UNIVERSITY OF OREGON
NORTH CAMPUS CONDITIONAL USE PERMIT PROJECT

Riparian Assessment and Management Report

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1.0 INTRODUCTION

The University of Oregon (UO) Campus Planning Office is planning for future land uses within the UO North Campus area adjacent to the Willamette River in Eugene, Oregon. Much of the North Campus area occurs within the City of Eugene's (City) Goal 5 Water Resource Conservation Overlay Zone that protects significant riparian areas, wetlands, and other water-related wildlife habitat areas. The City's Goal 5 Water Resource Conservation Overlay Zone land use code defines setbacks and standards to guide development actions within the overlay zone. Much of the North Campus area also occurs within the City's Goal 15 Willamette River Greenway boundary, which regulates new development, changes of use, and intensifications of use.

Mason, Bruce & Girard, Inc. (MB&G) was contracted to conduct a site assessment to determine the extent to which the Goal 5 and Goal 15 conservation setbacks are measured in the North Campus area. MB&G was also contracted to document riparian habitat and function characteristics within the North Campus area to provide riparian management recommendations to support the land use and master site planning effort.

Riparian areas are generally vegetated areas located adjacent to waterbodies that form the interface between terrestrial and aquatic areas. These areas protect water quality, remove contaminants, recharge groundwater, and are an important source of primary production for nutrient cycling and aquatic food webs. Riparian areas also provide habitat for a wide range of wildlife species, as well as flood storage and channel stability. The City of Eugene code (EC) states that "the overlay zone not only conserves the physical resources but also protects the water quality within the resource areas as a fundamental and essential requirement for continued survival of these biological systems" (EC 9.4900). The overlay zone establishes conservation setbacks that guide the planning, implementation, and management standards for multi-use development. These setbacks are established landward from a waterbody's top-of-high-bank (TOHB) or a waterbody's ordinary high water mark (OHWM).

Riparian areas within the City are defined in the EC by a 100-foot setback from the TOHB and a 120-foot setback from the OHWM. The EC defines TOHB as "the highest point at which the bank meets the grade of the surrounding topography, characterized by an abrupt or noticeable change from a steeper grade to a less steep grade" [EC 9.4920 (1)c1]. OHWM in the EC is defined as "the line on the bank or shore to which seasonal high water rises annually identified in the field by physical characteristics" [EC 9.4920 (1)c2]. This report addresses the methodology employed in the TOHB and OHWM determinations in the North Campus area, and an analysis of the baseline functional conditions of the riparian area.

1.1 Project Location

The project study area (PSA) is approximately 36 acres and is bounded to the north by the Willamette River, to the south and east by the Southern Pacific Railroad right-of-way (railroad), and to the west by a paved parking lot owned by the Eugene Water & Electric Board (EWEB) (Appendix A, Figure 1). The PSA includes the Millrace Slough from the confluence with the Willamette River upstream to the railroad crossing. The PSA lies within Township 17 South, Range 3 West, Sections 32 and 33, and within the Muddy Creek-Willamette River watershed (5th field HUC 1709000306). The PSA includes three tax lots (1703322100300, 1703322405300, and 1703322405400) owned by UO. Other major waterbodies near the PSA include the Coast Fork and Middle Fork of the Willamette River, the McKenzie River, Muddy Creek, and Amazon Creek.

The PSA includes approximately 3 acres of riparian habitat, defined in this report as the area between the OHWM and TOHB along the Willamette River and Millrace Slough and approximately 33 acres of upland habitat. Aquatic habitat comprises less than an acre of the PSA and is primarily Millrace Slough and Willamette River shoreline. A paved bike and pedestrian path runs east to west within the PSA. The PSA includes a landscaped access ramp south of the Frohnmayer Bridge. The Frohnmayer Bridge serves as a bike and pedestrian bridge that spans

Willamette River and connects the North Campus area to Alton Baker Park and Autzen Stadium on the north side of the river outside of the PSA. East of the roundabout within the PSA, the bike and pedestrian pathway merges with Riverfront Parkway which continues to the south under the railroad bridge and outside of the PSA.

The open space east of the Millrace Slough within the PSA was historically used for agriculture followed by a sand and gravel mining and processing operation owned by the Eugene Sand and Gravel Company (L.R. Squier Associates, Inc., 1990). The property was purchased by the UO in 1968. This area now includes a recreation field, bicycle path, mowed pastures with trees scattered throughout, several unmaintained foot paths, and Himalayan blackberry (*Rubus armeniacus*) patches. The portion of the PSA west of the Millrace Slough was historically a gravel and concrete plant and an EWEB transmission pole yard (L.R. Squier Associates, Inc., 1990). This area currently includes a large fenced field with several small depressions that may be seasonal wetlands created from years of soil compaction from industrial use.

2.0 METHODS

MB&G biologists conducted TOHB and OHWM determinations and a riparian assessment within the PSA on July 25, 26, and 27, 2017. During the field effort, aquatic, riparian, and upland areas within and around the PSA were examined and photographed. Prior to the field effort, MB&G biologists reviewed 2015 3-foot LiDAR-derived digital elevation models (DEMs) along with 1-foot interpolated contours and aerial imagery (OLC 2015). MB&G biologists created 30 target field points to focus the field effort to areas with unreliable or low point density LiDAR data. These target points identified both TOHB and OHWM sampling areas that required further information gathering in the field.

2.1 Top of High Bank Determination

MB&G determined the TOHB line by visual identification of the highest point at which the bank met the grade of the surrounding topography [EC 9.4920 (1)c1]. The TOHB locations were recorded with a Trimble GeoXT 6000 series GPS unit capable of sub-meter accuracy. MB&G collected 27 TOHB points along the Willamette River and Millrace Slough in the PSA. MB&G post-corrected these points using Trimble Pathfinder software and compared them to known monument locations near the PSA, resulting in an absolute accuracy of less than 2 feet. MB&G used the post-corrected points to select contour lines representative of the TOHB line and to serve as guidance in areas where LiDAR data were ambiguous. Finally, the TOHB line was reviewed by MB&G biologists and refined using field photos and riparian information collected on site.

2.2 Ordinary High Water Mark Determination

MB&G determined the OHWM by visual identification of one or more of the following [EC 9.4920 (1)c2]:

> "a. A clear, natural line impressed on the bank by the presence of water, flowing water or waves.
> b. Changes in the characteristics of soils.
> c. The presence of water-borne litter and debris.
> d. The uppermost limit of destruction of terrestrial vegetation by the presence of water, flowing water or waves."

MB&G recorded the OHWM using a Trimble GeoXT 6000 series GPS unit capable of sub-meter accuracy. MB&G collected 49 OHWM points along the Willamette River and Millrace Slough. MB&G post-corrected the points using Trimble Pathfinder software and compared them to known monument locations near the PSA, resulting in an absolute accuracy of less than 2 feet. MB&G used the post-corrected points to select contour lines representative

of the OHWM line and to serve as guidance in areas where LiDAR data were ambiguous. Finally, MB&G biologists reviewed the OHWM lines and refined them using field photos and riparian information collected on site.

2.3 Riparian Assessment Points

In order to describe the riparian area and functions within the PSA, MB&G created a data model to collect information using MobileMap™ data collection software. The data model included attributes used to characterize the riparian area function and physical structure at 57 riparian area sample points. MB&G documented attributes within a 15-foot radius of each riparian point; the attributes included:

- % shade
- Presence of erosion
- Presence of organic soil
- Vegetation cover
    - % tree cover
    - % shrub cover
    - % herbaceous species cover, and
    - % bare ground
- % invasive vegetation and dominant species
- River features (large woody debris, pools and riffles, backwater areas, gravel bars)
- Wildlife sign or potential habitat
- Ground photo description

The percentage of shade and invasive vegetation was not specific to one vegetation layer, but rather all layers combined (herbaceous, shrub, and tree) within a 15-foot radius of the riparian assessment point. These riparian assessment points allowed MB&G biologists to describe the collective baseline functional conditions within the PSA.

3.0 EXISTING CONDITIONS

Current conditions within the PSA have been altered from historical conditions after periods of development, vegetation management, and soil compaction. Over the years, the amount of fill added to the area has dramatically altered the physical and biological functions of the riparian habitat along the Willamette River. The bank of the Willamette River has been degraded due to use of riprap and other material to armor the bank, erosion from foot traffic, and alteration of existing vegetation communities. Dominant vegetation type and structure is different from historic conditions as a result of introduced flora and fauna and land uses discussed above that promote the spread of invasive species. Still, existing conditions within the PSA provide habitat that supports a wide range of native species associated with riparian areas. The riparian corridor has been historically reduced in size and function but still remains an important resource for terrestrial and aquatic species and provides other important riparian functions discussed below.

The PSA contains approximately 33 acres of disturbed habitat that now consists of maintained grassy fields. This open space area is relatively flat and is adjacent to the riparian zone which is steeply sloped. The Federal Emergency Management Agency National Flood Hazard Layer shows that the 1% annual chance flood hazard (100-year floodplain) encompasses approximately 14 acres of the PSA. It extends up over the Willamette River's steep riparian bank and into the flat open space to the south. Figure 2 in Appendix A describes the current floodplain conditions within the PSA.

Riparian areas act as an important interchange between aquatic and upland habitat. Hence, in order to describe riparian biological and physical functions, it is important to elucidate both aquatic and upland habitat characteristics. Aquatic, upland, and riparian habitats within the PSA are discussed below and are mapped on Figure 3 in Appendix A.

3.1 Aquatic Habitat

The riparian zone directly affects the health of the waterbody that it surrounds. Hence, riparian habitat with intact physical and biological function improves water quality and condition. Riparian vegetation stabilizes streambanks, slows erosion, moderates stream temperatures, and filters overland runoff to aquatic habitats. Aquatic habitat offers many of the necessary elements for fish, wildlife, and invertebrates to thrive.

