Multnomah Channel Marsh

Approvals for Site Conservation Plan

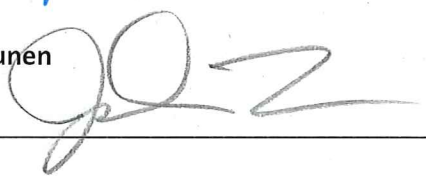
Date routed for final signatures: 12/19/18

Please return to Lori Hennings (Primary author: Curt Zonick)

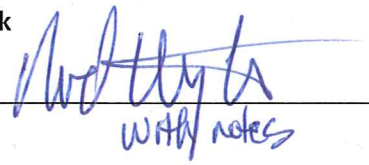
Jonathan Soll

Signature  Date 1/7/2019

Justin Takkunen

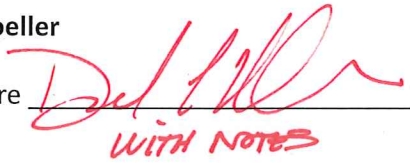
Signature  Date 1/24/19

Rod Wojtanik

Signature 
WITH NOTES

Date 1.17.19

Dan Moeller

Signature 
WITH NOTES

Date 2/19/19

SITE CONSERVATION PLAN

Multnomah Channel Marsh



North Multnomah Channel Marsh | Aug. 2018

South Multnomah Channel Marsh | TBD

August 2018

Metro

Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy, and sustainable transportation and living choices for people and businesses in the region. Voters have asked Metro to help with the challenges and opportunities that affect the 25 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to providing services, operating venues and making decisions about how the region grows. Metro works with communities to support a resilient economy, keep nature close by and respond to a changing climate. Together, we're making a great place, now and for generations to come.

Stay in touch with news, stories and things to do.

www.oregonmetro.gov/connect

TABLE OF CONTENTS

Chapter 1 | North Multnomah Channel Marsh

Maps

Chapter 2 | South Multnomah Channel Marsh

CHAPTER 1 | NORTH MULTNOMAH CHANNEL MARSH

INTRODUCTION

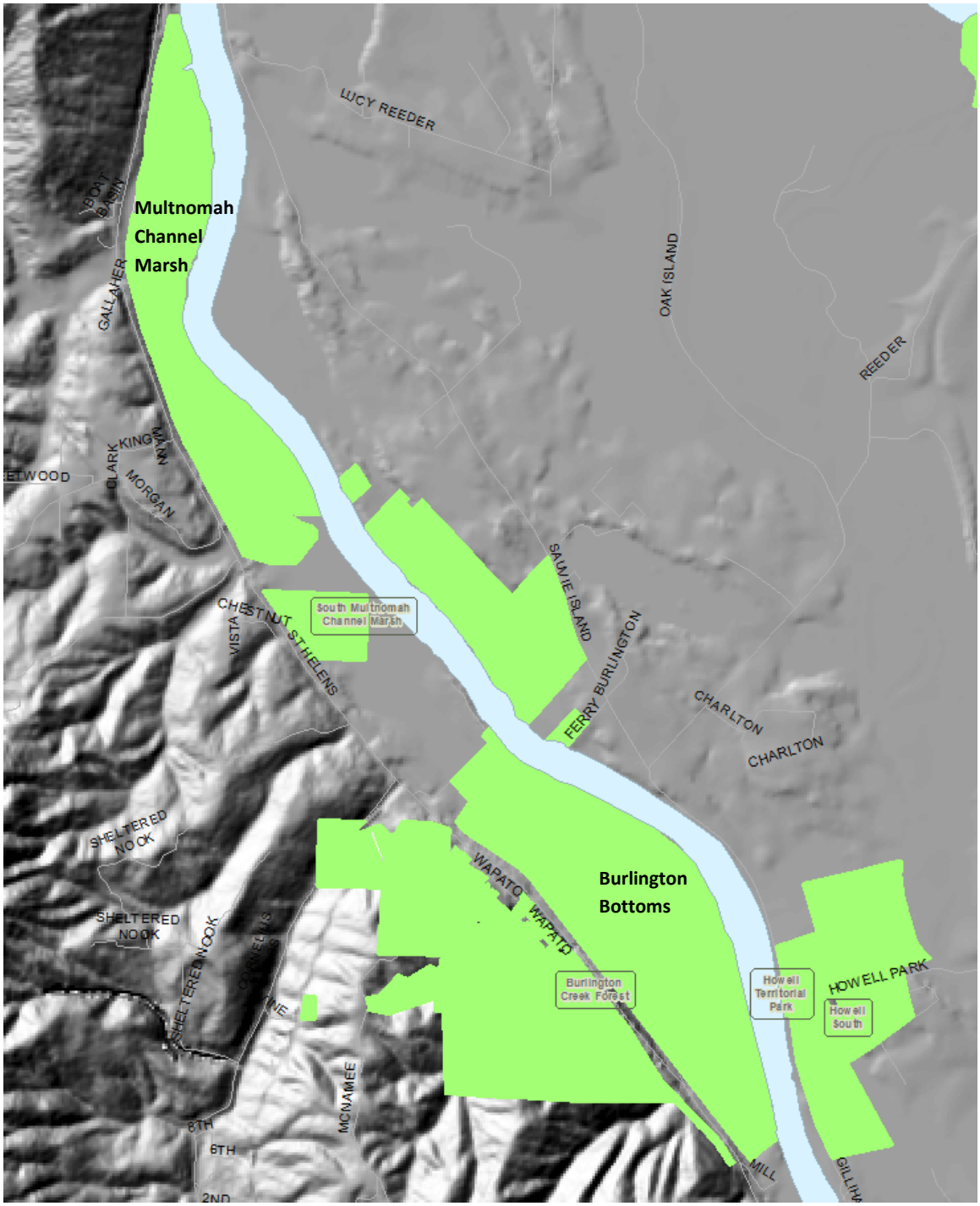
CONTEXT

The North Multnomah Channel Marsh Natural Area lies between Highway 30 and the Multnomah Channel of the Willamette River in Multnomah County, just across from Sauvie Island. The natural area's northern unit consists of 278 acres, with another 45 acres in the southern unit, for a total of 323 acres. There is also a 31-acre flood easement on property immediately south of the north unit.

The site is part of the 1995 Willamette River Greenway Target Area and is situated near other large publically owned lands including Metro's Burlington Creek Forest Natural Area, and the Bonneville Power Administration's Burlington Bottoms Wetlands, managed by the Oregon Department of Fish and Wildlife (Map 1). The North Multnomah Channel Marsh is part of an area identified in the Oregon Conservation Strategy as a Conservation Opportunity Area, and comprises significant acreage of aquatic habitats recognized as a Key Limiting Factor in the Lower Columbia Recovery Plan for ESA Salmonids.

Together with the South Multnomah Channel Marsh tract, the North Multnomah Channel Marsh protects around 300 acres of freshwater tidal wetlands along the Multnomah Channel, providing diverse wildlife habitat to the lower Columbia Region. The North Multnomah Channel Marsh contains two wetland basins that drain to the east into the Multnomah Channel through two tidal creeks. The Multnomah Channel creates the western boundary of Sauvie Island, branching off of the Willamette River and draining into the Columbia River. The site is close enough to the Pacific Ocean to exhibit a bimodal daily tidal cycle. Further hydrologic influence at the site comes from the freshwater inflows from Crabapple Creek and its tributaries (Patterson and Morgan Creeks) that drain the Tualatin Mountains to the west.

Two water control structures installed by Metro in 2001 allow hydrologic manipulation. Typically, these structures are operated between January and July to hold seasonal flooding at the site to mimic the historic flooding that occurred prior to dam construction and subsequent modifications of the Columbia and Willamette River systems. Taken together, these features contribute to a diverse hydrological gradient throughout the site that support a broad range of native wetland plant associations ranging from tidally-influenced aquatic wetlands to emergent wetlands and from shrub-scrub wetlands to bottomland hardwood forests. The property contains nearly two miles of river frontage along the Multnomah Channel and approximately 3,000 feet of stream frontage along Crabapple Creek as it flows through the site to join with the wetlands and sloughs, which are in turn drained by the two large tidal creeks. To the south, the site is separated by two private and one Metro-owned parcel from the 400-acre Burlington Bottoms wetlands.



Relief map of the Multnomah Channel Floodplain showing protected parks and natural areas, including the ~400-acre Burlington Bottoms (John R. Palensky Wildlife Area) wetland managed by ODFW.

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

KEY METRO STAFF AND PARTNERS

Staff

Curt Zonick, Natural Resources Scientist
Adam Stellmacher, Lead Natural Resources Specialist
Nathaniel Marquiss, Natural Resource Technician
Julie Jacks, Park Ranger
Marsha Holt Kingsley, Native Plant Materials Scientist
Katy Weil, Wildlife Monitoring Coordinator
Tannen Printz, Regional Park Planner
Ryan Ruggiero, Real Estate Negotiator

Private landowners and partners

National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NOAA)
Oregon Department of Fish and Wildlife - Corvallis Fisheries Lab (ODFW)
West Multnomah Soil and Water Conservation District (WMSWCD)
Bonneville Power Administration (BPA)
Ducks Unlimited (DU)
Lower Columbia River Estuary Partnership (LCEP)
Oregon Watershed Enhancement Board (OWEB)

EXISTING PLANNING/HISTORICALLY-RELEVANT DOCUMENTS

- Adolfson and Associates. 2000. Multnomah Channel Plant and Wildlife Inventories. Portland, OR. Content includes ecological inventory, plant association mapping, wildlife species list, plant list, weed list and maps.
- National Oceanic and Atmospheric Administration, Oregon Department of Fish and Wildlife, and Oregon State University (numerous authors, Regan A. McNatt lead author), Multnomah Channel Marsh Restoration Monitoring Project – Final Report, 2017. Summary of post-project fish monitoring focusing on juvenile salmonid use of the wetlands and connected system.

EXISITING CONDITIONS

SITE DESCRIPTION

North Multnomah Channel Marsh is located at T2N R2W, Sections 1, 12, and 41, and T2N, R1W, Sections 57 and 58 (Centerpoint Lat/Long: 45°40'45.73" N, 122°52'16.47" W).

Easements at the site include the PGE utility easement running along the eastern edge of the site parallel to the Multnomah Channel. This easement limits vegetation to low shrub cover, such as snowberry (*Symphoricarpos albus*) and spirea (*Spiraea douglasii*), within a 50-ft band under the power lines. Vegetation cover 50-100 feet away from the centerline of the power line corridor is limited to medium height shrubs such as willow (*Salix* spp) and Pacific dogwood (*Cornus nuttalii*).

Metro owns a 31-acre flood easement on the Holmes parcel directly adjacent and south of the North Multnomah Channel Marsh. This easement allows Metro to seasonally flood the Holmes parcel to the 12’ above mean sea level elevation.

The site consists of two wetland basins that were artificially isolated and drained by previous land uses. The wetlands have been largely restored to native emergent wetland, shrubland and riparian forest by Metro and its partners during the last decade. Table 1 provides an overview of the North Multnomah Channel Marsh's riparian habitats.

Table 1: **Soils present at the North Multnomah Channel Marsh**

MAP SOIL SYMBOL	MAP UNIT NAME	DESCRIPTION
39	Rafton silt loam	This very poorly drained soil is on broad floodplains of the Columbia River. This soil is formed in recent alluvium with some mixing of volcanic ash. Elevation is 10-20 feet. Slopes are 0-2 percent. The native vegetation is black cottonwood, willow, roses, common snowberry, sedges, cattails and grasses.
44	Sauvie Island silt loam	This poorly drained soil is on broad floodplains of the Columba River. This soil is formed in recent alluvium with some mixing of volcanic ash. Elevation is 10-20 feet. Slopes are 0-2 percent. The native vegetation is Oregon white oak, Oregon ash, black cottonwood, willow, roses, common snowberry, trailing blackberry, forbs and grasses.

VEGETATION AND WILDLIFE

HISTORIC VEGETATION

The 1851 General Land Office surveys described the marsh to have been primarily composed of closed riparian and wetland forest (analogous to Metro's bottomland forest), wet prairie (likely resembling Metro's emergent wetland) and shrubland. Map 3.

Historic maps demonstrate that Crabapple Creek and other headwater streams once flowed in a northeasterly direction through the north and south wetland basins before joining the Multnomah Channel. Subsequent alterations to the site by private landowners between 1860 and 1996 redirected the flow of these creeks through the south basin, substantially altering the site's hydrology.

Table 2: **Historic habitats at the North Multnomah Channel Marsh**

% COVER	HABITAT TYPE	HISTORIC HABITAT DESCRIPTION BY GLO SURVEYOR NOTES
5%	Shrub wetland	Willow swamp, sometimes with ninebark, including riparian stands on gravel or sand bars. May contain small amounts of ash.
15%	Prairie (emergent wetland)	Seasonally wet prairie. May have scattering trees, most with distances > 100 links.
80%	Closed riparian and wetland forest (bottomland hardwood forest)	Ash-mixed deciduous riparian forest with combinations of red alder, bigleaf maple, black cottonwood, white oak, dogwood, Conifers may be present in small quantities.

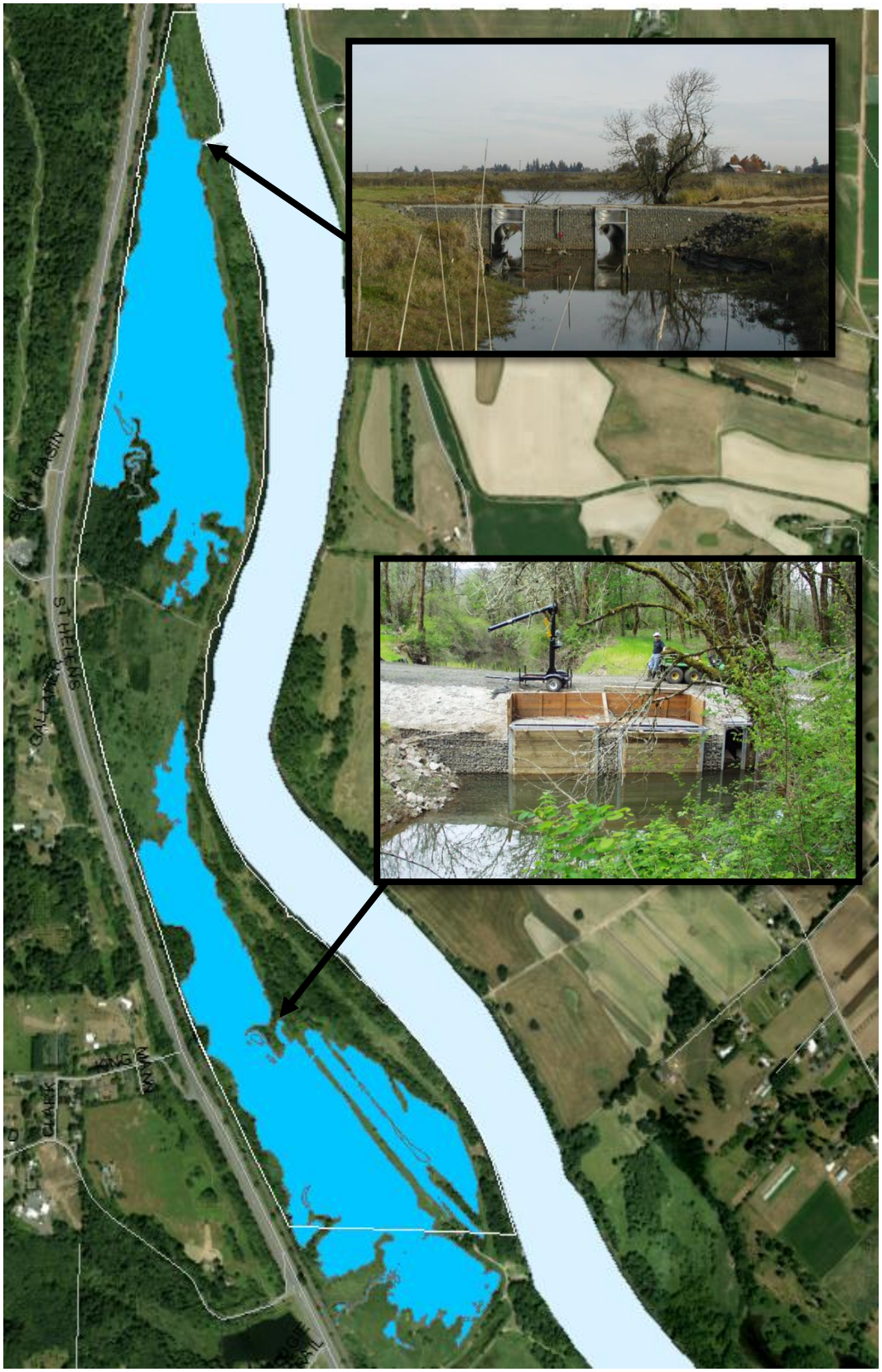
1852 GLO Survey Map of the North Multnomah Channel Marsh area. The marsh's boundaries are shown by a green polygon.

