nursery).
- Gates: Install gates or bollards as needed to prevent unauthorized vehicle access into the WRNA.
- Unauthorized Camping: Work to eliminate unauthorized camping within on the University-owned property and adjacent lands to limit issues with habitat impacts, water quality, and perceived public safety. Coordinate with local social service organizations to relocate campers to more suitable alternative locations with regular services and assistance.

4.7 Plan Implementation and Ongoing Maintenance

4.7.1 Plan Implementation

Full implementation of this plan will take a concerted effort over the 20-year planning window. Many of the proposed habitat restoration and enhancement actions go well beyond routine landscape maintenance and will require significant capital funding, much of which could come from State and Federal grant sources. Encouraging and coordinating academic research and monitoring efforts, student research projects, and on-the-ground volunteer activities at the WRNA will support plan implementation, advance the University's academic mission, and promote stewardship of this important on-campus natural area.

To adequately oversee implementation of the plan, conduct ongoing maintenance and management, and coordinate academic activities, it is highly recommended that the University add dedicated staffing with a special expertise in natural area management, habitat restoration, and coordination.

4.7.2 Ongoing Maintenance and Management

A significant ongoing management and maintenance effort will be required to adequately maintain the WRNA over time. Many of these tasks occur on an annual basis during a specified window of time or season, while others will occur regularly or as needed throughout the year. The table below lists ongoing maintenance tasks and recommended timing. Please Section 4.4 (Goals, Objectives, and Prioritized Actions) for more detail about individual tasks.

Figure 4-5: Ongoing Maintenance and Management Schedule

= Recommended timing

Maintenance and Management Activity	J	F	M	A	M	J	J	A	S	O	N	D
Vegetation Management												
• Invasive species control (focus on habitat altering species)*												
• Rough mowing (grassland and woodland): once annually*												
• Edge mowing along paths and trails: As needed												
• Irrigation of establishing trees and shrubs: 3 years minimum												
• Create artificial disturbance in grasslands (shade cloth, or other)												
• Overseed disturbed areas as needed (native grass and forb mix)												
• Create habitat snags (girdle, limb, and top as necessary)*												
Monitoring												
• General weed mapping (map significant concentrations)												
• Survey for emerging threat weed species to support EDRR												
• Coordinate with partners on emerging invasive species threats												
• Take photos at designated photo points (yearly to quarterly)												
• Conduct wildlife surveys (with academic/volunteer assistance)												
• Conduct plat surveys (with academic/volunteer assistance)												
• Update UO tree database within the WRNA (as needed)												
• Coordinate with Departments on academic efforts												
• Monitor specific restoration projects (as specified in protocol)												
Management of Human Uses and Facilities												
• Sweep surface of S. Bank Path (City conducts on a regular basis)												
• Rake/blow leaves, grass, and forest duff from UA trails												
• Monitor/redirect unauthorized camping w/UOPD (weekly)												
• Coordinate clean-up of debris and litter w/FS (at least weekly)												
• Remove/obliterate unofficial user trails (block and revegetate)												
• Install signage in impacted areas (no camping, no access, etc.)												
• Replace/repair damaged signage and other facilities												
Secure Funding for Proposed Capital Improvements												
• Identify funding opportunities from outside sources												
• Identify, write, and coordinate grant proposals												
• Coordinate with local Partner orgs. on project collaboration												

* Avoid mowing and use caution when clearing invasive species between March 15 through July 15 (or later if feasible) to protect native vegetation and ground-nesting birds.

4.8 Calculating Benefits

The site enhancements proposed in this plan will result in a wide range of ecological and social benefits once implemented. Monitoring vegetation, wildlife, and human use will allow the University to track benefits and gauge progress over time. Tracking and quantifying these multiple benefits over time could potentially constitute a valuable research project(s) for University faculty and students. A brief discussion of anticipated benefits from plan implementation is listed below.

4.8.1 Ecological

- Wildlife Habitat: As described in detail within this plan, habitat conditions that will support target wildlife species are anticipated to improve significantly over time as native plant communities are restored. Proposed habitat enhancements will benefit a wide range of native species including fish, reptiles, amphibians, and insects (see Section 3.1.1: Target Habitats and Species). The plan's focus on establishing nectar producing plants will particularly support native pollinators in line with the University's Bee Campus initiative.
- Carbon Sequestration: The plan proposes the preservation of approximately 6.9 acres of existing forest and the establishment of approximately 8.8 acres of new forest and woodland within the WRNA over time. The preservation and establishment of thousands of trees and shrubs will result in significant carbon sequestration. Based on the Winlock International carbon calculator tool, sequestration within the WRNA would total approximately 1,500 metric tons of carbon over a twenty-year period. This is a rough estimate which could be refined through more rigorous academic study in the future based on more complex methods and better knowledge of actual quantities and species of trees and shrubs planted.
- Water Quality: The proposed forest and woodland restoration will help improve water quality in the Willamette River in two ways. The multilayered vegetation will absorb and filter runoff before it enters the river. The increased tree cover will help create a cooler microclimate within the WRNA and cast shade directly onto the river. Since the WRNA is located on the south side of the river, the shading effect will be particularly beneficial.

4.8.2 Social

- Academic Uses: It is anticipated that academic use of the WRNA has potential to increase significantly over time as site access is improved and public safety issues are addressed. Multiple research projects, monitoring efforts, and inventories could be conducted on the site related to plant composition, wildlife use, soils, climate resiliency, and restoration and maintenance techniques. Improved site access, including integration of universal access trails and outdoor classrooms, will greatly improve the potential for academic use by many departments and students.
- Recreational Uses: Construction of improved access including additional universal access trails along the river will provide opportunities for passive recreational uses such as walking, running, and nature study for users of all abilities. The improved access to the river's edge proposed in three locations could also better accommodate river recreation.
- Public Safety: Encouraging legitimate academic and recreational uses within the WRNA will help activate the space and discourage unauthorized uses.
- Campus Identity: The improved visual quality and functionality of the land contained within the WRNA will support the University's identity as a sustainable institution and provide a strong connection to the natural environment and the Willamette River.
- Mental and Physical Health: Studies have shown significant mental health benefits associated with access to nature and trails.

Willamette River Natural Area Landscape Management Plan

Appendices

Appendix A: Related Plans and Studies

Appendix B: Historical Aerial Photo Set

Appendix C: Existing Conditions Maps with Tree Data
(East, Middle, and West)

Appendix D: Campus Natural Area Precedents

Appendix E: Photo Examples of Proposed Site Features

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