

SITE CONSERVATION PLANS

North Tualatin Mountain Forests



Burlington Creek Forest Natural Area | July 2014

Ennis Creek Forest Natural Area | July 2014

McCarthy Creek Forest Natural Area | Oct. 2015

Updated June 2016



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NORTH TUALATIN MOUNTAIN FORESTS NATURAL AREA

The North Tualatin Mountain Forests Natural Area describes a collection of three Metro natural area sites located in the northern portion of the Tualatin Mountains, just north of Forest Park. Collectively, the three sites – Burlington Creek Forest, Ennis Creek Forest and McCarthy Creek Forest – protect almost 1,000 acres of natural areas in the north Tualatin Mountains. This site conservation plan integrates the three sites into one guiding document, with separate chapters dedicated to each site.

CHAPTER 1 | BURLINGTON CREEK FOREST NATURAL AREA

INTRODUCTION

The 350-acre Burlington Creek Forest site is part of the Metro Forest Park target area, located on the eastern face of the northern Tualatin Mountains, north of Forest Park and west of Highway 30 in west Multnomah County.

The area surrounding Burlington Creek Forest contains a mixture of land uses including residential, timber harvest, gravel extraction and golf course. The City of Portland’s Forest Park lies south of the site. The ~400-acre BPA-owned and ODFW-managed Burlington Bottoms wetlands lies east and downslope of the site, across Highway 30.

The site is drained by Burlington Creek and several small unnamed seasonal streams.

PLANNING AREA

Although Burlington Creek Forest’s planning area is defined by the site’s boundaries, i.e., Metro ownership, there are large expanses of privately- and publicly-owned properties nearby that share habitat features with the forest, and influence its potential ecological viability and larger landscape value. These properties are important to the development of effective conservation strategies for Burlington Creek Forest, but detailed evaluations of their stewardship classification, targets, etc. are beyond the scope of this plan.

Key staff

Curt Zonick, natural resources scientist
Adam Stellmacher, lead natural resources specialist
Jeff Merrill, natural resources scientist
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Katy Weil, wildlife monitoring coordinator
Robert Spurlock, parks and natural areas planner
Laurie Wulf, property management specialist
Barbara Edwardson, real estate negotiator

Key private landowners

Brian Lightfoot
Michael Baker
Forest Park Conservancy
Skyline Ridge Neighbors

EXISTING PLANNING DOCUMENTS

1. *Forest Stand Management Recommendations; Metro's Agency Creek and Ennis Creek Tracts*, a forest stand assessment conducted by Trout Mountain Forestry in 2012. The document is located at: <M:\PN\Regional Properties\Forest Park Connections TA\Stewardship-Property Management\Stand Mgt>.
2. An assessment of pre-commercial thinning options for the site, including recommendations, was conducted by Trout Mountain Forestry in 2013/2014. A final report is pending.
3. *Greater Forest Park Conservation Initiative*, a 2013 document prepared by the Forest Park Conservancy in cooperation with the City of Portland, Metro and others. The document is located at: <M:\PN\Regional Properties\Forest Park Connections TA\Stewardship-Property Management\Forest Park\GFPCI Report>.
4. *Forest Park Ecological Prescriptions*, a 2011 Forest Park management plan developed by the City of Portland, with input from Metro, Audubon, the Forest Park Conservancy and others. The document is located at: <M:\PN\Regional Properties\Forest Park Connections TA\Stewardship-Property Management\Forest Park\City of Portland, Forest Park Ecological Prescriptions>.

SITE DESCRIPTION

The primary access points for the Burlington Creek Forest are along McNamee Road. The site is dominated by hardwood, Douglas-fir and mixed hardwood/conifer forest. Most of the forest at the site is just over 20 years old, following logging and reforestation of approximately 250 acres of the site in the early 1990s. Logging roads remain, providing good access. Because the site lies along the eastern side of the Tualatin Mountains, slopes are steep (30-60 percent) over much of the site. The lower/eastern edge is encumbered by railroad and utility uses, and these areas are among the most challenged by non-native weed populations.

Soils present at Burlington Creek Forest

MAP SOIL SYMBOL	MAP UNIT NAME	DESCRIPTION
17 D, E	Goble silt loam	Moderately well-drained soils on rolling ridgetops and convex side slopes of ridgetops.
37 B, C	Quatama loam	Moderately well-drained soil on low terraces, elevation 75-400 feet.
55	Wapato silt loam	Poorly drained floodplain soil. Present along lower Burlington Creek Forest in the site's northern extent.

Historic habitats at Burlington Creek Forest

~ % COVER	HABITAT TYPE	HISTORIC HABITAT DESCRIPTION BY GLO SURVEYOR NOTES
100%	Closed forest; upland	Northern half of site: Mesic mixed conifer forest with mostly deciduous understory. May include Douglas fir, western hemlock, red cedar, grand fir, bigleaf maple, yew, dogwood, white oak, red alder. Southern half of site: FFHC, but burned, often with scattered trees surviving fire.

RECENT MANAGEMENT HISTORY

The site has been managed with road maintenance and forest edge weed abatement priorities over the past 10-15 years. Periodic mowing along the access roads, and culvert cleaning/replacement actions have been implemented as needed. Actions to suppress English ivy infestations, primarily in

the site's northeast extent, began in 2013 and are expected to continue through 2015. Forest stand assessment and complementary pre-commercial thinning assessments were conducted in 2012 and 2013, and are expected to lead to selective thinning in 2015 to enhance forest structure, preserve maturing tree canopy, and understory native herb and shrub diversity.

ACCESS AND RECREATION

The Parks and Natural Areas Planning group is developing a new visitor experience overview that will be added to this site conservation plan as an appendix at a later date. Metro will also develop a comprehensive plan for the site in late 2014 and early 2015.

Metro staff conducted an internal process to consider an appropriate level of access for each of its natural areas. The access designation is offered as a starting point, with the understanding that judgment will always be needed on a case-by-case basis, and indicates that some part of that site could accept people at the stated level. It does not suggest that the entire site should have that level of access.

The designated access level at Burlington Creek Forest is *Natural Area – High*. Access at this type of sites is allowed and may be promoted on a site-by-site basis. Parking areas may or may not be developed at these sites to facilitate access if necessary; restrooms may be installed on a site-by-site basis; basic rules and site identification signage are standard; soft surface, mineral soil or gravel trails are formalized and wayfinding signage may be posted to channel access and protect sensitive habitat. These sites are visited weekly or bi-weekly by Metro staff to inspect for unauthorized use and to conduct maintenance. These sites could move to a Nature Park designation in the future.

At present, hikers, joggers, mountain bikers and equestrians occasionally use the old logging roads on the site.

NATURAL RESOURCES OF SPECIAL INTEREST

With the exception of areas of heavy weed infestation along the access roads and the utility easements, the site is becoming well-represented by native cover. This site contributes to a larger block of protected forest land, including greater Forest Park and other Metro sites in this target area.

Maturing canopy-producing trees have begun to shade-suppress the extensive non-native blackberry infestations that dominated cover at the site following logging in the early 1990s. Isolated Oregon oak clusters occur at the site, primarily along the railroad and interface with residential properties at the low elevation side of the site.

A thorough ecological inventory and assessment has not been done for the site. Listed and rare species, such as Chinook salmon (juvenile Chinook salmon were detected during fish surveys on Burlington Creek Forest in 2012), northern red-legged frog and others almost certainly occur in Burlington Creek Forest. Coho and winter steelhead are present in lower Burlington Creek Forest.

Rare species known to occur at Burlington Creek Forest

	ORBIC LIST	FEDERAL STATUS	URBANIZING FLORA (2009)
<i>No documented occurrences of rare species, though species like red-legged frogs, Chinook salmon, steelhead, etc. seem likely.</i>	N/A	N/A	N/A

CONSERVATION TARGETS

There are three conservation targets for Burlington Creek Forest:

1. Upland forest
2. Riparian forest
3. Upland shrub

CURRENT AND DESIRED FUTURE CONDITION OF CONSERVATION TARGETS

Non-technical status and desired future condition of targets at Burlington Creek Forest

TARGET	CURRENT CONDITION	DESIRED FUTURE CONDITION
Upland closed forest	Generally good habitat structure, with increasing sparse but present understory of native shrubs and herbs. Canopy closure is reducing understory blackberry cover. Ivy is a concern needing vigilance, especially east and north of the railroad. Edges are ongoing weed maintenance areas, especially for blackberry and broadleaf herbaceous weeds like knapweed and thistles.	Accelerating forest stand maturation accompanied by increase in forest floor wood accumulations, native understory diversity and cover, and increased snag and wildlife trees. A reduction in edge weed cover, and eradication or near total control of ivy and other shade-tolerant system modifying weeds.
Riparian forest	Generally good, although areas of erosion and weed establishment are a problem. Better assessment of this habitat at the site is needed.	Opportunities to enhance stream canopy cover/shading, % native vegetation cover, and improve instream structure are likely present. Further investigation and planning are necessary before associated project can be implemented.
Upland shrub	These units are generally associated with the utility corridors. Condition varies throughout the site, with some areas in good to very good condition with well-established native cover and limited non-native infestations, to areas with heavy blackberry and Scots broom needing intensive management.	Desired conditions are for native shrubs and herbs to dominate cover with a limited presence of non-native plant species that are not displacing natives, and can be controlled with occasional weed abatement every 3-5 years.

Key ecological attributes for upland forest at Burlington Creek Forest

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Native tree and shrub richness	Number of native tree and shrub species per acre	<5 species per 0.4 ha (1 ac)	5-8 species 0.4 ha (1 ac)	8-12 species per 0.4 ha (1 ac)	>12 species per 0.4 ha (1 ac)	TBD (likely Good)	Good	Very Good	Estimate via site walk. Native wildlife species diversity is associated with native vegetation. A diversity of shrubs is more likely to provide food and shelter for species over the seasons. Shrub diversity is particularly important to pollinators and songbirds (Hagar 2003; Hennings 2006; Burghardt et al. 2009).
Condition	Vegetative structure: native tree and shrub layer	% native tree and shrub canopy cover (combined)	<25% cover	25-50% cover	50-75% cover	>75% cover	TBD (likely Poor-Fair)	Good	Very Good	Estimate via site walk. Native bird species richness is associated with the amount of native shrub cover (Hagar 2003; Hennings 2006). Numbers based on data analysis from local studies at 54 riparian study sites (Hennings 2001). Native shrub cover was as high as ~60%, with highest native shrub cover in the 50-60% tree canopy cover range.
Condition	Mature trees	Number and size (dbh) of species such as Douglas fir, western red cedar, western hemlock and grand fir	Mature trees lacking	<3 per ac with dbh >24 in	3-5 per ac with dbh >24 in	>5 per ac with dbh >24 in	TBD (likely Poor-Fair)	Good	Very good	Recruitment of native trees necessary for long-term health of upland forests. Saplings are < 2m tall. Based on PIF (2000) biological objective for WV large-canopy trees in riparian deciduous woodland.
Condition	Standing and downed dead trees	Average # snags and large wood (> 50 cm, or 20 in, DBH) per acre	< 5 snags and <5% down wood	5-11 snags and 5-10% down wood	12-18 snags and 10-20% down wood with moderate variety of size and age classes	>18 snags and >20% cover down wood in a good variety of size and age classes	TBD (likely Poor)	Good	Very Good	Estimate via site walk. Rankings distilled from multiple references and particularly from <i>Habitat Conservation for Landbirds in Lowlands and Valleys of Western Oregon and Washington</i> (Altman and Alexander 2012) and DecAID results for species' use of dead wood in westside lowland conifer-hardwood forests.
Landscape context	Edge condition	% of edge bordered by natural habitats and/or managed for conservation	Patch surrounded by non-natural habitats (0-25% natural habitat)	25%+ of patch bordered by natural habitats	50-75% of patch bordered by natural habitats or managed for conservation	75-100% of patch bordered by natural habitats or managed for conservation	TBD (likely Good)	Good	Very Good	Assessment via aerial photographs. Intactness of the edge can be important to biotic and abiotic aspects of the site. Derived from <i>Ecological integrity assessment: North Pacific dry Douglas-fir forest and woodland</i> (Crawford/WDNR 2011).

*Desired future condition

Key ecological attributes for riparian forest (streams or rivers) at Burlington Creek Forest

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Vegetative structure: tree layer	% native tree canopy cover	<20% cover	20-30% cover	30-40% cover	40% or more	TBD (Likely Fair)	Very good	Very good	Estimate via site walk. Based on data from local study at 54 riparian sites, the best mix of native tree and shrub cover occurred when both were in the 40-60% range. Tree cover tended to support healthy shrub communities and helped control European starlings. Note that some species, such as yellow-breasted chat, rely on native shrub habitat rather than forest; therefore, if specific species are involved separate KEAs should be developed (Hennings 2001).
Condition**	Riparian habitat continuity	Gaps in woody vegetation	>2 gaps >50 m (55 yards) OR >3 or more 25-50 m (27-55 yards) gaps	1 or 2 gaps >50 m (54 yards) OR 2 or more gaps between 15-25 m (16-27 yards)	1, 25-50 m (27-55 y) gap OR 2 or more gaps between 15-25 m (16-27 yards)	0 or 1, 15-25 m (16-27 yards) gap	TBD (likely Good)	Good	Very Good	Estimate via GIS, per km stream length. Riparian contiguity for water quality and wildlife. Allows for continuity and also some mosaic for wildlife that need (or create, such as beaver) openings. Puget Sound studies suggest the fragmentation of upland vegetation and amount of riparian vegetation explain the greatest amount of variation in aquatic conditions. Studies document that some birds and small mammals are unwilling to cross vegetation gaps, with the most typical threshold being 50 m (164 ft) Hennings and Soll 2010).

*Desired future condition

** This KEA may not be appropriate where native turtles are present, because nesting turtles require some open habitat. Patches of bare ground may accommodate turtles and are important to native ground-nesting bees.

Key ecological attributes for upland shrub habitat at Burlington Creek Forest

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Vegetative structure: shrub layer	% native shrub canopy cover	<10% cover	10-25% cover	25-50%	>50%	TBD (likely Good)	Good	Very Good	Native shrubs and herbaceous plants provide 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	Native shrub richness	# native shrub species per acre	<2 species per 0.4 ha (1 acre)	2-5 species per 0.4 ha (1 acre)	6-9 species per 0.4 ha (1 acre)	>10 species per 0.4 ha (1 acre)	TBD (likely Fair)	Good	Very Good	Estimate via site walk. Native wildlife species diversity is associated with native vegetation. Shrub diversity is important to long-distance migratory songbirds. Partners in Flight biological objective for yellow warbler (sub-canopy, tall shrub foliage in riparian woodland) (Altman 2000).

*Desired future condition

THREATS TO CONSERVATION TARGETS AT BURLINGTON CREEK FOREST

Burlington Creek Forest is primarily threatened by factors that limit forest stand health (overstocking, disease, non-native species), given its near complete cover by upland forest habitat. Notable features that magnify these issues occur along property edges, along the more open, logging/access roads and public roads, and under and adjacent to the railroad and utility right of ways. The site also has modest, unplanned public use, which may increase in the future following a comprehensive plan, scheduled for 2016. Resulting public access increases and associative infrastructure, if they occur, would also likely result in increases in weed and human disturbance threats to native vegetation and wildlife.

Threats at conservation targets at Burlington Creek Forest

CONSERVATION TARGET	STRESS (DEGRADED KEA)	SEVERITY	SCOPE	OVERALL STRESS RANK	SOURCE (THREAT)	CONTRIBUTION	IRREVERSIBILITY	OVERALL SOURCE RANK	OVERALL THREAT RANK	COMMENTS
Upland forest	Forest stand structure – mature trees	High	High	High	Overstocking competition	Very High	Low	Moderate	High	This threat can be addressed with proactive thinning.
Upland shrub habitat	Vegetative structure: shrub layer	Very High	High	Very High	Non-native shrub species (e.g., Scotch broom, blackberry)	Very High	Low	Moderate	Very High	This threat can be addressed with proactive selective woody weed abatement and targeted revegetation.
Riparian vegetation	Canopy cover and continuity	Moderate	Moderate	Moderate	Fragmentation, previous logging and non-native shrub cover	High	Moderate	Moderate	Moderate	

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 key ecological attribute, 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
- Decreased water availability in summer

Indirect effects that may occur

- Increased risk of wildfire in hotter, dryer 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.

STRATEGIC ACTIONS

Enhancement and management strategies recommended for the site target improvements to forest structure, vegetation diversity and non-native species suppression. Priority actions are described below.

List of proposed strategies at Burlington Creek Forest

STRATEGY	SOURCES OF STRESS IT ADDRESSES	FOCAL CONSERVATION TARGETS/KEAS AFFECTED	WHY IS IT IMPORTANT AND ANY TIMING ISSUES	MEASURE(S) OF SUCCESS	RANK
Treat exotics, especially <i>Rubus armeniacus</i> and <i>Hedera helix</i> Survey and treat EDRR species and system-changing invasives	Competition from exotic plants	Upland forest: % native tree and shrub canopy cover (combined) Upland shrub: % native shrub canopy cover	Periodic treatments of certain exotics are essential to avoid losing native plants	Establish and maintain KEA rating of Good	Medium
Selectively thin upland forest patches that are accessible to machine harvest or affordable chainsaw thinning during the next 2-3 years	Reduces overstocking that is causing a loss of living tree canopy and understory native vegetation diversity	Upland forest: Number of native tree and shrub species per acre	Strategy will implement a pre-commercial thinning action recommended by the 2012 Forest Stand Management plan	Visual assessment/KEA	High

STRATEGY	SOURCES OF STRESS IT ADDRESSES	FOCAL CONSERVATION TARGETS/KEAS AFFECTED	WHY IS IT IMPORTANT AND ANY TIMING ISSUES	MEASURE(S) OF SUCCESS	RANK
Increase forest understory diversity of upland forests	Habitat simplicity; resiliency to climate change	% native tree and shrub canopy cover	Enhances resiliency to climate change while providing better wildlife habitat, forest soil benefits, weed suppression	Visual assessment/ KEA	Medium
Reduce non-native cover in upland shrublands	Non-native species competition	% native canopy cover		Visual assessment/ KEA	Medium

Strategy ranking:

High: must do within 5 years to protect target viability

Medium: target will persist without it but will degrade over 5-10 years or require additional future management

Low: addresses a non-critical threat or one that is unlikely to threaten target viability within 10 years

SPECIFIC ACTIONS AND FUNDING REQUIREMENTS

Enhancement and management strategies, as they pertain to the site’s conservation targets, are described below.

Specific actions to implement strategies tied to conservation targets at Burlington Creek Forest

STRATEGY	TARGET	PRIORITY (HOW SOON)	SPECIFIC TASKS	ESTIMATED COST
Develop response as knowledge develops	Riparian forest	Low – 10 years out or more	Monitor spread of ash borer and work with USDA and/or ODA on treatment options	Nominal; part of routine work
Treat exotics, especially <i>Rubus armeniacus</i> ; <i>Hedera helix</i>	Upland forest	High – ASAP	Sweep upland forest habitat to treat exotics	\$15,000 every 5 years? (about 5 crew days)
Interplant to increase understory diversity	Upland forest	Moderate – next 5 years	Develop a plant list of desired understory species (woody and herbaceous) and interplant to introduce sustainable cover of those species, if needed.	\$35,000
Selectively thin upland forest patches that are accessible to machine harvest in the next 2-3 years (~65 acres)	Upland forest	High – next 3 years	Implement a combination of machine and chainsaw thinning to selectively open overstocked forests to increase forests stand structure, diversity and resiliency to climate change.	\$20,000; costs could be offset by commercial thinning revenue, or increased if commercial logging offset is limited and chainsaw thinning is required
Treat exotics, especially <i>Rubus armeniacus</i> ; <i>Cytisus scoparius</i>	Upland shrub and forest understory post-thinning	High – next 10 years	Targeted herbicide applications	\$30-50,000
Interplant to increase understory diversity	Upland shrub	Moderate	Revegetation	\$20,000
Treat exotics, especially <i>Rubus armeniacus</i>	Riparian forest	Moderate	Targeted herbicide applications	\$15,000
Interplant to increase understory diversity	Riparian forest	Moderate	Revegetation	\$10,000
Boost snags and downed wood	Upland forest	Moderate	Selective topping and girding/ tree-falling, create wildlife piles	\$15,000
Increase instream complexity	Riparian forest	Moderate	Instream LWD placement	\$30,000
Increase riparian canopy and stream shading	Riparian forest	High	Interplanting with canopy tree species	\$10,000

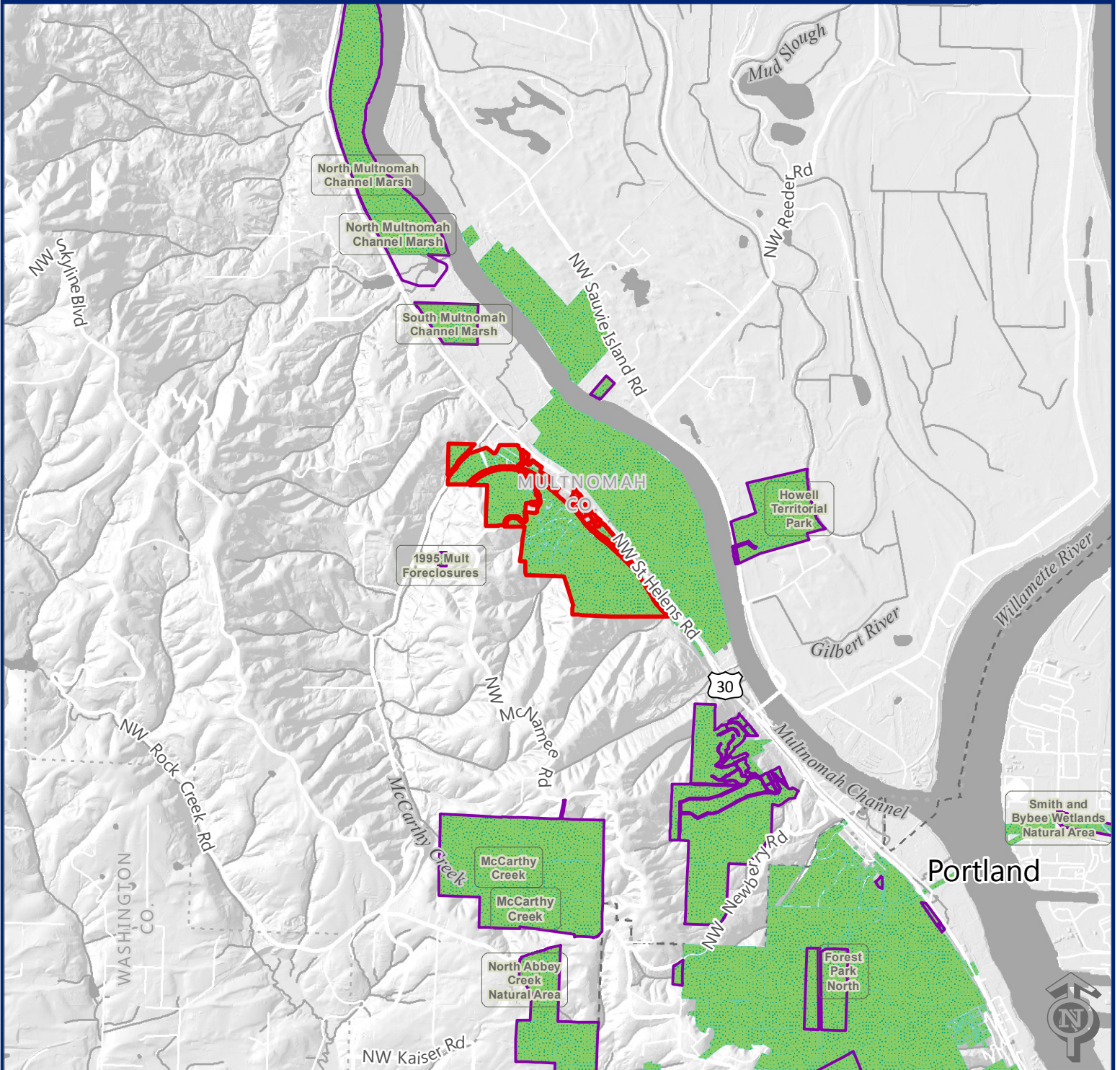
MONITORING PLAN

Monitoring for key ecological attributes associated with the site's conservation targets will largely be done via periodic visual assessment. In addition, periodic wildlife monitoring would be appropriate for the North Tualatin Mountains sites, focusing on long-term tracking of the avian community and periodic assessment of the terrestrial salamander population as it relates to increasing understory and large woody material improvements over time.