KEY RESTORATION AND CURRENT FISH AND WILDLIFE USE AT THE MARSH

The marsh has been significantly enhanced over the past 17 years. When acquired in the late 1990s, the site was a sporadically-flooded pasture recently released from grazing (dairy cattle). Most of the un-forested land was dominated by reed canarygrass, thistles and other associated pasture weeds. Modest tracts of Oregon ash and cottonwood forest remained, mostly on the site's edges.

Since the late 1990s, Metro and its partners have planted hundreds of thousands of native trees and shrubs to expand bottomland forest and shrub habitat at the Marsh. The largest enhancements at the site, though, have been realized in the lower portions of the floodplains.

In 2001, the first large phase of hydrologic enhancement was implemented. Two water control structures were installed to restore a seasonal flood regime to nearly 150 acres. These acres had previously been isolated from prolonged flooding by on site hydrologic alterations and regional water manipulations. The new seasonal flood regime helped convert extensive fields of reed canarygrass back to native emergent wetlands supporting spikerushes, sedges and other native herbs.



Aerial map showing the locations of the two water control structures installed in 2001.

In 2008, Phase II restoration directed the realignment of Crabapple Creek, the Marsh's primary stream, restoring it to its historic, pre-settlement alignment. This project expanded flow to the north wetland basin, supported re-vegetation and other wetland improvements, and enhanced ecological permeability for fish within the site the Multnomah Channel.

Figure showing the location of the realigned segment of Crabapple Creek as it was restored through the Marsh's floodplain in 2008.

In 2014, Phase III restoration was implemented, including the removal of three culverts within Crabapple Creek, and the construction of two 100' long high water spillways in strategic locations of the riparian berm bordering the Multnomah Channel. These projects were designed to enhance connectivity between the site's two wetland basins and create new periodic connection between the marsh and the Multnomah Channel.

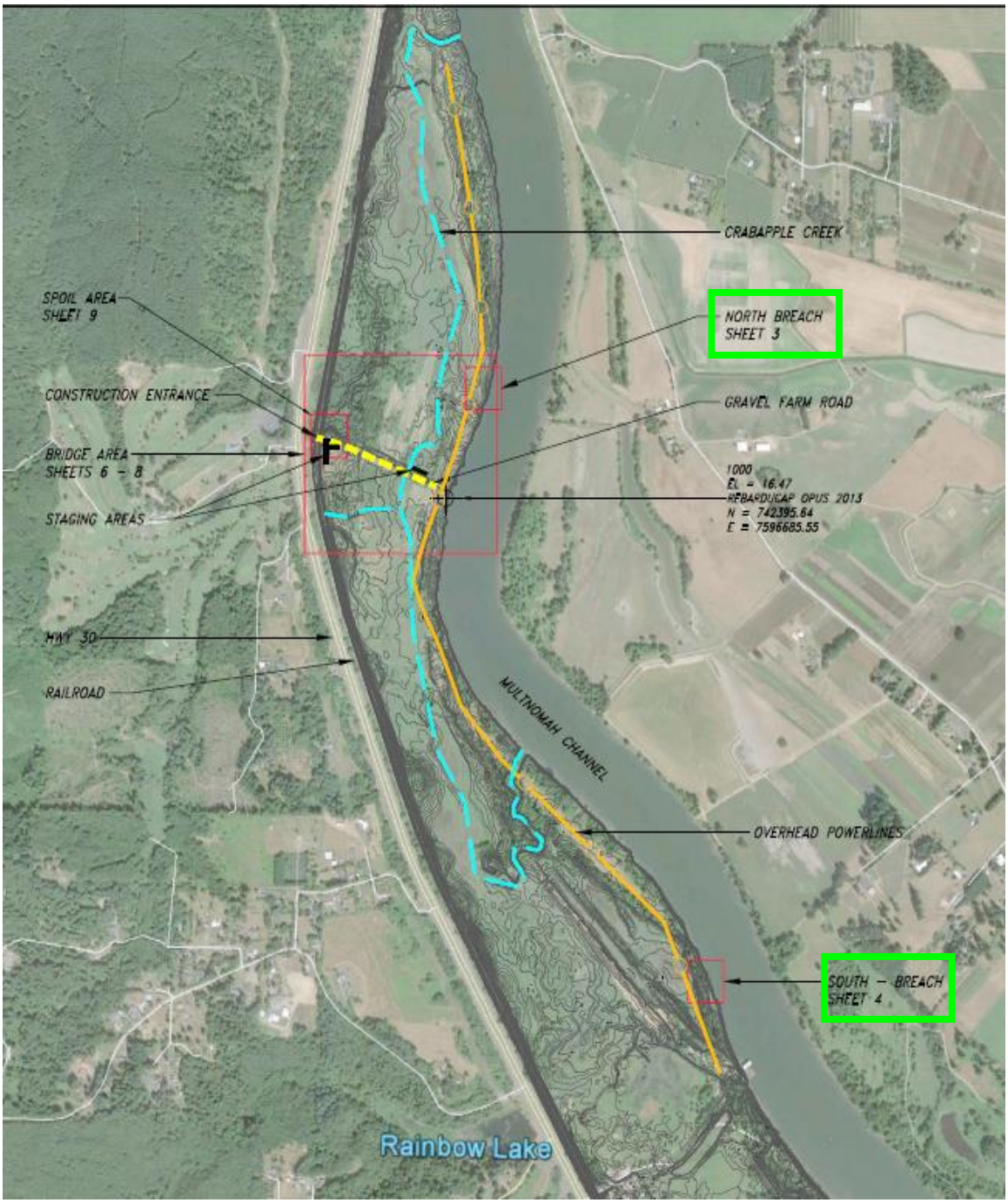


Figure showing the location of the two high water spillways (breaches) constructed at the marsh in 2008.

This photo shows the new bridge, constructed in the central access road in 2014. The stream connecting the two wetland basins, which was realigned in 2008, can be seen flowing below the new bridge. Prior to 2014, the stream flowed through a triad of 36" culverts. Prior to 2001, the road had no gaps, and the two wetland basins were completely isolated from each other.

This photo shows the south high water spillway, created in 2014 during a high water event. A companion spillway is located in the north basin. The photo is from the vantage of the south edge of the spillway looking north, during a period of sufficiently high water to overtop the spillway (>12.5' above mean sea level) and connect the Multnomah Channel (on the photo's right) to the marsh (on the left).

WILDLIFE

The site currently provides outstanding habitat for many wildlife species. The emergent wetlands, shrublands, forests and their transitions provide rich ecotones that attract a diverse bird population including wading birds, river ducks, waterfowl, raptors, and resident and migratory passerines. The site has periodically supported a great blue heron (*Ardea herodias*) colony since seasonal flooding was initiated in 2001, and provides foraging and rearing habitat for a pair of bald eagles (*Haliaeetus leucocephalus*) that nest directly across the Multnomah Channel from the site.

The enhancement of native seasonally-flooded wetlands supported wide and rapid expansions of pond-breeding native amphibians, such as the northern red legged frog (*Rana aurora aurora*), and northwestern salamanders, as gauged by systematic egg mass surveys.

Notable mammal observations at the site include mountain lion (*Puma concolor*), elk (*Cervus canadensis*), black-tailed deer (*Odocoileus hemionus*), river otter (*Lontra canadensis*), mink (*Neovison vison*), and beaver (*Castor canadensis*). Black bear (*Ursus americanus*) scat has also been observed at the site.

Invasive wildlife species at North Multnomah Channel Marsh include nutria (*Myocastor coypus*), bullfrog (*Lithobates catesbeianus*), mosquito fish (*Gambusia affinis*), carp (*Cyprinus carpio*) and many other warm water fish, Asian clam (*Corbicula fluminea*), and European starling (*Sturnus vulgaris*).

Figure X.

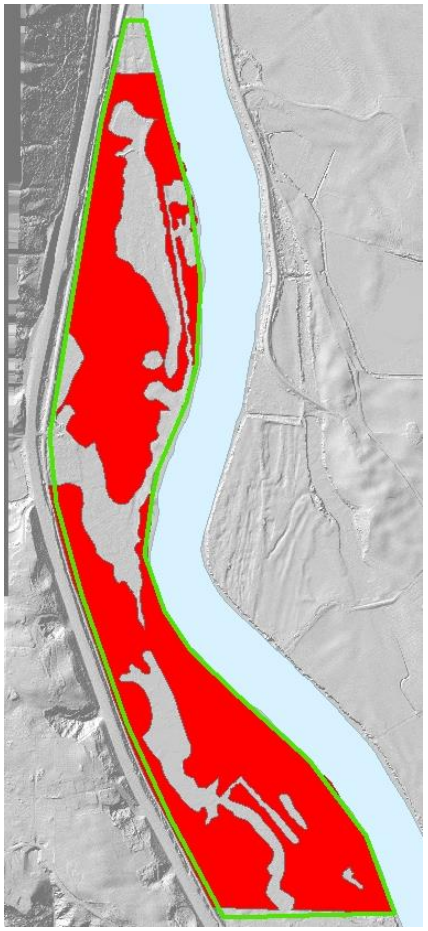


Figure XX.

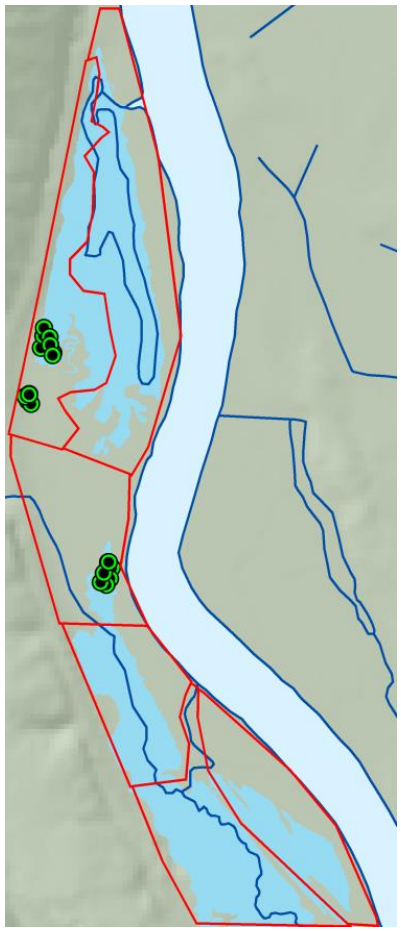


Figure XXX.

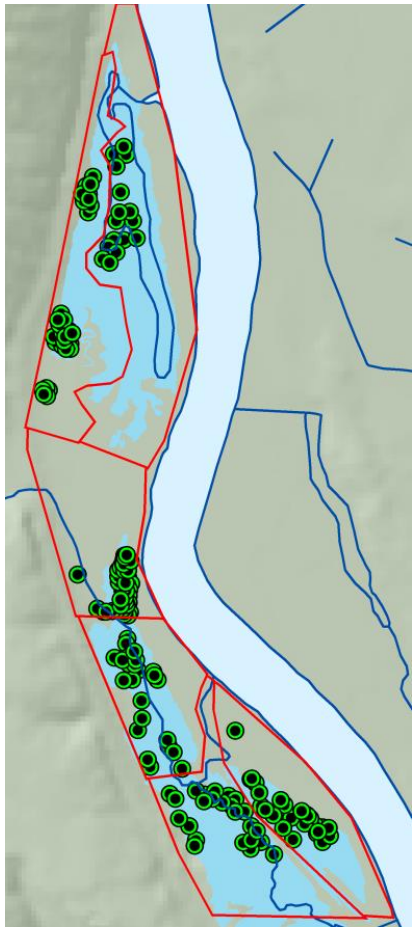


Figure IV.

Figure X. This 1995 aerial photo shows the northern half of the site just prior to Metro acquisition. The land had been managed as a dairy farm before the topography was modified in an attempt to dewater portions of the site and prepare the site for residential development. A year later, the entire site was under water during the 1996 Flood.

Figure XX. This map shows reed canarygrass cover (in red) at the North Multnomah Channel Marsh, as mapped by Adolfson Associates in 2000.

Figures XXX and IV. These figures show topographic maps of the marsh overlain with the expanded areas of seasonal flooding (in blue) and volunteer-mapped locations of northern red-legged frog egg masses (black-centered green dots). Figure XXX shows the masses found in the spring of 2001, the year before seasonal flooding was implemented. Figure IV shows masses found in 2004, during the third year of seasonal flooding.

WILDLIFE CONNECTIVITY

Native animals and plants require the ability to establish or re-establish at a site in order to maintain healthy populations. In areas such as ours, where significant habitat fragmentation has occurred, relatively linear connectivity areas (corridors) can help meet these needs.

North Multnomah Channel Marsh, along with the nearby South Multnomah Channel Marsh, are important pieces in a north-south movement corridor for wildlife along the western banks of the Multnomah Channel. Two private properties, flanking South Multnomah Channel Marsh, separate North Multnomah Channel Marsh from Burlington Bottoms, the ~400 acre Bonneville Power Administration-owned mitigation wetland tract. Northward biotic connectivity is more constricted, but still potentially viable for movement to wetlands and habitats in that direction.

Three potential east-west corridors between the Tualatin Mountains and the Willamette Floodplain were mapped in Metro-facilitated wildlife connectivity workshops. Currently, wildlife must navigate railroad tracks and Highway 30 to cross. These are key areas of restoration interest but would require substantial funds and inter-agency collaboration.

The site's adjacency to the river provides connectivity across the river to Wapato Access area and other Sauvie Island habitats for flying or swimming species.

These areas of connectivity are likely particularly important to native waterfowl, migratory birds, amphibians and turtles.

Aquatic connectivity for native fish is a key desired condition at the natural area. While improvements have been made, connectivity to high quality off-channel rearing habitat for juvenile salmonids is limited in three areas:

- Between Multnomah Channel and the two wetlands.
- Between the two wetland basins.
- Between the wetlands and the Crabapple Creek headwaters.

Table 3: Rare and uncommon species known to occur at the North Multnomah Channel Marsh.

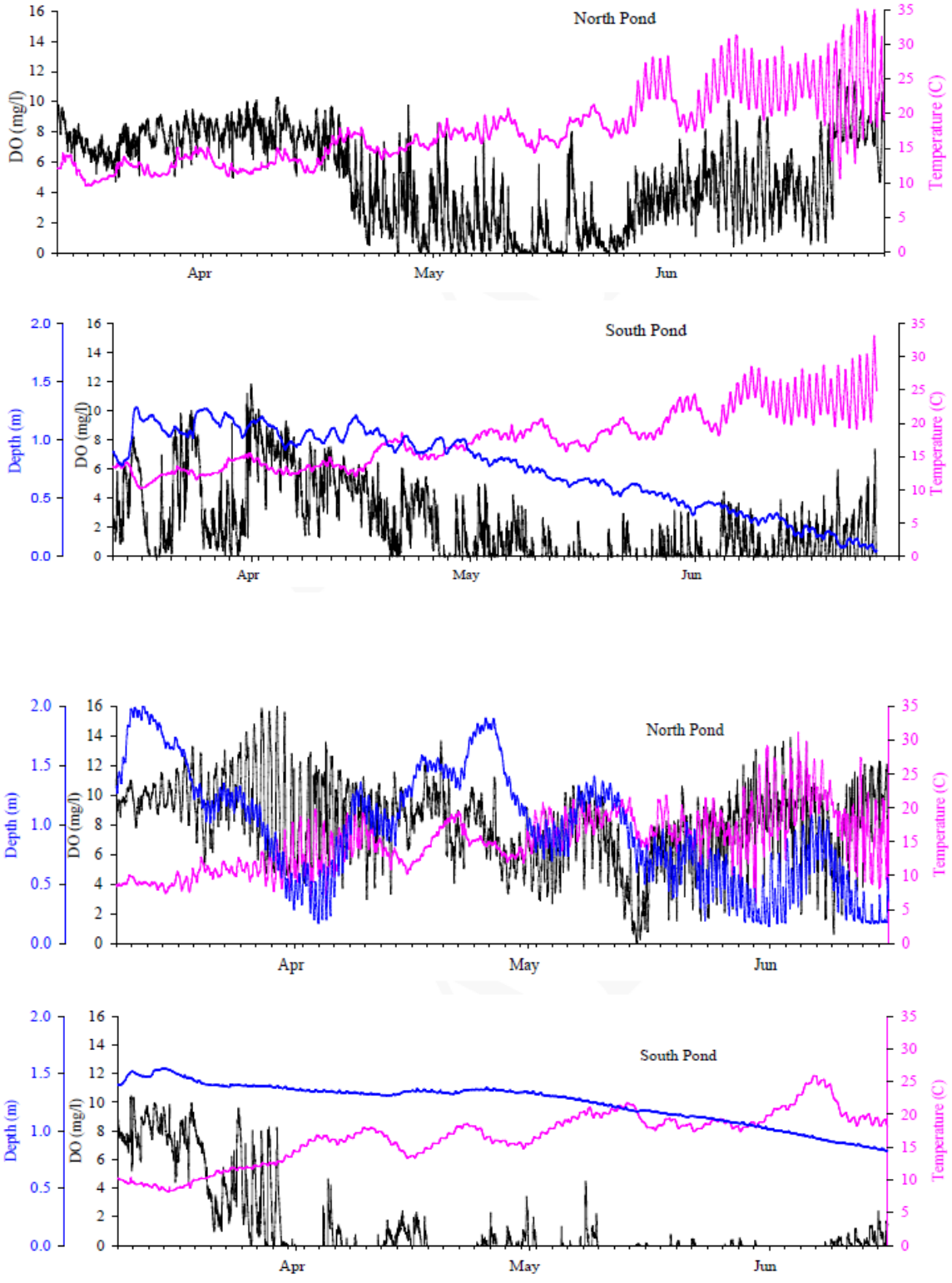
SPECIES	ORBIC LIST	FEDERAL STATUS	URBANIZING FLORA OR ODFW
Rana aurora aurora (Northern red legged frog)	Watch	N/A	State sensitive vulnerable
Chrysemys picta (Western painted turtle)	Threatened or endangered	N/A	State sensitive critical
Empidonax traillii brewsteri (Little willow flycatcher)	Watch	N/A	State sensitive vulnerable
Haliaeetus leucocephalus (Bald eagle)	Watch	N/A	State sensitive vulnerable
Onchorhynchus tshawytscha (Chinook salmon)	Threatened or endangered	Threatened	State sensitive critical
Onchorhynchus kisutch (Coho salmon)	Threatened or endangered	Endangered	Endangered
Onchorhynchus clarki (Coastal cutthroat trout)	Threatened or endangered	Species of concern	State sensitive vulnerable
Onchorhynchus mykiss (Rainbow trout [steelhead])	Threatened or endangered	Threatened	State sensitive critical
Entosphenus tridentatus (Pacific lamprey)	Threatened or endangered	Species of concern	State sensitive vulnerable