The PSA includes portions of the Willamette River and the Millrace Slough (Appendix A, Figure 1). The PSA is situated five miles downstream of the confluence of the Middle Fork Willamette River and the Coast Fork Willamette River. The portion of the Willamette River adjacent to the PSA runs east to west and measures approximately 400 feet wide at the OHWM. The Millrace Slough within the PSA runs south to north and bisects the western portion of the PSA.

3.1.1 Millrace Slough

The Millrace Slough enters the PSA from the south through a concrete box culvert with an adjacent water control structure under the railroad. The slough's channel is approximately 20 feet wide in this area and flows approximately 20 feet before passing under an unmaintained foot bridge with concrete abutments. The slough flows for approximately 150 feet before entering a culvert under the bike and pedestrian path near the Willamette River TOHB. The culvert under the bike path is constricted on the south side, obstructed by the heavy accumulation of sediment and debris. This constriction point appears to have caused a wider channel (the OHWM measuring approximately 30 feet wide) south of the culvert. The area north of the culvert has a narrow OHWM approximately 10 feet wide and continues to the north for approximately 200 feet before its confluence with the Willamette River.

During the July 2017 field effort, the Millrace Slough was stagnant, murky, and fairly degraded with English ivy (*Hedera helix*) dominating the herbaceous vegetation community above OHWM (Appendix B, Photos). However, the overstory was predominantly composed of black cottonwood (*Populus trichocarpa*), providing shade and cooling the water within the slough. This area provides habitat for amphibians, reptiles, small mammals, and birds to forage, migrate, and reproduce.

3.1.2 Willamette River

The portion of the Willamette River within the PSA contained many of the morphological components necessary for a healthy river ecosystem. These components 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.

These components along the Willamette River provide habitat and forage for a wide-range of native fish species, both resident and anadromous. In order to spawn, most native fish require spawning gravels of various sizes with adequate flow and cool clear water. In addition, rearing juveniles and adults need sufficient cover in the form of large woody debris, undercut banks, and backwater or side channel habitat to provide protection from predators and refuge during high flow events. Based on the aquatic habitat features present along the Willamette River, the aquatic habitat within in the PSA appears to provide habitat that is suitable for all native fish species life stages expected to occur in the river.

Many other aquatic and water-dependent terrestrial species can benefit from these aquatic habitat components. For example, vegetated benches provide excellent habitat for garter snakes (*Thamnophis* sp.). Backwater microhabitats, fringe wetlands, and large woody debris create habitat for turtles to bask, reproduce, migrate, and forage. Waterfowl utilize fringe wetlands and gravel bars for feeding and roosting as well as shelters from disturbance. Sensitive species such as bald eagles and osprey rely on these aquatic habitats for forage. River-dependent mammals such as beavers and otters, along with several species of bat, all rely on one or more of the river components listed above for food and shelter.

Although the Willamette River within the PSA provides habitat for aquatic species, the area has also been subject to anthropogenic disturbances for many years. Current and historic use of the area for recreation has also directly and indirectly affected local aquatic habitat through disturbances to vegetation and streambank morphology, refuse build up, and nonpoint source pollutants. The majority of the PSA adjacent to the aquatic habitat was used as a gravel plant, a concrete plant, a transmission pole yard, and a sand and gravel mine. These historical industrial land uses have contributed to degraded aquatic conditions due to the runoff of contaminants and the addition of artificial barriers at the bottom of the bank. During the July 2017 field effort, MB&G noted riprap as well as large blocks of concrete slabs along the streambanks in the PSA. These slabs were most likely excess material from the concrete plant and were likely used to stabilize the bank. While these concrete slabs can provide limited shade and shelter to some aquatic species, the unnatural shape and size likely deter native species. Riprap and concrete blocks along a streambank can affect local flow hydraulics and scour regimes resulting in degraded channel and streambank dynamics. In addition, large riprap and concrete pieces can transfer heat to waterbodies as they absorb solar radiation during long summer days. However, the majority of substrate materials along the river margin consisted of cobbles, cohesive silt, and clay and are relatively resistant to erosion.

3.2 Riparian Habitat

Historically, the PSA was completely comprised of riparian bottomland forest with a wide floodplain and sloped bankline (Johnson et. al., 2010). Land uses have dramatically reduced the historic extent of the PSA's riparian forest to a narrow band of habitat along the Willamette River and Millrace Slough. Thick patches of Himalayan blackberry grow adjacent to and within the riparian zone, degrading habitat function and composition. Streambank armoring and other local physical streambank alterations have affected the riparian zone's ability to adapt and respond naturally to various flow regimes in the river. Flood control measures upstream of the PSA at multiple large reservoirs have limited the frequency and intensity of flood events, which limits the natural development and maintenance of riparian habitat and floodplain connectivity. Still, this narrow band of riparian habitat provides many of the necessary functions that are beneficial to the adjacent floodplain and aquatic areas, such as channel stability, limited flood storage, primary production and nutrient cycling, and shade. It also provides direct habitat for aquatic and terrestrial wildlife species.

3.2.1 Millrace Slough

During the July 2017 field effort, the northern segment of the Millrace Slough (south of the confluence) was dominated by English ivy, with the majority of the riparian zone lacking a shrub layer. English ivy can exacerbate

erosion issues because its shallow root system lacks the ability to provide the deep soil anchoring and bank stabilization provided by mature trees and shrubs. Excessive soil erosion control can cause excessive sediment runoff, reducing water quality, and can lead to streambank failure and degraded riparian conditions. In addition, its climbing vines can eventually kill large overstory trees which provide the necessary shade for reducing water temperature. English ivy provides very little habitat for native wildlife species and reduces the overall biodiversity of the riparian zone.

The middle segment of the slough within the PSA provides improved habitat with a good mixture of tree, shrub, and herbaceous layers. However, the obstructed culvert on the south side of the bike path might restrict water from the Willamette River to flow freely into the slough, reducing flood storage. The southern segment of the slough at the railroad right-of-way near the Millrace Slough water control structure, contained little to no tree cover during the field effort. A lack of canopy cover may reduce shade, causing warmer water, and diminished habitat quality and species biodiversity.

The composition of vegetation strata at each riparian assessment point is shown in Figure 4, Appendix A.

3.2.2 Willamette River

Riparian habitat throughout the Willamette River within the PSA was fairly uniform with steep banks and multilayered vegetation composition. The narrow riparian zone along the Willamette River displayed complex vegetation structure providing shade for aquatic and riparian species (Appendix B). In addition, this multilayered vegetation composition protects and stabilizes the river bank and reduces water velocity during high flows. The riparian zone of the Willamette River within the PSA was fairly steep, most likely a result of historic degradation of riparian functions and upstream flood control measures in place for the last 50-60 years. However, there are pockets of gently sloped streambank sections in the PSA that still provide intact riparian functions.

There were pockets of Himalayan blackberry thickets within the riparian zone at the time of the July 2017 field effort. Figure 2 in Appendix A illustrates the general location of the larger infestations noted within the PSA. These thickets reduce riparian function by decreasing vegetation community complexity, resulting in decreased streambank stability and degraded riparian habitat conditions.

3.3 Upland Habitat

The upland habitat within the PSA has been historically used for mining, sand and gravel screening, concrete production, and utility pole storage, prior to the more recent, passive uses by UO (L.R. Squier Associates, Inc., 1990). This upland habitat is considered degraded or, in some areas marginal, due to these past land uses. The area has been converted to open fields used for recreation and educational purposes. As previously noted, a paved bike and pedestrian trail runs east-west within the PSA and there is a large access ramp south of the pedestrian bridge landscaped with ornamental shrubs. Well-established Himalayan blackberry patches are dispersed throughout the area, primarily adjacent to the riparian zone. The remaining open space contains a fenced field with possible seasonal wetlands, an irrigated athletic field, and a maintained area seeded with cultivar grasses. These habitat types are displayed in Appendix A, Figure 2.

This upland habitat contains compacted soils from years of industrial use. However, due to the location adjacent to the Willamette River, the area still serves to support baseline floodplain functions such as groundwater recharge and flood storage. In addition, with the buildup of urban areas surrounding the PSA, this upland open space provides a movement corridor for wildlife. Ungulates and larger terrestrial species might utilize this open space to access migration corridors or to forage. Upland wildlife species documented in the field are listed in Table 3.

3.4 Species Presence within PSA

MB&G conducted several queries for the potential presence of fish, wildlife, and plant species within the PSA prior to the July 2017 field effort. In addition, MB&G recorded wildlife and plant species observed during the July 2017 field effort. These species are documented below.

3.4.1 Sensitive Aquatic Species

MB&G conducted a query of potential sensitive aquatic species present within the PSA. Table 1 describes the sensitive species that have been historically present within the Willamette River, along with type of use, Federal Endangered Species Act (ESA) listing status, and run timing (StreamNet 2012). Additional native and non-native resident fish species are known to use the Willamette River and Millrace Slough within the PSA.

Table 1. Anadromous fish species distribution within the PSA (StreamNet, 2012).

Species	Federal ESA Status	Run	PSA Use Type
Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Spring	Rearing and migration
Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Fall	Spawning and rearing
Steelhead (*Oncorhynchus mykiss*)	Not listed	Summer	Migration only
Steelhead (*Oncorhynchus mykiss*)	Not listed	Winter	Migration only
White sturgeon (*Acipenser transmontanus*)	Not listed	N/A	Migration only
Western brook lamprey (*Lampetra richardsoni*)	Not listed	N/A	Unknown
Pacific lamprey (*Lampetra tridentate*)	Species of Concern	N/A	Unknown

3.4.2 Rare Species (ORBIC)

A data search from the Oregon Biodiversity Information Center (ORBIC) for the historic presence of rare species within one mile of the PSA resulted in nine species (other than those listed through StreamNet, Table 1 above) listed below in Table 2 (ORBIC 2017).