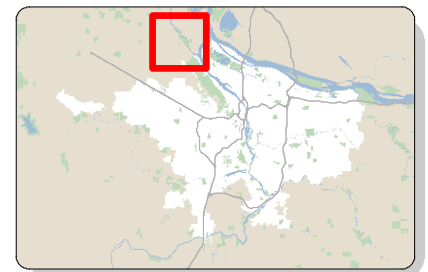
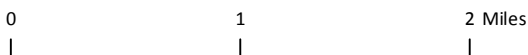
CURRENT PARTNERS, PARTNER PROJECTS AND POTENTIAL PARTNERS

- West Multnomah Soil and Water Conservation District
- City of Portland
- Forest Park Conservancy
- Trout Mountain Forestry
- The National Audubon Society

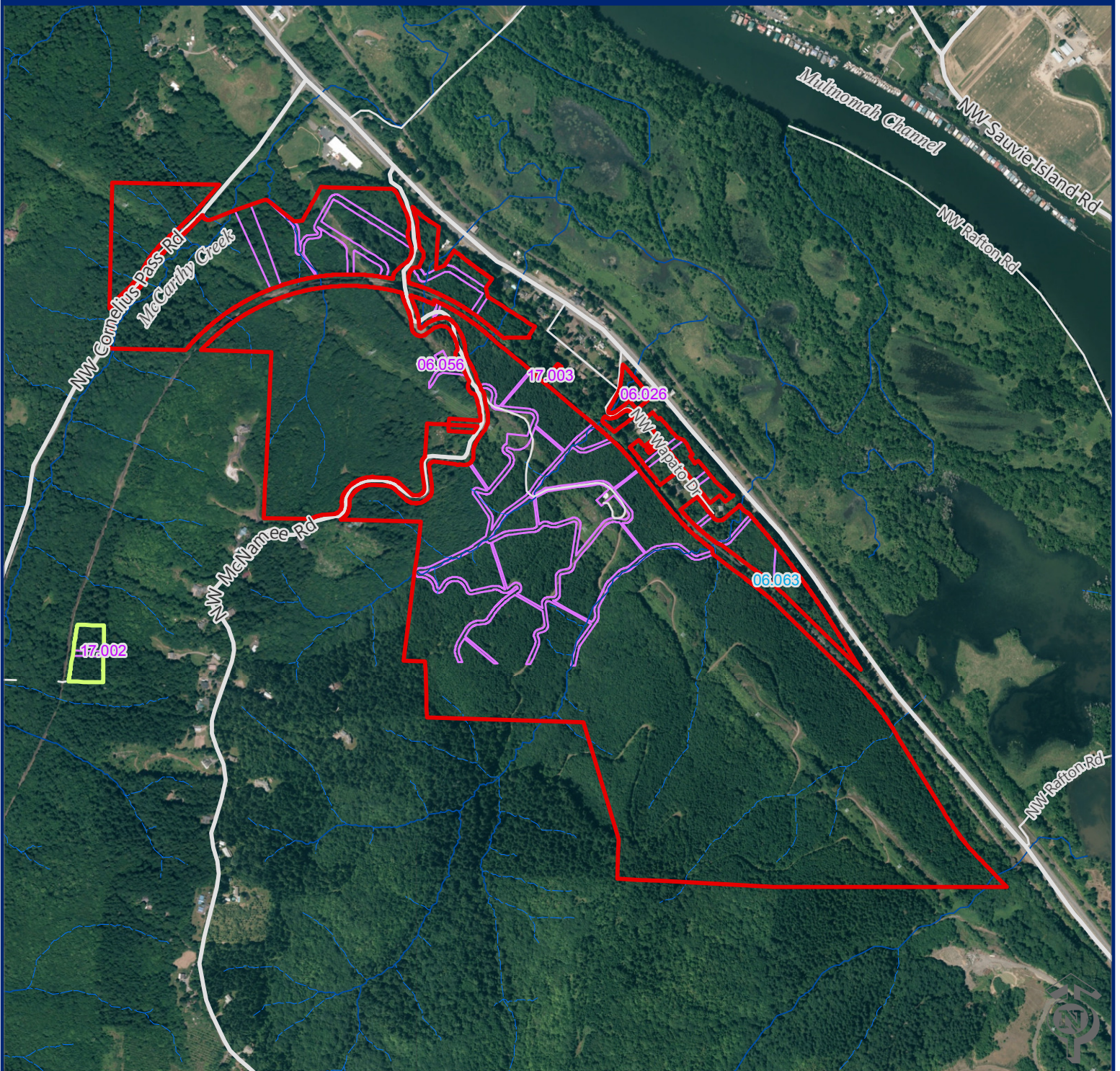
Vicinity Map




- Burlington Creek Forest site
- Other Metro sites
- Park and/or natural area



Site Map




 Burlington Creek Forest site


 Other Metro sites


Bond Measure

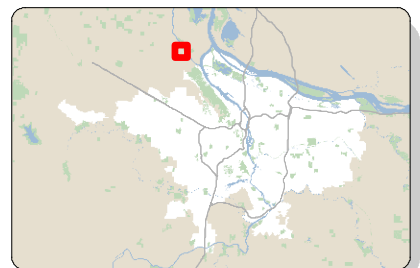
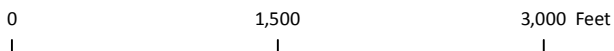
 1995 Bond Measure

 2006 Bond Measure

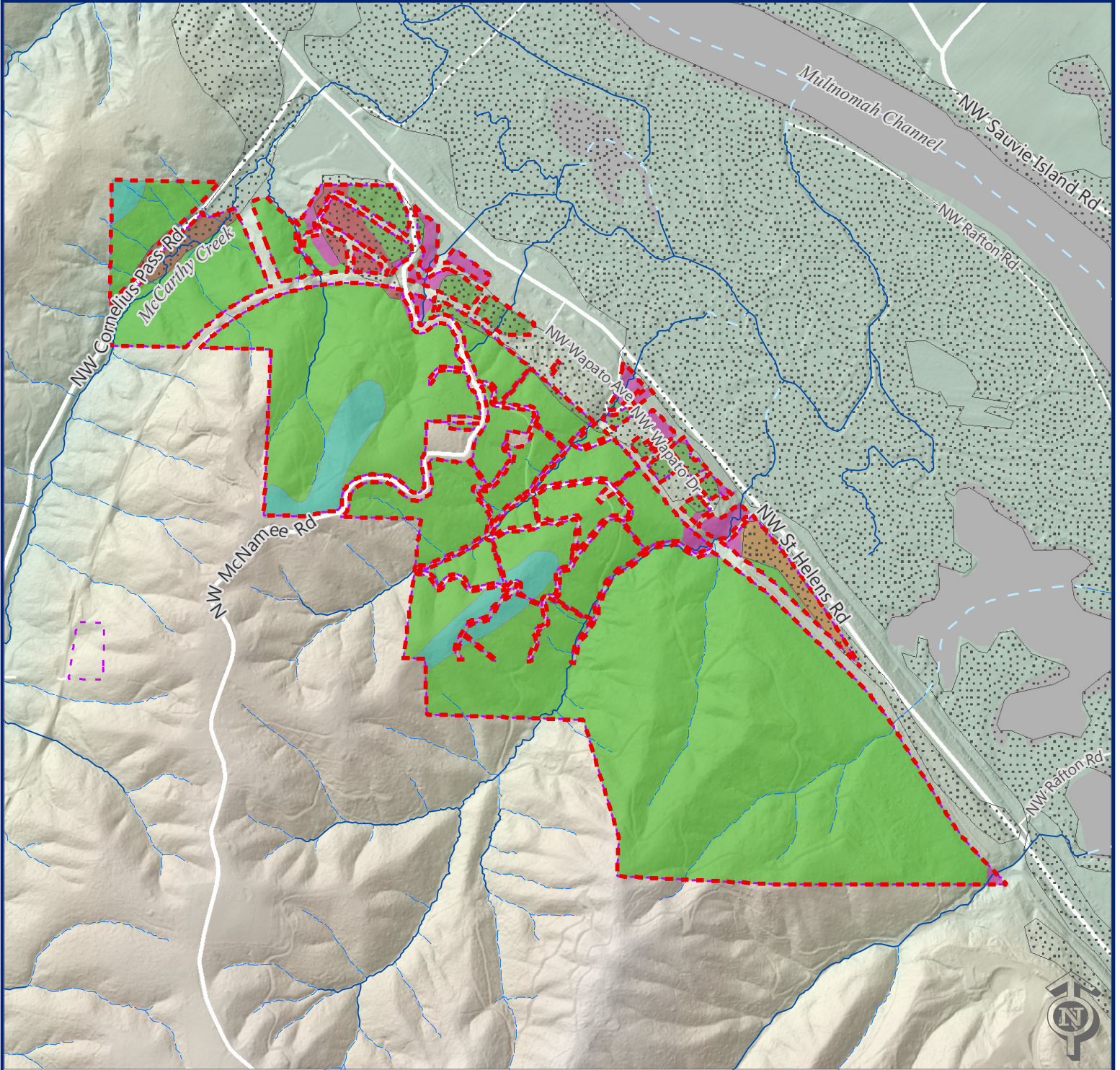
NHD Flowlines













 Intermittent stream

 Perennial stream



Soils

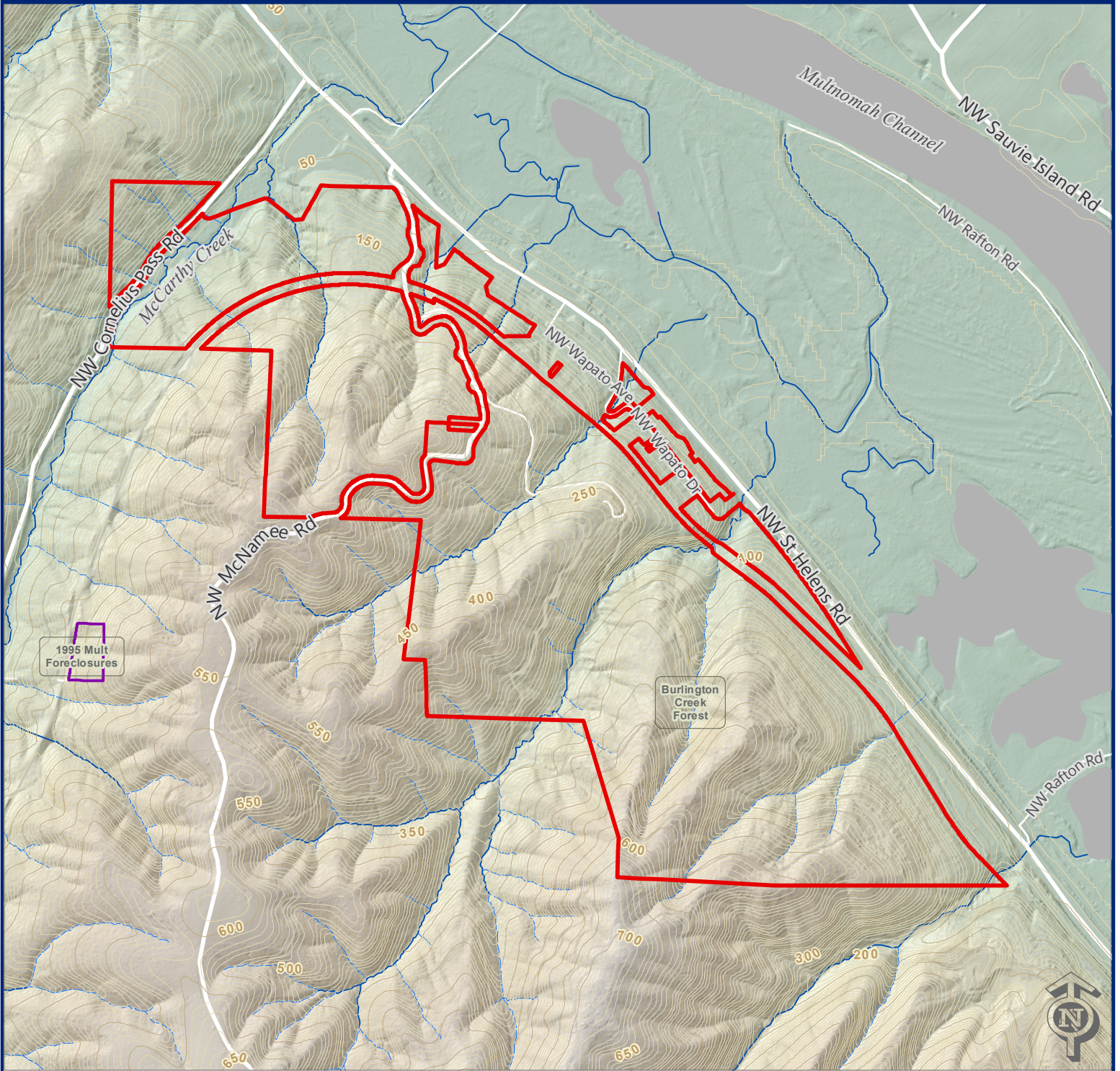


- | | | |
|---|---|---|
|  Burlington Creek Forest site | NRCS soils |  Quatama loam, 15 to 30 percent slopes |
|  Other Metro sites |  Burlington fine sandy loam, 0 to 8 percent slopes |  Quatama loam, 3 to 8 percent slopes |
|  Hydric soils |  Goble silt loam, 15 to 30 percent slopes |  Quatama loam, 8 to 15 percent slopes |
| |  Goble silt loam, 30 to 60 percent slopes |  Sauvie silt loam |
| |  Haploxerolls, steep |  Wapato silt loam |

0 1,500 3,000 Feet

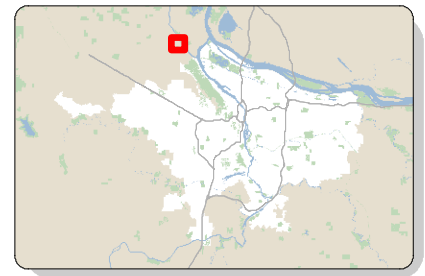
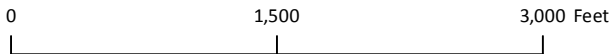


Topography

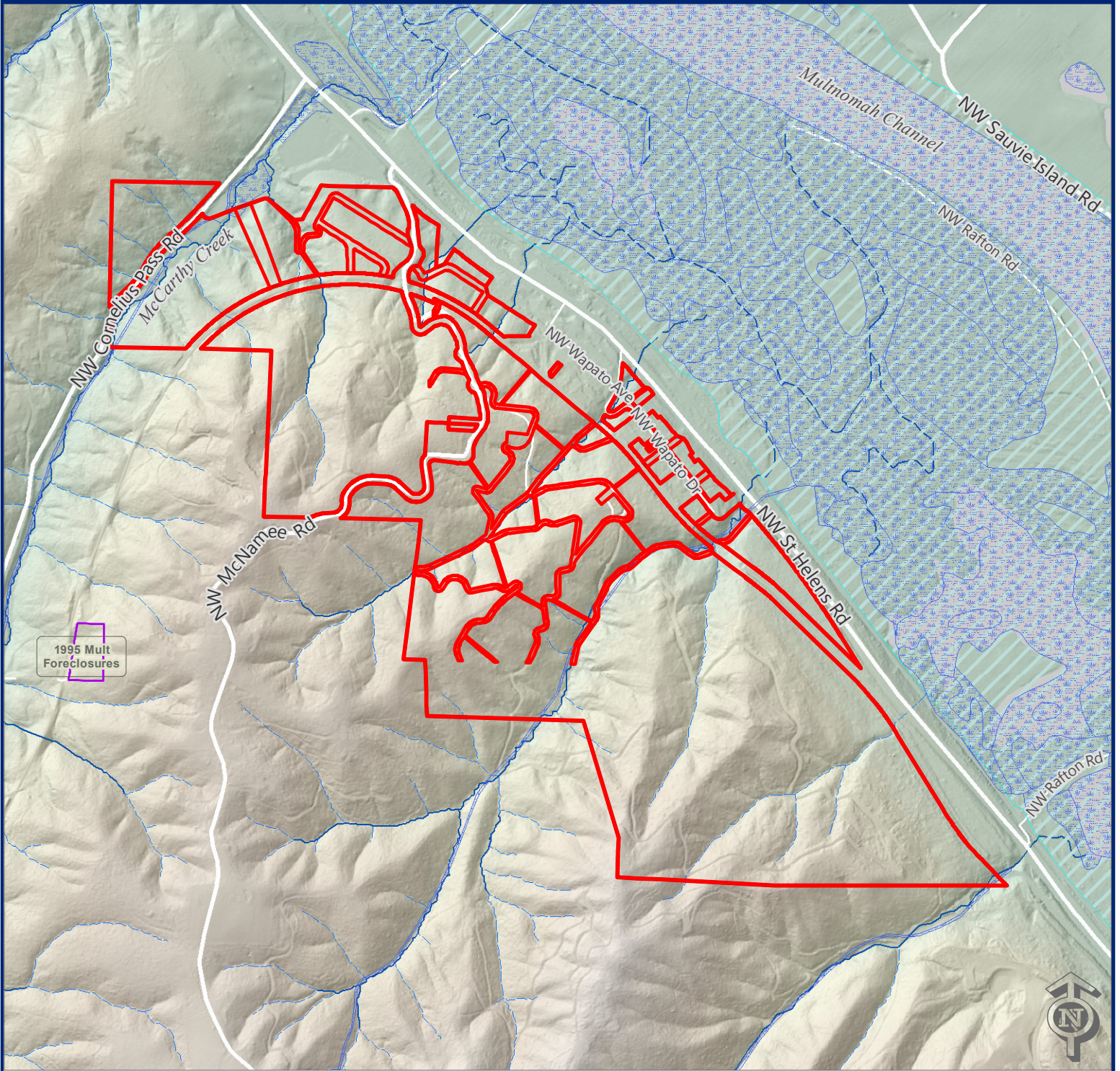






- Burlington Creek Forest site
- Other Metro sites

- NHD Flowlines**
- Intermittent stream
 - Perennial stream





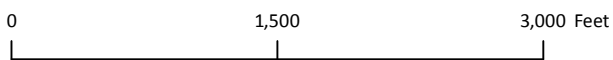
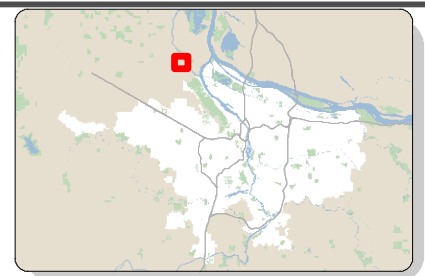
Hydrology