SALMON, WATER QUALITY AND HYDROLOGIC MANAGEMENT

One of the goals of the hydrologic restoration at the marsh - especially the Phase III restoration - has been enhancing the site for off-channel rearing by juvenile salmon. Research conducted in the early 2000s following the installation of the two large water control structures, identified the marsh as important off channel habitat for juvenile salmon, especially Chinook salmon and cutthroat trout (though the marsh is also used by coho, steelhead and Pacific and brook lamprey).

Fish surveys were conducted at North Multnomah Channel Marsh from 2001-2006 by OSU and later by NOAA and ODFW in 2014-2016 to document fish use during seasonal flooding, assess risks and benefits of juvenile salmon use, and document improved fish access due to increased hydrologic connectivity via water-control structures. Fish population data, as assessed by these studies, is presented in the appendix.

The three-year study by NOAA and ODFW evaluating the fish populations using the marsh found that the floodplain wetlands provide valuable habitat for rearing juvenile salmon in the early winter period (December – March). However, the study also revealed that the marsh becomes quickly uninhabitable for juvenile salmon in the spring (late April and beyond) as water temperatures rise and dissolved oxygen declines (see graphs below). By May, the flooded wetlands serve as a detriment to the larger regional wetland system by providing rearing and spawning habitat for pollution-tolerant warm water fish which compete for resources and depredate native fish, invertebrates and amphibians (but may provide important habitat for rearing native amphibians).



These graphs show water quality data for the north and south ponds at the North Multnomah Channel Marsh in 2015 (top two charts), and 2016 (lower two charts).

The water control structures were also identified as features that limited juvenile salmon egress, and blocked salmon ingress from the Multnomah Channel to the Marsh during most of the year, when water levels on the Channel were below 11.5' AMSL (the top of the North Water Control Structure).

Recommendations presented by the study's final report included managing the wetlands differently, by:

- Keeping one or both water control structures open throughout the year.
- Lowering the high water spillways (currently at an elevation of 12.5' AMSL).
- Removing the water control structures entirely, if managing only for juvenile salmon.

At a minimum, the report shed important light on the previously unknown water quality degradation occurring in mid-spring. The findings offer opportunities for Metro site managers to couple future water quality (and possibly also fish population) monitoring with adaptive management strategies. Lowering the board height in the water control structures to approximately 9' AMSL would allow significantly better mixing between the waters of the Multnomah Channel and the marsh. Alternatively, one or the other structures could be opened in late March, once most egg masses laid by red legged frogs and other native amphibians have hatched and larvae have greater capability to adjust to lowering water levels in the ponds. Lower water storage would not only provide better water mixing, leading to water quality benefits, but also provide improved juvenile salmon migration opportunities. Of course, lower water storage and smaller areas of spring seasonal flooding would reduce suppression of reed canarygrass and other pasture grasses. Adopting a strategy of reduced seasonal flooding and emergent wetland management would require a commitment to reforest these areas with bottomland hardwood species.

Juvenile salmon now appear to be able to enter the wetlands during high water events (>12.5' above mean sea level) in winter, grow substantially, and exit in spring. Crabapple Creek was restored as it meanders through the site in 2009, increasing stream flow and fish access to the Multnomah Channel. Chinook and Coho salmon both use the site for rearing, as do steelhead and cutthroat trout. Both trout species spawn upstream of the site, but those breeding populations are largely isolated by a culvert barrier under Highway 30 and the railroad that both border the western edge of the site.

If these actions were coupled with careful water quality monitoring, the beneficial effects of these actions could be determined and compared. These actions could, in turn, lead to plans to lower the high water spillways from their current elevation of 12.5' AMSL to 10.5' or 9.5' AMSL to create even greater mixing and fish migration opportunities.

ACCESS AND RECREATION

When first evaluated for possible public access, North Multnomah Channel Marsh was designated as Natural Area-Low. The Natural Area-Low designation is defined as follows:

Access by neighbors or local residents is permitted but not encouraged. These sites do not have formalized parking and interpretive or wayfinding signage. Trails on these sites are informal or demand in nature and are not built or maintained actively. Demand trails that travel through sensitive areas are actively decommissioned. Basic rule signage is posted at the property gate or primary entrance. These sites are visited monthly or bi-monthly by Metro staff to inspect for unauthorized use and to conduct maintenance.

The 2016 Parks and Nature System Plan combined Natural Area – Low and Natural Area –High into one designation called Natural Area, which is North Multnomah Channel Marsh's current designation.

Whereas the site does receive occasional impacts from unplanned access in the form of trash dumping, localized wood harvest, occasional theft or vandalism, impacts from stray grazing animals, etc., these effects are relatively minor, especially when compared to the direct and indirect impacts that would occur to habitat and wildlife from formal public use. No significant interest or public pressure exists to warrant opening the site to public visitation at this time. Past efforts to offer formal public tours (e.g., via Greenscene or Big Backyard offerings) have not attracted public interest.

Site restoration and maintenance access is adequately served by the existing access points. Ongoing signage replacement is generally required to ensure the site is adequately posted to prevent vehicle access, hunting, dog use, etc.

CONSERVATION

CONSERVATION TARGETS

The primary conservation targets for the North Multnomah Channel Marsh are emergent wetlands/open water, shrub wetlands, bottomland hardwood forest, riparian forest, oak woodlands.

Table 4: Current, non-technical status and desired future conditions of conservation targets.

TARGET	CURRENT CONDITION	DESIRED FUTURE CONDITION
Emergent wetlands – open water	**Substantially enhanced and greatly expanded.** The emergent wetland units at the marsh are found in the lower elevations, typically below 11 feet above mean sea level (AMSL). Due to the seasonal flood regime created by management of the water control structures, the lower regions of these units, (i.e., those that experience greater than ~18 inches of seasonal inundation) have transitioned from dominant pasture grass cover to a mix of native emergent vegetation (sedges, spikerushes and rushes, primarily, with native smartweeds and beggarticks). The areas that experience less than ~18" of seasonal flooding, however, are still dominated by reed canarygrass, velvet grass and other pasture weeds. The water control structures installed in 2001 were designed to allow capture of the greatest amount of water possible at the site. In retrospect, their operation at full flood storage has likely created an emergent wetland footprint that is artificially large. Poor water quality (high temperatures and low dissolved oxygen) has been recorded in the ponds in the spring.	**Reduce the footprint of this habitat while promoting greater % native cover, species richness, and associated water quality conditions.** The enhancement of the emergent wetland units is underway and likely limited by topography and Metro's ability to store deeper seasonal flooding. The only way to expand the area of functional native emergent wetland would seemingly be to excavate the edges down to 10' AMSL or lower and allow the flooding imposed by the water control structures to work. All indications are, however, that the current emergent wetland footprint matches or exceeds that of the historic, pre-European wetlands, so further expansions to this type of wetland seems artificial unless done for wildlife recovery (e.g., salmon). Shrinking the area covered by emergent wetlands may result in a better match of future and historic habitat coverage, and help support improvements to site water quality conditions.
Shrub wetlands	**Enhanced in some areas, and greatly reduced in others.** Most of the areas suitable for native shrub have become heavily infested with reed canarygrass, including a conversion of areas that were represented by native willow and shrubs when the property was acquired to fields of canarygrass now. The site's shrublands typically lie between 11' AMSL and 15' AMSL. Efforts to expand this habitat at the site have met with mixed results. For example, ~ 40 acres at the Marsh were prepped and planted with native shrubs between 2008 and 2011, however many of these plants died due to extended spring flooding in 2011. The units flanking the west side of the entry road fared best and have become well established, though beavers, prolonged flooding and reed canarygrass pose long-term threats to the willows and other shrubs in these units.	**Substantially expand the area of coverage of this habitat at the Marsh.** Forty-eight acres of the marsh that remain dominated by reed canarygrass and pasture grass have been mapped for enhancement to future shrub wetlands. Establishing an expanded network of willows and native shrubs throughout the site will provide key ecotone habitat between emergent wetlands and bottomland/riparian forest, benefiting several migratory perching birds, including willow flycatchers, as well as provide food and dam-building resources to the site's beaver population.

TARGET	CURRENT CONDITION	DESIRED FUTURE CONDITION
Bottomland hardwood forest	**This habitat is currently under-represented, though healthy remnants remain.** The site exhibits a limited remnant gallery of mature bottomland forest. Much of this habitat was cleared prior to Metro acquisition, and remains uncommon compared to historic maps. An Oregon ash (*F. latifolia*) swale runs up the west flank of the site. A thin, broken mixed ash/black cottonwood (*P. trichocarpa*) forest flanks the Multnomah Channel along the site's eastern edge and along the site's western boundary with the adjacent railroad and highway. These forests, narrow as they are, are in relatively good condition, burdened mostly by non-native blackberry which competes with snowberry, ninebark, roses, dogwood, elderberries and other native shrubs. The forests provide critical function by buffering the site from the noise and visual distraction of the bordering transportation corridor. The forests along the Multnomah Channel provide similar landscape buffering benefits as well as shoreline erosion control. They also provide important nesting habitat opportunities for birds including great blue herons and bald eagles.	**This habitat should be expanded into areas adjacent to the seasonal ponds edge, currently dominated by pasture grass and emergent wetland.** Areas for reintroduction of this habitat are dominated by canarygrass and blackberry. The emerald ash borer (*Agrilus planipennis*) poses a serious threat to the current and future forest tracts at the site, which are dominated by *F. latifolia*. Future plantings should introduce a diverse palette of trees and shrubs adapted to seasonal flooding to buffer the potential loss of ash trees.
Riparian forest	**This habitat was cleared prior to Metro acquisition and is currently under-represented, though healthy remnants remain.** Similar to the bottomland forests, the riparian forests are dominated by *F. latiflia* and *P. trichocarpa*, with a healthy native understory carried by *S. albus*, *P. capitatus*, *A. rubra*, and *Salix*, spp. Non-native blackberry (*R. armeniacus*) presents the greatest invasive threat to this target. Clearing by the previous landowner resulted in the removal of many areas of mature riparian forest, which has been only partially restored.	**This habitat should be expanded into areas adjacent to the seasonal ponds edge, currently dominated by pasture grass and emergent wetland.** The site will benefit from efforts to expand the existing hardwood forests, especially along its western and eastern edges. Primary goals for this target include expanding the habitat's footprint into areas dominated by canarygrass and suppressing weeds, especially non-native blackberry. Blackberry control and expansions into the edge areas dominated by reed canarygrass are the highest priority actions to achieve this goal. This effort will be constrained by the PGE utility corridor running along the site's eastern flank. Vegetation nearby this corridor must grow to no more than ~10' to avoid safety risk to the power lines (and subsequent control by PGE foresters).
Oak woodlands	The NW portion of the site has a small rock outcrop with mature oak trees.	The DFC for this target is to maintain the current habitat with targeted weed abatement as needed.

Table 5: Short-term goals, 2017-2023

GOAL	KEA	THREATS	ACTION(S)	COST
Reforest areas between the seasonal ponds and established forests with native shrubs and trees	Vegetative structure: tree layer	Reed canarygrass and other herbaceous cover	Targeted mowing and herbicide suppression, coupled with re-established seasonal flooding, where possible, coupled with tree and shrub planting.	$330,000* **see map and budget below*
Refine management of the two large water control structures	None	Stagnant water, migration barriers	Combine water quality monitoring and strategic modifications to the water control structures to achieve optimal results, balancing water quality, vegetation management, amphibian breeding, fish migration and other factors.	$15,000
Evaluate and upgrade the existing road system at the site as needed	None	Eroding and deeply rutted roads	Identify a preferred access route through the site and enhance that, while decommissioning other road features. Ideally, the road should support weekly 4-wheel drive access to the north and south WCS year-round under normal winter flood conditions.	$25,000
Targeted EDRR weed suppression/eradication	None	Weed population expansion	This work should focus on high priority, widely-spreading weed species that are within control, including purple loosestrife (*Lythrum salicaria*), yellow flag iris (*Iris pseudacorus*), and common reed (*Phragmites australis*).	$25,000
Track water quality metrics at the Wetlands and refine goals for these	None	High temperatures and low dissolved oxygen due to water management	Strategically deploy and periodically sample an array of water quality loggers in the wetlands.	$10,000
Develop designs for crossing through HWY 30/RR	Landscape	Migration barrier posed by road and culverts under the highway and railroad	Develop “ready-to-build” (30-70%) design for a crossing feature where Crabapple Creek enters the Marsh under HWY 30 and the railroad.	$100,000
Conduct additional fish monitoring	Landscape	Migration barriers	Monitoring should address unanswered questions associated with fish passage through the large WCSs and use of the high-water spillways by juvenile salmon.	$100,000

Table 6: Long-term goals, 2023-2040

GOAL	KEA	THREAT	ACTION(S)	COST
Improve landscape connectivity	None	Barriers created by HWY 30/RR	Continue coordinating with ODOT and regional transportation to create/seize opportunities to improve connection between the floodplain and Tualatin Mountains. This step would involve implementing the plan developed in the Short-term goals table.	$2,000,000-$5,000,000
Coordinated regional land management	None	N/A	Achieve a better-functioning working collaborative with other parks and natural area managers in the Lower Columbia/Willamette system to manage lands cooperatively to achieve the best uplift for salmon, amphibians, birds and other regionally significant biota.	N/A
Acquisition	Landscape	N/A	Acquire unprotected parcels in the adjacent Multnomah Channel Floodplain. This goal should be achieved as soon as possible, but given the current market and interest form landowners in the project area, may take longer.	N/A

THREATS AND THEIR SOURCES FOR THE NEXT 10 YEARS

The site is primarily challenged by:

- Fragmentation from the broader landscape
- Hydrologic modifications that drained the wetland for farming and pasture
- Impacts from non-native species (e.g., pasture grasses, broadleafs like purple loosestrife [Lythrum salicaria] and yellow flag iris [Iris pseudacorus], warm water fish, emerald ash borer [Agrilus planipennis])
- Human disturbance
- Climate change
- Industrial and residential development

Some of these threats are likely irreversible (e.g., climate change, nearby development), but others can be addressed through careful acquisition and restoration. The greatest threats to the site are summarized in Table 7, categorized by conservation target.

CLIMATE CHANGE CONSIDERATIONS

Climate change is anticipated to affect summer temperatures and availability of water in summer. Other indirect effects of climate change may include range shifts of plants and animals, some native to North America and some not, and increased competition by these species. It is possible that climate change may touch every KEA, though effects on some KEAs may be more important than others.

