# OSTROMS MUSHROOM FARM

**THURSTON COUNTY, WASHINGTON**

## OREGON WHITE OAK HABITAT MANAGEMENT PLAN

*Prepared By:*


Curtis Wambach, M.S.
Senior Biologist and Principal

EnviroVector
OPTIMIZE USABLE LAND


8 September 2022


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***Prepared For:***

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***Prepared By:***

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# 1.0 INTRODUCTION

## 1.1 Purpose

Fish and Wildlife Conservation Areas are protected under the City of Lacey Municipal Code (LMC) 14.33. Under LMC 14.33.030---*Definitions*, Subsection K--- "*Fish and wildlife habitat conservation areas*" and LMC 14.33.060---Designation, maps and inventory, Fish and Wildlife Conservation Areas include Priority Habitats and Species (PHS) defined by the Washington Department of Fish and Wildlife (WDFW). The WDFW defines certain oak stands as Priority habitat. Oak stands that have been identified on the subject property satisfy the WDFW definition of Priority Oak Habitat. Under LMC 14.33.110---*Application information requirements*, Subsection B, Priority Habitat required the preparation of a Priority Habitat Management Plan. This report was prepared to satisfy LMC 14.33.160---*Criteria for habitat conservation area approvals*.

This HMP will evaluate:

1) The existing conditions on the site,
2) Quality of existing oak habitat,
3) Potential construction impacts to oak habitat,
4) Opportunities to preserve, protect, or mitigate impacts, and
5) The implementation of Management Recommendations for Washington's Priority Habitats: Oregon White Oak Woodlands by the Washington Department of Fish and Wildlife (Larsen and Morgan, 1998).

## 1.2 Project Location

The 33.86-acre subject property is located on Steilacoom Road in Thurston County (**Figure 1; Table 1**).

**Table 1. Parcels Comprising Subject Property**

| No# | Address | Parcel Number | Map Coordinates | Area |
|---|---|---|---|---|
| 1 | 8322 STEILACOOM RD SE | 11814140500 | Section 23 Township 18 Range 1W | 33.86 |
| 1 Parcel | Total Size | | | 33.86 acres |

The permitting jurisdiction is City of Lacey

### 1.3 Property Description

The subject property consists of an abandoned mushroom farm with large buildings, hard surface, large area of stacked pallets, and other structures associated with mushroom farm operations (**Figure 2; Appendix A, Photos 1-24**). The central portion of the subject property primarily consists of concrete, pavement, and large buildings surrounded by a ring of grass on compressed rock. The northern and eastern peripheries of the subject property are vegetated by a forest of Oregon white oaks (*Quercus garryana*) with an understory dominated by invasive weeds, primarily Himalayan blackberry (*Rubus armeniacus*), English ivy (*Hedera helix*), and poison hemlock (*Conium maculatum*) (**Figure 2; Appendix A, Photos 61-86**). Some native oak-associated plant species are scattered in patches within the understory (**Figure 2; Appendix A, Photos 77-80**).

## 2.0 METHODOLOGY

### 2.1 Information Review

Background information was reviewed prior to field investigations and includes the following:

1. Department of Natural Recourses (DNR) Oak Stands (**Appendix B**)
2. Thurston County Geodatabase Soils (**Appendix C**)
3. Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) Database (**Appendix D**)
4. State Department of Natural Resources (DNR) Natural Heritage Database (**Appendix E**)
5. Thurston County Code (TCC)
6. Washington's Priority Habitats: Oregon White Oak Woodlands by the Washington Department of Fish and Wildlife

### 2.2 Field Investigation

The subject property has been evaluated on foot. Equipment included Trimble, diameter tape, portable camera, and field notebook. Site Evaluations were performed on 15 June 2022, 17 June 2022, 21 June 2022, 28 June 2022, 5 August 2022 and 11 August 2022. Vegetation types have been characterized and mapped on the site. Present and past land use practices were also recognized, as were significant geological and hydrological features.

## 2.3 Wildlife Reconnaissance Methodology

An inventory of wildlife occurrence on the subject property was compiled through the field survey and through a review of background information obtained from USFWS, WDFW, and the Department of Natural Resources (DNR) Natural Heritage Program. Information concerning amphibian and reptile species was based on Brown *et al.* (1995), Kozloff (1978), Leonard *et al.* (1993), Nussbaum *et al.* (1983), and Olson *et al*. (1997). Bird species information was based on Acorn and Baron (1997), Hunn (1982), Johnsgard (1990), and Kozloff (1978). Information concerning birds' nests, nesting cavities, woodpecker feeding stations, animal tracks, scats, and other wildlife indicators was based on Harrison (1979) and Murie (1974). Background information about mammals was based on Forey and Fitzsimons (1987), King County (1987), and Whitaker (1996).