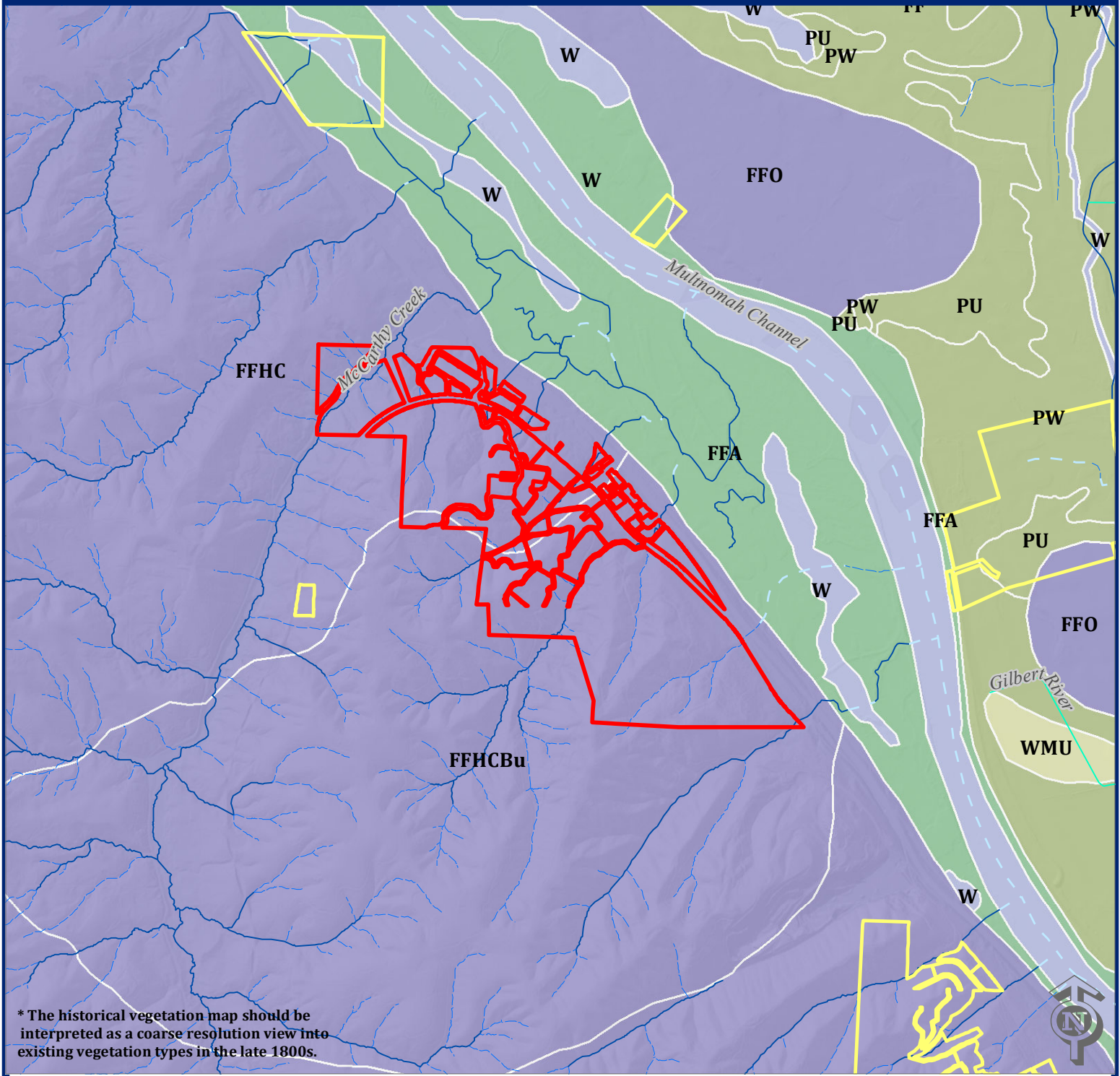
-  Burlington Creek Forest site
-  Other Metro sites
-  Wetlands
-  100 year floodplain

NHD Flowlines








-  Intermittent stream
-  Perennial stream




Historical Vegetation (1851-1910)



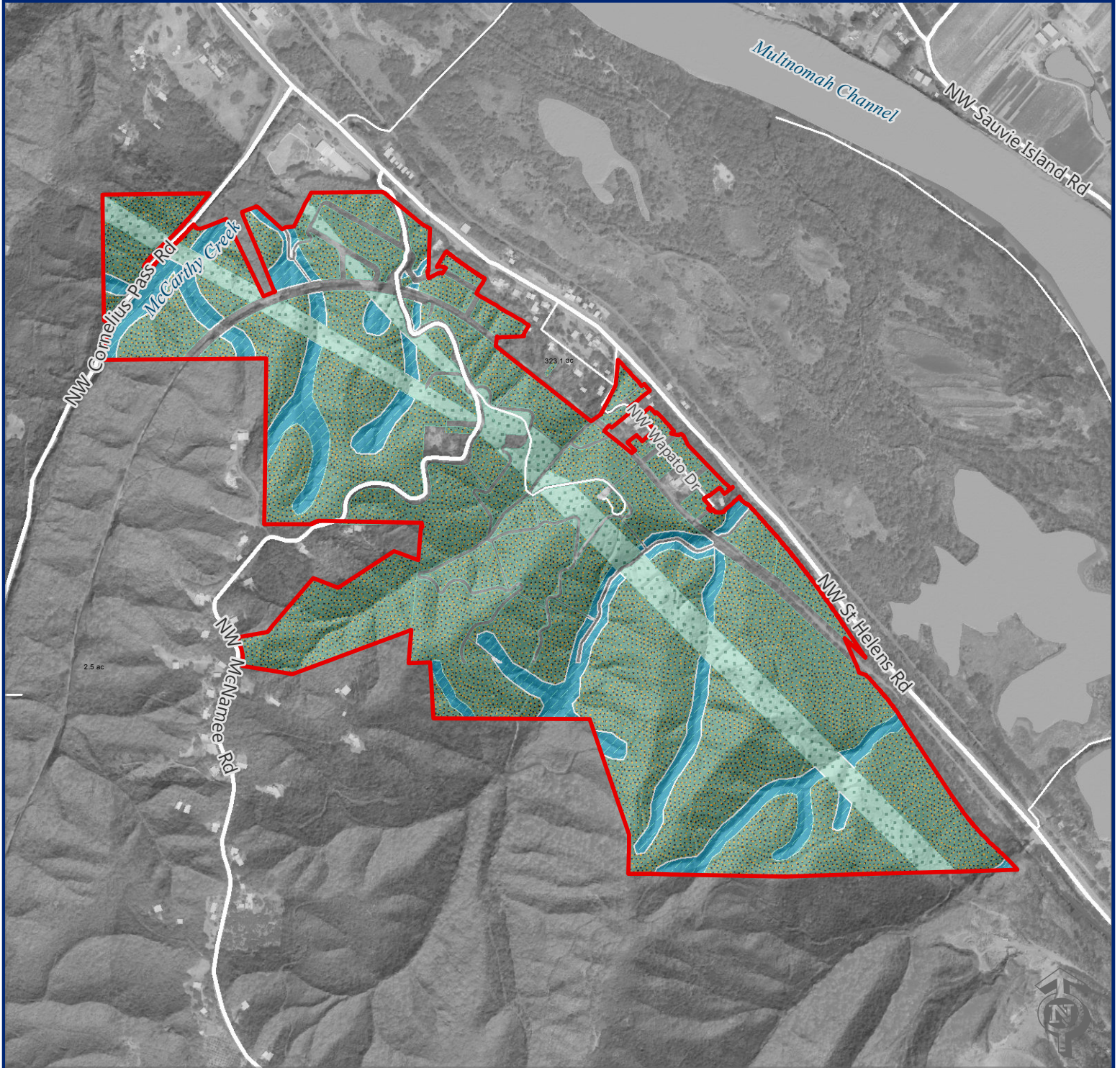
* The historical vegetation map should be interpreted as a coarse resolution view into existing vegetation types in the late 1800s.

	Burlington Creek Forest site	Historical vegetation		Closed forest; Riparian & Wetland
	Other Metro sites		Closed forest; Upland	
			Emergent wetlands	
			Prairie	
			Water	

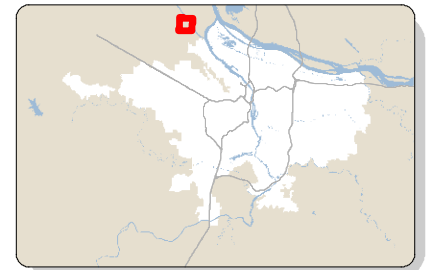
* Labels refer to vegetation subclasses. Detailed descriptions can be found in T:\OBMO\GIS\DATA_V\vegetation\Historical

0 2,000 4,000 Feet 

CURRENT COVER



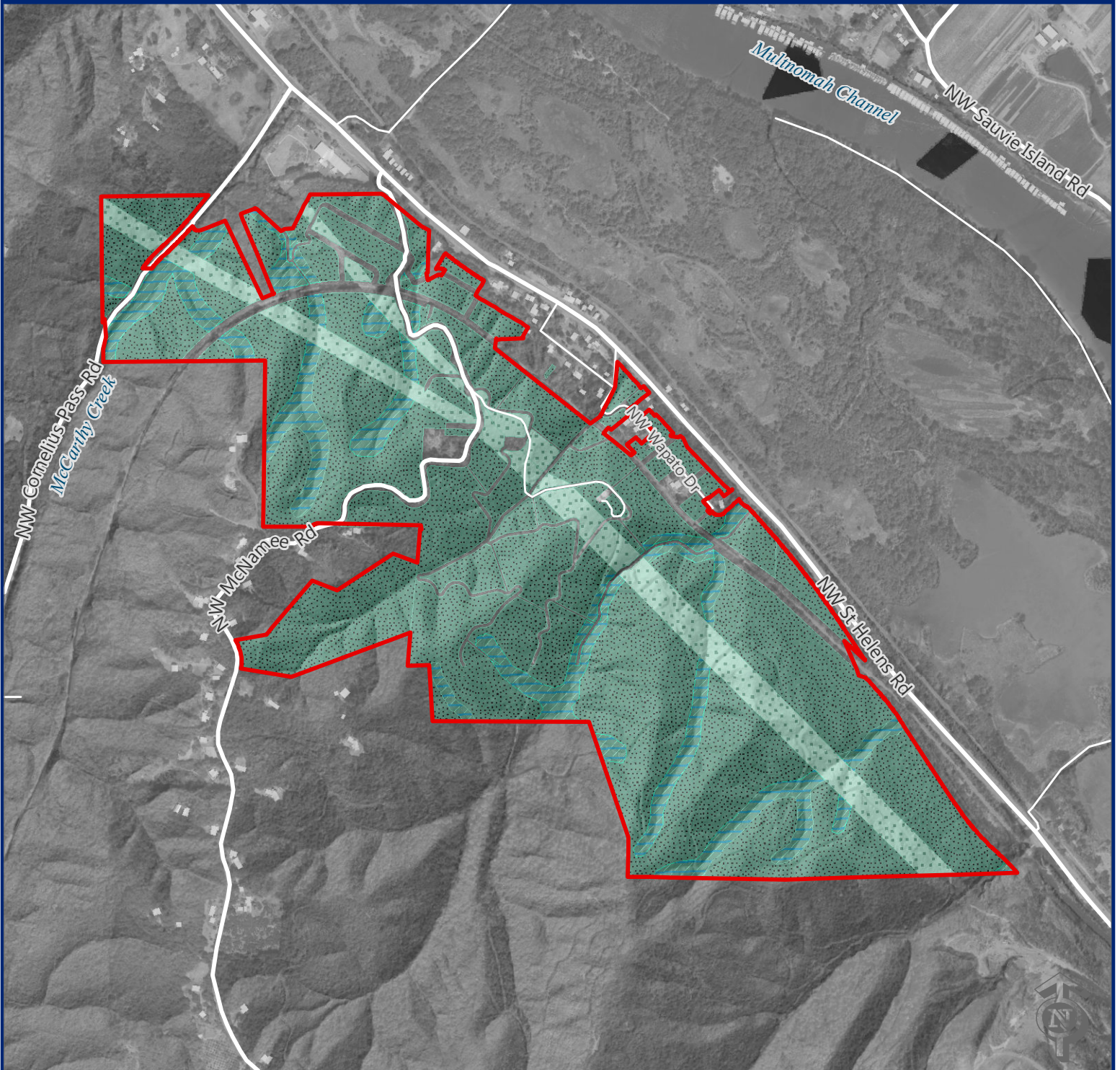
- Burlington Creek Forest site
- Riparian forest
- Upland forest - mixed
- Upland forest - shrub (stage)



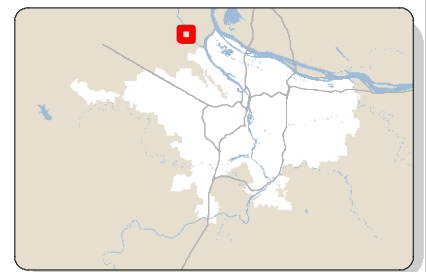
0 1,300 2,600 Feet



CONSERVATION TARGETS



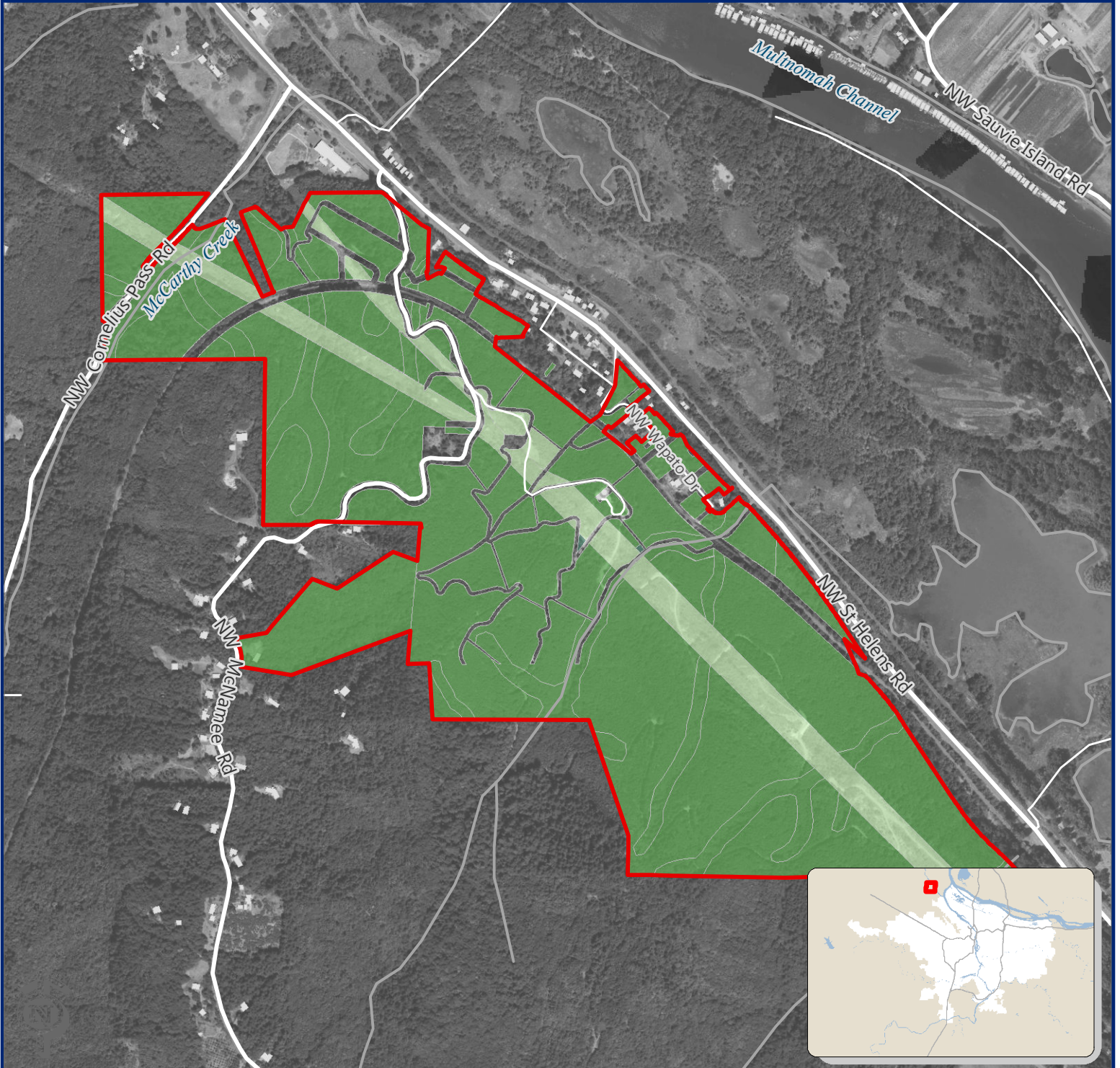
-  BURLINGTON CREEK FOREST SITE
-  Riparian forest
-  Upland forest
-  Upland forest - shrub (early successional)




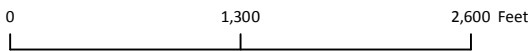
0 1,300 2,600 Feet



MANAGEMENT STATUS



	BURLINGTON CREEK FOREST SITE	Management status		4 - Refinement and long-term maintenance	
			0 - Pre-Initiation		9 - No targets (developed)
			1 - Initiation		
			2 - Establishment		
			3 - Consolidation		



CHAPTER 2 | ENNIS CREEK FOREST

INTRODUCTION

The 320-acre Ennis Creek Forest site is part of the Forest Park target area, located on the eastern face of the northern Tualatin Mountains, north of Forest Park and west of Highway 30 in west Multnomah County. In total, the Forest Park target area contains almost 1,000 acres of natural areas in the north Tualatin Mountains.

The area surrounding Ennis Creek Forest contains a mixture of land uses including residential, timber harvest, gravel extraction and golf course. The City of Portland's Forest Park lies south of the site. The ~400-acre BPA-owned and ODFW-managed Ennis Bottoms wetlands lies northeast of the site, and the town of Burlington lies east and across Highway 30 from the site.

The site is drained by Ennis Creek and several small unnamed seasonal streams.

PLANNING AREA

Although Ennis Creek Forest's planning area is defined by the site's boundaries, (i.e., Metro ownership) there are large expanses of privately and publicly owned properties nearby that share habitat features with the forest, and influence its potential ecological viability and larger landscape value. These properties are important to the development of effective conservation strategies for Ennis Creek Forest, but detailed evaluations of their stewardship classification, targets, etc. are beyond the scope of this plan.

Key staff

Curt Zonick, natural resources scientist
Adam Stellmacher, lead natural resources specialist
Jeff Merrill, natural resources scientist
Nathaniel Marquiss, natural resources technician
Katy Weil, wildlife monitoring coordinator
Robert Spurlock, parks and natural areas planner
Laurie Wulf, property management specialist
Barbara Edwardson, real estate negotiator

Key private landowners

Brian Lightfoot
Michael Baker
Forest Park Conservancy
Skyline Ridge Neighbors

EXISTING PLANNING DOCUMENTS

1. *Forest Stand Management Recommendations; Metro's Agency Creek and Ennis Creek Tracts*, a forest stand assessment conducted by Trout Mountain Forestry in 2012. The document is located at: <M:\PN\Regional Properties\Forest Park Connections TA\Stewardship-Property Management\Stand Mgt.>

2. An assessment of pre-commercial thinning options for the site, including recommendations, was conducted by Trout Mountain Forestry in 2013/2014. A final report is pending.
3. *Greater Forest Park Conservation Initiative*, a 2013 document prepared by the Forest Park Conservancy in cooperation with the City of Portland, Metro and others. The document is located at: M:\PN\Regional Properties\Forest Park Connections TA\Stewardship-Property Management\Forest Park\GFPCI_Report.
4. *Forest Park Ecological Prescriptions*, a 2011 Forest Park management plan developed by the City of Portland, with input from Metro, Audubon, the Forest Park Conservancy and others. The document is located at: <M:\PN\Regional Properties\Forest Park Connections TA\Stewardship-Property Management\Forest Park\City of Portland, Forest Park Ecological Prescriptions>.

SITE DESCRIPTION

The primary access points for Ennis Creek Forest are along McNamee Road. The site is dominated by hardwood, Douglas-fir and mixed hardwood/conifer forest. Most of the forest at the site is just over 20 years old, following logging and reforestation of approximately 250 acres of the site in the early 1990s. Logging roads remain, providing good access to large areas of the site. Because the site lies along the eastern side of the Tualatin Mountains, slopes are steep (30-60 percent) over much of the site. The lower/eastern edge is encumbered by railroad and utility uses, and these areas are among the most challenged by non-native weed populations.

Soils present at Ennis Creek Forest

MAP SOIL SYMBOL	MAP UNIT NAME	DESCRIPTION
17 D, E	Goble silt loam	Moderately well-drained soils on rolling ridgetops and convex side slopes of ridgetops.
37 B, C	Quatama loam	Moderately well-drained soil on low terraces, elevation 75-400 feet.
55	Wapato silt loam	Poorly drained floodplain soil. Present along lower Burlington Creek Forest in the site's northern extent.

Historic habitats at Ennis Creek Forest

~ % COVER	HABITAT TYPE	HISTORIC HABITAT DESCRIPTION BY GLO SURVEYOR NOTES
100%	Closed forest; upland	Mesic mixed conifer forest with mostly deciduous understory. May include Douglas fir, western hemlock, red cedar, grand fir, bigleaf maple, yew, dogwood, white oak, red alder.

RECENT MANAGEMENT HISTORY

The site has been managed with road maintenance and forest edge weed abatement priorities over the past 10-15 years. Periodic mowing along the access roads, and culvert cleaning/replacement actions as needed have been implemented. Actions to suppress English ivy infestations, primarily in the site's northeast extent, began in 2013 and are expected to continue through 2015. Forest stand assessment and complimentary pre-commercial thinning assessments were conducted in 2012 and 2013, and are expected to lead to selective thinning in 2015 to enhance forest structure, preserve maturing tree canopy, and understory native herb and shrub diversity.

ACCESS AND RECREATION

The Parks and Natural Areas Planning group is developing a new visitor experience overview that will be added to this site conservation plan as an appendix at a later date. Metro will also develop a comprehensive plan for the site in late 2014 and early 2015.

Metro staff conducted an internal process to consider an appropriate level of access for each of its natural areas. The access designation is offered as a starting point, with the understanding that judgment will always be needed on a case-by-case basis, and indicates that some part of that site could accept people at the stated level. It does not suggest that the entire site should have that level of access.

The designated access level at Ennis Creek Forest is *Natural Area – High*. Access at this type of site is allowed and may be promoted on a site-by-site basis. Parking areas may or may not be developed at these sites to facilitate access if necessary; restrooms may be installed on a site-by-site basis; basic rules and site identification signage are standard; soft surface, mineral soil or gravel trails are formalized and wayfinding signage may be posted to channel access and protect sensitive habitat. These sites are visited weekly or bi-weekly by Metro staff to inspect for unauthorized use and to conduct maintenance. These sites could move to a Nature Park designation in the future.