Direct effects that may occur

- Increased summer temperatures
- Increased severity of winter rain events and subsequent flooding
- Decreased water availability in summer

Indirect effects that may occur

- Increased risk of wildfire in hotter, drier summers
- Range shifts by undesirable plants increasing competition
- Disease introductions and/or increased vulnerability to disease
- Loss of synchronicity of plant reproduction and pollinators
- Loss of synchronicity of resident and migratory animals and food sources (e.g., insect hatches)
- Increased erosion in streams caused by the flashier winter rain events
- In upland forests, plant growth and survival may be affected by increased summer temperatures and reduced water availability in summer

Table 7: Threats

CONSERVATION TARGET	STRESS (DEGRADED KEA)	SEVERITY	SCOPE	OVERALL STRESS RANK	SOURCE (THREAT)	CONTRIBUTION	IRREVERSIBILITY	OVERALL SOURCE RANK	OVERALL THREAT RANK	COMMENTS
Bottomland hardwood forest	Extent of habitat	High	High	High	Habitat fragmentation	High	Medium	Medium	High	The flanking floodplain habitat west of the Multnomah Channel is limited to under 1000 acres, and most of Sauvie Island's natural wetlands are converted to farmland and artificially drained or disconnected from the rivers.
Emergent wetland	Native wetland plant cover in emergent area	High	High	High	Non-native weeds	High	High	High	High	Persistence (and possible encroachment from new species) of non-native plants such as reed canarygrass
Native fish habitat	Fish passage	High	High	High	Artificial features (control structures, culverts)	High	Low (structure management) to High (Removal)	High	High	Water control structures, when closed, act as barriers to movement of juvenile salmon into and, in some cases, out of the wetland. Small box culverts prevent migration of most wildlife west of Highway 30 and the railroad.
Native fish habitat	Water quality (TBD)	High	High	High	Warming of pond water in late winter	High	High	High	High	Temperature and dissolved oxygen become limiting factors for many fish and aquatic organisms by early April most years. The opportunities for mitigation are limited by similar spring declines in water quality in the flanking Multnomah Channel.

Table 8: Key ecological attributes for bottomland hardwood forest

			---------- INDICATOR RATING ----------							
CATEGORY	KEA	INDICATOR	POOR	FAIR	GOOD	VERY GOOD	CURRENT STATUS	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
Condition	Vegetative structure: other layers	% native cover	<30% cover	30-60% cover	60-90% cover	90% or more	Good	Good	Very Good	Native shrubs and herbaceous plants provide a number of services, including food and ovipositing sites, as well as structural complexity to the habitat that is associated with increased wildlife diversity. (Hagar 2003; Hennings and Edge 2004; Ares et al. 2010; Pendergrass et al. 2012)
Condition	Mature bottomland tree species	Number and size (dbh) of species such as Oregon ash and Pacific willow	Mature Oregon ash lacking	<3 per acre with dbh >61 cm (24 inches)	3-5 per acre with dbh >61 cm (24 inches)	>5 per acre with dbh >61 cm (24 inches)	TBD	Good	Good	Recruitment of native trees necessary for long-term health of riparian forest. Saplings are < 2m (6.6 ft) tall. Partners in Flight (2000) biological objective for Willamette Valley large-canopy trees in riparian deciduous woodland.
Condition	Vegetative structure: tree layer	% native tree canopy cover	<20% cover	20-30% cover	30-40% cover	40% or more	Very Good	Very Good	Very Good	Willow flycatcher abundance is positively correlated with dense mature deciduous riparian forest. (Partners in Flight 2000)
Condition	Key habitat feature presence: snags	Number of snags per 0.4 hectare (1 acre)	Snags absent	1-2 per 0.4 ha (1 acre)	3-5 per 0.4 ha (1 acre)	>5 per 0.4 ha (1 acre) with 2 per 0.4 ha >10" dbh	TBD	Good	Good	Partners in Flight (2000) biological objective for downy woodpecker (snags in riparian deciduous woodland).

*Desired future condition

Table 9: Key ecological attributes for emergent wetlands

CATEGORY	KEA	INDICATOR	---------- INDICATOR RATING ----------				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Native wetland plant cover in emergent area	Dominance of native herbaceous plants characteristic of the region's wetlands	<25% cover of vegetated areas	25-50% cover of vegetated areas	50-75% cover of vegetated areas	>75% cover of vegetated areas	Fair	Good	Good	Estimate based on site walk. Based on page 44 in the Division of State Lands HGM-based assessment guidebook (Adamus and Field 2001).

*Desired future condition.

**Some bare ground/mudflat area is important to native turtles, ground-nesting bees and some grassland birds. Evaluate on a site-by-site basis for species' needs.

Table 10: Key ecological attributes for native fish habitat (instream)

CATEGORY	KEA	INDICATOR	---------- INDICATOR RATING ----------				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Landscape context	Fish passage	Fish able to move to and from mainstem and tributaries	Complete blockage	Blocked more than half the year	Blocked less than half the year	Passage open year-round	Fair-Good	Good	Good-Very Good	Marking as fair-good currently as fish egress through the large WCSs is partial even when the structures are closed. Ingress is blocked by the closed WCS from January through July, or about half the year, except during high water events that overtop the natural riparian berm (north portion of the site) or the two engineered high water spillways.

*Desired future condition.

MONITORING PLAN

Monitoring at the site focuses primarily on:

- Salmon (contracted and occasional free ODFW/NOAA).
- Pond-breeding amphibians (volunteer-mediated).
- Breeding birds (volunteer-mediated).
- Emergent plant cover (point intercept; staff).
- Water quality (WMSWCD/LCEP).

KEAs will be monitored via annual site walks.

CURRENT PARTNERS, PARTNER PROJECTS AND POTENTIAL PARTNERS

- West Multnomah Soil and Water Conservation District
- The Lower Columbia Estuary Partnership
- Oregon Department of Fish and Wildlife
- The National Oceanic and Atmospheric Administration
- The Wetlands Conservancy
- Ducks Unlimited
- US Fish and Wildlife Service (North American Wetland Conservation Act Grant Program)

Table 11: Plant list for north Multnomah Channel Marsh (Adolfson, 2000)

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	N=NATIVE I=INTRODUCED U=UNKNOWN
TREES			
Acer macrophyllum	Maple, Big-Leaf	FACU	N
Abies grandis	Grand fir	FACU-	N
Alnus rubra	Alder, Red	FAC	N
Cornus nuttallii	Pacific dogwood	UPL	N
Fraxinus latifolia	Ash, Oregon	FACW	N
Malus fusca	Pacific crab apple	FACW	N
Malus sp.	apple, wild	NL	I-naturalized
Populus trichocarpa	Cottonwood, Black	FAC	N
Populus alba	White poplar	NI	I
Prunus emarginata var. emarginata	Bitter cherry	FAC-- NI	I-naturalized
Pseudotsuga menziesii	Fir, Douglas	FACU	N
Rhamnus purshiania	buckthorn, Cascara	FAC-	N
Salix lucida var. lasiandra	Willow, Pacific	FACW+	N
Sorbus spp.	Ash, Mountain	FACU-NL	N
Taxus brevifolia	Pacific yew	NI	N
Thuja plicata	Cedar, Western Red	FAC	N
Quercus garrayana	Oregon white oak	UPL	N
SHRUBS			
Acer circinatum	Maple, Vine	FAC-	N
Amelanchier alnifolia	Service-Berry, Saskatoon	FACU	N
Cornus stolonifera	Dogwood, Red-Osier	FACW	N
Corylus cornuta	Hazel-Nut, Beaked	FACU	N
Crataegus douglasii	Hawthorn, Douglas'	FAC	N
Crataegus monogyna	Hawthorn, Ornamental	FACU+	I
Cytisus scoparius	Broom, Scot's	UPL	I-invasive
Ilex aquifolium	Holly ,English	UPL	I-invasive
Lonicera involucrata	Twinberry	FAC+	N
Mahonia nervosa	Oregon-grape, Dull	UPL	N
Oemleria cerasiformis	Plum, Indian	FACU	N
Physocarpus capitatus	Ninebark, Pacific	FACW-	N
Prunus emarginata	Cherry, Bitter	FACU	I-naturalized
Ribes divaricatum	Gooseberry, Spreading	FAC	U
Rosa eglanteria	Rose, sweetbrier	FACW	I-naturalized
Rosa nutkana	Rose, Nootka	FAC	N
Rosa pisocarpa	Rose, Clustered	FAC	N
Rosa spp.	Rose, Wild	FAC-NI	U
Rubus discolor	Blackberry, Himalayan	FACU	I-invasive
Rubus laciniatus	Blackberry, Cut-Leaf	FACU+	I-invasive
Rubus parviflorus	Thimbleberry	FAC-	N
Rubus spectabilis	Berry, Salmon	FAC+	N
Rubus ursinus	Blackberry, California	FACU	N
Salix fluviatilis	Willow, Columbia River	OBL	N

SHRUBS (continued)			
Salix hookeriana	Willow,Hooker	FACW-	N
Salix lucida var. lasiandra	Willow, Pacific	FACW+	N
Salix sitchensis	Willow, Sitka	FACW	N
Sambucus racemosa	Elder, European Red	FACU	N
Spiraea douglasii	Spiraea, Douglas'	FACW	N
Symphoricarpos albus	Snowberry	FACU	N
Vaccinium parvifolium	Huckleberry, Red	UPL	N
GRASSES, SEDGES, RUSHES			
Agrostis gigantea	Redtop	FAC	I
Agrostis capillaris	Bentgrass, colonial	FAC	I
Agrostis oregonensis	Bentgrass, Oregon	FAC	N
Agrostis stolonifera	Bentgrass, Spreading	FAC	I
Alopecurus aequalis var. aequalis	Foxtail, Short-Awn	OBL	N
Alopecurus pratensis	Foxtail, Meadow	FACW	I
Anthoxanthum odoratum	Grass, Sweet Vernal	FACU	I
Bromus mollis	Brome, Soft	UPL	I
Bromus spp.	Brome	FAC+-UPL	U
Carex aquatilis var. dives	Sedge, water	OBL	N
Carex densa	Sedge, Dense	OBL	N
Carex deweyana	Sedge, Short-Scale	FACU	N
Carex hendersonii	Sedge, Henderson's	FAC	N
Carex lenticularis var. lasiocarpa	Sedge, lenticular	FACW+	N
Carex leporina	Sedge ,Hare's-Foot	FACW	N
Carex obnupta	Sedge, Slough	OBL	N
Carex spp.	Sedge	OBL-NI	U
Carex stipata var.stipata	Sedge, Stalk-Grain	OBL	N
Carex vesicara var. major	Sedge, inflated	OBL	N
Cyperus strigosus	nutsedge, straw-colored	FACW	N
Dactylis glomerata	Grass ,Orchard	FACU	I
Deschampsia cespitosa	tufted hairgrass	FACW	N
Echinochloa crusgalii	grass, barnyard	FACW	I
Eleocharis acicularis var. acicularis	Spikerush, Least	OBL	N
Eleocharis palustris	Spikerush, Creeping	OBL	N
Elytrigia repens	quackgrass	FAC-	I
Festuca arundinacea	Fescue, tall	FAC-	I
Glyceria elata	Grass, Tall Manna	FACW+	N
Glyceria borealis	Grass, Small Floating Manna	OBL	N
Glyceria grandis	Grass, reed manna	OBL	N
Holcus lanatus	Grass, Common Velvet	FAC	I
Juncus acuminatus	Rush, Taper-Tip	OBL	N
Juncus articulatus	Rush, jointed	OBL	N
Juncus effusus	Rush, Soft	FACW	N
Juncus ensifolius	Rush, Three-Stamen	FACW	N
Juncus oxymeris	Rush, pointed	FACW+	N
Lolium perenne	Ryegrass, Perennial	FACU	I
Ludwigia palustris	Seedbox, Marsh	OBL	N
Panicum capillare	grass, panic	FACU+	N

GRASSES, SEDGES, RUSHES			
Phalaris arundinacea	reed canarygrass	FACW	I-invasive
Phleum pratense var. pratense	timothy	FAC-	I
Poa palustris	Bluegrass, Fowl	FAC	I
Poa pratensis	Bluegrass, Kentucky	FAC	I
Poa spp.	Bluegrass	FACW-FACU	U
Scirpus acutis	Bullrush, hard-stem	OBL	N
Scirpus microcarpus	Bullrush, small-fruit	OBL	N
Sparganium emersum	burreed, narrow-leaf	OBL	N
HERBS			
Adantium pedatum	fern, Northern maiden-hair	FAC	N
Alisma plantago-aquatica var. americanum	water plantain, American	OBL	N
Anaphalis margaritacea	pearly everlasting, common	UPL	N
Athyrium filix-femina	Fern, Subarctic Lady	FAC	N
Azolla mexicana	Fern, Mexican Mosquito	OBL	N
Bellis perennis	Daisy, English	UPL	I
Bidens cernua	Beggar-Ticks, Nodding	FACW+	N
Bidens frondosa	Beggar-Ticks, Devil's	FACW+	N
Callitriche heterophylla	Water-Starwort, Larger	OBL	N
Chrysanthemum leucanthemum	daisy, english	FAC	I
Cirsium arvense	Thistle, Creeping	FACU+	I-invasive
Cirsium undulatum	thistle, wavy leaf	FACU	I
Cirsium vulgare	Thistle, Bull	FACU	I-invasive
Claytonia lanceolata	Springbeauty, Lance-Leaf	FAC-	U
Claytonia sibirica	Springbeauty, Siberian	FAC	U
Daucus carota	Wild Carrot	UPL	I
Digitalis purpurea	Foxglove	FACU	U
Disporum hookeri	Fairybells, Hooker's	UPL	U
Eichorium intybus	Chickory	NL	I
Epilobium ciliatum	Willow-Herb, Hairy	FACW-	N
Equisetum arvense	Horsetail, Field	FAC	N
Equisetum hyemale	Horsetail, Rough	FACW	N
Equisetum fluviatile	Horesetail, water	OBL	N
Equisetum telmatiea	Horesetail, giant	FACW	N
Erodium cicutarium	Alfilaria	UPL	U
Fragaria spp.	Strawberry, Wild	UPL	U
Galium aparine	Bedstraw, Catchweed	FACU	N
Geranium dissectum	geranium, cut-leaf	UPL	I
Geum macrophyllum	Avens, Large-Leaf	FACW-	N
Glycyrrhiza lepidota	Licorice, American	FAC+	N
Gnaphalium palustre	cudweed, Western marsh	FAC+	N
Hedera helix	Ivy, English	UPL	I-invasive
Helenium autumnale	Sneezeweed, common	FACW	U
Hydrophyllum tenuipes	Water-Leaf, Pacific	UPL	N
Hypericum perforatum	St. Johns wort	NL	I
Hypochaeris radicata	Cats-Ear, Hairy	FACU	I
Impatiens capensis	Touch-Me-Not, Spotted	FACW	N
Iris pseudacorus	Iris, Yellow	OBL	I-invasive

HERBS (continued)			
Lapsana communis	nipplewort	UPL	I
Lemna minor	Duckweed, Lesser	OBL	N
Lotus corniculatus	Trefoil, Birds-Foot	FAC	I
Lupinus rivularis	lupine, riverbank	FACU	N
Lychnis alba	campion, white	NL	I
Lysimachia nummularia	Jennie, creeping	FACW	N
Lysitchiuum americanum	Skunk-Cabbage, Yellow	OBL	N
Lythrum salicaria	loosestrife, purple	FACW+	I-invasive
Madia sp.	tarweed	NL	I
Matricavia discoidea	pineapple weed	NL	I
Medicago lupulina	Medic, Black	FAC	I
Medicago sativa	Alfalfa	NL	I
Mentha pulegium	pennyroyal	OBL	I
Mentha spicata	spearmint	OBL	I
Myostosis laxa	forget-me-not, bay	OBL	N
Myriophyllum hippuroides	water millfoil, western	OBL	N
Nuphar polysepalum	lilly, yellow-pond	OBL	N
Oenanthe sarmentosa	water parsley	OBL	N
Oenothera flava	evening-primrose, yellow	FAC+	U
Parentucellia viscosa	parentucellia, yellow	FAC-	I
Phlox idahoensis	phlox, clearwater	FACW	N
Plantago lanceolata	Plantain, English	FAC	I
Plantago major	Plantain, Common	FACU+	I
Polygonum amphibium var.emersum	smartweed	OBL	N
Polygonum hydropiperoides var. hydropiperoides	swamp smartweed	OBL	N
Polygonum persicara	lady's thumb	FACW	I
Polypodium glycyrrhiza	fern, licorice	NL	N
Polystichum munitum	Fern, Sword	FACU	N
Portulaca oleracea	Purslane, common	FAC	I
Potamogeton epihydrus	pondweed, ribbon-leaf	OBL	N
Potentilla palustris	Cinquefoil, marsh	OBL	N
Prunella vulgaris	Heal-all	FACU+	I
Pteridium aquilinum var. pubescens	fern, bracken	FACU	I
Ranunculus aquatilis var. hispidulus	Butter-cup, white water	OBL	N
Ranunculus flammula	Butter-cup, small creeping	FACW	N
Ranunculus repens	Butter-Cup, Creeping	OBL	I
Ranunculus sceleratus	Butter-cup, celery-leaved	OBL	N
Ranunculus uncinatus	Butter-Cup, hooked	FACW	N
Rorippa curvisiliqua	Yellow-cress, curve-pod	OBL	N
Rorippa nastrutium-aquaticum	cress, water	OBL	I
Rumex acetosella	Sorrel, Sheep	FACU+	I
Rumex crispus	Dock, Curly	FAC+	I
Sagitaria latifolia	Wapato	OBL	N
Senecio jacobaea	Ragwort, Tansy	FACU	I
Solanum dulcamara	Nightshade, climbing	FAC+	I
Stachys cooleyae	Hedgenettle, Cooley's	FACW	N
Taraxacum officinale	Dandelion, Common	FACU	I