## 2.4 WDFW Management Recommendations

Management recommendations are designed to maintain and enhance the integrity of Oregon white oak woodlands, reverse the trend of oak habitat loss, and promote the protection of oak habitat that is presently in good condition. Encroaching conifers within oak groves should be thinned, and conifers adjacent to these stands should be retained for wildlife. An alternative to removing trees is to leave them standing as snags.

Specific WDFW Management Recommendations include but are not limited to the following:

- Allow low-impact recreation.
- Thin encroaching conifers in oak woodlands.
- Retain large, dominant oaks and standing dead and dying trees.
- Create snags when thinning conifers instead of removing trees.
- Leave fallen trees, limbs, and leaf litter for foraging, nesting, and denning sites.
- Retain contiguous aerial pathways.

Other WDFW Management Recommendations for oak enhancement include the following:

- Planting Oregon white oak acorns and seedlings.
- Moving toward the elimination of grazing on oak woodlands.
- Designating contiguous oak and oak/conifer stands as critical areas.

# 3.0 OAK HABITAT

## 3.1 General Information

Oregon white oak (*Quercus garryana*) is Washington's only native oak. Oaks and their associated flora communities comprise distinct woodland ecosystems. The various plant communities and stand age mixtures within oak forests provide habitat that contributes to wildlife diversity statewide. In conjunction with other forest types, oak woodlands provide a mix of feeding, resting, and breeding habitat for many wildlife species. Oak woodlands provide habitat for more than two hundred (200) vertebrate species and a profusion of invertebrate species (Larsen & Morgan, 1998). Acorns, leaves, and wood provide food, shelter, and cavities to support wildlife species.

Conifer encroachment is a significant threat to oak habitat and is aggravated by fire suppression, timber conversion, and cattle grazing. Grazing, a primary use of oak woodlands, reduces species richness of ground cover, increases soil moisture, compacts soils, and disturbs sod, all of which may promote conifer growth and encroachment.

Fire suppression has contributed to the decline of Oregon white oak woodlands. Natural fires and those intentionally set by Native Americans historically played a paramount role in oak forest ecology, especially natural oak regeneration. Frequent low-intensity fires curbed conifer encroachment, controlled stand density, and initiated oak sprouting.

## 3.2 Distribution

Oak habitat originally became established during a warm and dry period about six thousand (6,000) years ago, when oak stands had reached their most widespread distribution in Washington State. The subsequent trend toward cooler and moister climatic conditions favored conifer establishment and has probably contributed to the diminished extent of Oregon white oak today (Larsen and Morgan, 1998). The current distribution of Oregon white oak woodlands in Washington is limited primarily to the Puget Trough, Washington's south-central counties, along the Columbia Gorge, and northward along the east side of the Cascade Range.

## 3.3 Habitat

Oregon oak is a component of several different plant community types within its range and often occupies a narrow sub-zone between prairies and conifer forests. It is found in open savannas, in pure stands, and intermixed with conifers and other deciduous trees, but it is usually confined to drier microsites within conifer zones.

In Washington, oak stands typically occur within the sixty-three (63) to one hundred two (102) cm (25-40 in) rainfall zone. Most important is a ten (10) to twenty-five (25) cm (4-10 in) range for rainfall during the growing season that occurs between April and September. Stands that receive more than twenty-five (25) cm (10 in) of rainfall during the growing season typically encounter greater competition from faster growing coniferous tree species (Sprague and Hansen, 1946; Larsen and Morgan, 1998).

Oregon white oak is tolerant of a broad array of soil types. It is frequently found in well-drained, gravelly soils, but in the Pacific Northwest it reaches optimum development in the deep loams of southwestern Washington and the Willamette Valley in Oregon.

In the moist, Douglas-fir dominated Puget Trough, Oregon white oaks are associated with subzones between prairie and conifer forest. Typical oak woodland understory shrub associates include ocean spray, high-bush cranberry, beaked hazelnut, serviceberry, common snowberry, trailing blackberry, Oso berry plum, poison oak, tall Oregon grape, and Scot's broom. Forb species may include western bittercress, American vetch, western wood strawberry, spring beauty, chickweed, balsamroot, and lupine. Some grasses found are velvet grass, bluebunch wheatgrass, long-stoloned sedge, red fescue, Idaho fescue, western ryegrass, orchard grass, and Kentucky bluegrass.