At present, hikers, joggers, mountain bikers and equestrians occasionally use the old logging roads on the site.

NATURAL RESOURCES OF SPECIAL INTEREST

With the exception of areas of heavy weed infestation along the access roads and the utility easements, the site is becoming well-represented by native cover. This site contributes to a larger block of protected forest land, including Forest Park and other Metro sites in this target area.

Maturing canopy-producing trees have begun to shade-suppress the extensive non-native blackberry infestations that dominated cover at the site following logging in the early 1990s. Isolated Oregon oak clusters occur at the site, primarily along the railroad and interface with lower residential properties.

A thorough ecological inventory and assessment has not been done for the site. Listed and rare species, such as northern red-legged frog and others almost certainly occur at the site.

Rare species known to occur at Ennis Creek Forest

	ORBIC LIST	FEDERAL STATUS	URBANIZING FLORA (2009)
<i>No documented occurrences of rare species, though species like red-legged frogs, Chinook salmon, steelhead, etc. seem likely.</i>	N/A	N/A	N/A

CONSERVATION TARGETS

There are three conservation targets for Ennis Creek Forest:

1. Upland forest
2. Riparian forest
3. Upland shrub

CURRENT AND DESIRED FUTURE CONDITION OF CONSERVATION TARGETS

Non-technical status and desired future condition of targets at Ennis Creek Forest

TARGET	CURRENT CONDITION	DESIRED FUTURE CONDITION
Upland closed forest	Generally good habitat structure, with increasingly sparse but present understory of native shrubs and herbs. Canopy closure reducing understory blackberry cover. Ivy is concern needing vigilance, but Ennis Creek Forest carries a greatly reduced ivy infestation compared to Burlington Creek Forest. Edges are ongoing weed maintenance areas, especially for blackberry and broadleaf herbaceous weeds like knapweed and thistles.	Accelerating forest stand maturation accompanied by increase in forest floor wood accumulations, native understory diversity and cover, and increased snag and wildlife trees. A reduction in edge weed cover, and eradication or near total control of ivy and other shade-tolerant system modifying weeds.
Riparian forest	Generally good, although areas of erosion and weed establishment are a problem. Better assessment of this habitat at the site is needed.	Opportunities to enhance stream canopy cover/shading, % native vegetation cover, and improve instream structure are likely present. Further investigation and planning necessary before associated project can be implemented.
Upland shrub	<p>These units are generally associated with the utility corridors. Condition varies throughout the site, with some areas in good to very good condition with well-established native cover and limited non-native infestations, to areas with heavy blackberry and Scots broom needing intensive management.</p> <p>This habitat also includes the open fields near the rental house and the small 4-acre elk meadow on the southwest portion of the site. The unit is currently dominated by non-native herbs and grasses, and fringed with lingering blackberry.</p>	<p>Desired conditions are for native shrubs and herbs to dominate cover with a limited presence of non-native plant species that are not displacing natives, and can be controlled with occasional weed abatement every 3-5 years.</p> <p>Desired condition for the open fields is one representing greater native grass and forb cover to provide open grazing areas for elk. Occasional maintenance mowing and spot spraying should be the only management needed, every 3-5 years to control blackberry and broadleaf weeds. Long term natural recruitment of trees and shrubs may move this conservation target towards upland closed forest.</p>

Key ecological attributes for upland forest at Ennis Creek Forest

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Native tree and shrub richness	Number of native tree and shrub species per acre	<5 species per 0.4 ha (1 ac)	5-8 species 0.4 ha (1 ac)	8-12 species per 0.4 ha (1 ac)	>12 species per 0.4 ha (1 ac)	TBD (likely Good)	Good	Very Good	Estimate via site walk. Native wildlife species diversity is associated with native vegetation. A diversity of shrubs is more likely to provide food and shelter for species over the seasons. Shrub diversity is particularly important to pollinators and songbirds (Hagar 2003; Hennings 2006; Burghardt et al. 2009).
Condition	Vegetative structure: native tree and shrub layer	% native tree and shrub canopy cover (combined)	<25% cover	25-50% cover	50-75% cover	>75% cover	TBD (likely Good)	Good or Very Good	Very Good	Estimate via site walk. Native bird species richness is associated with the amount of native shrub cover (Hagar 2003; Hennings 2006). Numbers based on data analysis from local studies at 54 riparian study sites (Hennings 2001). Native shrub cover was as high as ~60%, with highest native shrub cover in the 50-60% tree canopy cover range.
Condition	Mature trees	Number and size (dbh) of species such as Douglas fir, western red cedar, western hemlock and grand fir	Mature trees lacking	<3 per ac with dbh >24 in	3-5 per ac with dbh >24 in	>5 per ac with dbh >24 in	TBD (likely fAIR)	Good	Very Good	Recruitment of native trees necessary for long-term health of upland forests. Saplings are < 2m tall. Based on PIF (2000) biological objective for WV large-canopy trees in riparian deciduous woodland.
Condition	Standing and downed dead trees	Average # snags and large wood (> 50 cm, or 20 in, DBH) per acre	< 5 snags and <5% down wood	5-11 snags and 5-10% down wood	12-18 snags and 10-20% down wood with moderate variety of size and age classes	>18 snags and >20% cover down wood in a good variety of size and age classes	TBD (likely Poor)	Good	Very Good	Estimate via site walk. Rankings distilled from multiple references and particularly from <i>Habitat Conservation for Landbirds in Lowlands and Valleys of Western Oregon and Washington</i> (Altman and Alexander 2012) and DecAID results for species' use of dead wood in westside lowland conifer-hardwood forests.
Landscape context	Edge condition	% of edge bordered by natural habitats and/or managed for conservation	Patch surrounded by non-natural habitats (0-25% natural habitat)	25%+ of patch bordered by natural habitats	50-75% of patch bordered by natural habitats or managed for conservation	75-100% of patch bordered by natural habitats or managed for conservation	TBD (likely Good)	Good	Very Good	Assessment via aerial photographs. The intactness of the edge can be important to biotic and abiotic aspects of the site. Derived from <i>Ecological integrity assessment: North Pacific dry Douglas-fir forest and woodland</i> (Crawford/WDNR 2011).

*Desired future condition

Key ecological attributes for riparian forest (streams or rivers) at Ennis Creek Forest

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Vegetative structure: tree layer	% native tree canopy cover	<20% cover	20-30% cover	30-40% cover	40% or more	TBD (Likely Fair)	Very good	Very good	Estimate via site walk. Based on data from local study at 54 riparian sites, the best mix of native tree and shrub cover occurred when both were in the 40-60% range. Tree cover tended to support healthy shrub communities and helped control European starlings. Note that some species, such as yellow-breasted chat, rely on native shrub habitat rather than forest; therefore, if specific species are involved separate KEAs should be developed (Hennings 2001).
Condition**	Riparian habitat continuity	Gaps in woody vegetation	>2 gaps >50 m (55 yards) OR >3 or more 25-50 m (27-55 yards) gaps	1 or 2 gaps >50 m (54 yards) OR 2 or more gaps between 15-25 m (16-27 yards)	1, 25-50 m (27-55 y) gap OR 2 or more gaps between 15-25 m (16-27 yards)	0 or 1, 15-25 m (16-27 yards) gap	TBD (likely Good)	Good	Very Good	Estimate via GIS, per km stream length. Riparian contiguity for water quality and wildlife. Allows for continuity and also some mosaic for wildlife that need (or create, such as beaver) openings. Puget Sound studies suggest the fragmentation of upland vegetation and amount of riparian vegetation explain the greatest amount of variation in aquatic conditions. Studies document that some birds and small mammals are unwilling to cross vegetation gaps, with the most typical threshold being 50 m (164 ft) Hennings and Soll 2010).

*Desired future condition

** This KEA may not be appropriate where native turtles are present, because nesting turtles require some open habitat. Patches of bare ground may accommodate turtles and are important to native ground-nesting bees.

Key ecological attributes for upland shrub habitat at Ennis Creek Forest

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Vegetative structure: shrub layer	% native shrub canopy cover	<10% cover	10-25% cover	25-50%	>50%	TBD (likely Good)	Good	Very Good	Native shrubs and herbaceous plants provide 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	Native shrub richness	# native shrub species per acre	<2 species per 0.4 ha (1 acre)	2-5 species per 0.4 ha (1 acre)	6-9 species per 0.4 ha (1 acre)	>10 species per 0.4 ha (1 acre)	TBD (likely Fair)	Good	Very Good	Estimate via site walk. Native wildlife species diversity is associated with native vegetation. Shrub diversity is important to long-distance migratory songbirds. Partners in Flight biological objective for yellow warbler (sub-canopy, tall shrub foliage in riparian woodland) (Altman 2000).

*Desired future condition

THREATS TO CONSERVATION TARGETS AT ENNIS CREEK FOREST

Ennis Creek Forest is primarily threatened by factors that limit forest stand health (overstocking, disease, non-native species), given its near complete cover by upland forest habitat. Notable features that magnify these issues occur along property edges, along the more open, logging/access roads and public roads, and under and adjacent to the utility right of ways. The site also has modest, unplanned public use, which may well increase in the future following a comprehensive plan, scheduled for 2016. Resulting public access increases and associative infrastructure, if they occur, would also likely result in increases in weed and human disturbance threats to native vegetation and wildlife.

Threats to conservation targets at Ennis Creek Forest

CONSERVATION TARGET	STRESS (DEGRADED KEA)	SEVERITY	SCOPE	OVERALL STRESS RANK	SOURCE (THREAT)	CONTRIBUTION	IRREVERSIBILITY	OVERALL SOURCE RANK	OVERALL THREAT RANK	COMMENTS
Upland forest	Forest stand structure – mature trees	High	High	High	Overstocking competition	Very High	Low	Moderate	High	This threat can be addressed with proactive thinning.
Upland shrub habitat	Vegetative structure: shrub layer	Very High	High	Very High	Non-native shrub species (e.g., Scots broom, blackberry)	Very High	Low	Moderate	Very High	This threat can be addressed with proactive selective woody weed abatement and targeted revegetation.
Riparian vegetation	Canopy cover and continuity	Moderate	Moderate	Moderate	Fragmentation, previous logging and non-native shrub cover	High	Moderate	Moderate	Moderate	

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 key ecological attribute, 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
- Decreased water availability in summer

Indirect effects that may occur

- Increased risk of wildfire in hotter, dryer 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.

STRATEGIC ACTIONS

Enhancement and management strategies recommended for the site target improvements to forest structure, vegetation diversity, and non-native species suppression. Priority actions are described below.

List of proposed strategies at Ennis Creek Forest

STRATEGY	SOURCES OF STRESS IT ADDRESSES	FOCAL CONSERVATION TARGETS/KEAS AFFECTED	WHY IS IT IMPORTANT AND ANY TIMING ISSUES	MEASURE(S) OF SUCCESS	RANK
Treat exotics, especially <i>Rubus armeniacus</i> and <i>Hedera helix</i>	Competition from exotic plants	Upland forest: % native tree and shrub canopy cover (combined) Upland shrub: % native shrub canopy cover	Periodic treatments of certain exotics are essential to avoid losing native plants	Establish and maintain KEA rating of Good	Medium
Selectively thin upland forest patches accessible to machine harvest or affordable chainsaw thinning during next 2-3 years	Reduces over-stocking that is causing loss of living tree canopy and understory native vegetation diversity	Upland forest: Number of native tree and shrub species per acre	This strategy will implement a pre-commercial thinning action recommended by the 2012 Forest Stand Management plan	Visual assessment/ KEA	High
Increase forest understory diversity of upland forests	Habitat simplicity; resiliency to climate change	% native tree and shrub canopy cover	Enhances resiliency to climate change while providing better wildlife habitat, forest soil benefits, weed suppression	Visual assessment/ KEA	Medium

STRATEGY	SOURCES OF STRESS IT ADDRESSES	FOCAL CONSERVATION TARGETS/KEAS AFFECTED	WHY IS IT IMPORTANT AND ANY TIMING ISSUES	MEASURE(S) OF SUCCESS	RANK
Reduce non-native cover in upland shrublands	Non-native species competition	% native canopy cover		Visual assessment/KEA	Medium

Strategy ranking:

High: must do within 5 years to protect target viability

Medium: target will persist without it but will degrade over 5-10 years or require additional future management

Low: addresses a non-critical threat or one that is unlikely to threaten target viability within 10 years

SPECIFIC ACTIONS AND FUNDING REQUIREMENTS

Enhancement and management strategies, as they pertain to the site’s conservation targets, are described below.

Specific actions to implement strategies tied to conservation targets at Ennis Creek Forest

STRATEGY	TARGET	PRIORITY (HOW SOON)	SPECIFIC TASKS	ESTIMATED COST
Monitor spread of ash borer and work with USDA and/or ODA on treatment options	Riparian forest	Low – 10 years out or more	Develop response as knowledge develops	Nominal; part of routine work
Treat exotics, especially <i>Rubus armeniacus</i> ; <i>Hedera helix</i>	Upland forest	High – ASAP	Sweep upland forest habitat to treat exotics	\$15,000 every 5 years? (about 5 crew days)
Interplant to increase understory diversity	Upland forest	Moderate – next 5 years	Develop a plant list of desired understory species (woody and herbaceous) and interplant to introduce sustainable cover of those species	\$25,000
Selectively thin upland forest patches that are accessible to machine harvest in the next 2-3 years (~ 100 acres)	Upland forest	High – next 3 years	Implement a combination of machine and chainsaw thinning to selectively open overstocked forests to increase forests stand structure, diversity and resiliency to climate change	\$20,000, though these costs could be offset by commercial thinning revenue, or increased if commercial logging offset is limited and chainsaw thinning is required
Treat exotics, especially <i>Rubus armeniacus</i> ; <i>Cytisus scoparius</i>	Upland shrub and forest understory post-thinning	High – next 10 years	Targeted herbicide applications	\$30-40,000
Interplant to increase understory diversity	Upland shrub	Moderate	Revegetation	\$15,000
Treat exotics, especially <i>Rubus armeniacus</i>	Riparian forest	Moderate	Targeted herbicide applications	\$15,000
Interplant to increase understory diversity	Riparian forest	Moderate	Revegetation	\$10,000
Boost snags and downed wood	Upland forest	Moderate	Selective topping and girding/tree-falling	\$15,000
Increase instream complexity	Riparian forest	Moderate	Instream LWD placement	\$20,000
Increase riparian canopy and stream shading	Riparian forest	High	Interplanting with canopy tree species	\$10,000

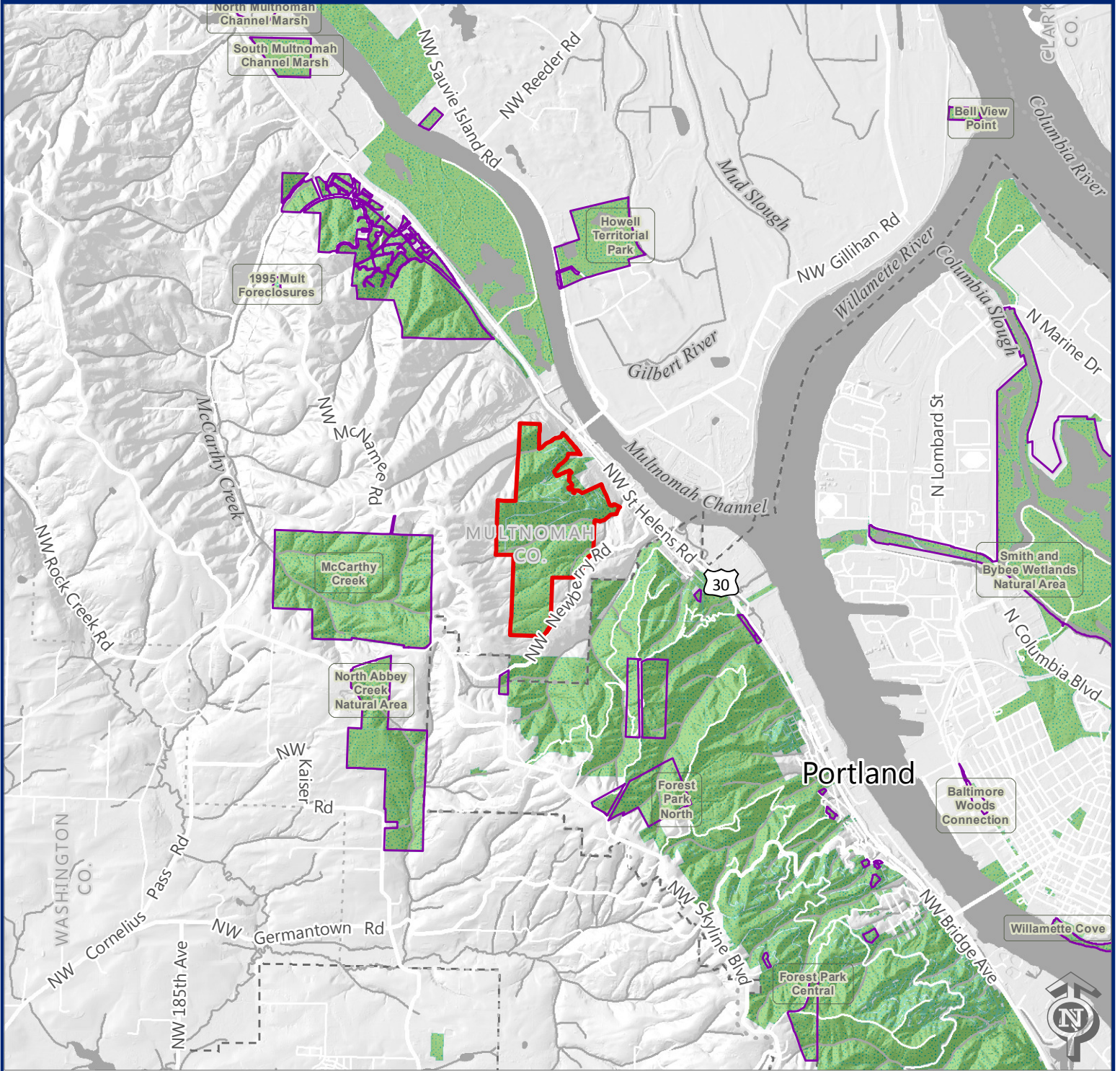
MONITORING PLAN

Monitoring for key ecological attributes associated with the site's conservation targets will largely be done via periodic visual assessment. In addition, periodic wildlife monitoring would be appropriate for the North Tualatin Mountains sites, focusing on long-term tracking of the avian community and periodic assessment of the terrestrial salamander population as it relates to increasing understory and large woody material improvements over time.

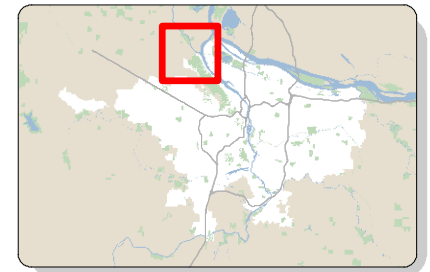
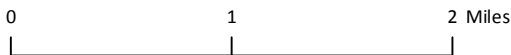
CURRENT PARTNERS, PARTNER PROJECTS AND POTENTIAL PARTNERS

- West Multnomah Soil and Water Conservation District
- City of Portland
- Forest Park Conservancy
- Trout Mountain Forestry
- The National Audubon Society

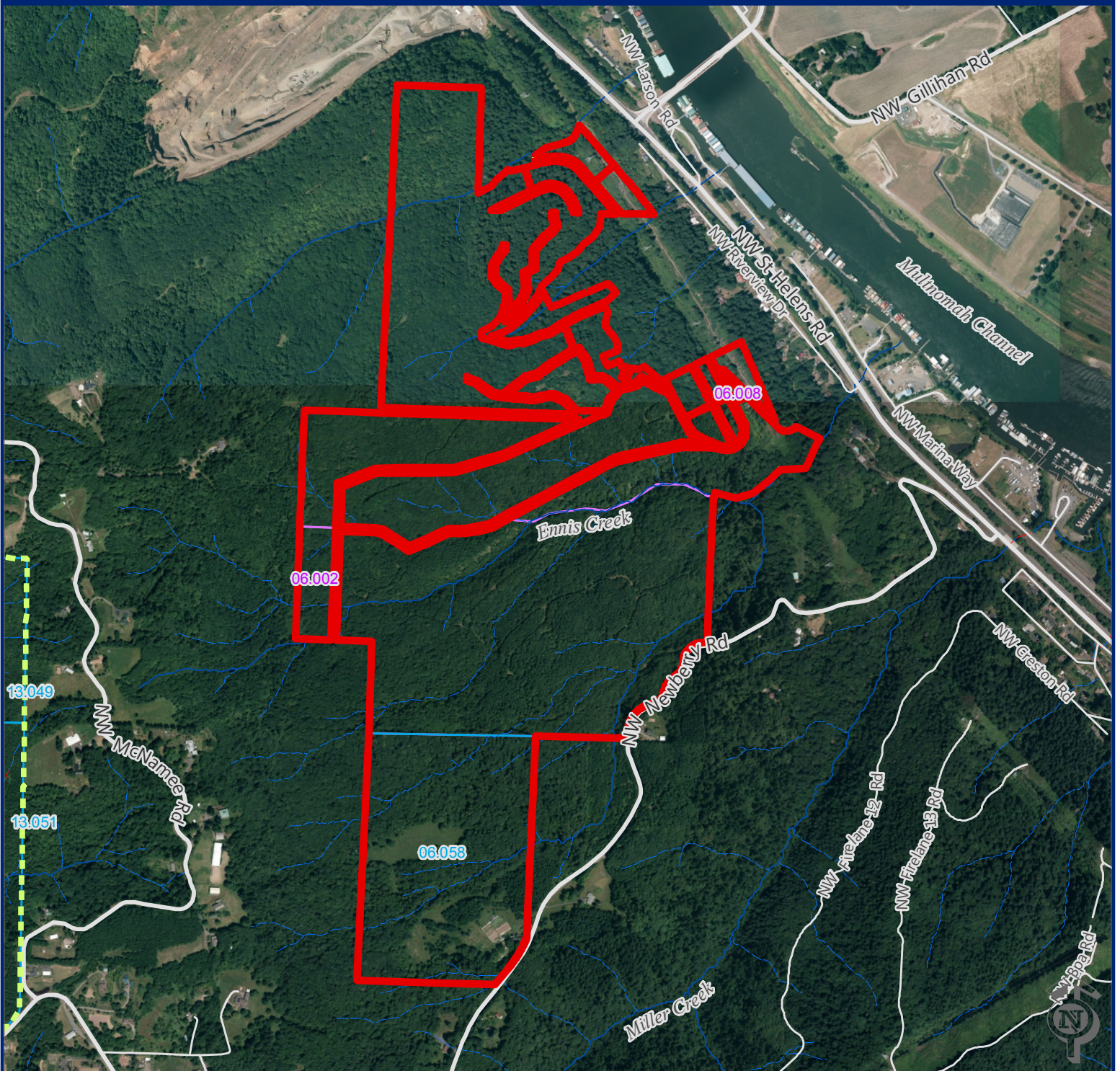
Vicinity Map




- Ennis Creek Forest site
- Other Metro sites
- Park and/or natural area




Site Map




 Ennis Creek Forest site


 Other Metro sites


Bond Measure

 1995 Bond Measure

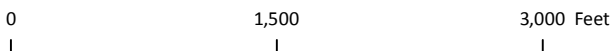
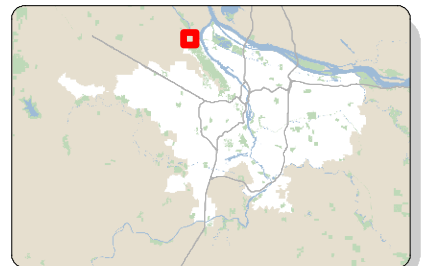
 2006 Bond Measure