HERBS (continued)			
Tellima grandiflora	Fringecup	UPL	N
Tolmiea menziesii	Plant, Piggy-Back	FAC	N
Trifolium pratense	Clover, Red	FACU	I
Trifolium repens	Clover, White	FAC	I
Typha latifolia	Cattail, Broad-Leaf	OBL	N
Urtica dioica	Nettle, Stinging	FAC+	I
Vancouveria hexandra	Inside-Out-Flower	UPL	N
Veratrum viride	False-Hellebore, American	FACW	N
Verbascum blattaria	mullein, moth	UPL	I
Verbascum thapsis	mullein, common	UPL	I
Veronica americana	Speedwell, American	OBL	N
Vicia americana	purple vetch, American	FAC	I
Vicia sativa	common vetch	FAC	I
Vicia spp.	Vetch	FAC-NI	U
Vicia villosa	vetch, hairy	UPL	I
Vinca major	Vinca	NL	N

Table 12: Wildlife species observed on the Multnomah Channel Property

SCIENTIFIC NAME	COMMON NAME	HABITATS			
BIRDS		OPEN WATER	GRASSLAND	SCRUB/SHRUB	FOREST
Accipter striatus	Sharp-shinned hawk			λ	λ
Accipter cooperii	Cooper's hawk		λ		λ
Actitus macularia	Spotted sandpiper	λ			
Agelaius phoeniceus	Red-winged blackbird	λ	λ		
Anas americana	American wigeon	λ			
Anas cyanoptera	Cinnamon teal	λ			
Anas platyrhyncos	Mallard	λ			
Aphelocoma californica	Western scrub-jay		λ	λ	λ
Ardea herodias	Great blue heron	λ			
Bombycilla cedrorum	Cedar waxwing			λ	λ
Branta canadensis	Canada goose	λ	λ		
Bubo virginianus	Great horned owl				λ
Buteo jamaicensis	Red-tailed hawk		λ	λ	λ
Butoroides virescens	Green heron				
Callipepla californica	California quail		λ		
Carduelis tristis	American goldfinch		λ	λ	
Cathartes aura	Turkey vulture	λ	λ	λ	λ
Cathurus ustalatus	Swainson's thrush			λ	
Ceryle alcyon	Belted kingfisher	λ			
Charadrius vociferus	Killdeer	λ	λ		
Chordeiles minor	Common nighthawk		λ	λ	
Circus cyaneus	Northern harrier				λ
Cistothorus palustris	Marsh wren		λ	λ	
Colaptes auratus	Northern flicker			λ	λ
Contopus sordidulus	Western wood-pewee			λ	λ
Corvus brachyrhyncos	American crow	λ	λ	λ	λ
Dendroica petechia	Yellow warbler		λ	λ	
Empidonax difficilis	Pacific-slope flycatcher				λ
Falco sparverius	American kestrel		λ	λ	λ
Fulica mericana	American coot	λ			
Gallinago gallinago	Common snipe		λ		
Geothlypis trichas	Common yellowthroat	λ	λ		
Haliaeetus leucocephalus	Bald eagle	λ			λ
Hirundo rustica	Barn swallow	λ	λ	λ	
Icterus bulockii	Bullocks oriole	λ			λ
Larus argentatus	Herring gull	λ			
Melospiza melodia	Song sparrow	λ	λ	λ	λ

SCIENTIFIC NAME	COMMON NAME	HABITATS			
BIRDS (continued)		OPEN WATER	GRASSLAND	SCRUB/SHRUB	FOREST
Mergus merganser	Common merganser	λ			
Molothrus ater	Brown-headed cowbird			λ	λ
Otus kennicottii	Western screech owl				λ
Parus atricapillus	Black-capped chickadee		λ	λ	λ
Passer domesticus	House sparrow		λ	λ	λ
Passerculus sandwichensis	Savannah sparrow		λ	λ	
Passerella iliaca	Fox sparrow	λ	λ	λ	
Phalacrocorax auritus	Double-crested cormorant	λ			
Phalaropus tricolor	Wilson's phalarope	λ			
Phasianus colchicus	Ring-necked pheasant		λ		λ
Pheucticus elanocephalus	Black-headed grosbeak				λ
Picoides pubescens	Downy woodpecker				λ
Pipilo maculatus	Spotted towhee			λ	λ
Psaltriparus minimus	Bushtit			λ	
Regulus calendula	Ruby-crowned kinglet		λ		
Riparia riparia	Bank swallow	λ			
Selasphorus rufus	Rufous hummingbird	λ	λ		
Sialia mexicana	Western bluebird		λ	λ	
Sitta carolinensis	White-breasted nuthatch				λ
Sturnella neglecta	Western meadowlark		λ		
Sturnus vulgaris	European starling			λ	λ
Tachycineta thalassina	Violet-green swallow	λ	λ	λ	
Thryomanes bewickii	Bewick's wren			λ	
Troglodyles troglodytes	Marsh wren	λ	λ		
Turdus migratorius	American robin	λ	λ	λ	λ
Tyrannus vertacalis	Western kingbird			λ	λ
Vireo huttoni	Hutton's vireo			λ	
Wilsonia pusilla	Wilson's warbler	λ	λ	λ	λ
Zenaida macrona	Mourning dove		λ	λ	
Zonotrichia leucophrys	White-crowned sparrow	λ	λ	λ	λ
AMPHIBIANS, REPTILES, FISH					
Ambystoma gracile	Northwestern salamander	λ			
Ambystoma macrodactylum	Long-toed salamander	λ			
Cottus gulosus	Riffle sculpin	λ			
Ensatina eschscholtzi	Ensatina				λ
Gambusia affinis	Mosquitofish	λ			
Pseudacris regilla	Pacific treefrog/chorus frog	λ		λ	λ
Plethodon vehiculum	Western red-backed salamander	λ			λ
Rana aurora aurora	Northern red-legged frog	λ			
Rana catesbeiana	Bullfrog	λ		λ	

SCIENTIFIC NAME	COMMON NAME	HABITATS			
AMPHIBIANS, REPTILES, FISH (continued)		OPEN WATER	GRASSLAND	SCRUB/SHRUB	FOREST
Taricha granulosa	Roughskin newt	λ			
Thamnophis sirtalis	Common garter snake	λ			
Thamnophis ordinoides	Northwestern garter snake	λ			
MAMMALS					
Canis latrans	Coyote		λ		λ
Castor canadensis	Beaver	λ	λ	λ	
Didelphis marsupalis	Common opossum		λ		
Eptesicus fuscus	Big brown bat				λ
Eutamias townsendii	Townsend chipmunk			λ	λ
Felis concolor	Mountain lion		λ		
Lutra canadensis	River otter	λ			
Lynx rufus	Bobcat				λ
Mephitis mephitis	Striped skunk		λ		
Microtus oregoni	Creeping vole		λ		λ
Microtus townsendii	Townsend's vole		λ		
Mus musculus	House mouse				λ
Mustela frenata	Long-tailed weasel		λ		
Myocastor coypu	Nutria	λ			
Neotoma fuscipes	Dusky-footed woodrat				λ
Neotoma sp.	Woodrat		λ	λ	λ
Neurotrichus gibbsii	Shrew-mole				λ
Odocoileus hemonius ssp. columbianus	Mule deer		λ	λ	λ
Peromyscus maniculatus	Deer mouse				λ
Procyon lotor	Common raccoon	λ		λ	
Scapanus townsendii	Townsends'mole		λ		λ
Sciurus griseus	Western gray squirrel			λ	λ
Sorex bendirii	Marsh shrew		λ		
Sylvilagus bachmani	Brush rabbit		λ		

Table 13: Results of small mammal live trapping at North Multnomah Channel Marsh (Adolfson, 2000)

WILDLIFE TRANSECT 1					
SPECIES	**POINT 1**	**POINT 2**	**POINT 3**	**POINT 4**	**POINT 5**
Townsend's vole (*Microtus townsendii*)	**1**	0	0	0	**1**
Creeping vole (*Microtus oregoni*)	0	0	**1**	0	0
House mouse (*Mus musculus*)	**1**	0	0	0	0
Dusky-footed woodrat (*Neotoma fuscipes*)	0	0	**1**	0	0
Shrew-mole (*Neurotrichus gibbsii*)	0	**1**	**1** (dead)	0	0
WILDLIFE TRANSECT 2					
SPECIES	**POINT 1**	**POINT 2**	**POINT 3**	**POINT 4**	**POINT 5**
Townsend's vole (*Microtus townsendii*)	0	**1**	**2**	0	0
House mouse (*Mus musculus*)	0	0	**1**	**1**	0
Marsh shrew (*Sorex bendirii*)	0	0	0	**2**	0
WILDLIFE TRANSECT 4					
SPECIES	**POINT 1**	**POINT 2**	**POINT 3**	**POINT 4**	**POINT 5**
Townsend's vole (*Microtus townsendii*)	**1**	0	0	0	0
Dusky-footed woodrat (*Neotoma fuscipes*)	0	**1**	0	0	0
Deer mouse (*Peromyscus maniculatus*)	0	0	0	0	**2**

Table 14: Monthly catch of fish and crustacean species from Oneida Lake traps in the north and south Multnomah Channel Marsh wetland ponds combines, January-June 2014. Sampling effort in trap-days is shown in parenthesis.

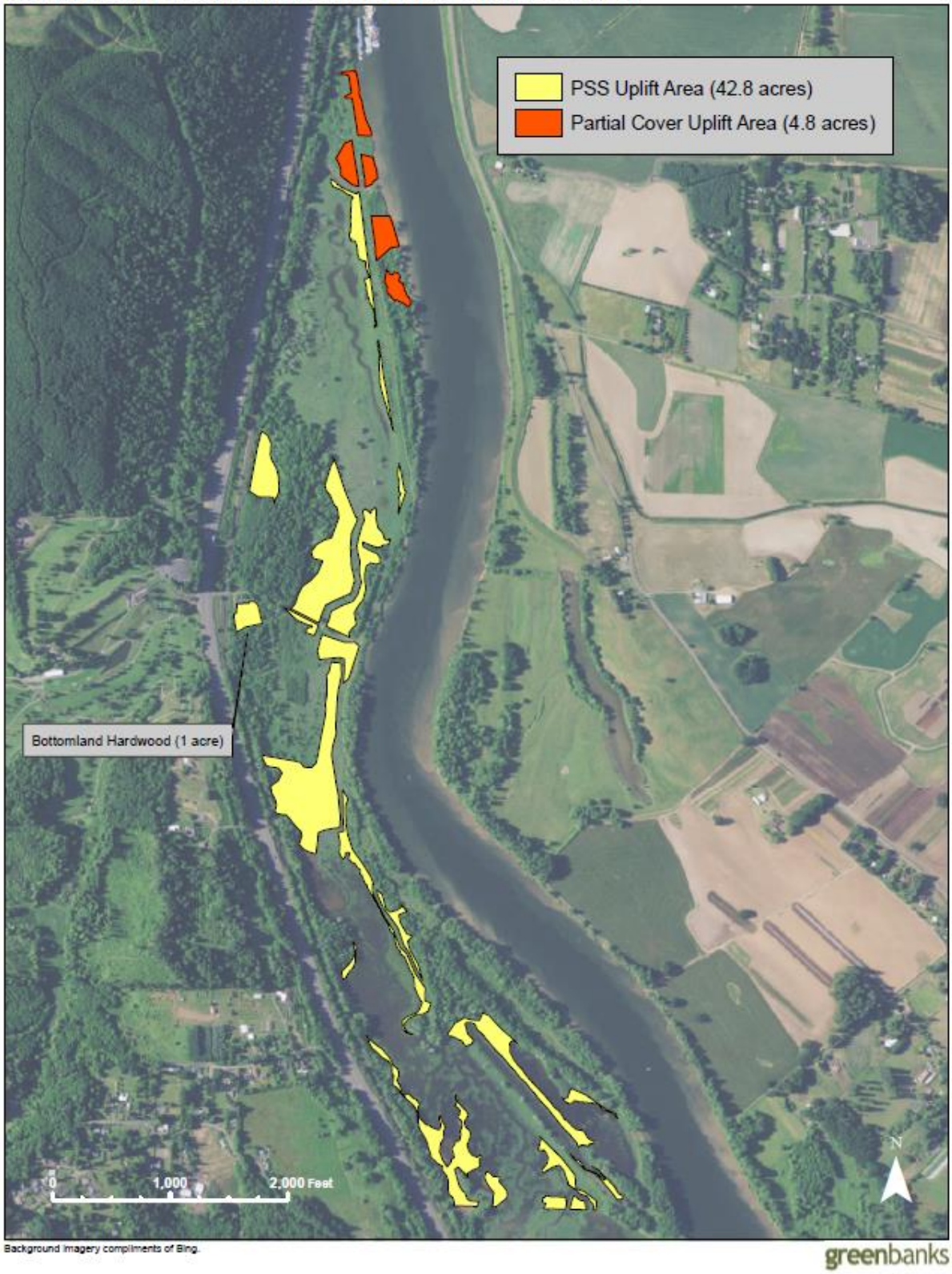
	Oneida net catch 2014						
Species	January (26)	February (60)	March (58)	April (34)	May (42)	June (11)	Total
Salmonids							
Chinook salmon (juvenile)				2	3		5
Coho salmon (juvenile)		1	2	14			17
Native species							
Chiselmouth		1					1
Largescale sucker		3	7	4	5	6	25
Northern pikeminnow	31	22	6	1	1	6	67
Pacific lamprey					1	2	3
Peamouth	2	10	664	180	6		862
Redside shiner	17	206	116	5	20		364
Reticulate sculpin	5	23	212	85	80	15	420
Threespine stickleback	5,966	3,847	868	766	16,044	2,340	29,831
Western brook lamprey	1	7	4	2			14
Signal crayfish			1				1
Non-native species							
Amur goby			1	3	2		6
Banded killifish	1		3	1	10	4	19
Bluegill	6	3	17	50	67	13	156
Black crappie				7	4	115	126
Brown bullhead	470	1,547	2,438	713	309	456	5,933
Common carp		1	5			1,475	1,481
Golden shiner	467	9	7	13	26	4	526
Goldfish	82	92	712	20	138	8	1,052
Largemouth bass			1	1	3	881	886
Oriental weatherfish	106	196	497	408	310	40	1,557
Pumpkinseed	43	18	59	109	242	66	537
Siberian shrimp				2	5		7
Warmouth	5	9	5	4	25	3	51
White crappie	5		4				9
Yellow perch	2	3	11	13	4	27	60
Total catch	7,209	6,004	5,640	2,401	17,301	5,477	44,023

Table 15: Monthly Oneida Lake trap net catch of fish and crustacean species in the north and south Multnomah Channel ponds, January-June 2015 (data combined for both ponds). Parentheses indicate sampling effort in trap days.