Like oaks in Washington, western gray squirrels were probably more widely distributed in prehistoric times, and their decline parallels that of the Oregon white oak. However, it should be noted that the decline of this squirrel species is also attributed to factors not related to the Oregon white oak. Introduction of non-native species, diseases transmitted from those species, and competition from these non-native species in a rapidly changing human-dominated landscape, have contributed to the decline of the species. Eastern gray squirrels are more tolerant of human disturbance and have invaded urbanizing areas within western gray squirrel range and can more easily adapt to alternative food sources.

### 3.4 Threats to Oregon Oak

Thurston County contains about ten thousand (10,000) acres of oak and mixed oak stands (WDFW, 1998). The decline of Oregon white oak in Washington has been accelerated by a number of human activities. Stand thinning and land conversion for conifer production, agriculture, fuel wood cutting, cattle grazing, and other human land uses are all considered significant contributors to the current decline of Oregon white oak. The suppression of wildfires, along with continued cattle grazing and timber conversion, are thought to contribute to encroachment by Douglas fir in sites historically dominated by Oregon white oak.

Douglas fir encroachment may be the most significant and widespread threat to the existence of Oregon white oak communities within its western range. Douglas fir grows at a rate three (3) to five (5) times that of Oregon white oak (Sprague and Hansen, 1946), and oak seedlings and saplings can be quickly outcompeted by faster growing conifers. Shade tolerance is higher in the juvenile stage than mature stages of Oregon white oak. Once oak trees become overtopped by Douglas-fir, they are unable to withstand the subsequent low light intensities.

## 4.0 RESULTS

### 4.1 Analysis of Existing Information

#### 4.1.1 DNR Oak Habitat

No grassland or oak habitat has been mapped in the subject property by the Washington State Department of Natural Resources (DNR) Natural Heritage oaks and grasslands database (**Figure 10**). Oak habitat has been mapped south of the subject property across Steilacoom Road SE.

### 4.1.2 Thurston County Geodata Center (Soils)

Three (3) soil types are mapped on the subject property by the Thurston County Geodata Center (**Appendix B; Table 2**).

**Table 2. Summary of Thurston County Soils**

| Soil Unit | Comments |
|---|---|
| Everett very gravelly sandy loam, 3 to 15% slopes | Mapped on the Northeastern corner of the property |
| Spanaway gravelly sandy loam, 0 to 3% slopes | Mapped on the majority of the property |
| Spanaway gravelly loam | Mapped on southeastern corner of the property |

### 4.1.3 WDFW PHS Database

No priority habitats or species, including oak habitat or oak endemic species, have been mapped on the subject property by the PHS database (**Appendix C**).

Mazama (western) pocket gopher (Thomomys mazama) occurrence has been mapped approximately eight hundred (~800) feet southwest of the subject property.

The big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), Yuma myotis (*Myotis yumanensis)* have been mapped in the township.

### 4.1.4 DNR Natural Heritage Database

No rare plants and nonvascular species of high conservation value were mapped on the subject property or within one thousand (1,000) feet of the subject property by the DNR Natural Heritage Database (**Appendix E**).

## 4.2 Field Evaluation

### 4.2.1 Vegetation Communities and Habitat Types

Two (2) vegetation types occur on the subject property:

1. <u>European Lawn Forbes/ Grasses</u>

   Vegetation on periphery of the abandoned mushroom farm facility is mowed European lawn grasses and associated non-native lawn forbs on compressed rock (**Figure 2**).

2. <u>Oak Woodland Habitat</u>

   Vegetation on the northern, eastern, and southeastern property boundaries of the subject property has been identified as oak habitat, as defined by the WDFW (**Figure 3**, **Appendix A, Photos 21-86**). Understory vegetation primarily consists of the non-native invasive weeds Himalayan blackberry and poison hemlock (**Appendix A, Photos 61-86**).

### 4.2.2 Oregon White Oak Habitat

Priority oak habitat, as defined by the WDFW, has been identified and mapped on the northern, eastern, and southeastern periphery of the subject property (**Figure 3; See Section 6.3 for WDFW Definition of Priority Oak Habitat**). The site contains pure oak stands where canopy coverage of the oak component of the stand is greater than twenty-five percent (>25%) and oak savannah but oak trees accounts for at least fifty percent (≥50%) of the canopy coverage present.

In urban or urbanizing areas, such as at the subject property, single oaks, or stands of oaks less than one (<1) acre in size, may also be considered a priority when found to be particularly valuable to fish and wildlife (*i.e.,* they contain many cavities, **have a large diameter at breast height [dbh]**, are used by priority species, or have a large canopy). The WDFW defines "large dbh" as oak trees with a dbh greater than fifty (>50) centimeters. Fifty (50) centimeters equals 19.69 inches. Individual trees larger than 19.69 dbh are considered priority habitat.