Table 2. Rare species historically documented within one mile of the PSA (ORBIC 2017).

Scientific Name	Common Name	Federal ESA Status	State ESA Status
Actinemys marmorata	Western pond turtle	Species of Concern	Sensitive critical
Carex retrorsa	Retrorse sedge	N/A	N/A
Chrysemys picta	Painted turtle	N/A	Sensitive critical
Corynorhinus townsendii	Townsend's big-eared bat	Species of Concern	Sensitive critical
Haliaeetus leucocephalus	Bald eagle	N/A	Sensitive vulnerable
Lomatium bradshawii	Bradshaw's lomatium	Endangered	Endangered
Oregonichthys crameri	Oregon chub	N/A	Sensitive critical
Salvelinus confluentus pop. 28	Bull trout (Coastal population)	Threatened	Sensitive critical/vulnerable

Two species presented in Table 2 are listed as threatened or endangered under the federal ESA. Bradshaw's lomatium, a small flowering plant, was recorded in a disturbed/maintained field less than one mile south of the PSA in 2000, and bull trout presence within the Willamette River was derived from Oregon Department of Fish and Wildlife distribution maps from 2001 (ORBIC 2017). Bradshaw's lomatium occurs in wet prairie habitats with poorly drained soils. The majority of populations occur near small rivers, in seasonally flooded prairies with a dense clay soil layer (ODA 2017). Bull trout require colder water than most salmonids to carry out their life histories. Other bull trout habitat requirements include waters that connect to spawning grounds, clean stream

substrates, and complex habitats with side channels, undercut banks, large woody debris, pools, and riffles (U.S. Fish and Wildlife Service [USFWS] 2017). The PSA contains the appropriate aquatic, upland, and riparian habitat to support all nine of the rare species listed above.

A USFWS Information for Planning and Consultation (IPaC) query of potential rare and listed species is included in Appendix C. The list should be used as a reference only as it does not guarantee species presence within the PSA. The list is composed of the known or expected range of each species that have the potential to be affected directly or indirectly by activities within the PSA.

3.4.3 Wildlife Species Observed in PSA

MB&G documented wildlife species in the field via visual observation, audible identification, the presence of distinct tracks, or scat. The results of those observations are listed below in Table 3.

Table 3. Wildlife species documented within the PSA on July 25, 26, 27, 2017.

Common Name	Scientific Name	Type
Common muskrat	*Ondatra zibethicus*	Mammal
Coyote	*Canis latrans*	Mammal
Raccoon	*Procyon lotor*	Mammal
Western gray squirrel	*Sciurus griseus*	Mammal
American crow	*Corvus brachyrhynchos*	Bird
American robin	*Turdus migratorius*	Bird
Barn swallow	*Hirundo Rustica*	Bird
Belted kingfisher	*Ceryle alcyon*	Bird
Black-capped chickadee	*Poecile atrcapilla*	Bird
Bushtit	*Psaltriparus minimus*	Bird
Canada goose	*Branta canadensis*	Bird
Dark-eyed junco	*Junco hyemalis*	Bird
European starling	*Sturnus vulgaris*	Bird
Great blue heron	*Ardea herodias*	Bird
Great egret	*Ardea alba*	Bird
Killdeer	*Charadrius vociferus*	Bird
Mallard	*Anas platyrhynchos*	Bird
Osprey	*Pandion hallaetus*	Bird
Rock dove	*Columba livia*	Bird
Scrub jay	*Aphelocoma californica*	Bird
Song sparrow	*Melospiza melodia*	Bird
Spotted towhee	*Pipilo maculatus*	Bird
Turkey vulture	*Cathartes aura*	Bird
Western hybrid gull	*Larus glaucescens x Larus occidentalis*	Bird
Pacific treefrog	*Hyla regilla*	Amphibian

3.4.4 Plant Species Observed in PSA

MB&G recorded plant species, both native and invasive, within the study area. Plant species were associated with either herbaceous, shrub, or tree strata. The most common species observed in the field are listed below in Table 4. A complete list of plants observed during the July 2017 field effort is included in Appendix C.

Table 4. Most common plant species documented within the PSA on July 25, 26, and 27, 2017.

Common Name	Scientific Name	Strata	Native or Invasive
Bird's foot trefoil	*Lotus corniculatus*	Herbaceous	Invasive
Perennial pea	*Lathyrus latifolius*	Herbaceous	Invasive
Poison hemlock	*Conium maculatum*	Herbaceous	Invasive
Queen Anne's lace	*Daucus carota*	Herbaceous	Invasive
Reed canary grass	*Phalaris arundinacea*	Herbaceous	Invasive
Common snowberry	*Symphoricarpos albus*	Shrub	Native
English hawthorn	*Crataegus monogyna*	Shrub	Invasive
Himalayan blackberry	*Rubus armeniacus*	Shrub	Invasive
Sweetbriar	*Rosa rubiginosa*	Shrub	Invasive
Bigleaf maple	*Acer macrophyllum*	Tree	Native
Black cottonwood	*Populus trichocarpa*	Tree	Native
Oregon ash	*Fraxinus latifolia*	Tree	Native
Red alder	*Alnus rubra*	Tree	Native
Pacific willow	*Salix lasiandra*	Tree	Native

The percentage of invasive plants was also documented at each riparian assessment point. Invasive species coverage greater than 50% was recorded at approximately half of the riparian assessment points. Riparian assessment points with high percentages of invasive plant coverage (i.e., greater than 80%) were located mostly within the Millrace Slough and east of the Frohnmayer Bridge along the Willamette River. There were minor infestations of Japanese knotweed (*Fallopia japonica*) within the southern portion of the PSA as well as scotch broom (*Cytisus scoparius*) along the Willamette River bank.

Areas in the PSA that appear to be farthest from the disturbances discussed in this report had a lower percentage of invasive plant species with better composition of vegetation strata. Areas closer to trails and human disturbance were dominated by well-established patches of Himalayan blackberry, creating degraded habitat with single-layered vegetation structure. In addition, several homeless encampments were located in the blackberry thickets. These encampments were littered with refuse, which may attract invasive wildlife species to the area. These blackberry patches are shown in Figure 2, Appendix A. Percent cover of invasive plant species is shown on Figure 5, Appendix A.

4.0 BASELINE FUNCTIONAL CONDITIONS

Riparian functions contribute to maintaining water temperature and channel stability; providing flood storage and groundwater recharge; removing sediments; promoting nutrient cycling and aquatic food webs; and providing fish and wildlife habitat. The degradation of any of these functions, singularly or cumulatively, can result in diminished riparian function.

The following sections discuss the baseline riparian conditions within the PSA, relative to riparian functions listed in the paragraph above.

4.1 Temperature and Shade

The riparian plant community within the PSA's riparian zone is characterized by both disturbed and relatively undisturbed habitats. Vegetation within the riparian zone of the Willamette River is mostly uniform with a mixed strata of herbaceous, shrub, and tree species. The mixed strata provides coverage for terrestrial and aquatic

species. Trees along the Willamette River are mature and represent a thin, but functioning late-seral riparian tree canopy and provide beneficial shade to aquatic species dependent on cooler water. However, the river is wide and these functions are only effective along the shoreline. Still, the bankline is north facing so shade impacts may be greater here than on the north side of the channel. The Millrace Slough contained little canopy coverage in the southern portion of the PSA. However, several large cottonwoods located towards the confluence with the Willamette appear to provide adequate shade and temperature moderation to the northern portion of the slough.

MB&G collected the percent of tree and shrub cover at riparian assessment points along the OHWM of Millrace Slough and the Willamette River. Three-quarters of these points provided greater than 50% shade coverage to create cool microclimates and aquatic habitat. Riparian assessment points collected along the Millrace Slough showed a high percentage of shade but the extensive English ivy understory could threaten the overstory in the future if left uncontrolled. Riparian assessment points collected along the Willamette River revealed several areas with adequate shade. Conversely, Himalayan blackberry infestations along the parts of the Willamette River streambank resulted in an open canopy with minimal shading capacity. Figure 6 in Appendix A shows the percentage of shade documented in the field along the Willamette River and the Millrace Slough during MB&G field efforts.

4.2 Channel Stability

Channel stability is partially dependent on streambank and riparian dynamics that act as the physical container of a stream and control floodplain connectivity. The majority of the riparian zones within the PSA are vegetated with a riparian forest overstory, an interspersed shrub layer, and a dense layer of herbaceous groundcover. Dense riparian vegetation and natural streambank roughness (e.g., downed wood and large boulders) attenuate streambank erosion and help to promote channel stability.

The streambank of the Willamette River within the PSA has been stabilized in some areas by large concreate blocks and riprap. This riprap and concrete can promote undesirable habitat for aquatic and terrestrial species, and can reduce channel stability via the processes previously discussed in this report. However, natural substrate materials consisting mostly of cobbles, cohesive silt, and clay dominate the streambank areas and appear to promote bank stability and decrease erosion potential.

The presence of erosion was recorded at each riparian data point along the Willamette River and the Millrace Slough. Eroded banks were most commonly noted within the western half of the PSA along the Willamette River and throughout the Millrace Slough. The presence of erosion within the PSA is documented in Figure 7 in Appendix A.

4.3 Flood Storage

Naturally vegetated riparian and floodplain areas serve a number of beneficial functions for flood storage and control. Intact vegetated riparian areas reduce the force and velocity of floodwaters by providing roughness and resistance to flood flows, which in turn, spreads flood flows more evenly over the floodplain. The combined effect of all these functions reduces downstream flooding and peak instream flow volume, leading to effective flood storage.

Naturally vegetated riparian areas are common throughout the PSA along the Willamette River. However, these areas have been historically reduced to narrow strips along the river, reducing flood storage function. The fields within the PSA are flat and can contribute to storing flood flows given their undeveloped nature, lack of excessive amounts of impervious surfaces, and ability to infiltrate flood flows directly on site. However, infiltration rates may vary throughout the upland parts of the PSA due to various levels of soil compaction.