Species	January (26)	February (32)	March (56)	April (56)	May (16)	Total
Salmon						
Chinook salmon	2				3*	5
Coastal cutthroat trout				1		1
Coho salmon				4	1	5
Native Species						
Chiselmouth				3		3
Largescale sucker		1		1		2
Northern pikeminnow	4	1	5	2	1	13
Pacific lamprey			2	1		3
Peamouth				1		1
Prickly sculpin		1		1		2
Redside shiner	211	162	14			387
Reticulate sculpin	3		2			5
Threespine stickleback	3,579	1,633	8,259	25,832	86,044	125,347
Unidentified cyprinid	10		3			13
Western brook lamprey	1				1	2
Non-Native Species						
Banded killifish	3	2		6	1	12
Black crappie	314	113	238	89	15	769
Bluegill	7	4	60	12	9	92
Brown bullhead	599	351	2,489	2,342	1,321	7,102
Common carp	19	16	50	136	5	226
Golden shiner	88	49	124	289	12	562
Goldfish	244	61	308	418	25	1,056
Largemouth bass	2		2	6	5	15
Mosquitofish	4			1		5
Oriental weatherfish	25	32	864	1,804	197	2,922
Pumpkinseed	43	21	67	50	96	277
Warmouth			6	2	2	10
Yellow perch	23	1	5	26	2	57
Total catch	5,181	2,448	12,498	31,027	87,741	138,895

* Two hatchery fish

Multnomah Channel Marsh: Ecotone Enhancement



MULTNOMAH CHANNEL MARSH ECOTONE ENHANCEMENT PROJECT ESTIMATE

Table 16: Site preparation, 2018

TASK	UNITS	TIMING	COST PER UNIT (GREEN BANKS)	ESTIMATED COST	COMMENTS
PSS uplift area (41.8 acres)					
Site prep - backpack spot of area spray	41.8 acres	Early summer	$300.00	$12,540.00	
Site prep - herbicide material cost	41.8 acres	Early summer	$41.00	$1,713.80	
Site prep - backpack spot of area spray	41.8 acres	Late summer	$300.00	$12,540.00	
Site prep - herbicide material cost	41.8 acres	Late summer	$41.00	$1,713.80	
Bottomland hardwood uplift area (1 acre)					
Site prep - backpack spot of area spray	1 acre	Early summer	$300.00	$300.00	
Site prep - herbicide material cost	1 acre	Early summer	$41.00	$41.00	
Site prep - backpack spot of area spray	1 acre	Late summer	$300.00	$300.00	
Site prep - herbicide material cost	1 acre	Late summer	$41.00	$41.00	
Partial cover uplift area (4.8 acres)					
Site prep - backpack spot of area spray	4.8 acres	Early summer	$300.00	$1,440.00	
Site prep - herbicide material cost	4.8 acres	Early summer	$41.00	$196.80	
Site prep - backpack spot of area spray	4.8 acres	Late summer	$300.00	$1,440.00	
Site prep - herbicide material cost	4.8 acres	Late summer	$41.00	$196.80	
			SUB TOTAL:	$32,266.40	

Table 17: Planting, fall 2018 to early summer 2019

TASK	UNITS	TIMING	COST PER UNIT (GREEN BANKS)	ESTIMATED COST	COMMENTS
PSS uplift areas (41.8 acres)					
Planting - scalp	151,060	Fall to summer	$0.29	$43,807.40	
Plant material - live stake (4 foot)	108,730	Fall to summer	$1.00	$108,730.00	Harvest or acquire from nursery
Planting - install large pole cuttings	108,730	Fall to summer	$0.30	$32,619.00	
Plant material - large bare root	42,330	Winter to spring	$0.80	$33,864.00	Acquire from nursery
Planting - plant large bare root plants	42,330	Winter to spring	$0.55	$23,281.50	
Bottomland hardwood uplift area (1 acre)					
Planting - scalp	3,630	Winter to spring	$0.29	$1,052.70	
Plant material - large bare root	3,630	Winter to spring	$0.80	$2,904.00	Acquire from nursery
Planting - plant large bare root plants	3,630	Winter to spring	$0.55	$1,996.50	
Partial cover uplift areas (4.8 acres)					
Planting – scalp	6,975	Winter to spring	$0.29	$2,022.75	
Plant material - live stake (4 foot)	1,200	Fall to summer	$1.00	$1,200.00	Harvest or acquire from nursery
Planting - install large pole cuttings	1,200	Fall to summer	$0.30	$360.00	
Plant material- large bare root	5,775	Winter to spring	$0.55	$3,176.25	Acquire from nursery
All uplift planting areas					
Maintenance - hourly labor	100	Fall to summer	$33.00	$3,300.00	Install browse fencing
Material - browse protection fencing	1	Fall to summer	$1,000.00	$1,000.00	Material cost of fencing
Planting - hourly planting	100	Fall to summer	$33.50	$3,350.00	Some hourly planting budgeted for difficult areas
			SUB TOTAL:	$262,664.10	

Table 18: Maintenance, 2019

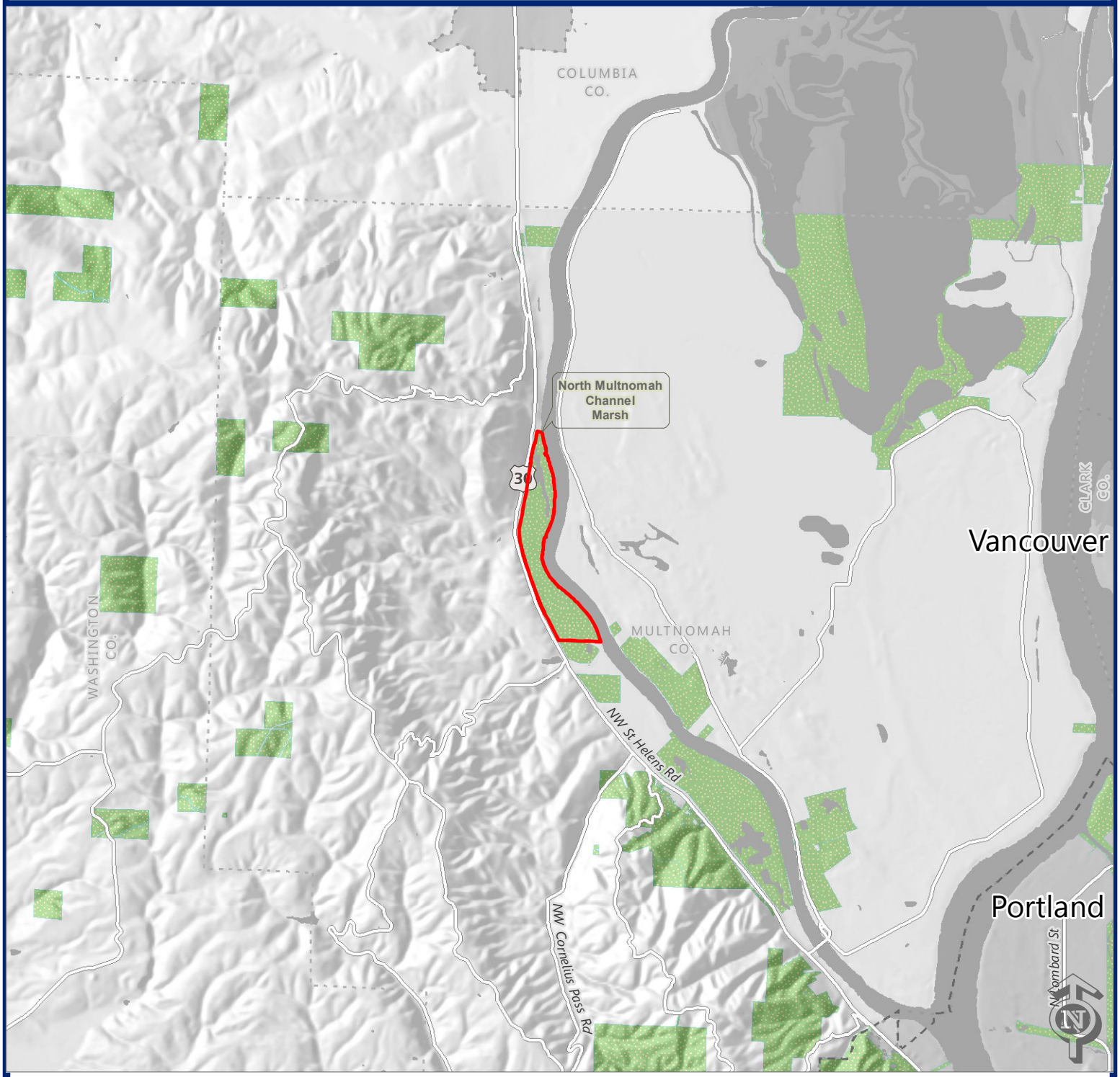
TASK	UNITS	TIMING	COST PER UNIT (GREEN BANKS)	ESTIMATED COST	COMMENTS
PSS uplift areas (41.8 acres)					
Maintenance - field mowing between planting rows or clusters of plants	20 acres	Early summer	$182.00	$3,640.00	Estimated acreage that can be Billy Goat Mowed
Maintenance - field mowing mobilization	8 acres	Early summer	$88.00	$704.00	Mobilization
Maintenance - hand mow/cut	21.8 acres	Early summer	$360.00	$7,848.00	String trimming
Maintenance - backpack ring or row spray	10 acres	Early summer	$230.00	$2,300.00	
Maintenance - herbicide material cost	10 acres	Early summer	$30.00	$300.00	
Maintenance – field mowing between planting rows or clusters of plants	20 acres	Late summer	$182.00	$3,640.00	Estimated acreage that can be Billy Goat mowed
Maintenance - field mowing mobilization	8 acres	Late summer	$88.00	$704.00	Mobilization
Maintenance - hand mow/cut	21.8 acres	Late summer	$360.00	$7,848.00	String trimming
Maintenance - backpack ring or row spray	10 acres	Late summer	$230.00	$2,300.00	
Maintenance - herbicide material cost	10 acres	Late summer	$30.00	$300.00	
Bottomland hardwood uplift area (1 acre)					
Maintenance - Field mowing between planting rows or clusters of plants	1 acre	Early summer	$182.00	$182.00	Billy Goat mow
Maintenance - Backpack ring or row spray	1 acre	Early summer	$230.00	$230.00	
Maintenance - Herbicide material cost	1 acre	Early summer	$30.00	$30.00	
Maintenance - field mowing between planting rows or clusters of plants	1 acre	Late summer	$182.00	$182.00	Billy Goat mow
Maintenance - backpack ring or row spray	1 acre	Late summer	$230.00	$230.00	
Maintenance - herbicide material cost	1 acre	Late summer	$30.00	$30.00	
Partial cover uplift areas (4.8 acres)					
Maintenance - field mowing between planting rows or clusters of plants	4.8 acres	Early summer	$182.00	$873.60	Billy Goat mow
Maintenance - backpack ring or row spray	4.8 acres	Early summer	$230.00	$1,104.00	
Maintenance - herbicide material cost	4.8 acres	Early summer	$30.00	$144.00	
Maintenance - field mowing between planting rows or clusters of plants	4.8 acres	Late summer	$182.00	$873.60	Billy Goat mow

Table 18: Maintenance, 2019
(continued)

Partial cover uplift areas (4.8 acres) continued					
Maintenance - backpack ring or row spray	4.8 acres	Late summer	$230.00	$1,104.00	
Maintenance - herbicide material cost	4.8 acres	Late summer	$30.00	$144.00	
			SUB TOTAL:	$34,711.20	
TOTAL COST of site preparation, planting, and 2019 maintenance					**$329.641.70**