Six (6) oak stands have been identified and recorded on the subject property (**Figure 3**). Area 1 contains a high concentration of oak trees. Additional oak trees occur in this area beyond that recorded in this report. Monotypic thickets of Himalayan blackberry intermixed with dense poison oak occur between Areas 1, 2, 5, & 5 (**Figure 3**). Areas 2, 3, 5, & 6 contain a high density of oak trees at varying sizes, most of which have not been recorded as part of this study. Area 3 consists of one (1) single large tree.

Understory vegetation priority consists of Himalayan blackberry, poison hemlock, and English Ivy (**Appendix A, Photos 61-86**). Some less abundant native plants, such as trailing blackberry (*Rubus ursinus),* tall Oregon grape (*Mahonia aquifolium*), and serviceberry (*Amelanchier alnifolia*), are scattered among the dominant invasive weeds (**Appendix A, Photos 77-80**). General habitat quality is low considering the understory vegetation is dominated by non-native invasive weeds.

A total of four hundred fourth-eight (448) Oregon white oak trees were identified and surveyed on the outer periphery of the oak stands (**Appendix E, Figures 4-9**). Note that not all the oak trees in the stand were tagged and recorded. Only the oak trees on the outer periphery of the oak stand have been identified, located, and recorded. The center of the oak stands contains a relatively high density of oak trees. However, it was theorized that any potential impacts as a result of a land use application would occur to the outer periphery of the oak stand and if necessary, additional oaks could be recorded at a later date.

### 4.2.3 Oak Associated Plant Species

Plant species identified that are associated with onsite oak trees include:

- Himalayan blackberry (*Rubus armeniacus*)
- Poison hemlock (*Conium maculatum*)
- English ivy (*Hedera helix*)
- Field bindweed (*Convolvulus arvensis)*
- Purple fox glove (*Digitalis purpurea*)
- Douglas fir (*Pseudotsuga menziesii*)
- Big-leaf maple (*Acer macrophyllum*)
- Pacific madrone (*Arbutus menziesii*)
- Ocean spray (*Holodiscus discolor*)
- Serviceberry (*Amelanchier alnifolia*)
- Tall Oregon grape (*Mahonia aquifolium*)
- Beaked hazelnut (*Corylus cornuta*)
- Osoberry (*Oemleria cerasiformis*)
- Snowberry (*Symphoricarpos albus*)
- Trailing blackberry (*Rubus ursinus*)
- Scotch broom (*Cytisus scoparius*)

### 4.2.4 European Lawn Grass

European grasses that are typically associated with lawns occur on the periphery around the abandoned facility.

Dominant lawn plant species include:

- Orchard grass (*Dactylis glomerata*)
- Red fescue (*Festuca rubra)*
- Sweet vernal grass (*Anthoxanthum odoratum*)
- Reed canary grass (*Phalaris arundinacea*)
- English plantain (*Plantago lancelata*)
- Hairy cat's ear (*Hypochaeris radicata*)
- Common vetch (*Vicia sativa*)
- Common chickweed (*Stellaria media*)
- Subterranean clover (*Trifolium subterraneum*)

## 5.0 WILDLIFE

No endemic oak-associated species, such as the western gray squirrel (*Sciurus griseus*), were observed on the subject property during the site evaluation. No squirrel nests were observed on the site that were likely constructed by the western gray squirrel. A list of wildlife species identified on the subject property can be found in **Table 5.**

Wildlife observed during the field investigations was typical of rural/suburban adapted species (**Table 5**). The big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*) and Yuma myotis (*Myotis yumanensis*) were mapped within the Township by the Priority Habitat Species (PHS) database (**Appendix C**). None of these species were identified on the subject property.

Other species adapted to rural/suburban areas may inhabit or visit the site for food and shelter. No evidence of State-listed, Federally-listed or priority species were identified on the subject property during the site evaluation.

**Table 5. Observed Wildlife Occurrence**

| Common Name | Scientific Name | Status | Habitat | Observation | Comments |
|---|---|---|---|---|---|
| **BIRDS** | | | | | |
| Spotted towhee | *Pipilo maculatus* | None | Brush | In brushes | Throughout property |
| Western scrub-Jay | *Aphelocoma californica* | None | Urban/ Suburban | In trees | Observed in trees |
| **MAMMALS** | | | | | |
| Eastern gray squirrel | *Sciurus carolinensis* | None | Urban/ Suburban | In Trees | Several observed in mixed forest |
| Black-tailed deer | *Odocoileus hemionus* | None | Urban/Forests, clearings, transition areas | Forests, clearings, transition areas | Observed in forest, footprints and scats |
| Eastern cottontail rabbit | *Sylvilagus floridanus* | None | Urban/Forests, clearings, transition areas | Forested understory | Observed in Forest and Scat |
| Western scrub-Jay | *Aphelocoma californica* | None | Urban/ Suburban | In trees | Observed in trees |
| **AMPHIBIANS** | | | | | |
| None | | | | | |
| **REPTILES** | | | | | |
| Northwestern garter snake | *Thamnophis ordinoides* | None | Brush | Tall grass | Observed in tall grass and along forested fringe |
| EX: Extirpated<br>FE: Federal Endangered<br>FT: Federal Threatened<br>FSC: Federal Species of Concern<br>FC: Federal Candidate | | SE: State Endangered<br>ST: State Threatened<br>SC: State Candidate<br>SS: State Sensitive<br>SM: State Monitor | | None: No listing status<br>None*: This species has no state listing status, but it is classified as protected wildlife.<br>EX: Extirpated | |