4.4 Groundwater Recharge

Riparian and floodplain areas are important groundwater recharge areas that allow precipitation to infiltrate soil and pass to the water table. Un-compacted soils are porous and absorb moisture. Organic debris, vegetation, and native stream substrates can slow down surface runoff, providing additional time for infiltration of precipitation events and flood flows.

With the PSA, the riparian zone's relatively dense vegetation slows runoff rates and promotes infiltration. The upland areas of the PSA are undeveloped and have compacted soils in some locations due to historic mining, gravel and concrete production, and industrial land uses. These compacted soils can reduce the recharge of groundwater within the PSA. However, the PSA occurs in an urban area with extensive development and associated impervious surfaces. As such, there is a lack of local undeveloped floodplain areas that have the capacity to infiltrate precipitation or flood flows. Therefore, the riparian and floodplain areas in the PSA are critical for supporting infiltration and groundwater recharge in the urban project area.

4.5 Sediment and Contaminant Removal

Sediment loads to streams are often increased by roads and land management practices (e.g., grazing, logging, etc.) that disturb soils and create vectors for overland erosion and sediment transport. Trees, shrubs, and grasses act as a filter by reducing water flow rates and encouraging infiltration allowing sediments, nutrients, pesticides, pathogens, metals, and other pollutants to settle out prior to reaching water bodies. Vegetated riparian areas are common throughout the PSA and contribute to this riparian function. In addition to the well-vegetated riparian zones, there are several small potential wetland depressions and drainages within the PSA that may function to remove sediments from overland flows. Due to their depressional nature, these potential wetlands reduce the velocity of water allowing the sediments to settle in place.

4.6 Fish and Wildlife Habitat

Streamnet (2012) lists the Willamette River as habitat for spring and fall Chinook salmon (rearing and migration; spawning and rearing, respectively) and summer and winter steelhead (migration only) within the PSA. Bradshaw's lomatium has been reported as historically occurring near the PSA and bull trout have been recorded within the PSA (ORBIC 2017). Several other species were documented during the July 2017 field effort. It is expected that other mammals such as deer (*Odocoileus* sp.), coyotes (*Canis latrans*), muskrats (*Ondatra zibethicus*), rabbits (*Sylvilagus bachmani*), and small mammals from the family Sciuridae (such as squirrels and chipmunks) utilize the riparian and floodplain areas. Woody debris, benches, overhanging banks, rocks, and dense, stratified vegetation are present along the Willamette River riparian corridor within the PSA; providing food, water, and shelter to a large diversity of wildlife and serve as migration routes and stopping points between habitats for a variety of wildlife. Based on the riparian habitat functions observed within the PSA, it is expected that the riparian zone provides resting and wintering habitat to Canada goose, northern pintail (*Anas acuta*), mallards, herons (*Ardea* sp.), and other waterfowl; and breeding habitat to songbirds during the spring and summer. The riparian zone also provides potential habitat for reptiles and amphibians, such as gopher snakes (*Pituophis* sp.), garter snakes, and various native frogs (*Rana* sp., *Bufo* sp.), though none were observed during the site visit. Fish and wildlife habitat in the Millrace Slough within the PSA appears to be of lower quality due to the extensive English ivy infestation, degraded flow regime of the slough, and degraded streambank morphology. However, it is expected that some of the specific habitat functions for species listed above are marginally provided along the Millrace Slough part of the PSA.

5.0 SUMMARY

MB&G documented riparian functions at 57 riparian assessment points throughout the PSA. Riparian areas were analyzed as well as the surrounding aquatic and upland habitat, as these habitats contribute greatly to riparian and floodplain functions. The PSA provides many of the necessary functions and values necessary for healthy local aquatic and terrestrial ecosystems. However, these ecosystems are also influenced by other functions that occur outside of the PSA on multiple temporal and spatial scales. The streambank of the Willamette River includes several biologic and morphologic components conducive to supporting native aquatic species. The riparian vegetation along the Willamette River and Millrace Slough streambanks attenuates erosion, promotes groundwater recharge and infiltration, provides shade to moderate stream temperatures, and provides habitat for wildlife species. However, the history of disturbances associated with multiple land uses within the PSA has degraded or removed the historic, native vegetation composition in many locations. In addition, it is expected that areas with compacted soils within the upland portion of the PSA may have reduced the riparian/floodplain functions and values discussed in this report.

There are areas of the PSA that are in need of large scale invasive plant removal. These infestations are common adjacent to the TOHB within the PSA. In addition, restoration actions could be targeted to provide immediate benefit to riparian function, such as the removal of concrete riprap along the shoreline of the Willamette River. Pristine areas along the riparian corridor should be considered for protection and enhancement to maintain the functions and values discussed in this report.

6.0 REFERENCES

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APPENDIX A

Figures

Figure 1.
Project Study Area Map

University of Oregon
North Campus Conditional
Use Permit Project
Lane County, Oregon

Project Study Area
Top of High Bank (TOHB)
Ordinary High Water Mark (OHWM)

MB&G

Source: Aerial imagery from Microsoft Bing, PSA from MB&G. Reproduced for informational purposes and may not be suitable for legal, engineering or surveying purposes. Conclusions drawn from such information are the responsibility of the user.

1 inch = 500 feet

0 125 250 500 Feet

CUP_Figure1, 9/13/2017

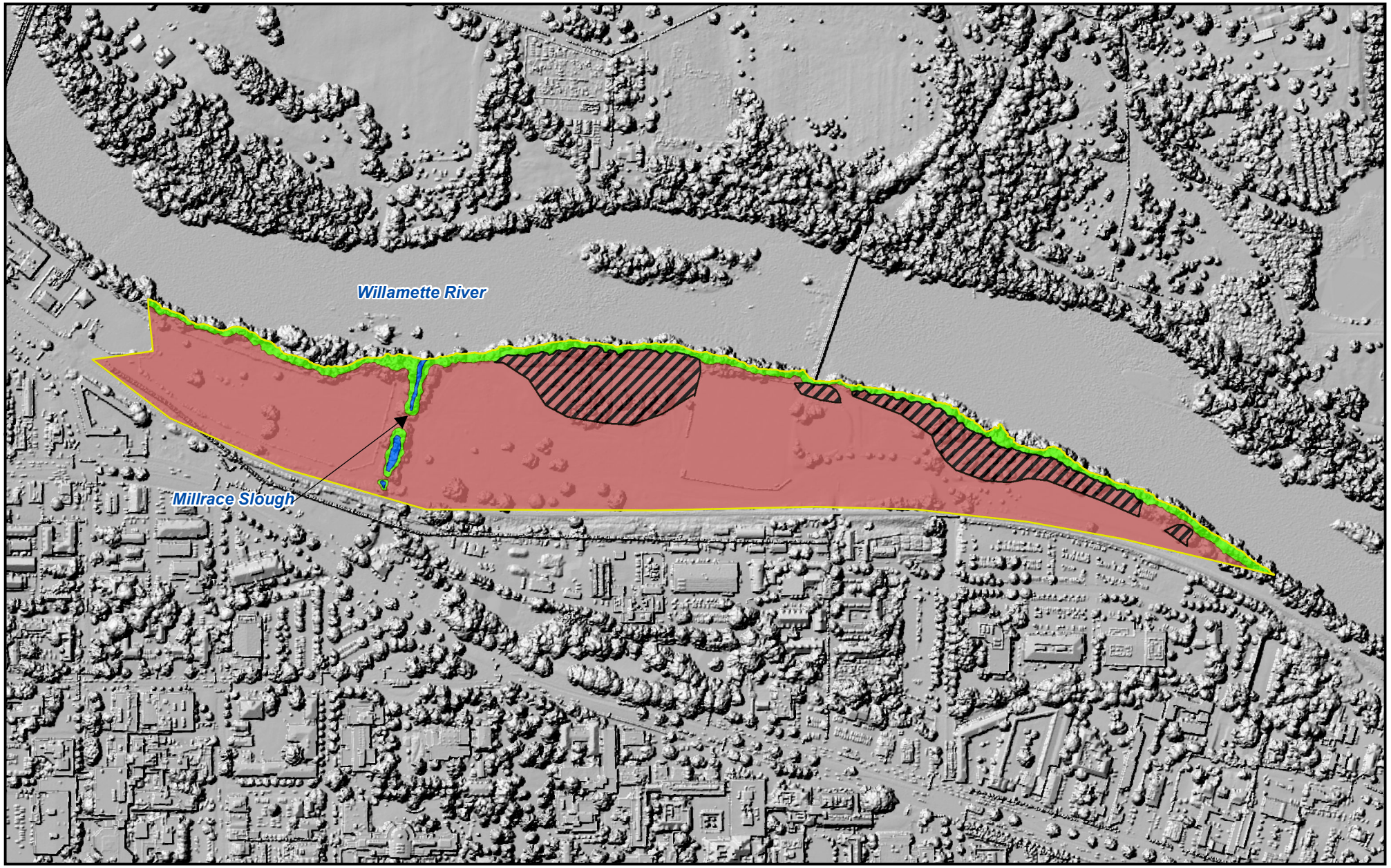


Figure 2.
Habitat Map

University of Oregon
North Campus Conditional
Use Permit Project
Lane County, Oregon

Project Study Area
Himalayan Blackberry Infestation

Habitat Type

Aquatic Habitat
Riparian Habitat
Upland Habitat

MB&G

Source: Highest hit DEM derived from OLC LiDAR. Habitat types from MB&G. Reproduced for informational purposes and may not be suitable for legal, engineering or surveying purposes. Conclusions drawn from such information are the responsibility of the user.