NHD Flowlines

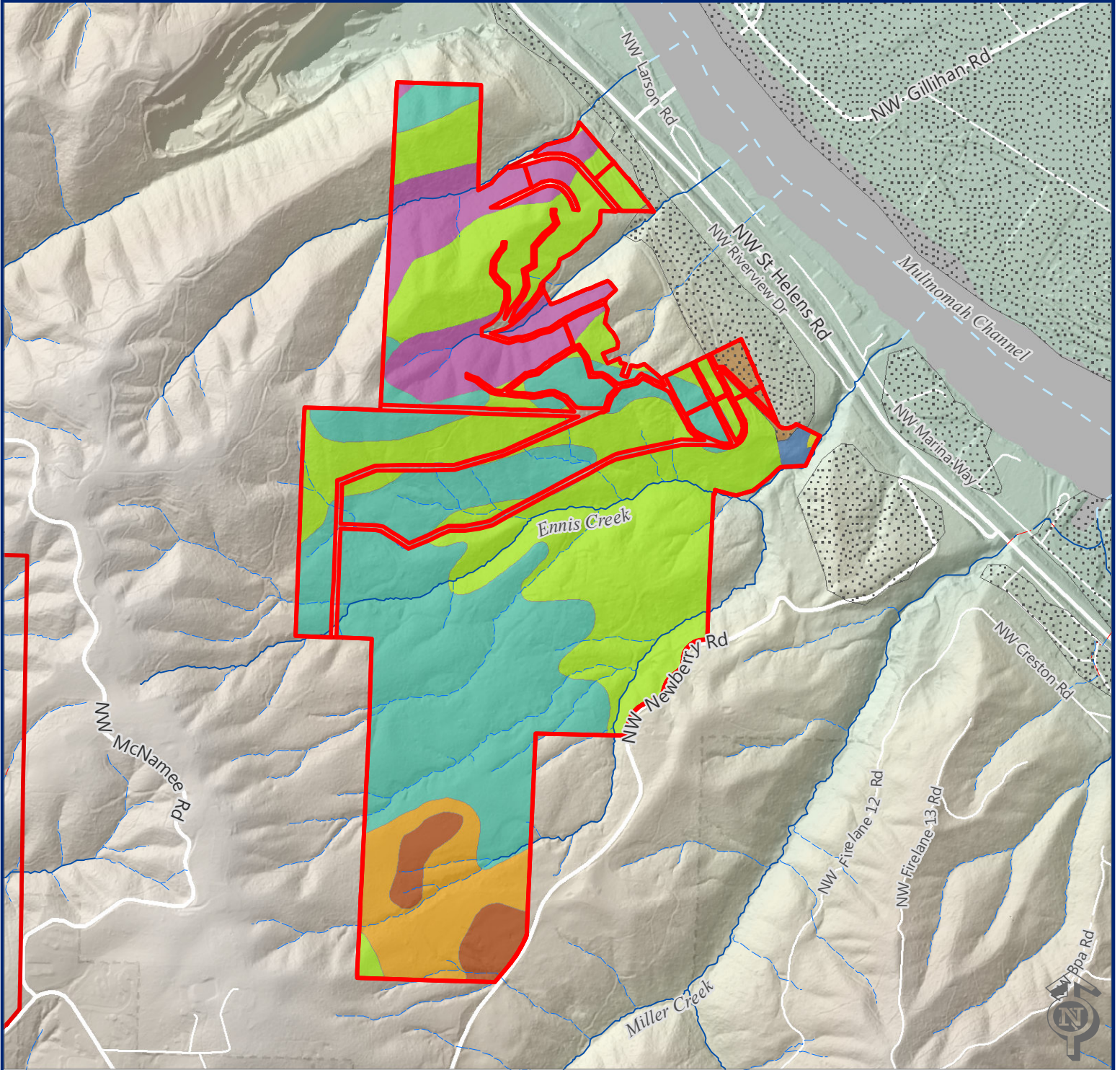
 Intermittent stream

 Perennial stream

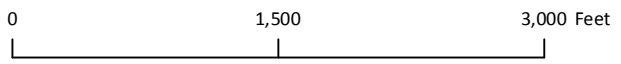
 Pipeline



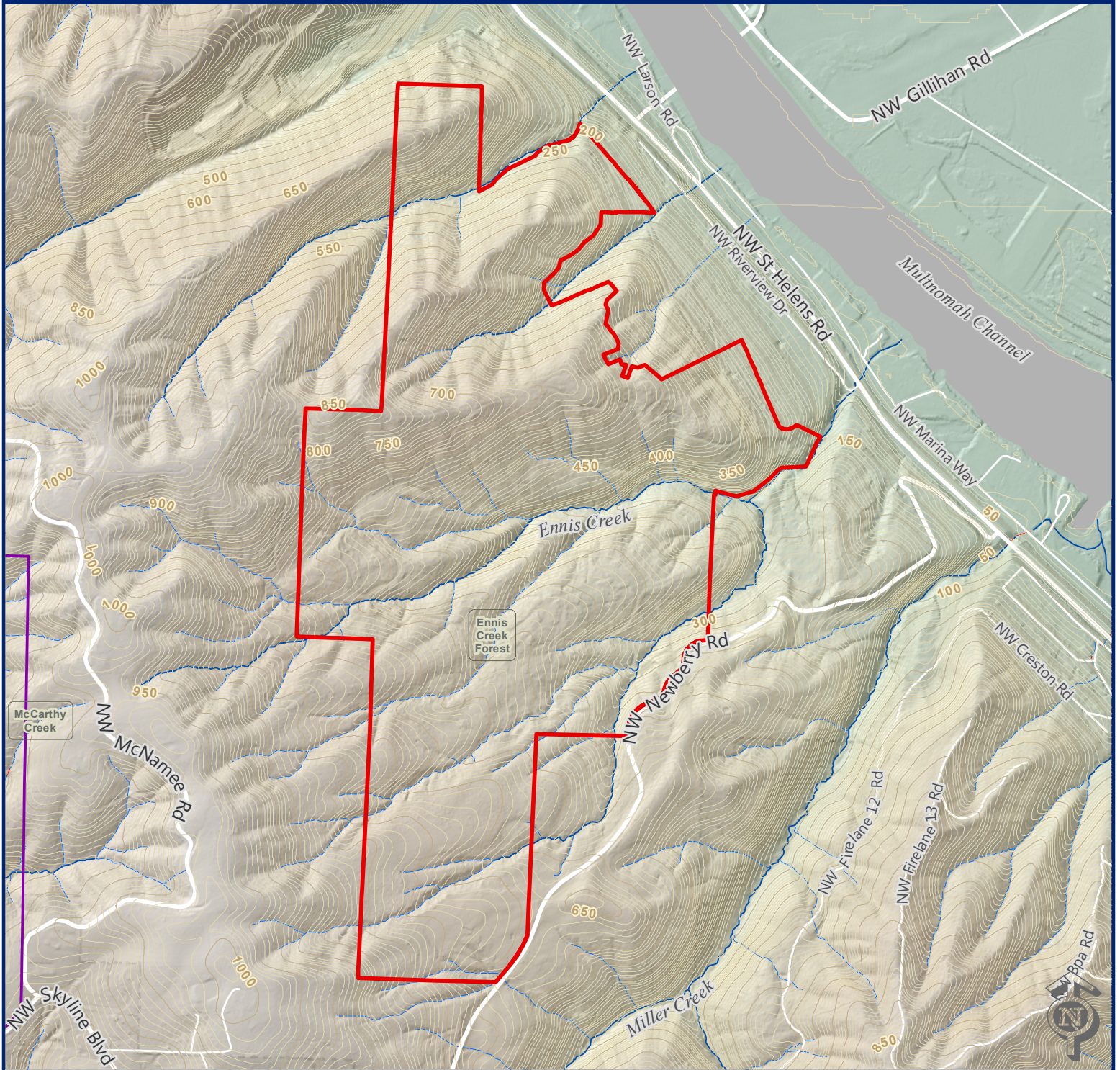
Soils



- | | | |
|-------------------------|--|--|
| Ennis Creek Forest site | NRCS soils | Haplumbrepts, moderately steep |
| Other Metro sites | Cascade silt loam, 15 to 30 percent slopes | Haplumbrepts, very steep |
| Hydric soils | Cascade silt loam, 8 to 15 percent slopes | Quatama loam, 15 to 30 percent slopes |
| | Goble silt loam, 15 to 30 percent slopes | Urban land-Quatama complex, 8 to 15 percent slopes |
| | Goble silt loam, 30 to 60 percent slopes | Wauld very gravelly loam, 30 to 70 percent slopes |



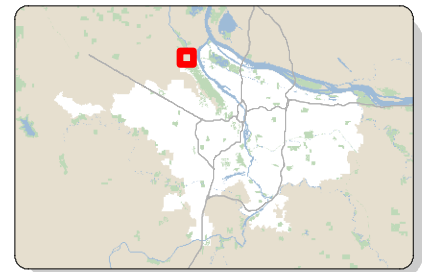
Topography



- Ennis Creek Forest site
- Other Metro sites

NHD Flowlines

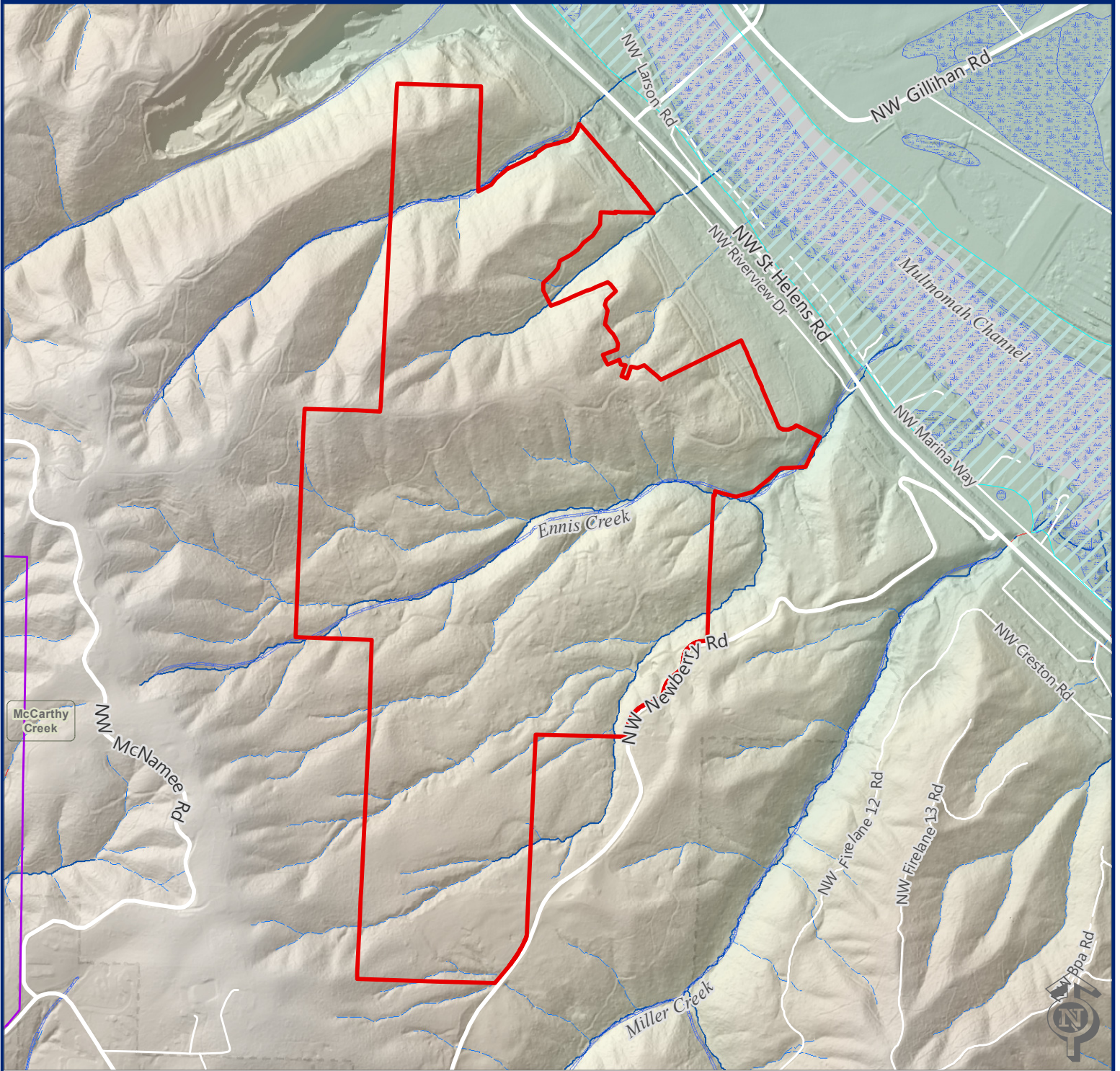
- Intermittent stream
- Perennial stream
- Pipeline







0 1,500 3,000 Feet






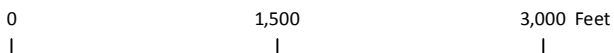
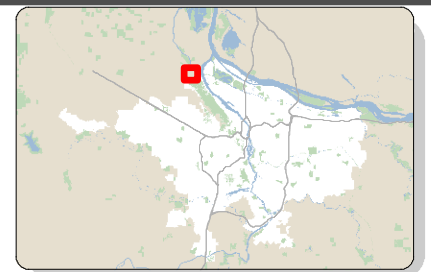
Hydrology



-  Ennis Creek Forest site
-  Other Metro sites
-  100 year floodplain
-  Wetlands

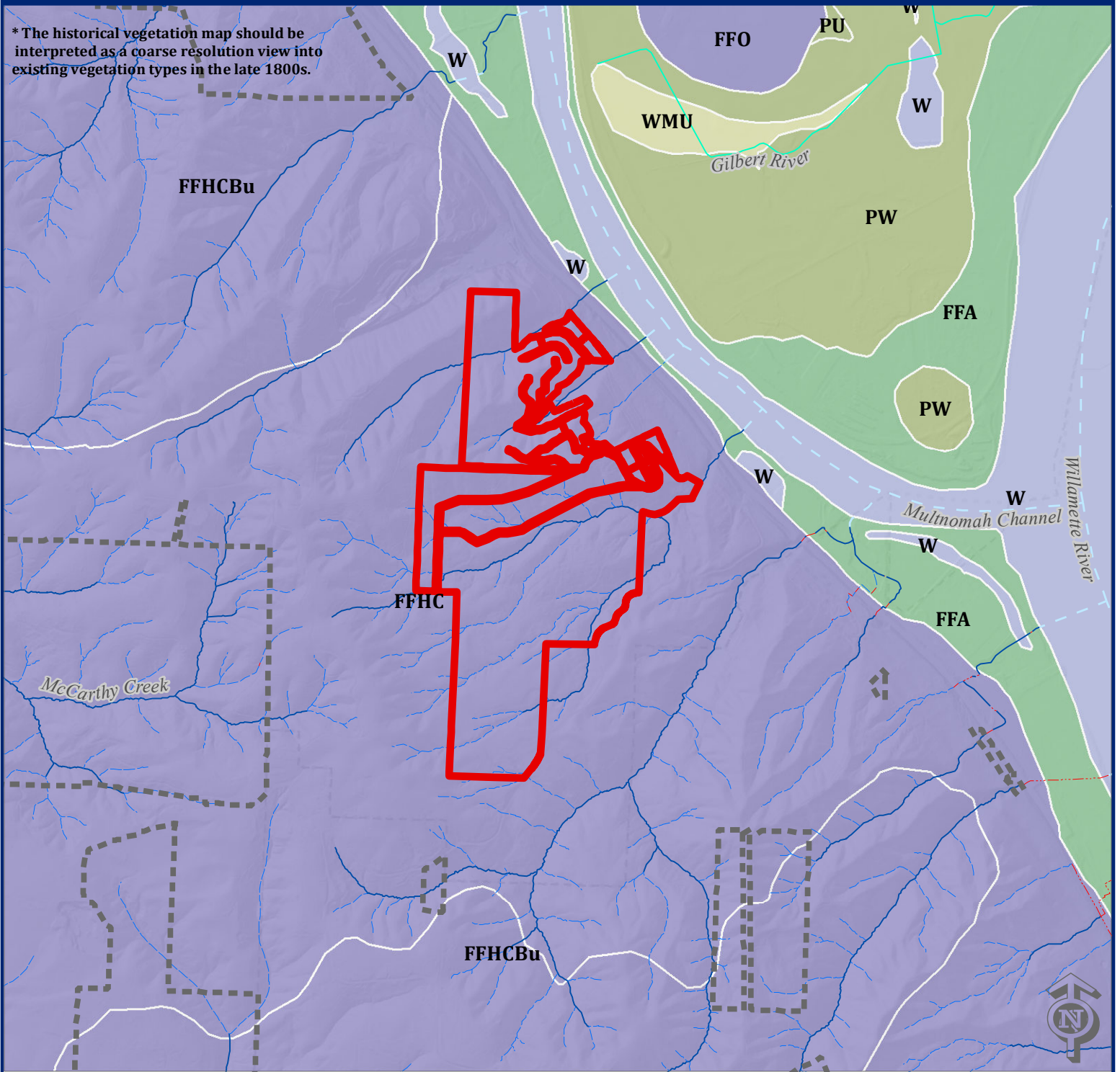
NHD Flowlines

-  Intermittent stream
-  Perennial stream
-  Pipeline



Historical Vegetation (1851-1910)

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

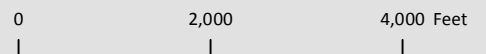


- Ennis Creek Forest site
- Other Metro sites

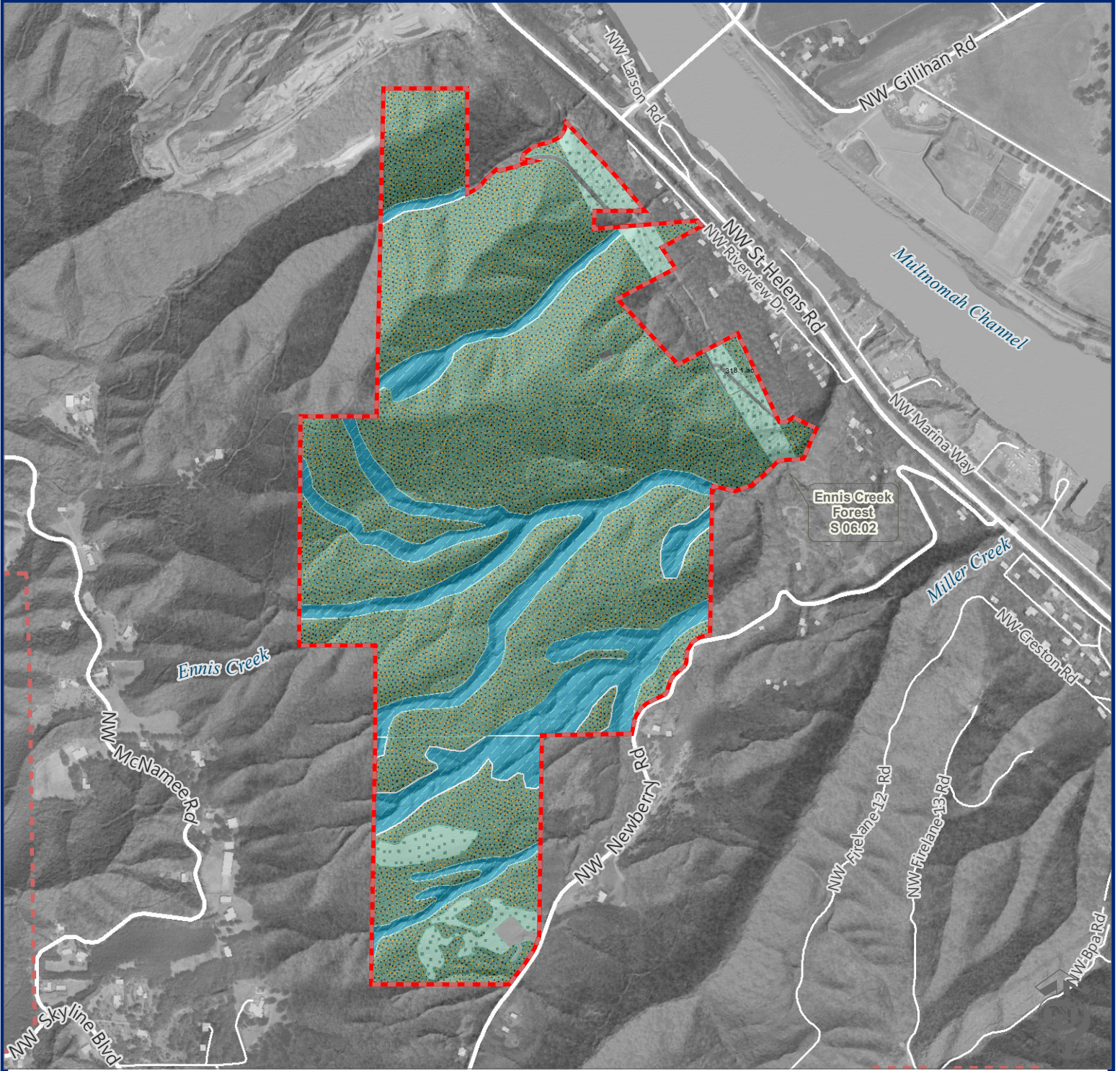
Historical vegetation







- Closed forest; Riparian & Wetland
- Closed forest; Upland
- Emergent wetlands
- Prairie
- Water