# 6.0 REGULATORY CONSIDERATIONS

## 6.1 Fish and Wildlife Conservation Areas

Under LMC 14.33.030---*Definitions*, Subsection K, "Fish and wildlife habitat conservation areas," also referred to as "habitat conservation areas," means areas that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem, and which, if altered, may reduce the likelihood that the species will persist over the long term. These areas shall be managed for maintaining species in suitable habitats within their natural geographic distribution so that isolated sub-populations are not created; and populations or habitats are not degraded or reduced so they are no longer viable over the long term. These areas include:

1. Areas with which state or federally designated endangered, threatened, and sensitive species have a primary association;
2. Habitats and species of local importance, including but not limited to areas designated as priority habitats or priority species by the Department of Fish and Wildlife;
3. Commercial and recreational shellfish areas;
4. Kelp and eelgrass beds, herring, smelt, and other forage fish spawning areas;
5. Naturally occurring ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat, including those artificial ponds intentionally created from dry areas in order to mitigate impacts to ponds, if permitted by a regulatory authority;
6. Waters of the state, including lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and watercourses within the jurisdiction of the state of Washington;
7. Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity;
8. State natural area preserves and natural resource conservation areas;
9. Land essential for preserving connections between habitat blocks and open spaces; and
10. Riparian ecosystems including salmonid habitat, which also includes marine nearshore areas.

Fish and wildlife habitat conservation areas do not include artificial features or constructs such as irrigation delivery systems, irrigation infrastructure, irrigation canals, or drainage ditches that lie within the boundaries of and are maintained by a port district or an irrigation district or company.

Under LMC 14.33.060---*Designation, maps and inventory,* Subsection B, Fish and wildlife habitat conservation areas include:

1. Areas with which state or federally designated endangered, threatened, and sensitive species have primary association.

    a. Federally designated endangered and threatened species are those fish and wildlife species identified by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service that are in danger of extinction or threatened to become endangered. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service should be consulted as necessary for current listing status.

    b. State designated endangered, threatened, and sensitive species native to the state of Washington identified by the Department of Fish and Wildlife, that are in danger of extinction, threatened to become endangered, vulnerable, or declining and are likely to become endangered, or threatened in a significant portion of their range within the state without cooperative management or removal of threats. State designated endangered, threatened, sensitive species are periodically recorded in WAC 232-12-014 (state endangered species), and WAC 232-12-011 (state threatened and sensitive species). The state Department of Fish and Wildlife maintains the most current listing and should be consulted as necessary for current listing status;

2. State priority habitats and areas associated with state priority species. Priority habitats and species are considered to be priorities for conservation and management. Priority species require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority habitats are those habitat areas or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element. Priority habitats and species are identified by the state Department of Fish and Wildlife;

3. Habitat and species of local importance. Habitats and species of local importance are those identified by the city of Lacey, including those that possess unusual or unique habitat warranting protection because of qualitative species diversity or habitat system health indicators;

4. Kelp and eelgrass beds, and herring, smelt and other forage fish spawning areas;

5. Naturally occurring ponds under twenty acres. Naturally occurring ponds are those ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat, including those artificial ponds intentionally created from dry areas in order to mitigate impacts to ponds, if permitted by a regulatory agency. Naturally occurring ponds do not include ponds deliberately designed and created from dry sites, such as canals, detention facilities, wastewater treatment facilities, farm ponds, temporary construction ponds, and landscape amenities, unless such artificial ponds were intentionally created for mitigation;

6. Waters of the state. Waters of the state includes lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and watercourses within the jurisdiction of the state of Washington, as classified in WAC 222-16-030 or 222-16-031 depending upon the classification used;

7. Type S, F, Np, and Ns waters as designated by the State Department of Natural Resources. Type S, F, Np, and Ns waters are those water bodies designated by the Department of Natural Resources stream typing pursuant to WAC 222-13-030;