1 inch = 500 feet

0 125 250 500 Feet

CUP_Figure2_habitat, 9/13/2017

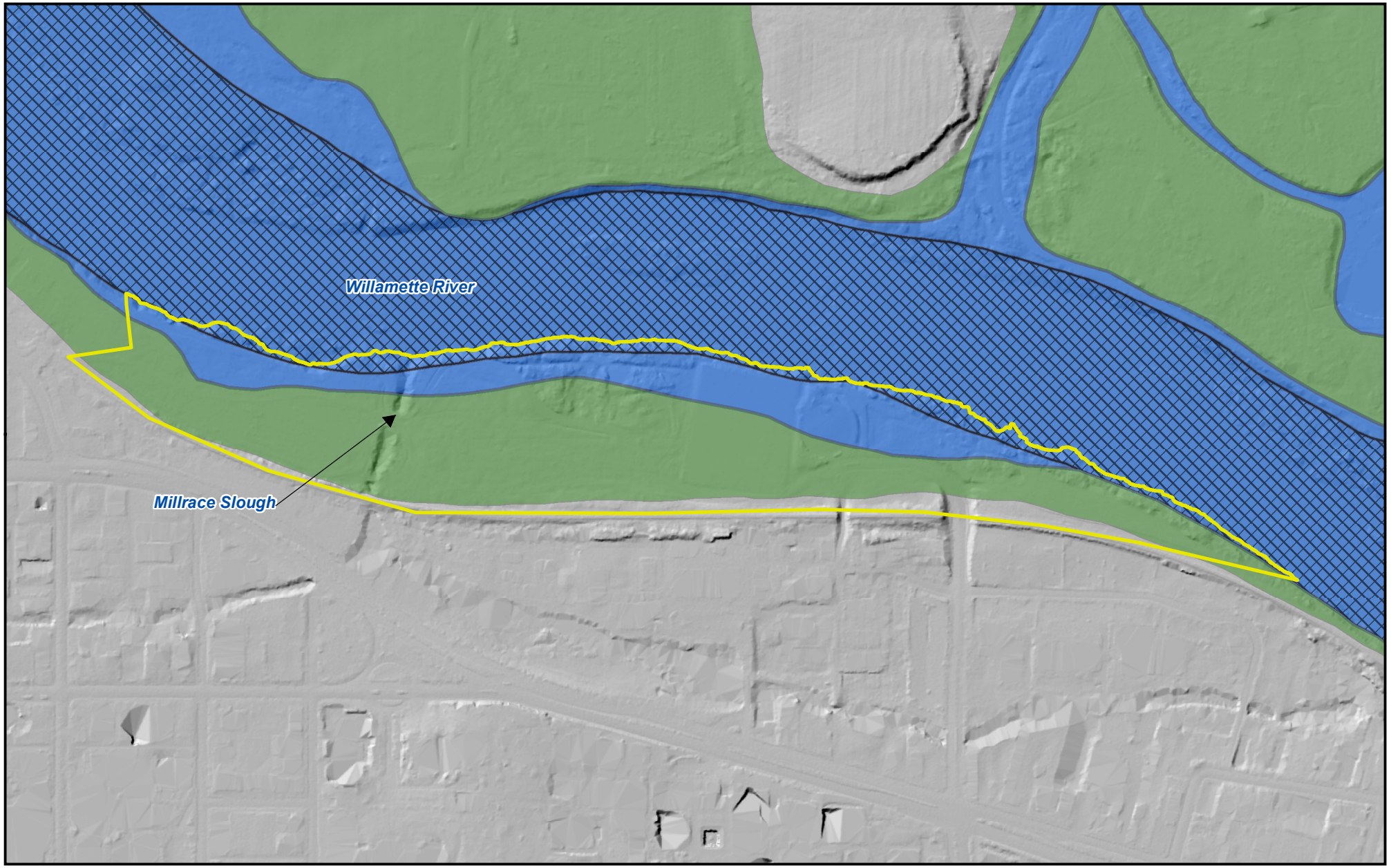


Figure 3.
FEMA Floodplain Map

University of Oregon
North Campus Conditional
Use Permit Project
Lane County, Oregon

Project Study Area
1% Annual Chance Flood Hazard
0.2% Annual Chance Flood Hazard
Floodway

MB&G

Source: Bare Earth DEM derived from OLC LiDAR. Habitat types from MB&G. Reproduced for informational purposes and may not be suitable for legal, engineering or surveying purposes. Conclusions drawn from such information are the responsibility of the user.

1 inch = 481 feet

0 125 250 500 Feet

CUP_Figure3_floodplain, 9/12/2017

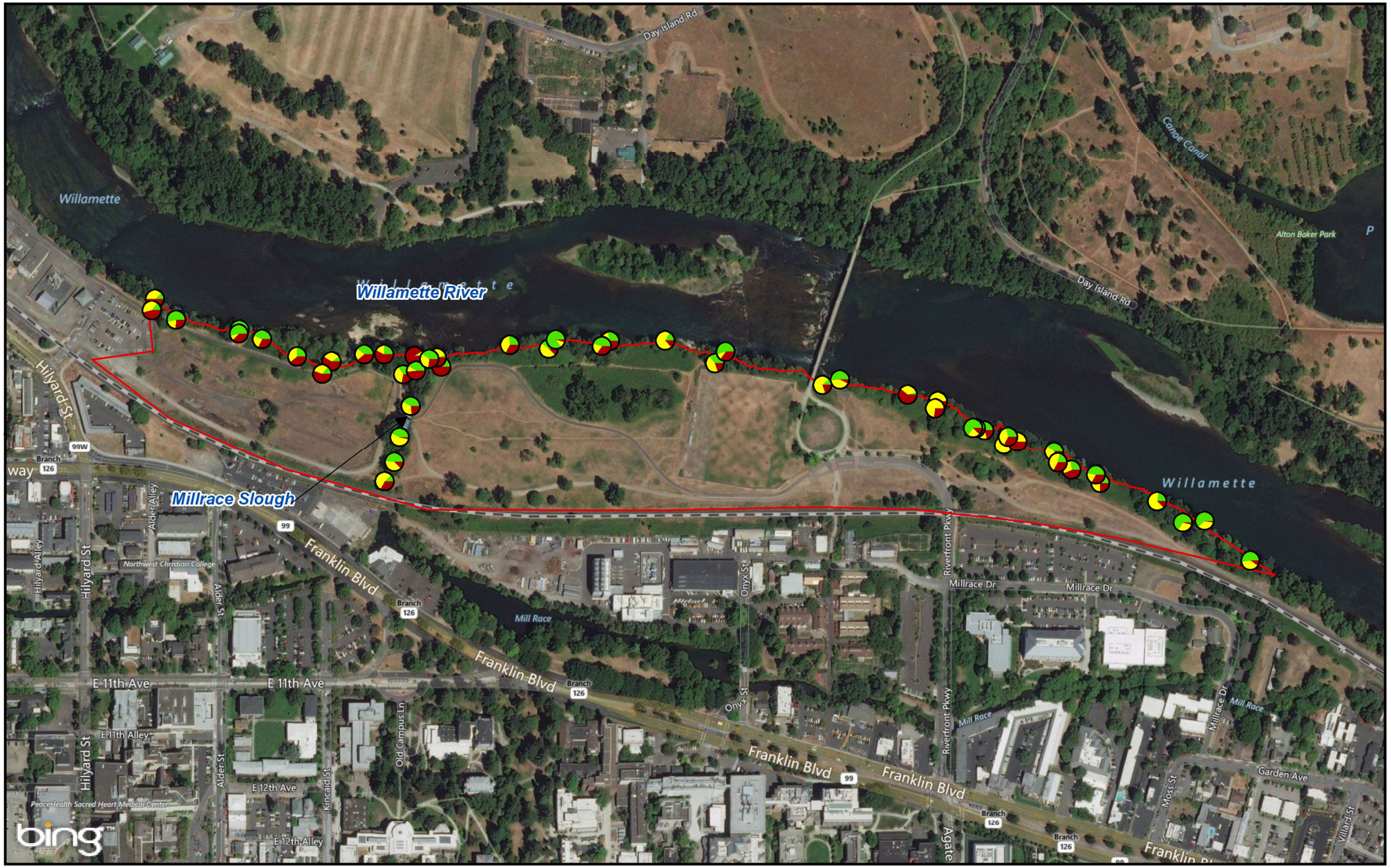


Figure 4.
Vegetation Composition Map

University of Oregon
North Campus Conditional
Use Permit Project
Lane County, Oregon

- Vegetation Composition Pie Chart
- % Tree Cover
- % Shrub Cover
- % Herbaceous Cover
- Project Study Area

MB&G

Source: Aerial imagery from Bing, vegetation composition from MB&G. Reproduced for informational purposes and may not be suitable for legal, engineering or surveying purposes. Conclusions drawn from such information are the responsibility of the user.