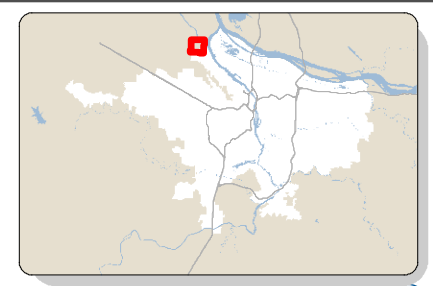
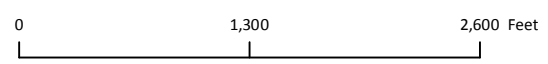
* Labels refer to vegetation subclasses. Detailed descriptions can be found in T:\OBMO\GIS\DATA_V\vegetation\Historical



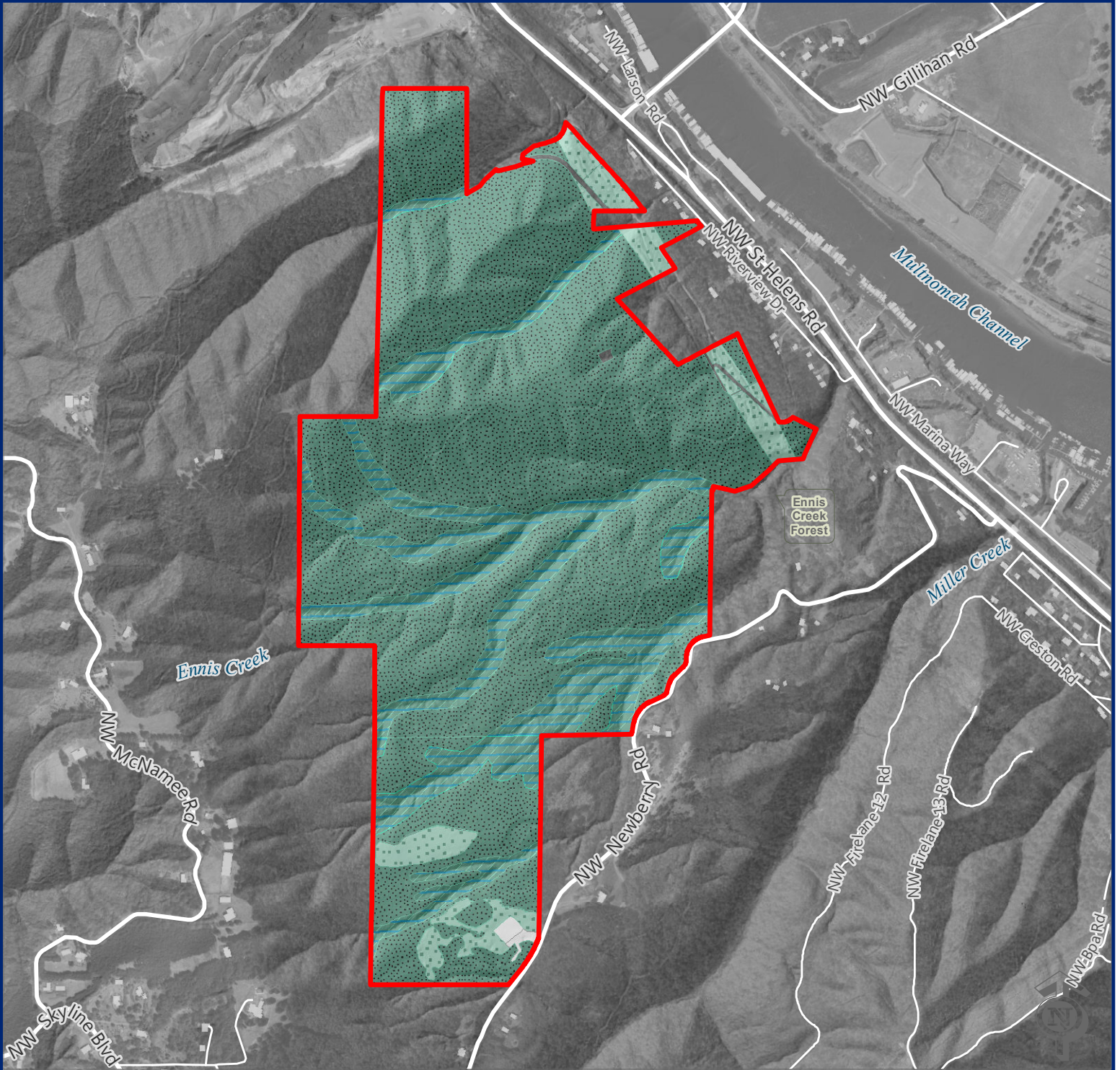
CURRENT COVER



- | | | | |
|--|-------------------------|---|-------------------------------|
|  | Ennis Creek Forest site |  | Developed - (impervious) |
|  | Other Metro sites |  | Riparian forest |
| | |  | Upland forest - mixed |
| | |  | Upland forest - shrub (stage) |

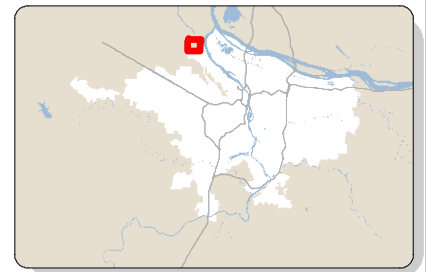


CONSERVATION TARGETS

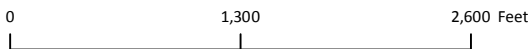
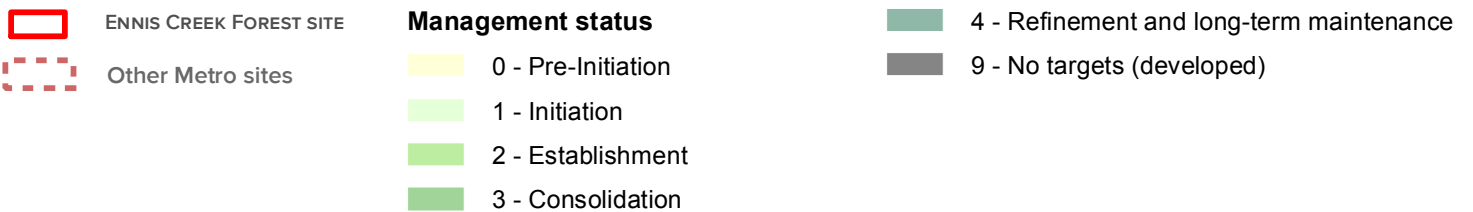
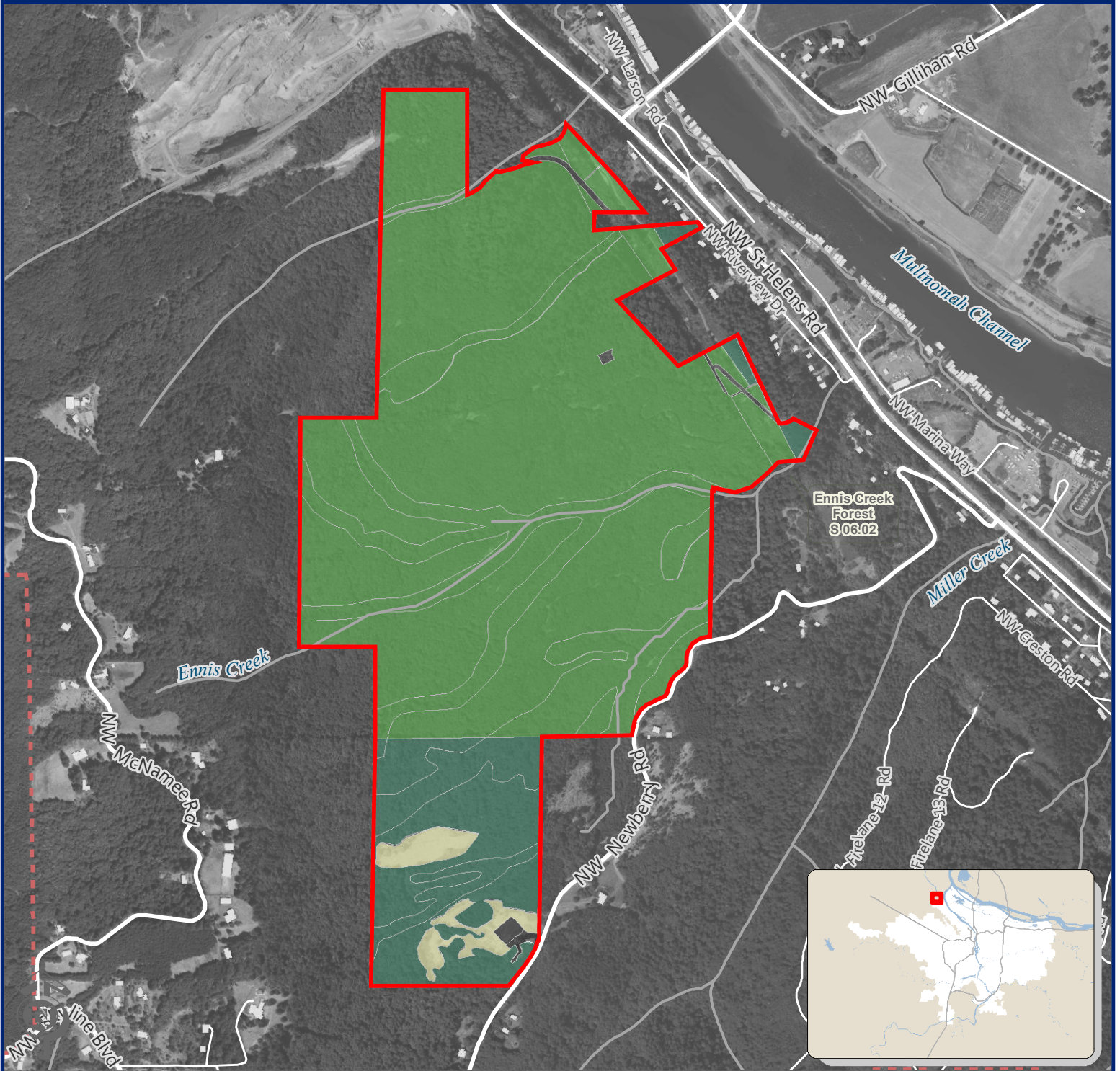


- ENNIS CREEK FOREST SITE
- No targets
- Riparian forest
- Upland forest
- Upland forest - shrub (early successional)

0 1,300 2,600 Feet



MANAGEMENT STATUS



CHAPTER 3 | McCARTHY CREEK NATURAL AREA

INTRODUCTION

The 400-acre McCarthy Creek Natural Area is part of the North Tualatin Mountains focal area and is located on the eastern face of the northern Tualatin Mountains, north of Forest Park and north of Skyline Road in west Multnomah County.

The area surrounding the McCarthy Creek Natural Area contains a mixture of land uses including residential, schools, agriculture and timber harvest. Metro's Burlington Creek Forest Natural Area (including a portion of the lower McCarthy Creek watershed) to the northeast, Ennis Creek Natural Area to the southeast, and North Abbey Creek Natural Area to the south are all in close proximity to the site. The city of Portland's Forest Park lies south of the site (see vicinity map).

PLANNING AREA

Although McCarthy Creek's planning area is defined by the site's boundaries, i.e., Metro ownership, there are large expanses of privately and publicly owned properties nearby that share habitat features with the forest and influence its potential ecological viability and larger landscape value. These properties are important to the development of effective conservation strategies for McCarthy Creek, but detailed evaluations of their stewardship classification, targets, etc. are beyond the scope of this plan.

Key staff

Kate Holleran, natural resources scientist
Jeff Merrill, natural resources scientist
Ryan Jones, natural resources specialist
Jonathan Soll, conservation science manager
Katy Weil, wildlife monitoring coordinator
Olena Turula, parks and natural areas planner
Robert Spurllock, parks and natural areas planner
Laurie Wulf, property management specialist
Bonnie Lyn Shoffner, restoration volunteer coordinator

Key private landowners

Brian Lightfoot
Michael Baker
Forest Park Conservancy
Skyline Ridge Neighbors

EXISTING PLANNING DOCUMENTS

All documents are available from Metro on request:

McCarthy Creek Stabilization Plan (2012) documents the activities that will be implemented as part of the new acquisition stabilization process.

McCarthy Creek Road Management Plan (2012) documents road management options and recommendations for the natural area.

Greater Forest Park Conservation Initiative, a 2013 document prepared by the Forest Park Conservancy in cooperation with the City of Portland, Metro and others.

Forest Park Ecological Prescriptions, a 2011 Forest Park management plan developed by the City of Portland, with input from Metro, Audubon Society, Forest Park Conservancy and others.

SITE DESCRIPTION

The entire site sits within the upper McCarthy Creek watershed. Most of the forests at the site are less than 30 years old, following logging and reforestation of approximately 350 acres in the early 1990s. Slightly older forest structure exists in the narrow riparian zones protected from logging. Logging roads exist, providing access to the southeastern corner. The north-south road crosses numerous small drainages and is in a degraded condition, with multiple slumps and failing culverts. Current plans call for decommissioning roads north of the loop road. Slopes are steep (30-60 percent) over much of the site.

The primary access points for the McCarthy Creek Natural Area are along Skyline Road. Secondary access points are on McNamee Road and Pauley Road. The site is dominated by hardwood, Douglas fir and mixed conifer/hardwood forests.

Soils present at McCarthy Creek

MAP SOIL SYMBOL	MAP UNIT NAME	DESCRIPTION
17 C, E	Goble silt loam	Moderately well-drained soils on low terraces, rolling ridgetops and convex side slopes of ridgetops.
7 C, D, E	Cascade silt loam	Varying slopes, highly erodible.

Historic habitats at McCarthy Creek

~ % COVER	HABITAT TYPE	HISTORIC HABITAT DESCRIPTION BY GLO SURVEYOR NOTES
100%	Closed forest; upland	Mesic mixed conifer forest with mostly deciduous understory. May include Douglas fir, western hemlock, red cedar, grand fir, bigleaf maple, yew, dogwood, white oak, red alder.

RECENT MANAGEMENT HISTORY

Recent site management has focused on implementation of the stabilization plan with an emphasis on weed control, forest stand assessments and road management. Road decommissioning is tentatively scheduled for 2016. The forest stand assessment currently being conducted is expected to lead to selective thinning in 2015-2017 to enhance forest structure, preserve maturing tree canopy and understory native herb and shrub diversity.

Management summary 2012-2014

YEAR	TREATMENT
2012	Road ROW mowing Field mowing Blackberry treatment Scotch broom treatment Road assessment

YEAR	TREATMENT
2013	Road ROW mowing Blackberry and other broadleaf treatments Boundary survey Early seral habitat enhancement
2014	Road ROW mowing Bare root planting Seedling release circle spray Forest stand assessment (ongoing)

ACCESS AND RECREATION

Current use

The loop road just north of Skyline Road is listed in a local hiking guide. Though no formal use surveys have been conducted, the loop road appears to receive low use by hikers, dog walkers and to a lesser degree off-road cyclists (mountain bikers). Parking is limited to 2-3 cars at the entrance gate. Some unauthorized equestrian use and off-road vehicle use has been observed.

Comprehensive plan

The Parks and Natural Areas Planning group, in collaboration with the Conservation, Communications, Education and Visitor Services teams, is currently leading the development of a comprehensive plan for the four North Tualatin Mountains sites, which is expected to be completed in fall 2015. The plan will identify access and visitor experience opportunities at the four sites and provide a recommendation for how to balance access improvements across the sites while protecting habitat and water quality. McCarthy Creek Natural Area provides opportunity to support activities such as hiking, off-road cycling, bird watching, being in nature, scenic viewing and others. Two access points are being considered. If planned, a day use area at one of these will likely include a parking area, picnic shelter, restrooms, kiosk and trailheads; a secondary access could include a small ADA parking lot.

NATURAL RESOURCES OF SPECIAL INTEREST

A young Douglas fir forest is not a regionally rare habitat type. However, the size of this natural area (400 acres) and its proximity to other large blocks of forested habitat make it a regionally important site. Within the 400-acre site there are over 250 acres of interior forest habitat. Interior forest habitats have relatively stable habitat and low disturbance conditions and provide critical habitat for species sensitive to edge conditions such as predation and parasitism.

Additionally, the natural area protects approximately 15 percent of the McCarthy Creek watershed and many of the upper watershed headwater streams. A 20-acre patch of forest dominated by Douglas fir, Western red cedar and big leaf maple in the northwest corner of the natural area and remnant older trees in the narrow riparian zones provide some structural diversity. Legacy logging roads and failing culverts exist throughout the upper watershed and are a priority for decommissioning to reduce risks of failures delivering sediment to the streams. Isolated Oregon oak clusters occur at the site, as well as small groups of black cottonwood.

A thorough ecological inventory and assessment has not been done for the site. Listed and rare species, such as Chinook salmon (juvenile Chinook salmon were detected during fish surveys on

McCarthy Creek in 2012), northern red-legged frog and others almost certainly occur in McCarthy Creek and in more mature forests. Coho and winter steelhead are present in lower McCarthy Creek.

Rare species known to occur at McCarthy Creek

	ORBIC LIST	FEDERAL STATUS	URBANIZING FLORA (2009)
<i>No documented occurrences of rare species occur at McCarthy Creek; more investigation is needed.</i>	N/A	N/A	N/A

CURRENT AND DESIRED FUTURE CONDITION OF CONSERVATION TARGETS

Non-technical status and desired future condition of targets at McCarthy Creek

TARGET	CURRENT CONDITION	DESIRED FUTURE CONDITION
Upland closed forest	Simplified habitat structure due to previous management as a tree farm. The site lacks large trees, snags and down wood, and retains a mosaic of native understory and sparse understory due to shade and/or blackberry competition. Current forest stand assessment process should provide a better understanding of understory conditions. Canopy closure is reducing understory blackberry cover as well as native understory diversity. Holly and ivy are present and should be treated as part of any habitat restoration project. Edges will be ongoing weed maintenance areas.	Late successional forest habitat within forest floor wood accumulations, native understory diversity and cover, and increased snag and wildlife trees. Reduced edge weed cover and control of ivy and other shade-tolerant system modifying weeds.
Riparian forest	Generally in fair condition though lacks large trees and dead wood. Riparian forests are composed of narrow buffers of older forest along streams bordered by young, mixed forests.	Late successional forest habitat with increases in forest floor wood accumulations, native understory diversity and cover, and increased snag and wildlife trees. Opportunities to improve instream structure are likely present. Further investigation and planning are necessary before associated projects can be implemented.
Upland shrub	These patches are a minor component of the site and include a 15-acre abandoned pasture that was recently planted to shrubs with a minor component of Oregon white oak, and two areas of failed conifer regeneration that have been enhanced with additional conifer removal.	Desired conditions are for native shrubs and herbs to dominate cover with a limited presence of non-native plant species that are not displacing natives, and can be controlled with occasional weed abatement every 3-5 years.

Key ecological attributes for upland forest at McCarthy Creek Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Size	Forested habitat patch size	Patch size (includes native shrub patches or natural clearings)	<12 ha (30 ac)	12-40 ha (30-100 ac)	40-61 ha (100-150 ac)	>61 ha (150 ac)	Very Good	Very Good	Very Good	Calculate by delineating forest patch in GIS. If more than one patch present, rank based on a composite. In the Puget Sound, most native forest birds were present in patches \geq 42 ha (104 ac). Local studies suggest a lowest threshold for birds and mammals of about 12 ha (30 ac) (Environmental Law Institute 2003; Donnelly and Marzluff 2004; Soll and Hennings 2010).
Condition	Native tree and shrub richness	Number of native tree and shrub species per acre	<5 species per 0.4 ha (1 ac)	5-8 species 0.4 ha (1 ac)	8-12 species per 0.4 ha (1 ac)	>12 species per 0.4 ha (1 ac)	TBD (likely Good)	Good	Very Good	Estimate via site walk. Native wildlife species diversity is associated with native vegetation. A diversity of shrubs is more likely to provide food and shelter for species over the seasons. Shrub diversity is particularly important to pollinators and songbirds (Hagar 2003; Hennings 2006; Burghardt et al. 2009).
Condition	Mature trees	Number and size (dbh) of species such as Douglas fir, western red cedar, western hemlock and grand fir	Mature trees lacking	<3 per ac with dbh >24 in	3-5 per ac with dbh >24 in	>5 per ac with dbh >24 in	Poor	Poor**	Very good	Recruitment of native trees necessary for long-term health of upland forests. Saplings are < 2m tall. Based on PIF (2000) biological objective for WV large-canopy trees in riparian deciduous woodland. **It will likely take decades to achieve a 24" DBH if thinning is not implemented. Even with thinning, it may take approximately 20 years to achieve large diameters.
Condition	Standing and downed dead trees	Average # snags and large wood (> 50 cm, or 20 in, DBH) per acre	< 5 snags and <5% down wood	5-11 snags and 5-10% down wood	12-18 snags and 10-20% down wood with moderate variety of size and age classes	>18 snags and >20% cover down wood in a good variety of size and age classes	Poor	Poor***	Very Good	Estimate via site walk. Rankings distilled from multiple references and particularly from <i>Habitat Conservation for Landbirds in Lowlands and Valleys of Western Oregon and Washington</i> (Altman and Alexander 2012) and DecAID results for species' use of dead wood in Westside Lowland Conifer-hardwood forests. ***There will be a limited improvement in snags and down wood where thinning is implemented in the next five years. On the remaining areas where thinning is expected to occur in 15-25 years, snag and down wood recruitment will be very low until thinning is implemented.