8. State natural area preserves and natural resource conservation areas. Natural area preserves and natural resource conservation areas are defined, established, and managed by the state Department of Natural Resources;

9. Land essential for preserving connections between habitat blocks and open spaces; and

10. Riparian ecosystems including salmonid habitat, which includes marine nearshore areas.

## 6.2 Determination of Habitat Conservation Area

Under 14.33.070--Determination of habitat conservation area:

A. The exact location of the fish and wildlife habitat conservation area shall be determined by the applicant through the performance of a field investigation applying specific habitat or species recommendations pursuant to the Department of Fish and Wildlife. A qualified professional wildlife habitat biologist shall perform habitat conservation area delineations using the methodology prescribed by the State of Washington Department of Fish and Wildlife. Provided that if no methodology is available the consultant shall use best available science to delineate the site for the Department of Fish and Wildlife's review. The applicant is required under LMC 14.33.110 to show the location of the habitat conservation area on a scaled drawing as a part of the approval application.

B. The city of Lacey shall verify the accuracy of, and may render adjustments to, the boundary delineation. In the event the adjusted boundary delineation is contested by the applicant, the city of Lacey shall, at the applicant's expense, obtain expert services to render a final delineation. (Ord. 1505 §22, 2017; Ord. 1215 §22, 2003; Ord. 935 §9 (part), 1992).

## 6.3 WDFW Definition of Priority Oak Habitat

The Washington Department of fish and 'Wildlife (WDFW) defines Priority Oregon white oak habitat as:

1. Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is greater than twenty-five percent (>25%); or where total canopy coverage of the stand is less than twenty five percent (<25%), but oak accounts for at least fifty percent (≥50%) of the canopy coverage present. The latter is often referred to as an oak savanna.
2. In non-urbanized areas west of the Cascades, priority oak habitat consists of stands greater than or equal to one (≥1) acre in size.
3. East of the Cascades, priority oak habitat consists of stands greater or equal to five (≥5) acres in size.
4. In urban or urbanizing areas, single oaks, or stands of oaks **less than one (<1) acre**, may also be considered a priority when found to be particularly valuable to fish and wildlife (*i.e.,* they contain many cavities, **have a large diameter at breast height [dbh]**, are used by priority species, or have a large canopy). The WDFW defines "large dbh" as oak trees with a dbh greater than fifty (>50) centimeters. Fifty (50) centimeters equals 19.69 inches.

Priority oak habitat consists of stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is greater than twenty-five percent (>25%); or where total canopy coverage of the stand is less than twenty five percent (<25%), but oak accounts for at least fifty percent (≥50%) of the canopy coverage present are oaks. Areas of pure oak stands and conifer/oak associations are located within areas delineated and illustrated on **Figure 3**.

It is important to point out that under the WDFW, large DBH single oak trees are Priority Habitat. This was verified in communication with the WDFW habitat biologist (Darrin Masters, WDFW Habitat Biologist for Pierce County, Pers Com. 14 January 2022). Also verified with the WDFW, oak stands containing large DBH trees also are considered priority habitat, which is compounded if more than one (>1) large tree is located in the stand. Also, important to point out is that oak trees naturally grow in clusters on the landscape. Oak trees on the subject property occur in clusters as they would in a natural oak woodland. The oak component of a stand can be less than twenty-five percent (<25%) canopy coverage if at the least fifty percent (≥50%) of the canopy coverage present are oak trees. And thus, under the WDFW definition, oak stands on the subject property if defined as Priority Oak Habitat.

## 6.5 Prairie Oak Management Plan

Under LMC 14.33.110---*Application information requirements*:

A. An application for site plan review within a habitat conservation area or its buffer shall be determined complete only when it contains all of the information described in Section 1B.050 of the City of Lacey Development Guidelines and Public Works Standards.

B. The application shall also have the following information and materials:

1. A description and maps overlaid on an aerial photograph at a scale no smaller than 1" = 400' showing the entire parcel of land owned by the applicant and the exact boundary of the habitat conservation area pursuant to guidelines established in this chapter;

2. A description of the vegetative cover of the site and adjacent area including dominant species;

3. A site plan for the proposed activity overlaid on an aerial photograph at a scale no smaller than 1" = 400' showing the location, width, depth and length of all existing and proposed structures, roads, sewage treatment, and installations within the site;

4. The exact sites and specifications for all proposed activities including the amounts and methods;

5. Elevations of the site and adjacent lands within the habitat conservation area at contour intervals of no greater than five feet;

6. Top view and typical cross section views of the habitat conservation area to scale;

7. Specific means to mitigate any potential adverse environmental impacts of the applicant’s proposal;

8. A critical area report containing information required in LMC 14.33.115;

9. A priority habitat and priority species management plan prepared by a qualified habitat biologist based upon best available science information provided in the critical area report. The plan shall detail how the designated fish and wildlife habitat conservation area and any priority species found within said area shall be protected. The plan shall follow all recommendations provided by the Department of Fish and Wildlife in its priority habitat and priority species program according to its publication “Management Recommendations of Washington Priority Habitats and Species” or based on site specific recommendations made by the Department of Fish and Wildlife based on review of the project site. (Ord. 1505 §23, 2017; Ord. 1215 §25, 2003; Ord. 1192 §59, 2002; Ord. 935 §9 (part), 1992).