1 inch = 500 feet

0 125 250 500 Feet

CUP_Figure4_composition, 9/12/2017

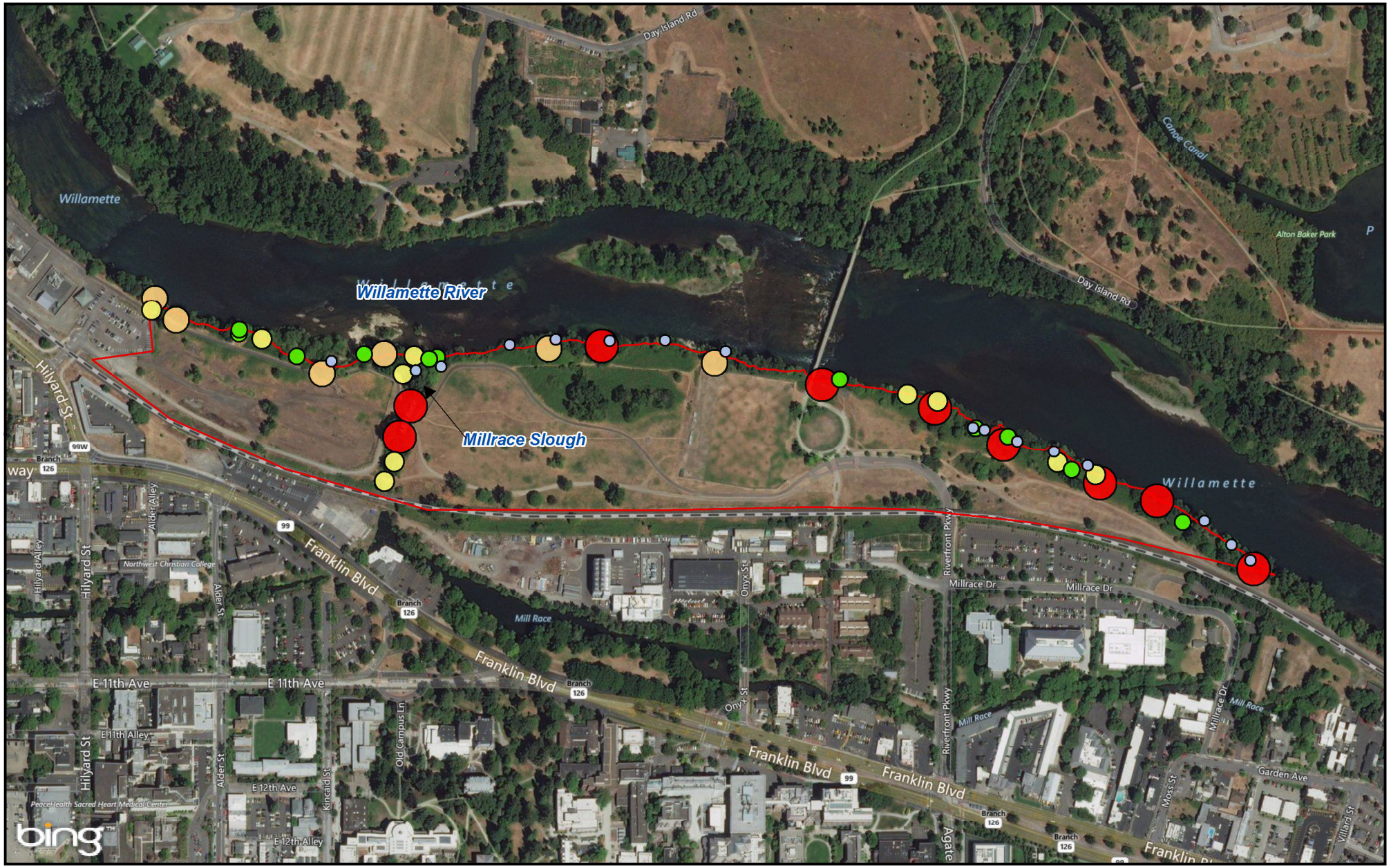


Figure 5.
Percentage of
Invasive Plant Species

University of Oregon North Campus
Conditional Use Permit Project
Lane County, Oregon

- Project Study Area
- <20% Invasive Plants
- 20-40% Invasive Plants
- 40-60% Invasive Plants
- 60-80% Invasive Plants
- 80-100% Invasive Plants

MB&G

Source: Aerial imagery from Bing, percentage of shade from MB&G. Reproduced for informational purposes and may not be suitable for legal, engineering or surveying purposes. Conclusions drawn from such information are the responsibility of the user.

1 inch = 500 feet

0 125 250 500 Feet

CUP_Figure5_invasives, 9/12/2017

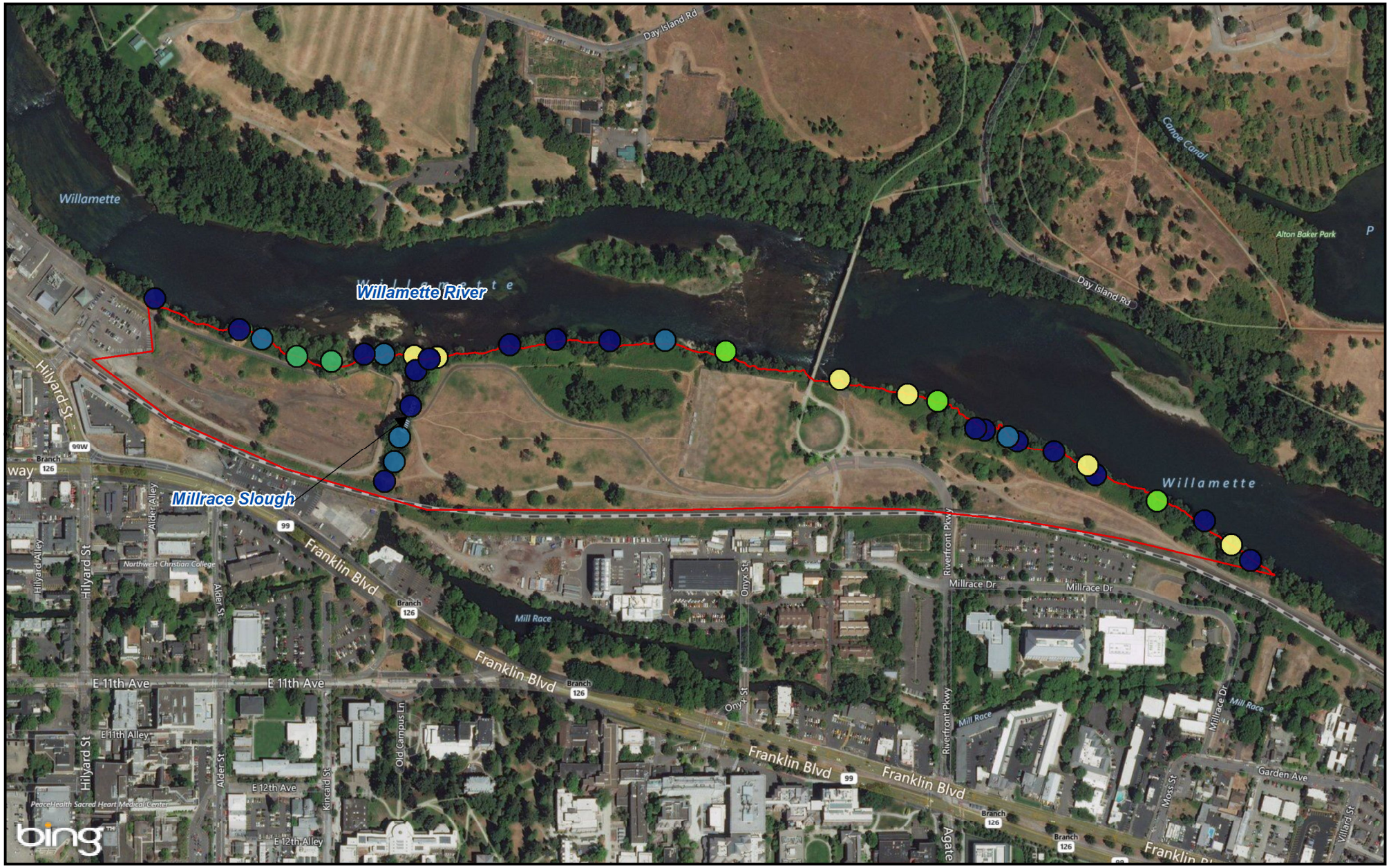


Figure 6.
Percentage of Shade from Shrub and Tree Species

University of Oregon North Campus
Conditional Use Permit Project
Lane County, Oregon

- Project Study Area
- <20% Shade
- 20-40% Shade
- 40-60% Shade
- 60-80% Shade
- 80-100% Shade

MB&G

Source: Aerial imagery from Bing, percentage of shade from MB&G. Reproduced for informational purposes and may not be suitable for legal, engineering or surveying purposes. Conclusions drawn from such information are the responsibility of the user.

1 inch = 500 feet

0 125 250 500 Feet

CUP_Figure6_shade, 9/12/2017

Figure 7.
Presence of Streambank Erosion

University of Oregon
North Campus Conditional
Use Permit Project
Lane County, Oregon

Project Study Area
No Erosion Present
Erosion Present

MB&G

Source: Aerial imagery from Bing, erosion data from MB&G. Reproduced for informational purposes and may not be suitable for legal, engineering or surveying purposes. Conclusions drawn from such information are the responsibility of the user.

1 inch = 500 feet

0 125 250 500 Feet

CUP_Figure7_erosion, 9/12/2017

APPENDIX B

Photographs of the Project Study Area

PHOTO 1
July 25, 2017

Photo looking west of a seasonally-exposed vegetated bench along the Willamette River.

PHOTO 2
July 25, 2017

Mud flat along the Willamette River channel with raccoon and waterfowl tracks.

PHOTO 3
July 25, 2017

Photo looking east along the Willamette River at fringe wetland vegetation.

PHOTO 4
July 25, 2017

Backwater area of the Willamette River during higher flow events.

PHOTO 5
July 25, 2017

Refuse within a blackberry thicket adjacent to the TOHB of the Willamette River.

PHOTO 6
July 26, 2017

Photo looking north of the Willamette River showing a seasonally-exposed bedrock outcropping in the foreground and riffle in the background.

PHOTO 7
July 25, 2017

Photo looking north at the Willamette River at the head of a backwater channel (in the foreground). Note the vegetated cobble island, large wood debris, and riffles.

PHOTO 8
July 25, 2017

Apparent OHWM line across tree trunk with exposed root system at the Willamette River.

PHOTO 9
July 25, 2017

Photo taken from TOHB looking north at the Willamette River. Note the well-stratified riparian vegetation.