*Desired future condition

Key ecological attributes for riparian forest (streams or rivers) at McCarthy Creek Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Vegetative structure: shrub layer	% native shrub cover	<10% cover	10-25% cover	25-50% cover	>50% cover	TBD	Fair	Very good	Estimate via site walk. Indicator categories based on data from local study at 54 riparian study sites. Abundance and species richness of many bird and mammal species is associated with native shrub cover and woody vegetation volume. Puget Sound studies suggest that the fragmentation of upland vegetation and the total amount of riparian vegetation explain the greatest amount of variability in riparian bird communities (Carey and Johnson 1995; Hennings 2001; Hagar 2003; Shandas and Alberti 2009; Hagar 2011).
Condition	Native herbaceous layer richness	# native species of grasses, herbs, forbs and ferns, at least half of which are riparian-associated, per 0.4 ha (1 ac)	<5 species	6-12 species	12-18 species	>18 species	TBD	Fair	Very good	Estimate via site walk. Species numbers based on field experience of Marsha Holt-Kingsley and Lori Hennings; currently using species list from McCain and Christy 2005, Technical Paper R6-NR-ECOL-TP-01-05.

*Desired future condition

Key ecological attributes for upland shrub habitat at McCarthy Creek Natural Area

CATEGORY	KEA	INDICATOR	----- INDICATOR RATING -----				CURRENT RATING	DFC* FOR THIS SCP	LONG TERM DFC	COMMENTS
			POOR	FAIR	GOOD	VERY GOOD				
Condition	Vegetative structure: shrub layer	% native shrub canopy cover	<10% cover	10-25% cover	25-50%	>50%	Good	Good	Very Good	Native shrubs and herbaceous plants provide 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	Native shrub richness	# native shrub species per acre	<2 species per 0.4 ha (1 acre)	2-5 species per 0.4 ha (1 acre)	6-9 species per 0.4 ha (1 acre)	>10 species per 0.4 ha (1 acre)	TBD	Good	Very Good	Estimate via site walk. Native wildlife species diversity is associated with native vegetation. Shrub diversity is important to long-distance migratory songbirds. Partners in Flight biological objective for yellow warbler (sub-canopy, tall shrub foliage in riparian woodland) (Altman 2000).

*Desired future condition

THREATS TO CONSERVATION TARGETS AT McCARTHY CREEK NATURAL AREA

McCarthy Creek Natural Area is primarily threatened by factors that limit forest stand health (overstocking, disease, non-native species), given its near complete cover by upland forest habitat. Notable features that magnify these issues occur along property edges. The site also has modest, unplanned public use, which may increase in the future following a comprehensive plan, currently in progress. Resulting public access increases and associative infrastructure, if they occur, would also likely result in increases in weed and human disturbance threats to native vegetation and wildlife.

Threats at conservation targets at McCarthy Creek Natural Area

CONSERVATION TARGET	STRESS (DEGRADED KEA)	SEVERITY	SCOPE	OVERALL STRESS RANK	SOURCE (THREAT)	CONTRIBUTION	IRREVERSIBILITY	OVERALL SOURCE RANK	OVERALL THREAT RANK	COMMENTS
Upland forest	Forest stand structure – mature trees	High	High	High	Overstocking competition	Very High	Low	Moderate	High	This threat can be mitigated with thinning that includes snag, down wood and wildlife pile creation.
Upland shrub habitat	Vegetative structure: shrub layer	Very High	High	Very High	Overstocking competition, non-native shrub species (e.g., Scotch broom, blackberry)	Very High	Low	Moderate	Very High	This threat can be addressed with selective woody weed abatement and targeted revegetation.
Riparian vegetation	Native herbaceous layer richness	Moderate	Moderate	Moderate	Previous land management as commercial tree farm	High	Low	Moderate	Moderate	Thinning and under-planting will increase native herbaceous diversity.

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 key ecological attribute, 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
- Decreased water availability in summer

Indirect effects that may occur

- Increased risk of wildfire in hotter, dryer 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.

STRATEGIC ACTIONS

Enhancement and management strategies recommended for the site target improvements to forest structure, vegetation diversity and non-native species suppression. Priority actions are described below.

List of proposed strategies at McCarthy Creek Natural Area

STRATEGY	SOURCES OF STRESS IT ADDRESSES	FOCAL CONSERVATION TARGETS/KEAS AFFECTED	WHY IT IS IMPORTANT AND ANY TIMING ISSUES	MEASURE(S) OF SUCCESS	RANK
Treat exotics, especially <i>Rubus armeniacus</i> and <i>Hedera helix</i> . Survey and treat EDRR species and system-changing invasives.	Competition from exotic plants.	Riparian forest: % native shrub and herbaceous cover (combined). Upland shrub: % native shrub canopy cover.	Periodic treatments of certain exotics are essential to avoid losing native plants.	Establish and maintain KEA rating of Good	Medium
Selectively thin upland forest patches that are accessible to machine harvest or affordable chainsaw thinning during the next 2-3 years.	Reduces overstocking that is causing a loss of living tree canopy and understory native vegetation diversity.	Upland forest: number and size of native tree and shrub species per acre.	This strategy will implement a pre-commercial thinning action recommended by the 2012 Forest Stand Management plan.	Visual assessment/KEA	High

STRATEGY	SOURCES OF STRESS IT ADDRESSES	FOCAL CONSERVATION TARGETS/KEAS AFFECTED	WHY IT IS IMPORTANT AND ANY TIMING ISSUES	MEASURE(S) OF SUCCESS	RANK
Decommission legacy logging roads not needed for site management.	Delivery of sediment to streams, barriers to wildlife movement.	Native fish.	Legacy roads and failing culverts are a source of sediment to McCarthy Creek.	Miles of road decommissioned and number of culverts removed or improved	High
Increase forest understory diversity of upland forests	Habitat simplicity; resiliency to climate change.	% native tree and shrub richness.	Enhances resiliency to climate change while providing better wildlife habitat, forest soil benefits, weed suppression.	Visual assessment/KEA	Medium
Reduce non-native cover in upland shrublands	Non-native species competition.	% native canopy cover.		Visual assessment /KEA	Medium

Strategy ranking:

High: must do within 5 years to protect target viability

Medium: target will persist without it but will degrade over 5-10 years or require additional future management

Low: addresses a non-critical threat or one that is unlikely to threaten target viability within 10 years

SPECIFIC ACTIONS AND FUNDING REQUIREMENTS

Enhancement and management strategies, as they pertain to the conservation targets, are described below.

Specific actions to implement strategies tied to conservation targets at McCarthy Creek Natural Area

STRATEGY	TARGET	PRIORITY (HOW SOON)	SPECIFIC TASKS	ESTIMATED COST
Selectively thin forest stands to promote late successional structure and improve function	Upland and riparian forest	High – next 3 years	Implement a combination of machine and chainsaw thinning to selectively open overstocked forests to increase forest stand structure, diversity and resiliency to climate change.	\$40,000-65,000
Decommission legacy roads, repair or replace any remaining culverts	Native fish and water quality*	High	Implement road management recommendations developed by AKS Engineering.	\$100,000-150,000
Treat exotics, especially the non-native ivies, clematis and holly	All	Moderate	Forest stand assessment currently in progress may provide more information about scope ivy and holly presence. Sweep upland forest habitat to treat exotics.	\$30,000 for the first five years
Interplant to increase understory diversity	Upland forest	Low	Develop plant list of desired understory species (woody and herbaceous) and interplant to introduce sustainable cover of those species in thinned areas.	\$35,000
Interplant to increase understory diversity	Upland shrub	High	Re-vegetation.	\$20,000
Boost snags and downed wood	Upland forest	Moderate	Selective topping and girding/ tree-falling, create wildlife piles as part of thinning.	\$15,000
Increase instream complexity	Riparian forest	Low	Instream LWD placement as part of thinning	\$30,000

MONITORING PLAN

Monitoring for key ecological attributes associated with the site's conservation targets will largely be done via periodic visual assessment. In addition, periodic wildlife monitoring would be appropriate for the North Tualatin Mountains sites, focusing on long-term tracking of the avian community and periodic assessment of the terrestrial salamander population as it relates to increasing understory and large woody material improvements over time.

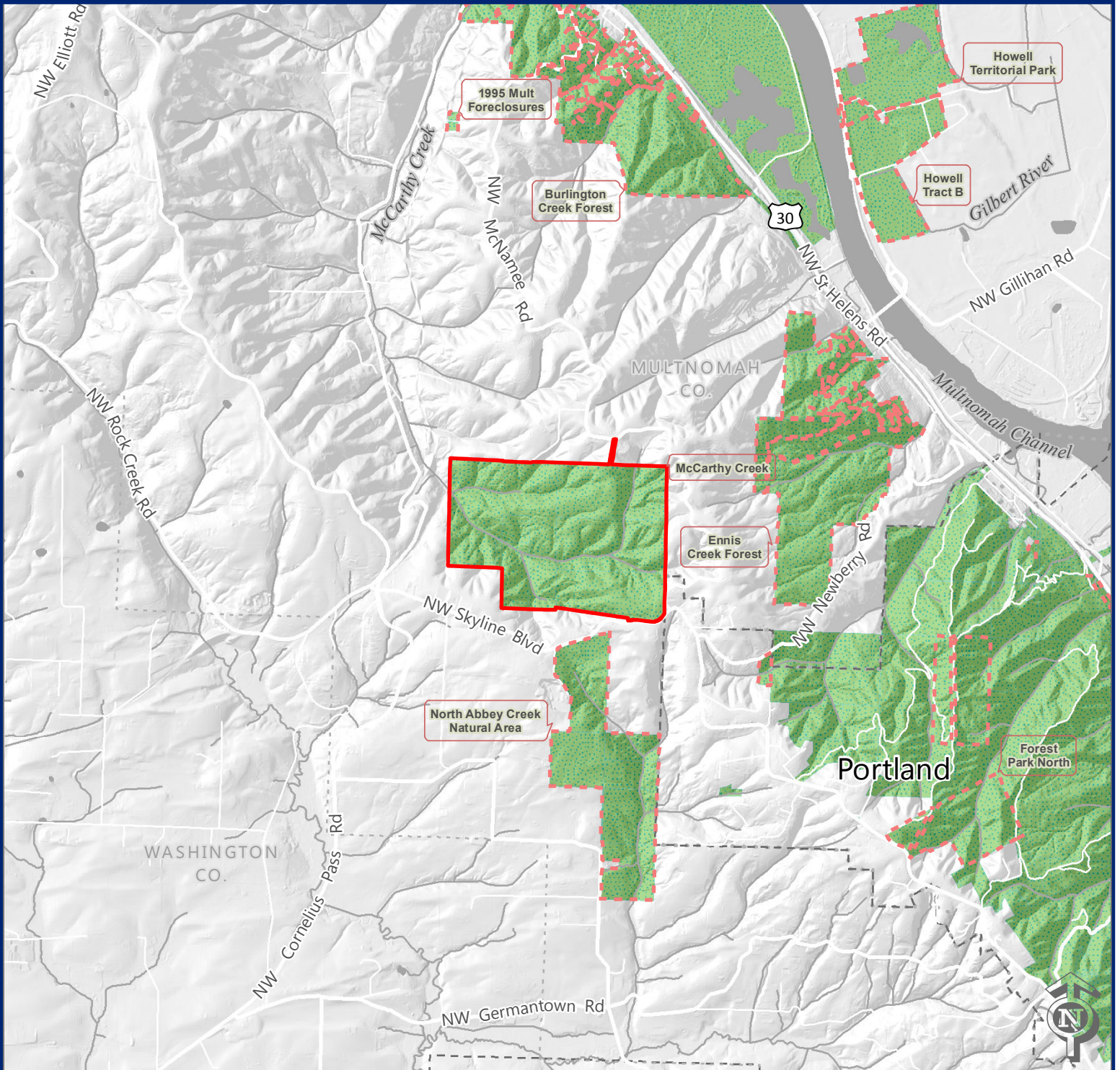
KEY STAKEHOLDERS

- West Multnomah Soil and Water Conservation District: Michael Ahr, michael@wmswcd.org
- City of Portland: Kendra Peterson-Morgan, kendra.peterson-morgan@portlandoregon.gov
- Forest Park Conservancy: Renee Meyers, renee@forestparkconservancy.org
- Trout Mountain Forestry: Mike Messier, mike@troutmountain.com

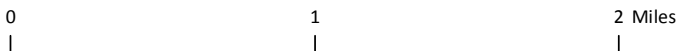
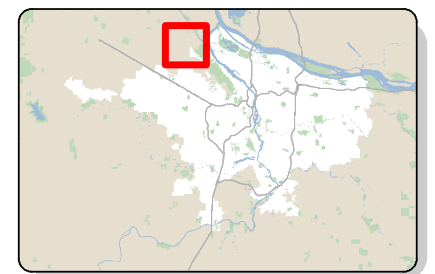
PUBLIC INVOLVEMENT AND OUTREACH

The access off of Skyline Blvd., though parking is limited, and the loop road provide relatively easy access for small public events. McCarthy Creek Natural Area has been utilized by conservation and outdoor education groups such as TrackersNW. Skyline Elementary School has expressed an interest in exploring environmental education opportunities at the site. Self Enhancement, Inc. has utilized the nearby North Abbey Natural Area.