## 7.0 PROPOSED PROJECT

No project is proposed at this time. Thereby, no impacts are anticipated.

This HMP recommends to avoid and minimize oak tree or oak habitat impacts to the greatest extent practicable to achieve project goals. No mitigation measures would be necessary if all potential impacts to oak habitat can be avoided. Unavoidable impacts would require mitigation.

The areas mapped as Oak Habitat in **Figure 3** contain a high density of oak trees. However, the poor condition of the understory vegetation provides a high degree of mitigation value. Understory vegetation is severely degraded, primarily consisting of the non-native, invasive weeds Himalayan blackberry and poison hemlock. Because of the invasive weed understory, habitat value of the existing oak stands is relatively low. However, with potential habitat restoration, the mitigation value is relatively high. This condition may provide the opportunity for high value mitigation in exchange for impacts to low quality habitat.

Recommended mitigation would consist of replacing the existing non-native invasive weeds in the understory with native plant species typically associated with high quality oak habitat. Perhaps a stormwater pond could be installed in the oak area but surrounded by restored oak habitat. Another option may be to install oaks as part of the landscaping. Landscaping with the Oregon white oak and associated native plant species would improve oak habitat on the subject property. Oaks could be preserved in openspace areas or tree tracts as part of a mitigation strategy.

Maintaining or creating habitat corridors and linkages to on-site and off-site habitat would comply with the WDFW management recommendations for the Oregon white oak.

The degraded on-site oak habitat provides mitigation opportunity for habitat restoration. Low quality oak habitat could be transformed into high quality oak woodland and forest. Mitigation would require monitoring and maintenance to ensure mitigation success and to offset temporal loss of habitat.

## 8.0 SUMMARY AND CONCLUSION

The purpose of this HMP is to identify, map, and characterize Oregon white oak habitat identified on the subject property. This Habitat Management Plan has been prepared to satisfy Thurston County reporting requirements.

A total of four hundred forty-eight (448) Oregon white oak trees have been mapped on the subject property and have been GNSS located using a Trimble Geo 7x with sub-foot accuracy and plotted on AutoCAD (**Figure 3**). Oak trees were plotted on AutoCAD (**Figures 4-9**). A regulatory analysis was performed to determine how the City of Lacey protects priority oak habitat, as defined by the WDFW.

This HMP recommends to avoid and minimize oak tree or oak habitat impacts to the greatest extent practicable to achieve project goals. No mitigation measures would be necessary if all potential impacts to oak habitat can be avoided. Unavoidable impacts would require mitigation.

The areas mapped as Oak Habitat in **Figure 3** contain a high density of oak trees. However, the poor condition of the understory vegetation provides a high degree of mitigation value. Understory vegetation is severely degraded, primarily consisting of the non-native, invasive weeds Himalayan blackberry and poison hemlock. Because of the invasive weed understory, habitat value of the existing oak stands is relatively low. However, with potential habitat restoration, the mitigation value is relatively high. This condition may provide the opportunity for high value mitigation in exchange for impacts to low quality habitat.

Recommended mitigation would consist of replacing the existing non-native invasive weeds in the understory with native plant species typically associated with high quality oak habitat. Perhaps a stormwater pond could be installed in the oak area but surrounded by restored oak habitat. Another option may be to install oaks as part of the landscaping. Landscaping with the Oregon white oak and associated native plant species would improve oak habitat on the subject property. Oaks could be preserved in openspace areas or tree tracts as part of a mitigation strategy.

Maintaining or creating habitat corridors and linkages to on-site and off-site habitat would comply with the WDFW management recommendations for the Oregon white oak.

The degraded on-site oak habitat provides mitigation opportunity for habitat restoration. Low quality oak habitat could be transformed into high quality oak woodland and forest. Mitigation would require monitoring and maintenance to ensure mitigation success and to offset temporal loss of habitat.

## 9.0 REFERENCES

Baron, N. and J. Acorn, 1997, Birds of the Pacific Northwest Coast, Lone Pine Publishing, Renton, Washington.

Bornkamm R., 1987, Allochthonous Ecosystems, Landscape Ecology Vol. 1 No. 2, pp 119-122, 1987.