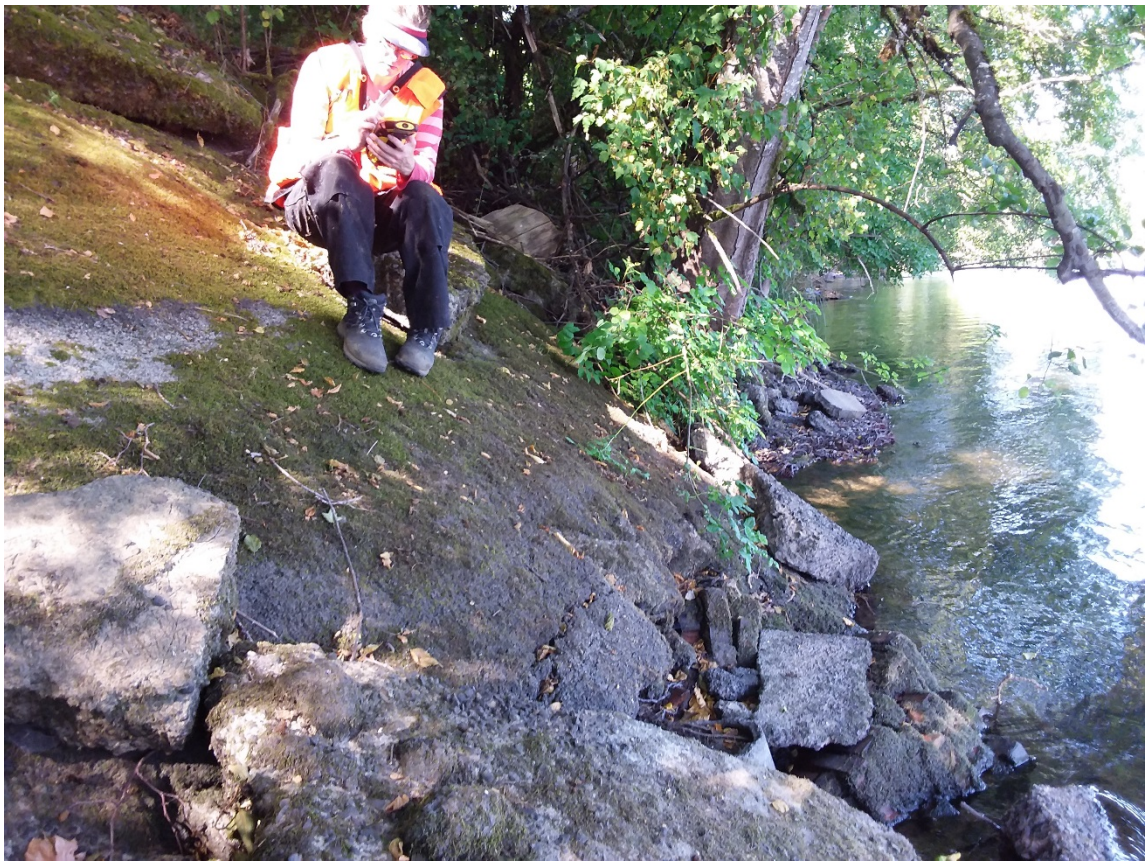


PHOTO 10
July 26, 2017

Photo looking west along the Willamette River of concrete bank stabilization measures.

PHOTO 11
July 25, 2017

View to the south of the Millrace Slough with stagnant, turbid water dominated by English ivy ground cover.

PHOTO 12
July 26, 2017

(Left) Photo looking to the south within the Millrace Slough of the 3-foot diameter culvert under the bike and pedestrian path. (Right) Photo taken looking north at the same culvert obstructed by debris (constricted to a 6-inch diameter opening, red arrow).

PHOTO 13
July 27, 2017

Photo to the north of a potential wetland created by compacted soil and precipitation on the western side of the PSA.

PHOTO 14
July 27, 2017

Photo looking northwest of a potential depressional wetland within a large blackberry thicket adjacent to TOHB of the Willamette River within the 100-year floodplain.

PHOTO 15
July 27, 2017

Photo to the southeast of a maintained grass field with a potential wetland drainage adjacent to the bike path.

APPENDIX C

Additional Tables and Information

Plants Observed During the July 2017 Field Effort

Habitat	Genus	Species	Common Name	Native or Introduced
Herbaceous	*Agrostis*	*exerata*	spike bentgrass	N
Herbaceous	*Aira*	*caryophyllea*	hairgrass	I
Herbaceous	*Alopecurus*	*pratensis*	meadow foxtail	I
Herbaceous	*Arrhenatherum*	*elatius*	tall oatgrass	I
Herbaceous	*Avena*	*barbata*	slim oat	I
Herbaceous	*Avena*	*fatua*	wild oat	I
Herbaceous	*Avena*	*sativa*	common oat	I
Herbaceous	*Bellis*	*perennis*	English lawn daisy	I
Herbaceous	*Brassica*	*sp.*	mustard species	I
Herbaceous	*Briza*	*minor*	little quaking grass	I
Herbaceous	*Bromus*	*sp*	brome	n/a
Herbaceous	*Carex*	*obnupta*	slough sedge	N
Herbaceous	*Cichorium*	*intybus*	chicory	I
Herbaceous	*Circium*	*vulgare*	bull thistle	I
Herbaceous	*Cirsium*	*arvense*	Canada thistle	I
Herbaceous	*Conium*	*maculatum*	Poison hemlock	I
Herbaceous	*Convolvulus*	*arvensis*	field bindweed	I
Herbaceous	*Dactylis*	*glomerata*	orchard grass	I
Herbaceous	*Daucus*	*carota*	Queen Anne's lace	I
Herbaceous	*Dipsacus*	*fullonum (old=sylvestris)*	teasel	I
Herbaceous	*Epilobium*	*sp.*	fireweed	N
Herbaceous	*Epilobium*	*ciliatum*	fringed willow herb	N
Herbaceous	*Equisetum*	*arvense*	field horsetail	N
Herbaceous	*Eschscholzia*	*california*	California poppy	N
Herbaceous	*Festuca*	*rubra*	red fescue	I
Herbaceous	*Festuca*	*sp.*	fescue	n/a
Herbaceous	*Foeniculum*	*vulgare*	sweet fennel	N
Herbaceous	*Geranium*	*robertianum*	stinky bob	I
Herbaceous	*Gnaphalium*	*palustre*	lowland cudweed	N
Herbaceous	*Hedera*	*helix*	English ivy	I
Herbaceous	*Heracleum*	*lanatum*	cow parsnip	N
Herbaceous	*Holcus*	*lanatus*	velvet grass	I
Herbaceous	*Hordeum*	*murinum ssp. leporinum*	mouse barley	I
Herbaceous	*Hypericum*	*perforatum*	Klamathweed	I
Herbaceous	*Hypochaeris*	*radicata*	false dandelion	I
Herbaceous	*Ilex*	*aquifolium*	English holly	I
Herbaceous	*Iris*	*pseudacorus*	yellow flag	I
Herbaceous	*Lapsana*	*communis*	nipplewort	I
Herbaceous	*Lathyrus*	*latifolius*	perennial pea	I
Herbaceous	*Linum*	*bienne (old=augustifoliium)*	pale flax	I
Herbaceous	*Lotus*	*corniculatus*	bird's foot trefoil	I
Herbaceous	*Marah*	*oregana*	man-root	N
Herbaceous	*Melica*	*sp.*	melicgrass	N
Herbaceous	*Mentha*	*pulegium*	pennyroyal	I
Herbaceous	*Myosotis*	*sp.*	field forget-me-not	I
Herbaceous	*Phalaris*	*arundinacea*	reed canary grass	I
Herbaceous	*Plagiobothrys*	*scouleri*	meadow popcorn-flower	N

Habitat	Genus	Species	Common Name	Native or Introduced
Herbaceous	*Plantago*	*lanceolata*	English plantain	I
Herbaceous	*Poa*	*annua*	annual bluegrass	I
Herbaceous	*Poa*	*pratensis*	Kentucky bluegrass	I
Herbaceous	*Polygonum*	*cuspidatum*	Japonese knot-weed	I
Herbaceous	*Pteridium*	*aquilinum*	sword fern	N
Herbaceous	*Rumex*	*crispus*	curly dock	I
Herbaceous	*Schedonorus*	*arundinaceas (old=Festuca)*	tall fescue	I
Herbaceous	*Senecio*	*jacobaea*	tansy ragwort	I
Herbaceous	*Sisymbrium*	*officinale*	hedge mustart	I
Herbaceous	*Solanum*	*dulcamara*	climbing nightshade	I
Herbaceous	*Sonchus*	*asper*	prickly sow-thistle	I
Herbaceous	*Stachys*	*cooleyae*	coastal hedgenettle	N
Herbaceous	*Taraxacum*	*officianale*	common dandelion	I
Herbaceous	*Tragopogon*	*dubius*	yellow salsify	I
Herbaceous	*Trifolium*	*arvense*	rabittfoot clover	I
Herbaceous	*Trifolium*	*dubium*	least hop clover	I
Herbaceous	*Trifolium*	*pratense*	red clover	I
Herbaceous	*Trifolium*	*repens*	white clover	I
Herbaceous	*Urtica*	*dioica ssp. gracilis*	stinging nettle	N
Herbaceous	*Verbascum*	*thapsus*	common mullein	I
Shrub	*Berberis*	*aquifolium*	tall Oregon grape	N
Shrub	*Cornus*	*sericea (old=stolonifera)*	red-osier dogwood	N
Shrub	*Corylus*	*cornuta*	wild hazelnut	N
Shrub	*Crataegus*	*monogyna*	English hawthorn	I
Shrub	*Cytisus*	*scoparius*	Scot's broom	I
Shrub	*Physocarpus*	*capitatus*	Pacific ninebark	N
Shrub	*Rosa*	*eglantera*	sweetbriar rose	I
Shrub	*Rosa*	*sp.*	rose	n/a
Shrub	*Rubus*	*armenicaus*	Himalayan blackberry	I
Shrub	*Rubus*	*laciniatus*	cut-leaf blackberry	I
Shrub	*Salix*	*sp.*	willow	N
Shrub	*Salix*	*hookeriana*	dune willow	N
Shrub	*Symphoricarpos*	*albus*	common snowberry	N
Shrub	*Toxicodendron*	*diversilobum*	poison oak	N
Tree	*Acer*	*macrophyllum*	bigleaf maple	N
Tree	*Alnus*	*rhombifolia*	white alder	N
Tree	*Alnus*	*rubra*	red alder	N
Tree	*Calocedrus*	*decurrens*	incense cedar	N
Tree	*Fraxinus*	*latifolia*	oregon ash	N
Tree	*Juglans*	*nigra*	black walnut	I
Tree	*Oemleria*	*cerasiformis*	osoberry	N
Tree	*Populus*	*trichocarpa*	black cottonwood	N
Tree	*Prunella*	*vulgaris*	self-heal	N
Tree	*Prunus*	*sp.*	plum	n/a
Tree	*Pseudotsuga*	*menziesii*	Douglas fir	N
Tree	*Quercus*	*garryana*	Oregon white oak	N
Tree	*Quercus*	*sp.*	oak	n/a
Tree	*Robinia*	*pseudoacacia*	black locust	I
Tree	*Salix*	*lasiandra*	red willow	N