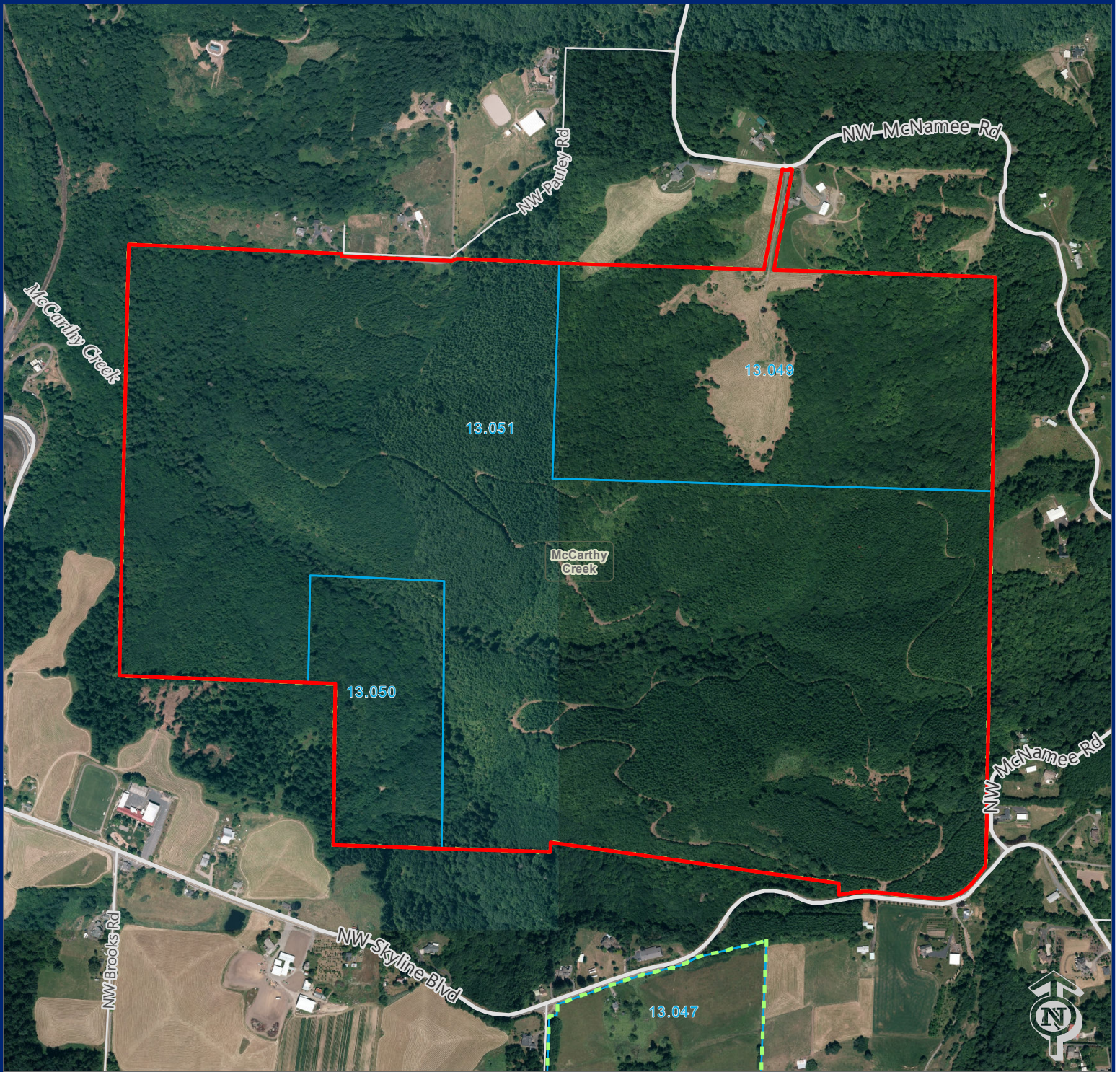
VICINITY MAP




- McCarthy Creek site
- Other Metro sites
- Park and/or natural area




SITE MAP

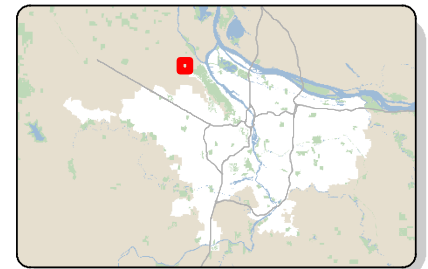


 McCarthy Creek site

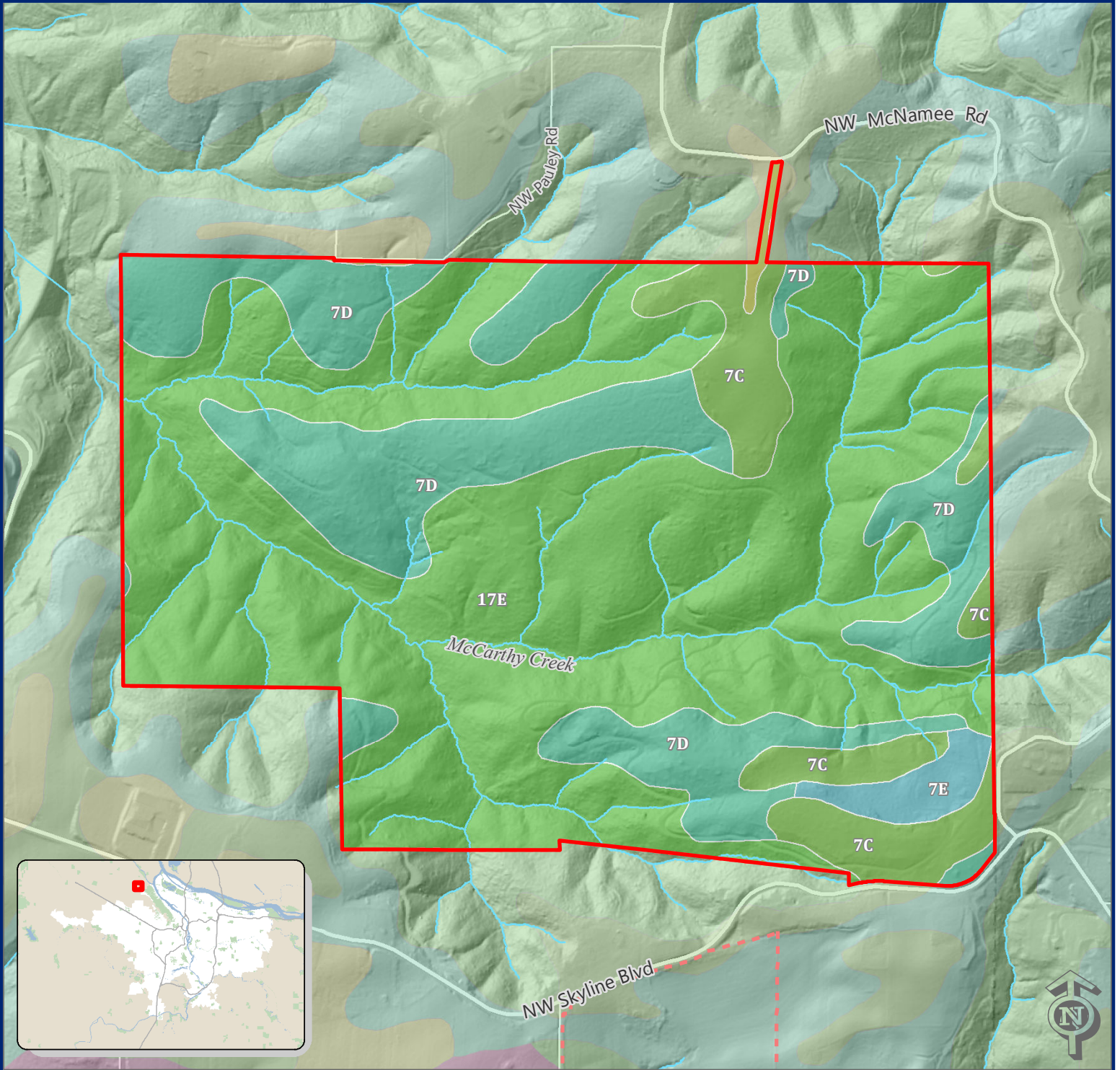
 Other Metro sites

Bond Measure

 2006 Bond Measure



SOILS



McCarthy Creek



Other Metro sites



Hydric soils

NRCS soils on Site



Cascade silt loam, 15 to 30 percent slopes



Cascade silt loam, 3 to 8 percent slopes



Cascade silt loam, 30 to 60 percent slopes



Cascade silt loam, 8 to 15 percent slopes

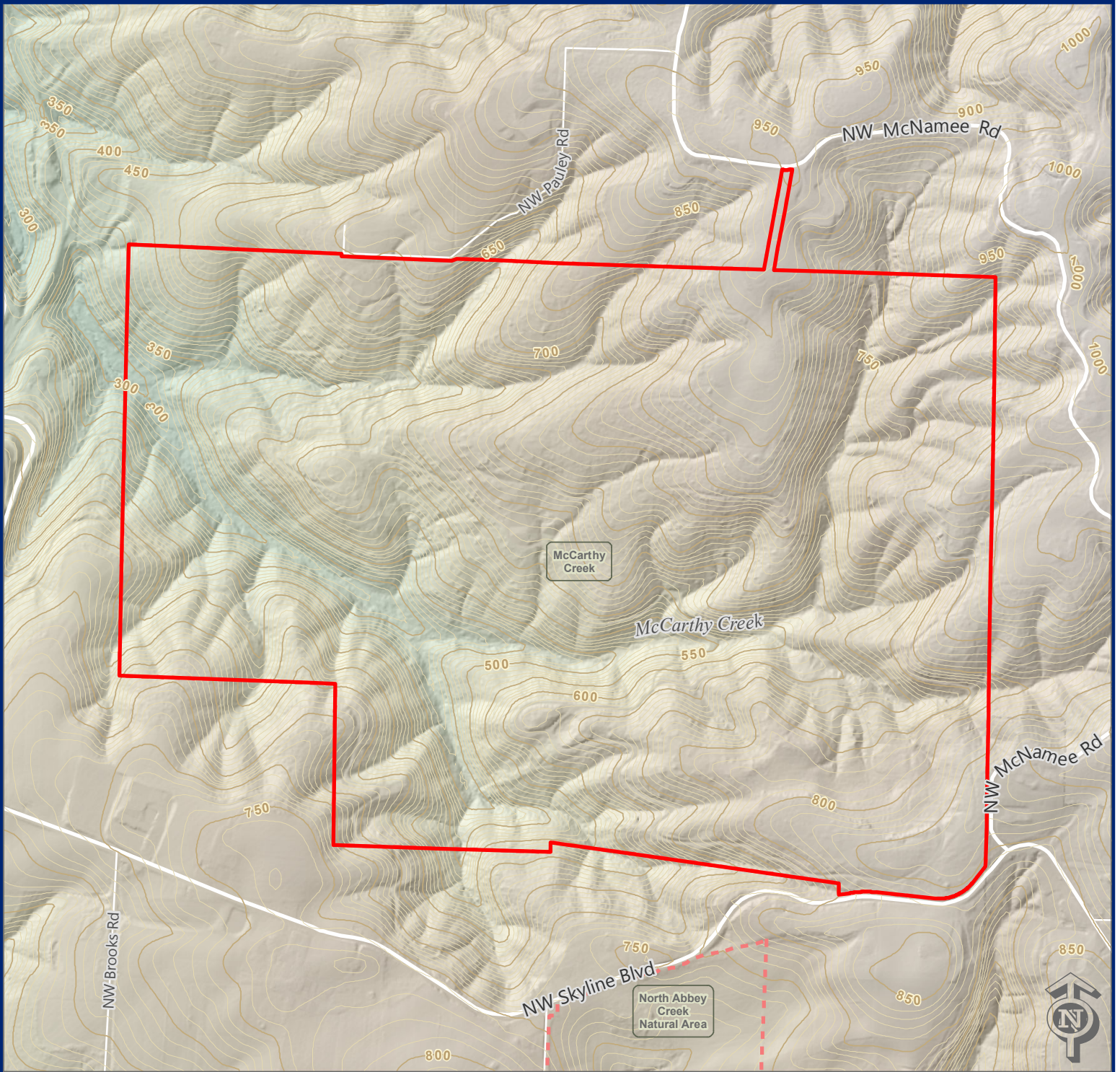




Goble silt loam, 30 to 60 percent slopes

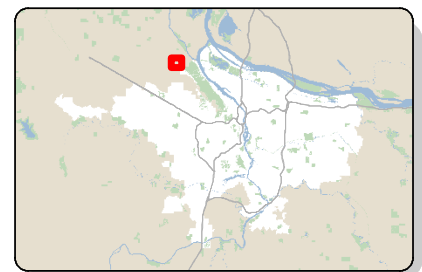
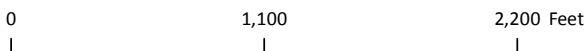
0 1,000 2,000 Feet



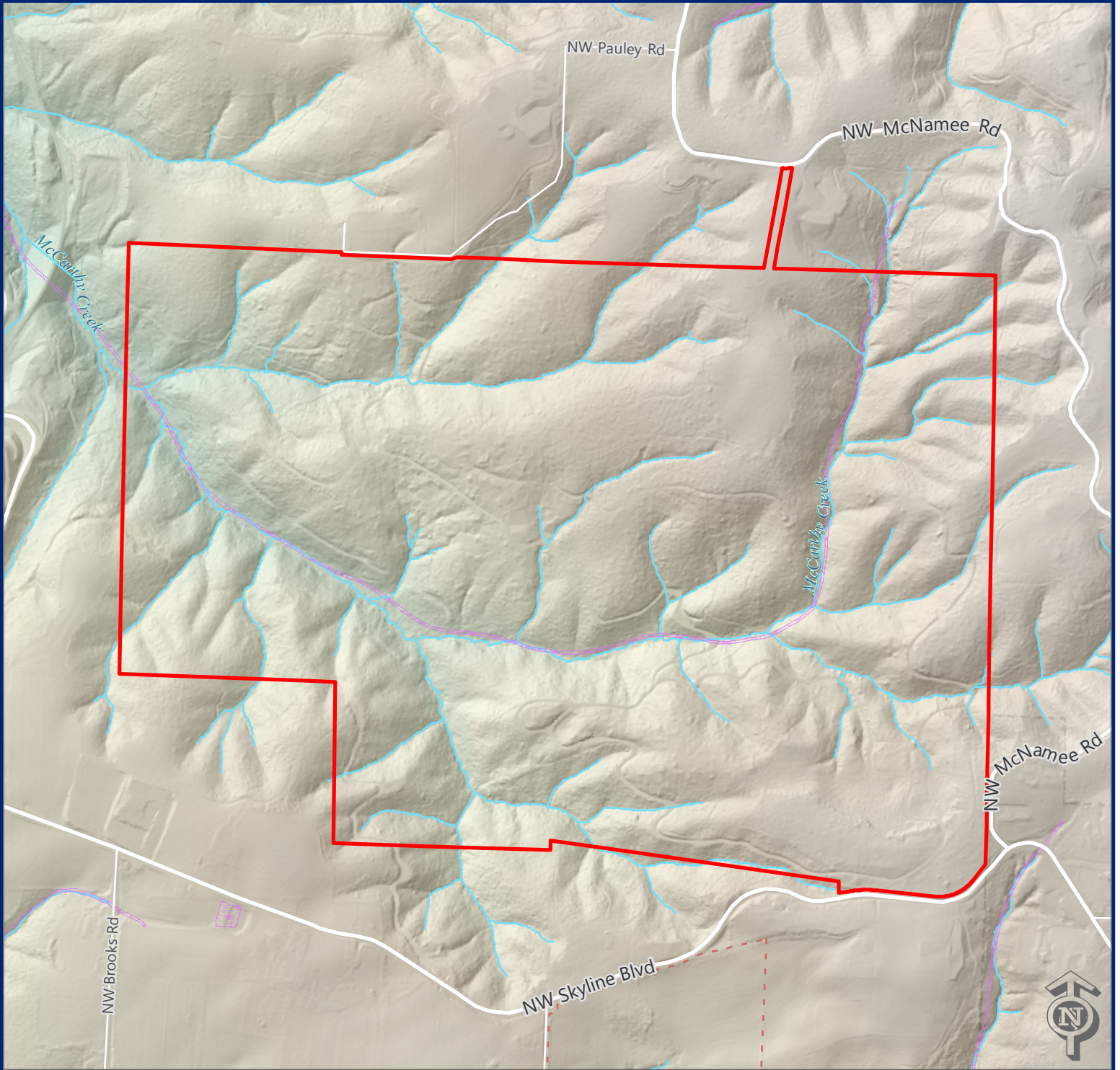
TOPOGRAPHY






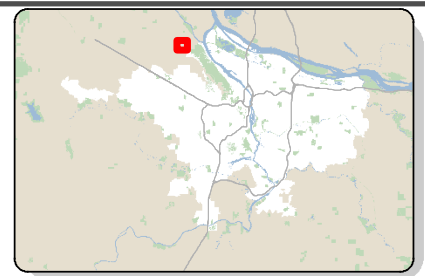
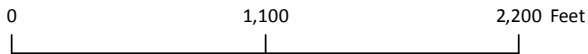
-  McCarthy Creek site
-  Other Metro sites



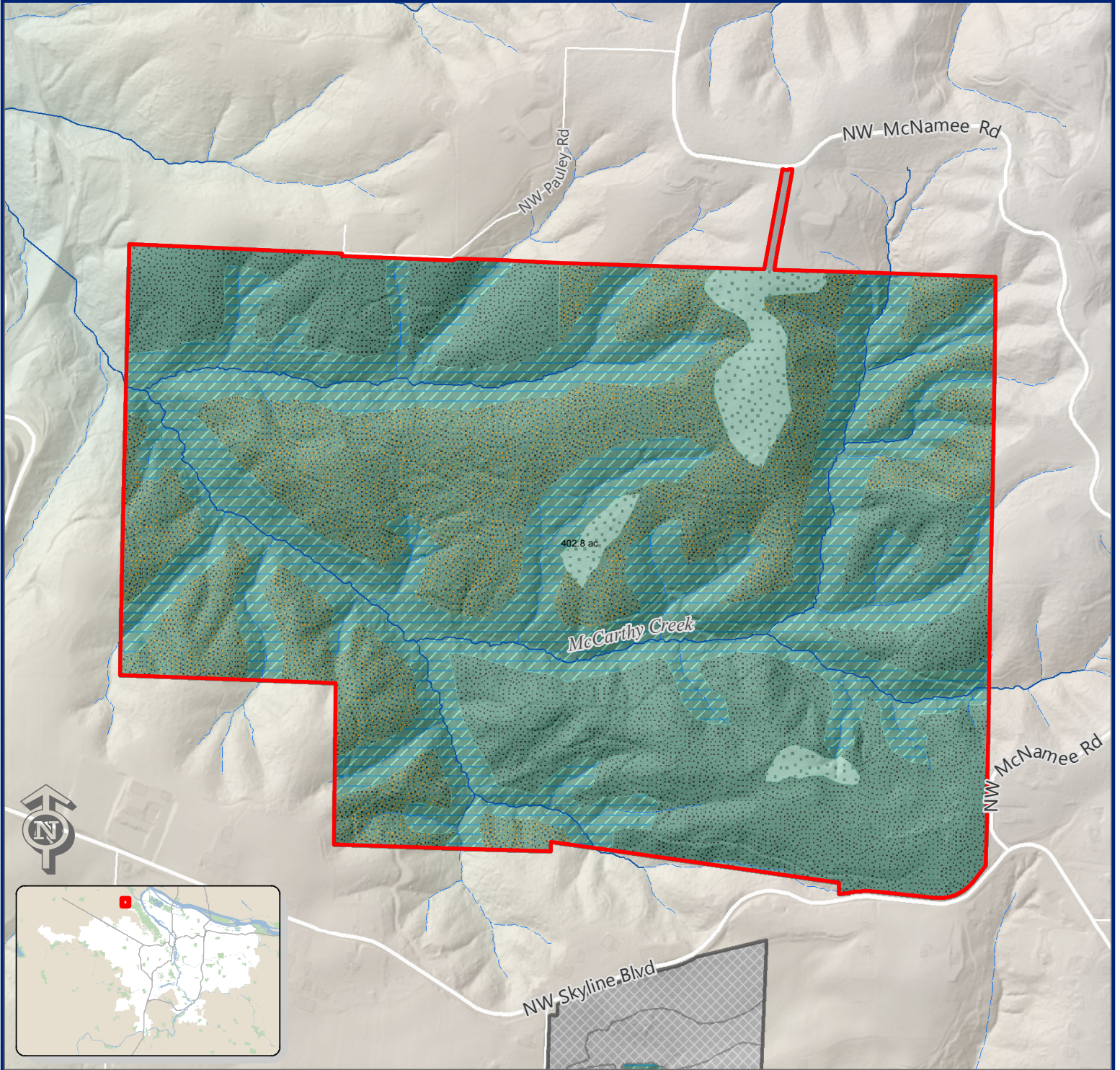
HYDROLOGY



-  McCarthy Creek site
-  Other Metro sites
-  100 year floodplain
-  Wetlands (Wetlands Conservancy data)



CURRENT COVER

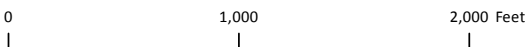


- McCarthy Creek site
- Other Metro sites

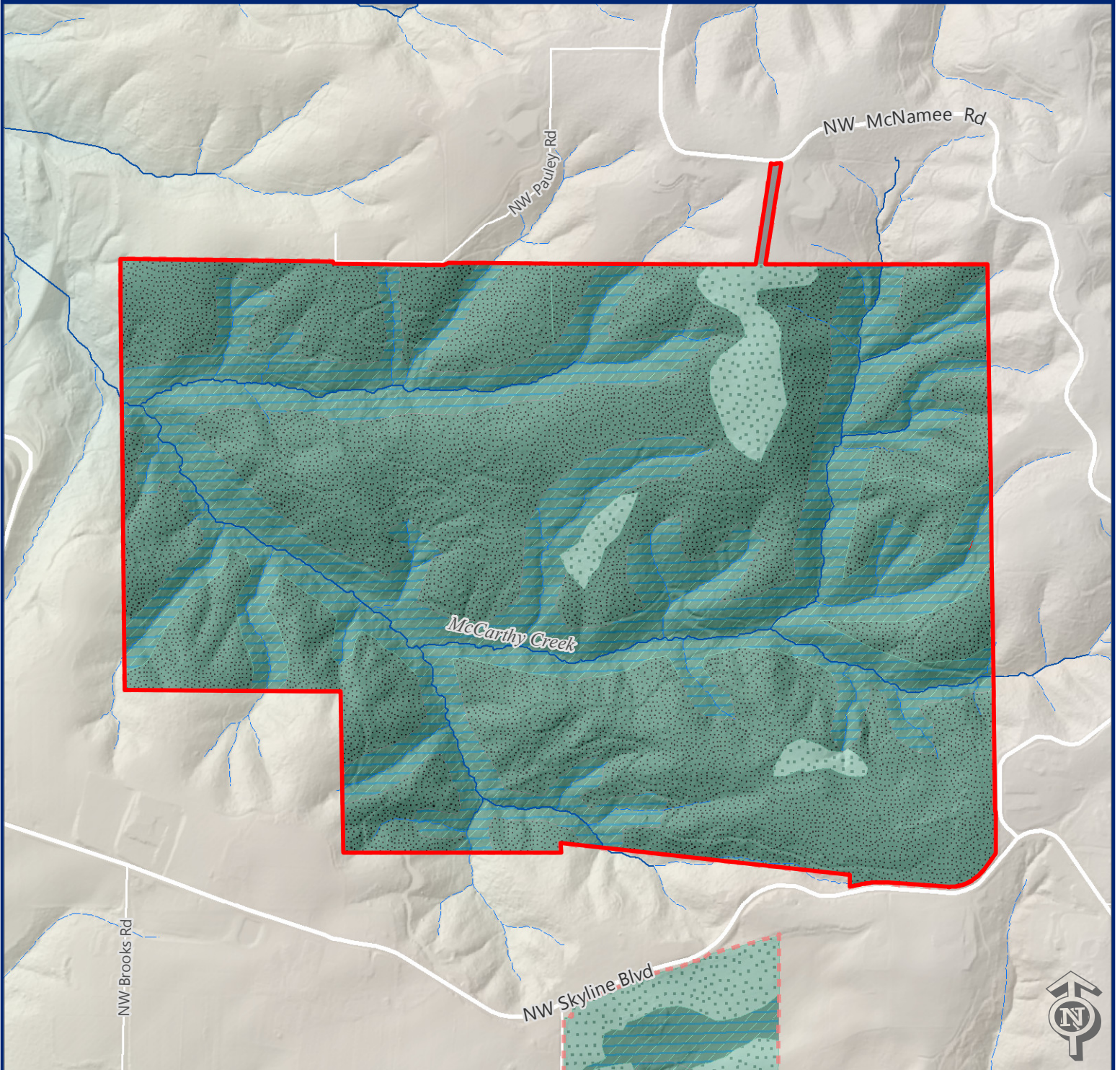
Current cover

- Developed - (impervious)
- Developed - (pervious/non ag)
- Riparian forest

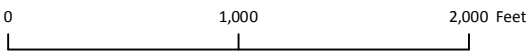
- Upland forest - coniferous
- Upland forest - mixed
- Upland forest - shrub (stage)



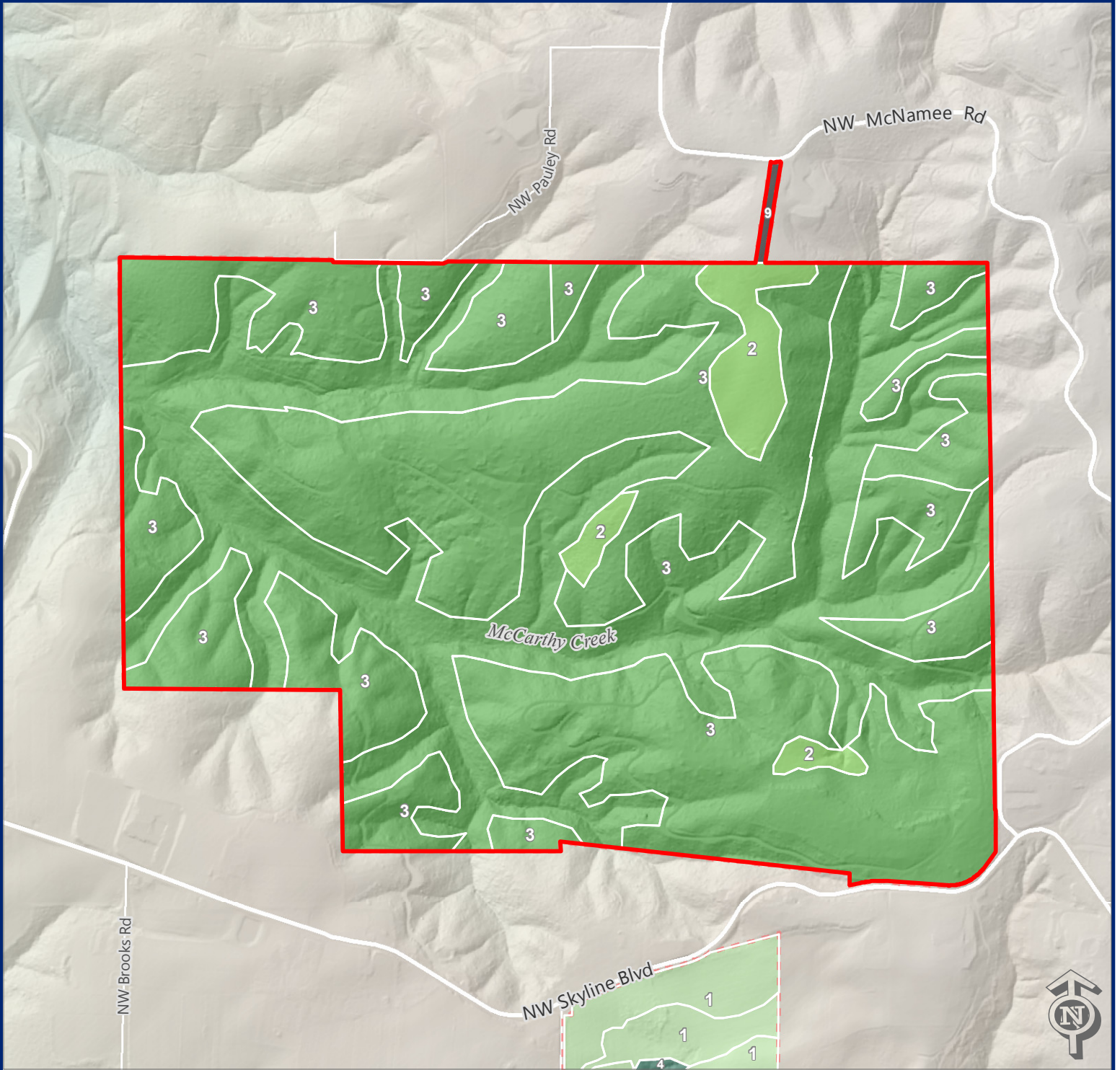
CONSERVATION TARGETS



- | | | |
|--|---|--|
|  site | Conservation targets |  Upland forest |
|  Other Metro sites |  No Targets |  Upland forest - shrub (early successional) |
| NHD Flowlines |  Riparian forest | |
|  Intermittent stream | | |
|  Perennial stream | | |
|  Pipeline | | |

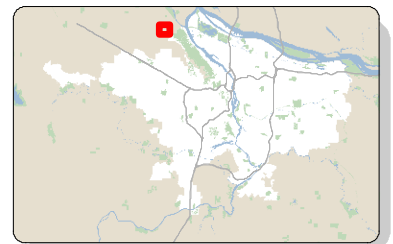


CONSERVATION TARGET STATUS



- site
- Other Metro sites

- Management status**
- 1 - Initiation
 - 2 - Establishment
 - 3 - Consolidation
 - 4 - Refinement and long-term maintenance
 - 9 - No targets (developed)



0 1,000 2,000 Feet