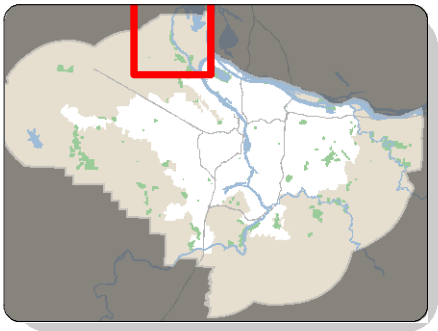
VICINITY MAP

Metro



North Multnomah Channel Marsh site

Other Metro sites



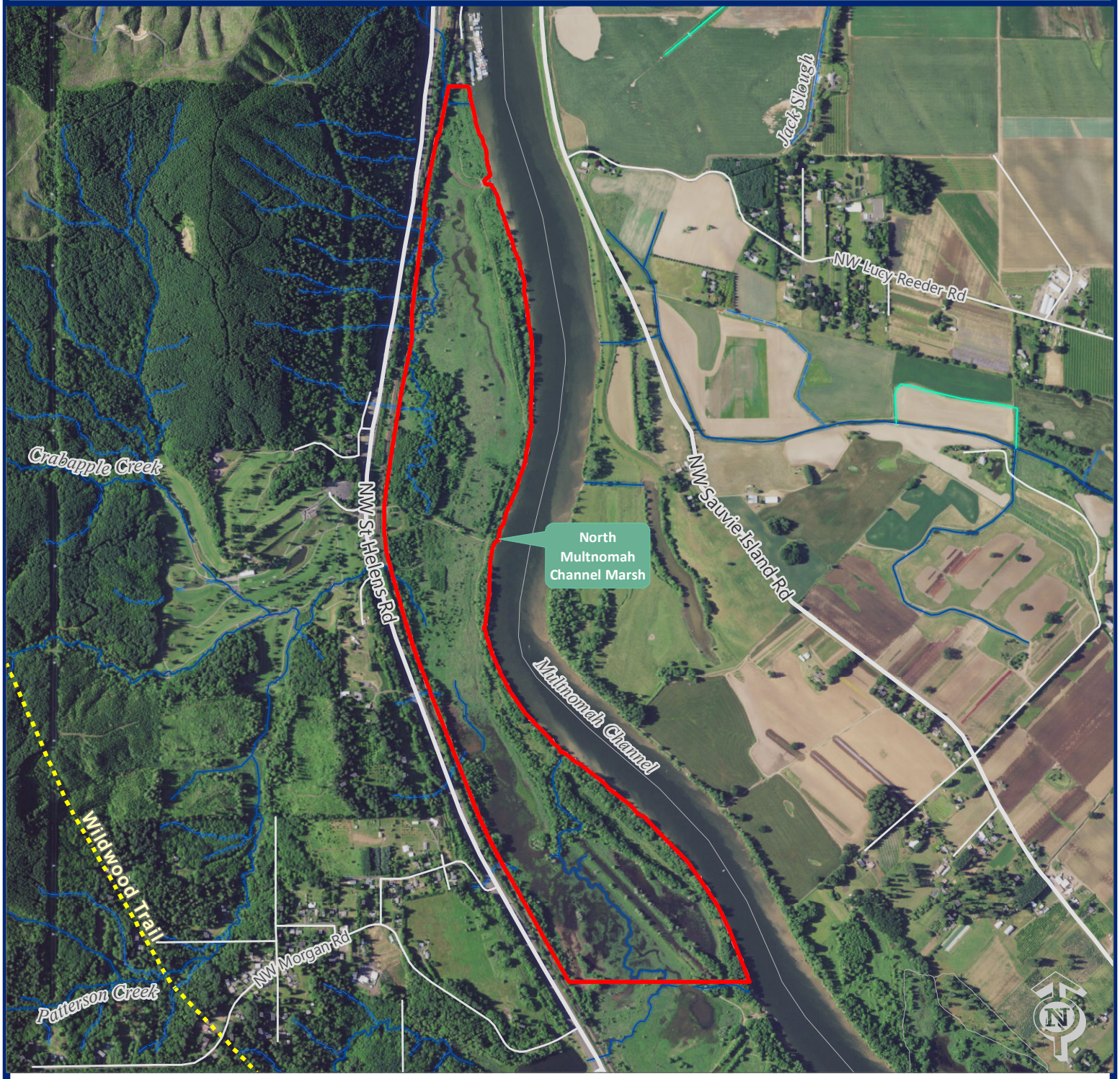
0 1.5 3 Miles

North Multnomah Channel Marsh Site Conservation Plan

map date: 11/9/2017

SITE MAP

Metro



North Multnomah Channel Marsh site

Other Metro sites

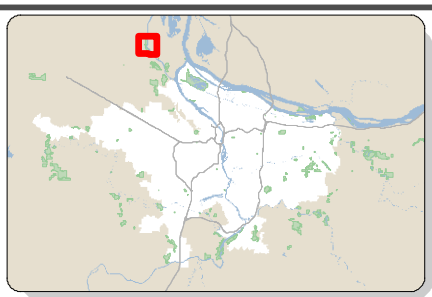
Canal

NHDplusStrmFlowline

Intermittent stream

Perennial stream

Proposed Trail



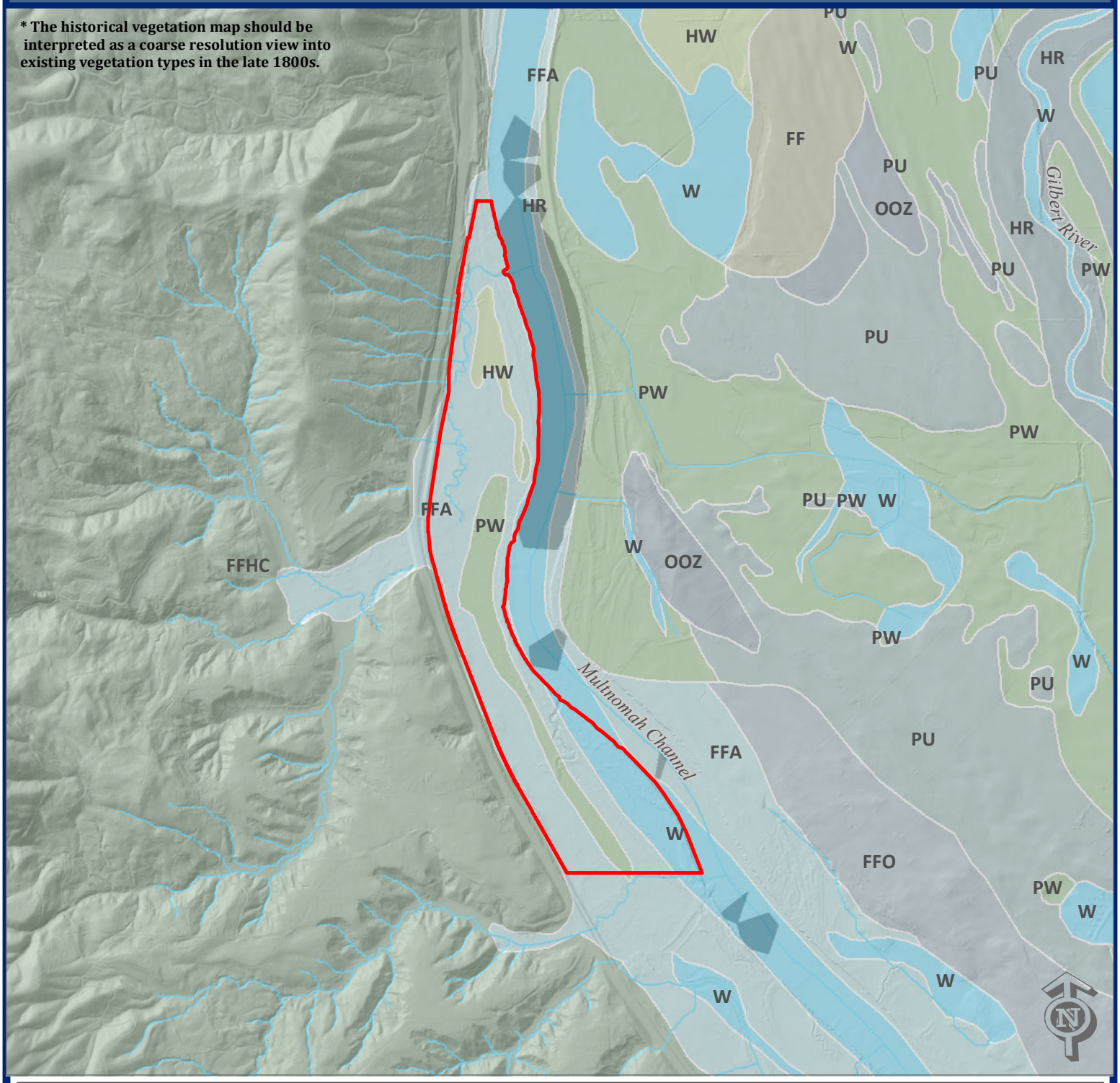
0 2,100 4,200 Feet

North Multnomah Channel Marsh Site Conservation Plan

map date: 11/9/2017

HISTORICAL VEGETATION

Metro



North Multnomah Channel Marsh site

Other Metro sites

Historical vegetation

- FF - Closed forest; Upland
- FFA - Closed forest; Riparian & Wetland
- FFHC - Closed forest; Upland
- FFO - Closed forest; Upland
- HR - Shrubland
- HW - Shrubland
- OOZ - Woodland
- PU - Prairie
- PW - Prairie
- W - Water

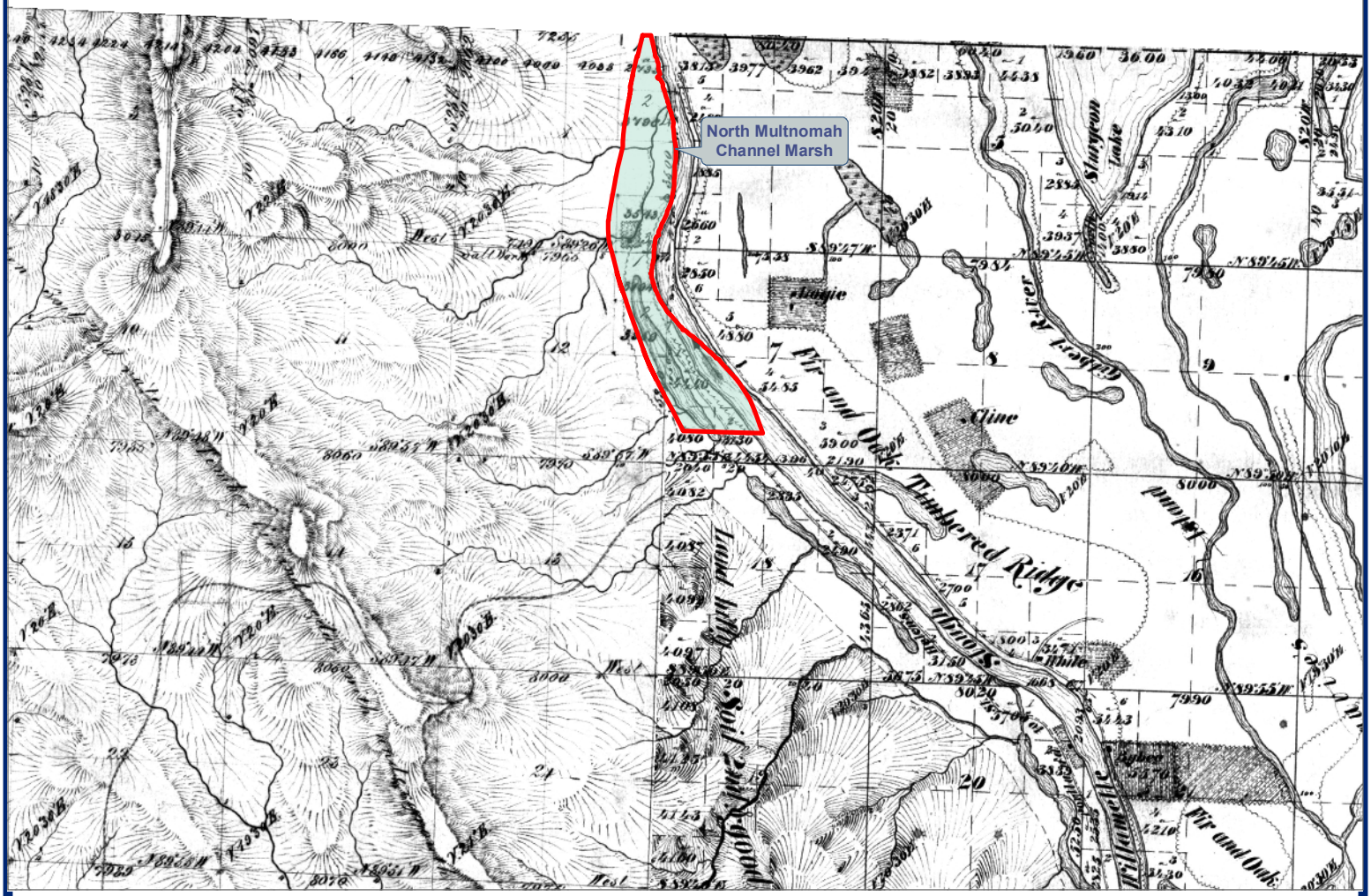
0 2,000 4,000 Feet

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

GENERAL LAND OFFICE (GLO) MAP

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

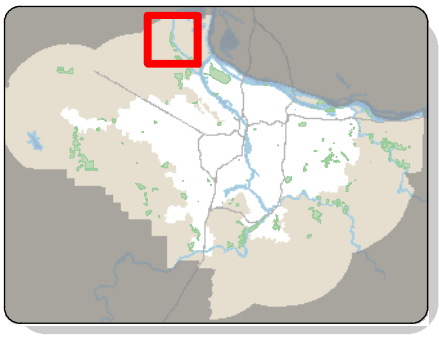
Metro



North Multnomah Channel Marsh site

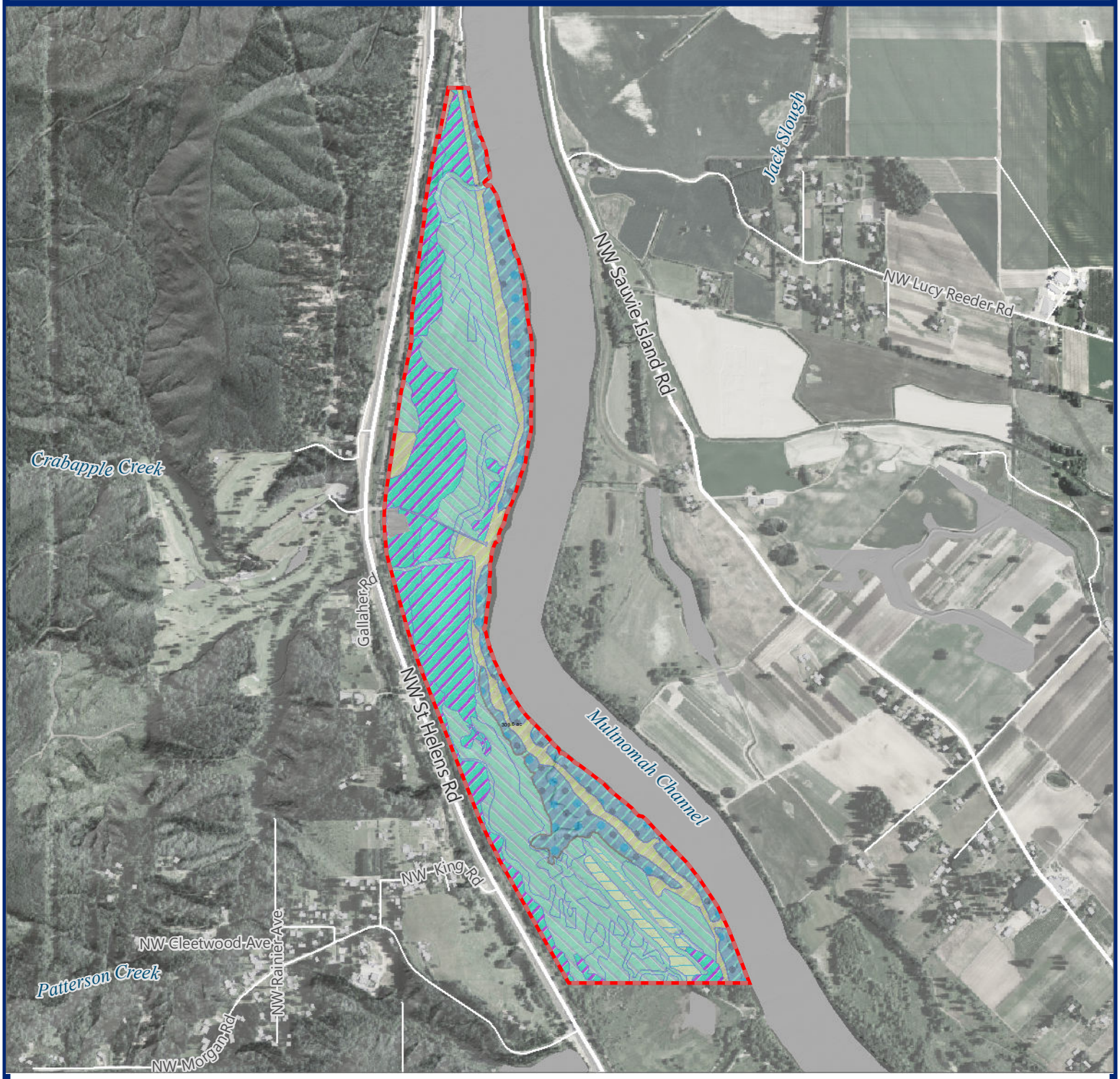
Other Metro sites

0 1 2 Miles



CURRENT COVER

Metro



North Multnomah Channel Marsh site

Other Metro sites

Developed - (impervious)

Prairie - (wet)