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

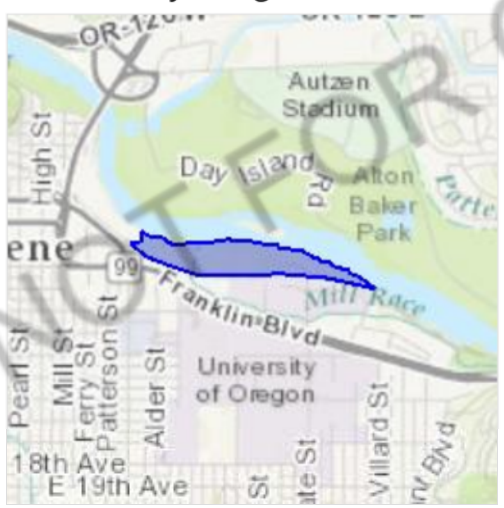
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as trust resources) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Lane County, Oregon



Local office

Oregon Fish And Wildlife Office

(503) 231-6179
(503) 231-6195

2600 Southeast 98th Avenue, Suite 100
Portland, OR 97266-1398

https://www.fws.gov/oregonfwo/articles.cfm?id=149489416

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS

Marbled Murrelet Brachyramphus marmoratus — Threatened
There is **final designated** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/4467

Northern Spotted Owl Strix occidentalis caurina — Threatened
There is **final designated** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1123

Streaked Horned Lark Eremophila alpestris strigata — Threatened
There is **final designated** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/7268

Yellow-billed Cuckoo Coccyzus americanus — Threatened
There is **proposed** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/3911

Fishes

NAME	STATUS
Bull Trout Salvelinus confluentus There is **final designated** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8212	Threatened

Insects

NAME	STATUS
Fender's Blue Butterfly Icaricia icarioides fenderi There is **final designated** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6659	Endangered

Flowering Plants

NAME	STATUS

Bradshaw's Desert-parsley Lomatium bradshawii — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/5743

Kincaid's Lupine Lupinus sulphureus ssp. kincaidii — Threatened
There is **final designated** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/3747

Nelson's Checker-mallow Sidalcea nelsoniana — Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/7340

Water Howellia Howellia aquatilis — Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/7090

Willamette Daisy Erigeron decumbens — Endangered
There is **final designated** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/6270

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any activity that results in the take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service[3]. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured. Any person or organization who plans or conducts activities that may result in the take of migratory birds is

responsible for complying with the appropriate regulations and implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are USFWS Birds of Conservation Concern that might be affected by activities in this location. The list does not contain every bird you may find in this location, nor is it guaranteed that all of the birds on the list will be found on or near this location. To get a better idea of the specific locations where certain species have been reported and their level of occurrence, please refer to resources such as the E-bird data mapping tool (year-round bird sightings by birders and the general public) and Breeding Bird Survey (relative abundance maps for breeding birds). Although it is important to try to avoid and minimize impacts to all birds, special attention should be given to the birds on the list below. To get a list of all birds potentially present in your project area, visit the E-bird Explore Data Tool.

NAME	BREEDING SEASON
Black Oystercatcher Haematopus bachmani https://ecos.fws.gov/ecp/species/9591	Breeds Apr 15 to Oct 31
Black Turnstone Arenaria melanocephala	Breeds elsewhere
Great Blue Heron Ardea herodias https://ecos.fws.gov/ecp/species/2170	Breeds Mar 15 to Aug 15
Lesser Yellowlegs Tringa flavipes https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-billed Curlew Numenius americanus https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere

Marbled Godwit Limosa fedoa https://ecos.fws.gov/ecp/species/9481	Breeds elsewhere
Olive-sided Flycatcher Contopus cooperi https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Red Knot Calidris canutus ssp. roselaari https://ecos.fws.gov/ecp/species/8880	Breeds elsewhere
Red-throated Loon Gavia stellata	Breeds elsewhere
Rock Sandpiper Calidris ptilocnemis ptilocnemis	Breeds elsewhere
Rufous Hummingbird selasphorus rufus https://ecos.fws.gov/ecp/species/8002	Breeds Apr 15 to Jul 15
Semipalmated Sandpiper Calidris pusilla	Breeds elsewhere
Short-billed Dowitcher Limnodromus griseus https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Whimbrel Numenius phaeopus https://ecos.fws.gov/ecp/species/9483	Breeds elsewhere

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in your project's counties during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee

was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

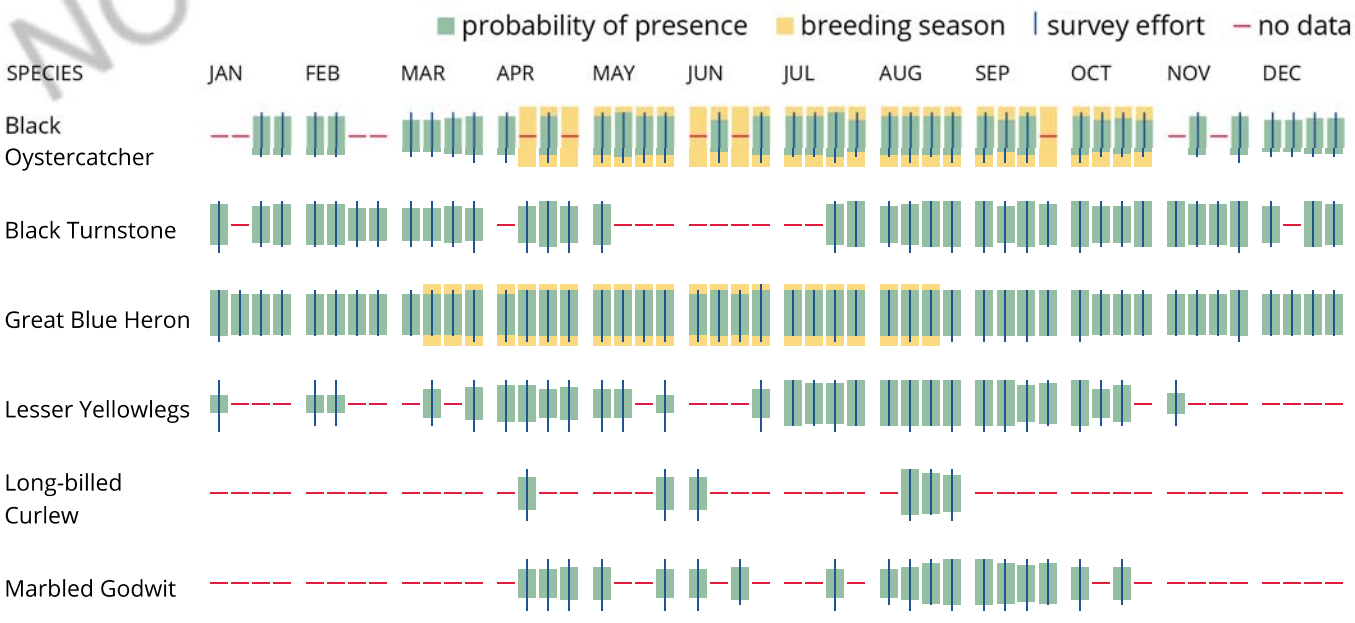
Breeding Season (▪)
Yellow bars denote when the bird breeds in the Bird Conservation Region(s) in which your project lies. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the counties of your project area. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Such measures are particularly important when birds are most likely to occur in the project area. To see when birds are most likely to occur in your project area, view the Probability of Presence Summary. Special attention should be made to look for nests and avoid nest destruction during the breeding season. The best information about when birds are breeding can be found in Birds of North America (BNA) Online under the "Breeding Phenology" section of each species profile. Note that accessing this information may require a subscription. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) that might be affected by activities in your project location. These birds are of priority concern because it has been determined that without additional conservation actions, they are likely to become candidates for listing under the Endangered Species Act (ESA).

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets. The AKN list represents all birds reported to be occurring at some level throughout the year in the counties in which your project lies. That list is then narrowed to only the Birds of Conservation Concern for your project area.

Again, the Migratory Bird Resource list only includes species of particular priority concern, and is not representative of all birds that may occur in your project area. Although it is important to try to avoid and minimize impacts to all birds, special attention should be made to avoid and minimize impacts to birds of priority concern. To get a list of all birds potentially present in your project area, please visit the E-bird

Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird entry on your migratory bird species list indicates a breeding season, it is probable the bird breeds in your project's counties at some point within the time-frame specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

Facilities

Wildlife refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGES AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

PSSC

RIVERINE

R2UBH

A full description for each wetland code can be found at the National Wetlands Inventory website: https://ecos.fws.gov/ipac/wetlands/decoder

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.