Riparian forest

Wetland - bottomland hardwood

Wetland - emergent

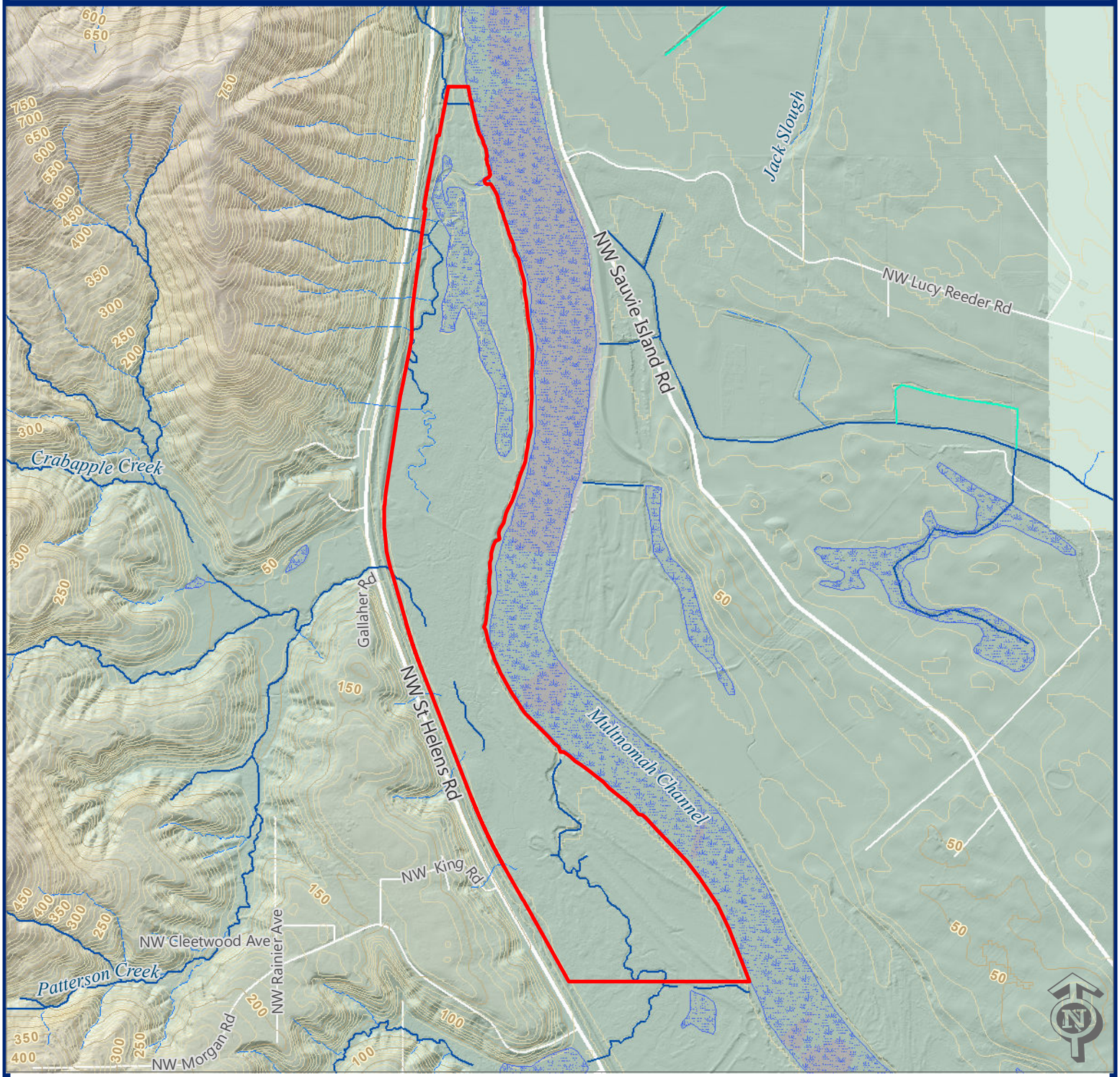
Wetland - shrub

Woodland - oak

0 1,800 3,600 Feet

TOPOGRAPHY

Metro



North Multnomah Channel Marsh site

Other Metro sites

NHDplusStrmFlowline

Intermittent stream

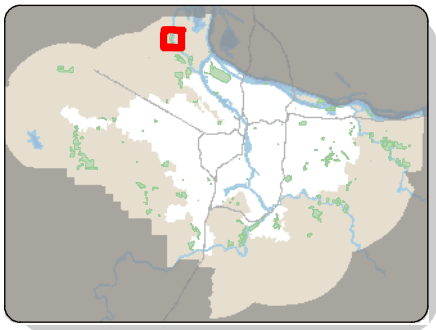
Perennial stream

Canal

10 ft contour

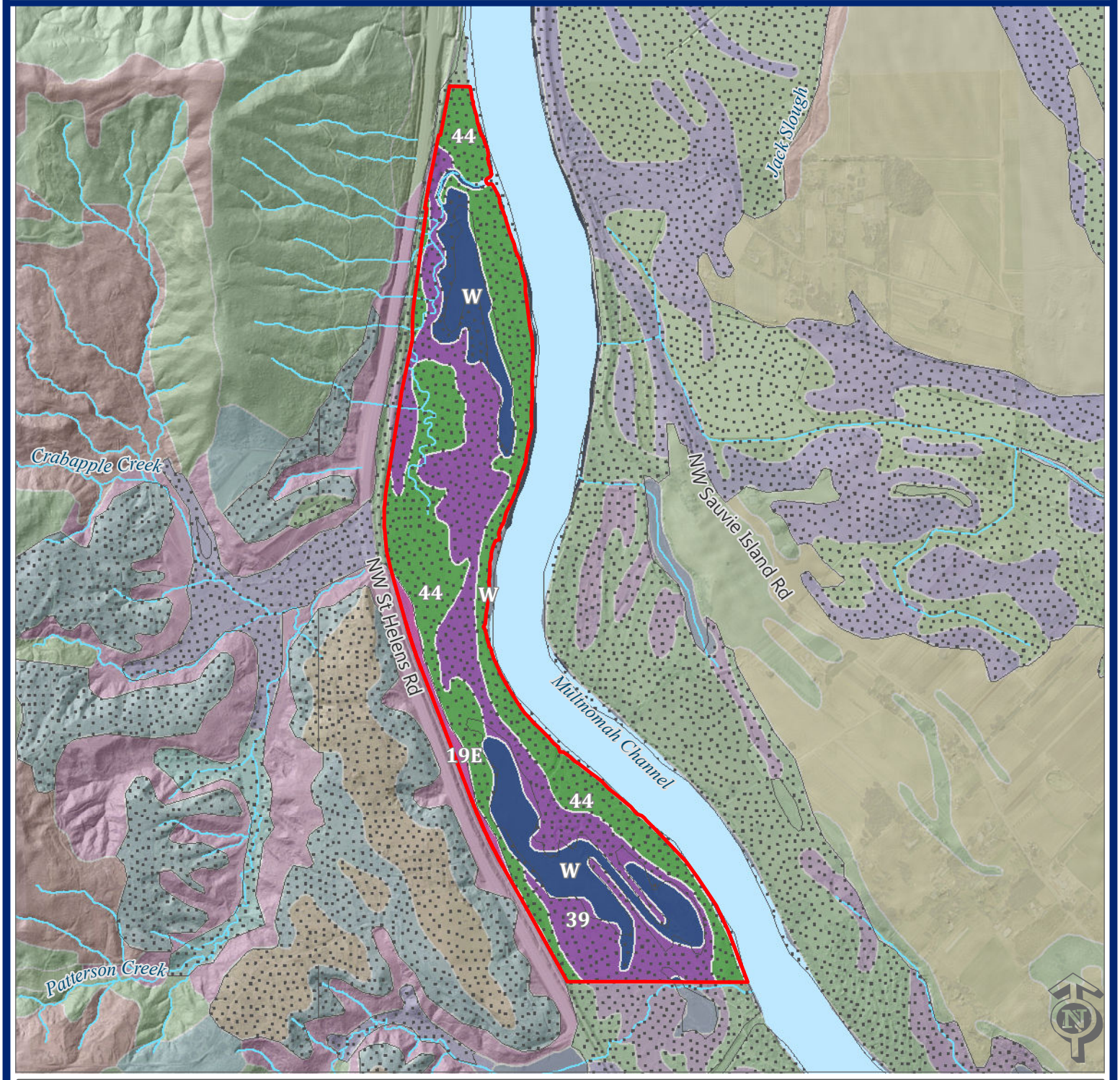
50 ft contour

0 2,100 4,200 Feet



SOILS

Metro



North Multnomah Channel Marsh

Hydric soils

19E - Haploxerolls, steep

39 - Rafton silt loam

44 - Sauvie silt loam

W - Water

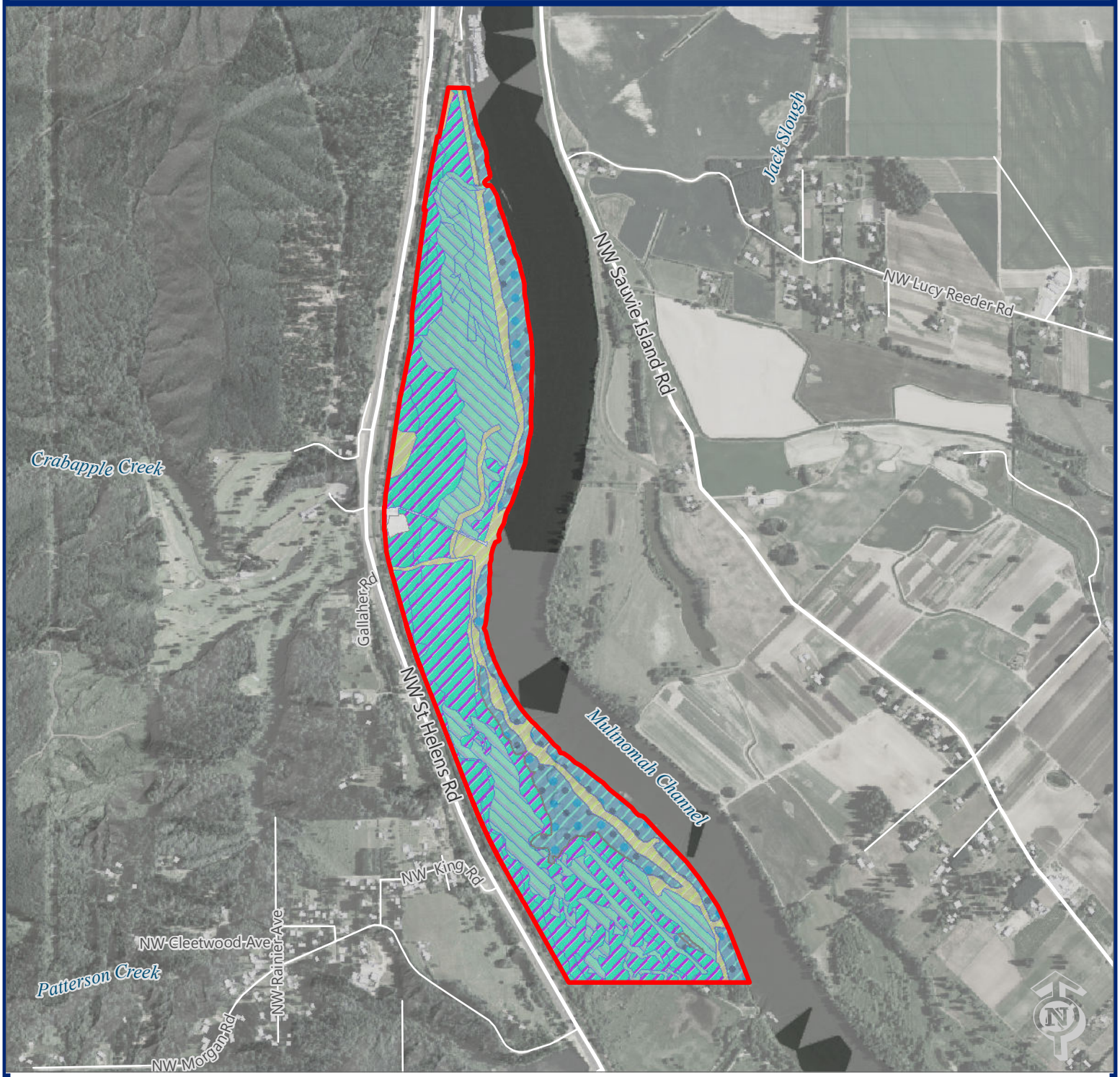
0 1,800 3,600 Feet

North Multnomah Channel Marsh Site Conservation Plan

map date: 2/27/2018

CONSERVATION TARGETS

Metro



North Multnomah Channel Marsh site

Other Metro sites

No targets

Bottomland hardwood wetland

Emergent wetland

Oak woodland

Riparian forest

Shrub dominated wetland

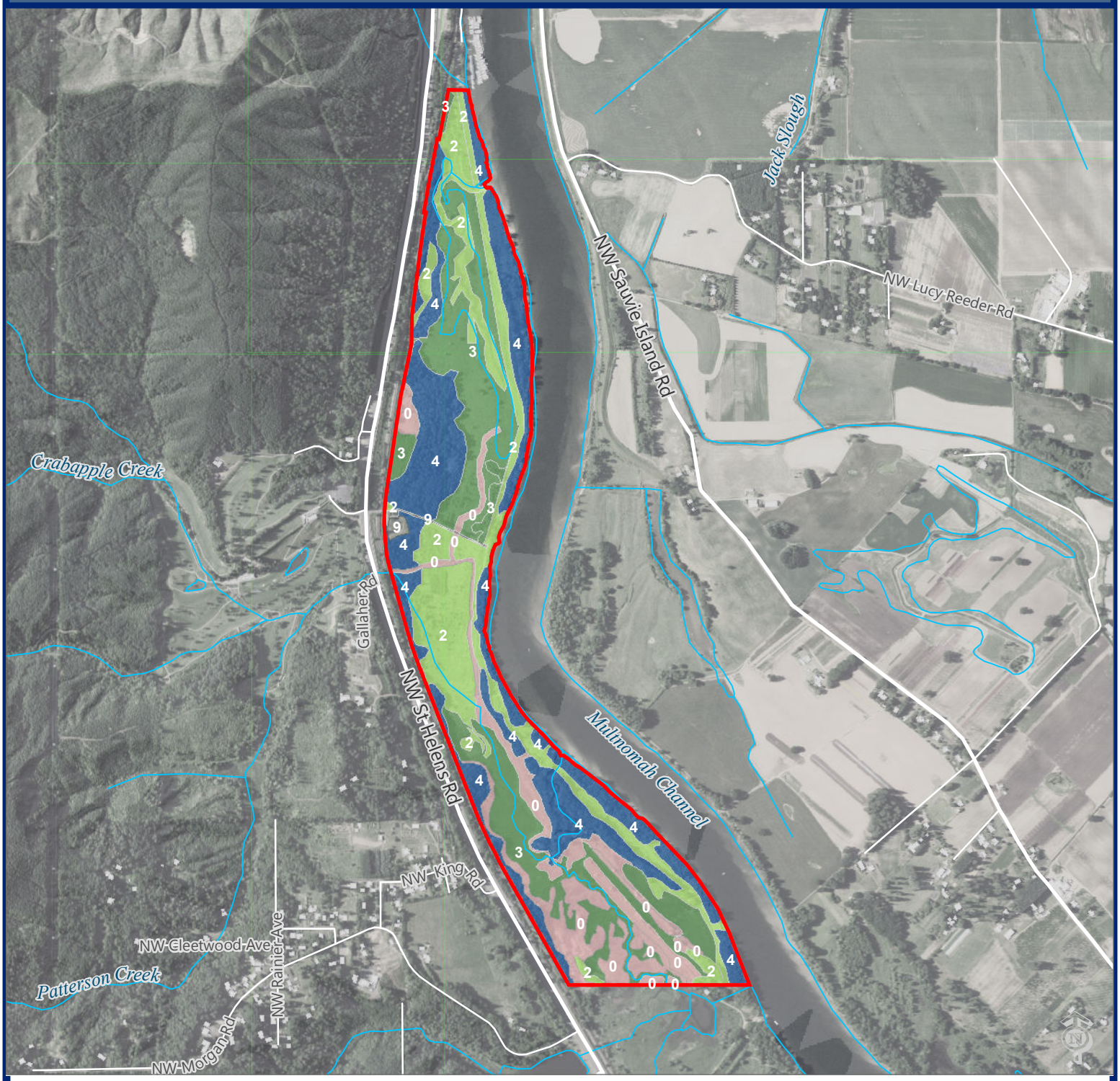
0 1,800 3,600 Feet

North Multnomah Channel Marsh Site Conservation Plan

map date: 2/27/2018

MANAGEMENT STATUS

Metro



North Multnomah Channel Marsh site

Other Metro sites

0 - Pre-Initiation

1 - Initiation

2 - Establishment

3 - Consolidation

4 - Refinement and long-term maintenance

9 - No targets (developed)

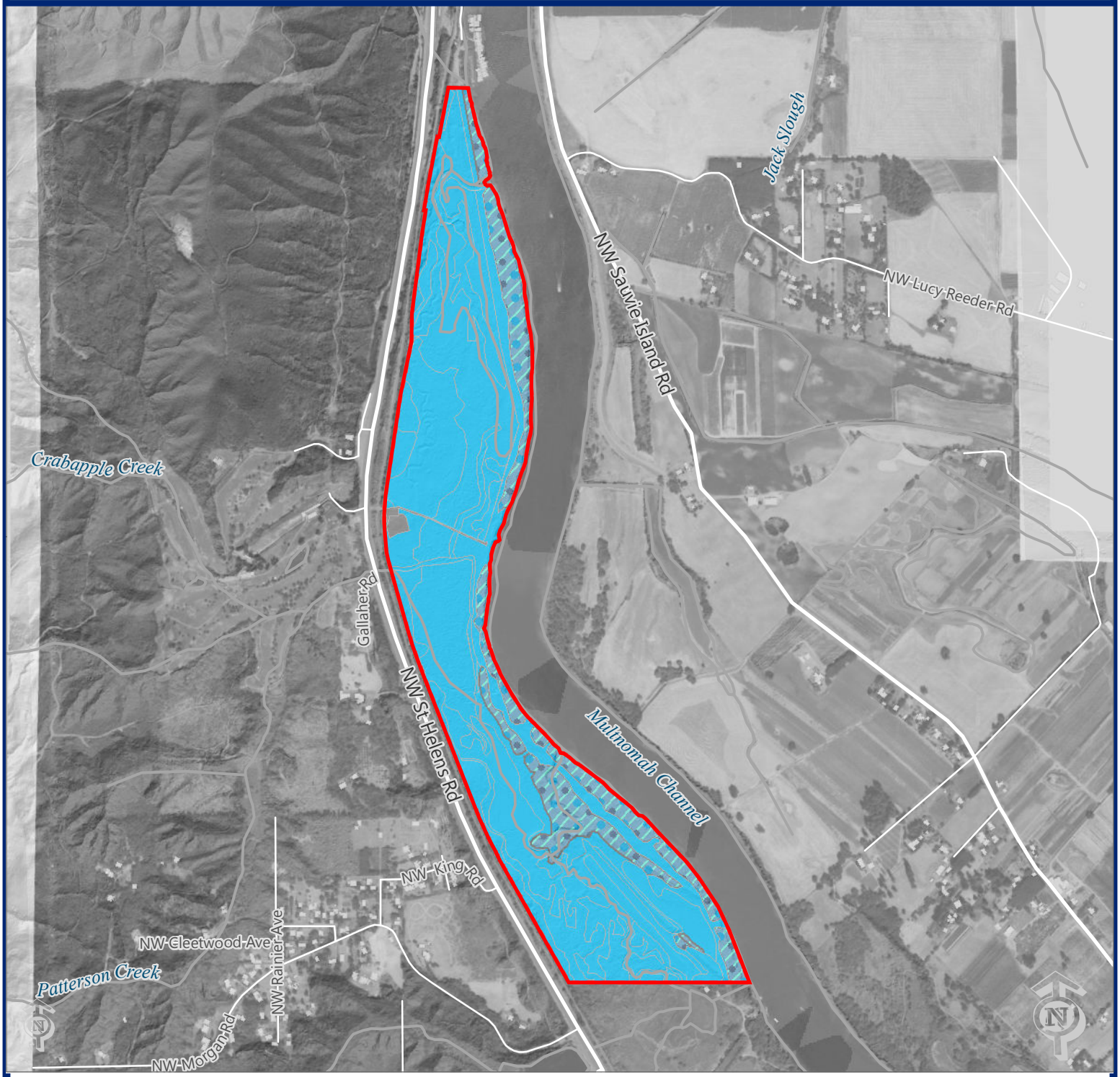
0 1,800 3,600 Feet

North Multnomah Channel Marsh Site Conservation Plan

map date: 2/27/2018

STEWARDSHIP CLASS

Metro



North Multnomah Channel Marsh site

Other Metro sites

Stewardship Class

- Agriculture
- Beaches, bars and mudflats
- Developed
- Prairie
- Riparian forest
- Savanna
- Upland forest
- Water
- Wetland
- Woodland
- Undeclared

0 1,800 3,600 Feet

North Multnomah Channel Marsh Site Conservation Plan

map date: 2/27/2018