Brown, H. A., R. M. Storm, W. P. Leonard, 1995, Reptiles of Washington and Oregon, Seattle Audubon Society, Seattle, Washington.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, Department of the Interior. FWSOBS-70/31.

Corkran C. C. and C. Thoms, 1996, Amphibians of Oregon, Washington, and British Columbia: A Field Identification Guide, Lone Pine Publishing, Renton, Washington.

Devine, Warren D. and C.A. Constance. 2010. Planting native oak in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-804. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 25 pp.

Gary Oak Ecosystems Recovery Team. 2011. Restoring British Columbia's Garry Oak Ecosystems: Principles and Practices. Gary Oak Ecosystems Recovery Team, Victoria, British Columbia. 514 pp. Available at: http://www.goert.ca/gardeners_restoration/restoration.php

Forey, P. and C. Fitzsimons, 1987, An Instant Guide to Mammals, Random House Publishing.

Harrington, C. A. and W. D. Devine. 2006. A Practical Guide to Oak Release. Gen. Tech. Rep. PNW-GTR-666. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 24 pp.

Harrison, H. H., 1979, A Field Guide to Western Birds' Nests of 520 Species Found Breeding in the United States West of the Mississippi River, Houghton Mifflin, Boston.

Hinman, Curtis. 2012. Low Impact Development: Technical Guidance Manual for Puget Sound. Publication number PSP 2012-3. Washington State University Extension and Puget Sound Partnership, Tacoma, WA. 346 pp. Available at: http://www.psp.wa.gov/LID_manual.php

Hitchcock, C.L., and A. Cronquist. 1973. *Flora of the Pacific Northwest*. University of Washington Press. 730 pp.

Hunn, E. S., 1982, Birding in Seattle and King County, Seattle Audubon Society, Seattle, Washington.

Johnsgard, P. A., 1990, Hawks, Eagles, & Falcons of North America: Biology and Natural History, Smithsonian Institution Press, Washington, DC.

King County, 1987, Wildlife Habitat Profile, King County Open Space Program, Parks, Planning, and Resources Department.

Kozloff, E.N., 1978, Plants and Animals of the Pacific Northwest: An Illustrated Guide to the Natural History of Western Oregon, Washington, and British Columbia, University of Washington Press, Seattle, Washington.

Larsen, E. M., and J. T. Morgan. 1998. Management recommendations for Washington's priority habitats: Oregon white oak woodlands. Washington Department of Fish and Wildlife, Olympia. 37pp.

Leonard, W. P., 1993, Amphibians of Washington and Oregon, Seattle Audubon Society, Seattle, Washington.

Munsell Color. 1988. *Munsell Soil Color Charts*. Kollmorgen Instruments Corp., Baltimore, Maryland.

Murie, O. J., 1974, A Field Guide to Animal Tracks, Houghton Mifflin, Boston.

Olson, D. H., W. P. Leonard, and R. B. Bury, 1997, Sampling Amphibians in Lentic Habitats: Methods and Approaches for the Pacific Northwest, Society for Northwestern Vertebrate Biology, Olympia, Washington.

Sprague, F.L. and H.P. Hansen. 1946. Forest succession in the McDonald Forest, Willamette Valley, Oregon. Northwest Science 20:89-98

Thurston County Geodata center http://www.geodata.org/online.html

U.S. Department of Agriculture, Soil Conservation Service. June, 1991. *Hydric Soils of the United States.*

U.S. Department of Agriculture, Soil Conservation Service. 1973. Thurston County Area Soil Survey.

U.S. Fish and Wildlife Service. 1973. *National Wetlands Inventory Map, Issaquah Quadrangle.*

Vesley, D. and G. Tucker. 2004. A Landowner's Guide for Restoring and Managing Oregon White Oak Habitats. U.S. Department of the Interior, Bureau of Land Management, Salem District, Salem, OR. 65 pp. Available at: http://www.blm.gov/or/districts/salem/files/white_oak_guide.pdf

Washington State Department of Natural Resources. 1994. *Endangered, Threatened and Sensitive Vascular Plants of Washington*.

Washington State Department of Fish and Wildlife. 1999. Species of concern: State candidate species. WDFW. Olympia, WA.

Washington State Department of Health. 2002. Glendon Biofilters; Recommended standards and guidance for performance, application, design, and operation & maintenance. Office of Environmental Health and Safety. Olympia, WA.

Washington State Department of Fish and Wildlife, 1999, Species of Concern: State Candidate Species, Olympia, Washington.

Whitaker, J. O., 1996, National Audubon Society Field Guide to North American Mammals, Random House Publishing, New York.

# FIGURES

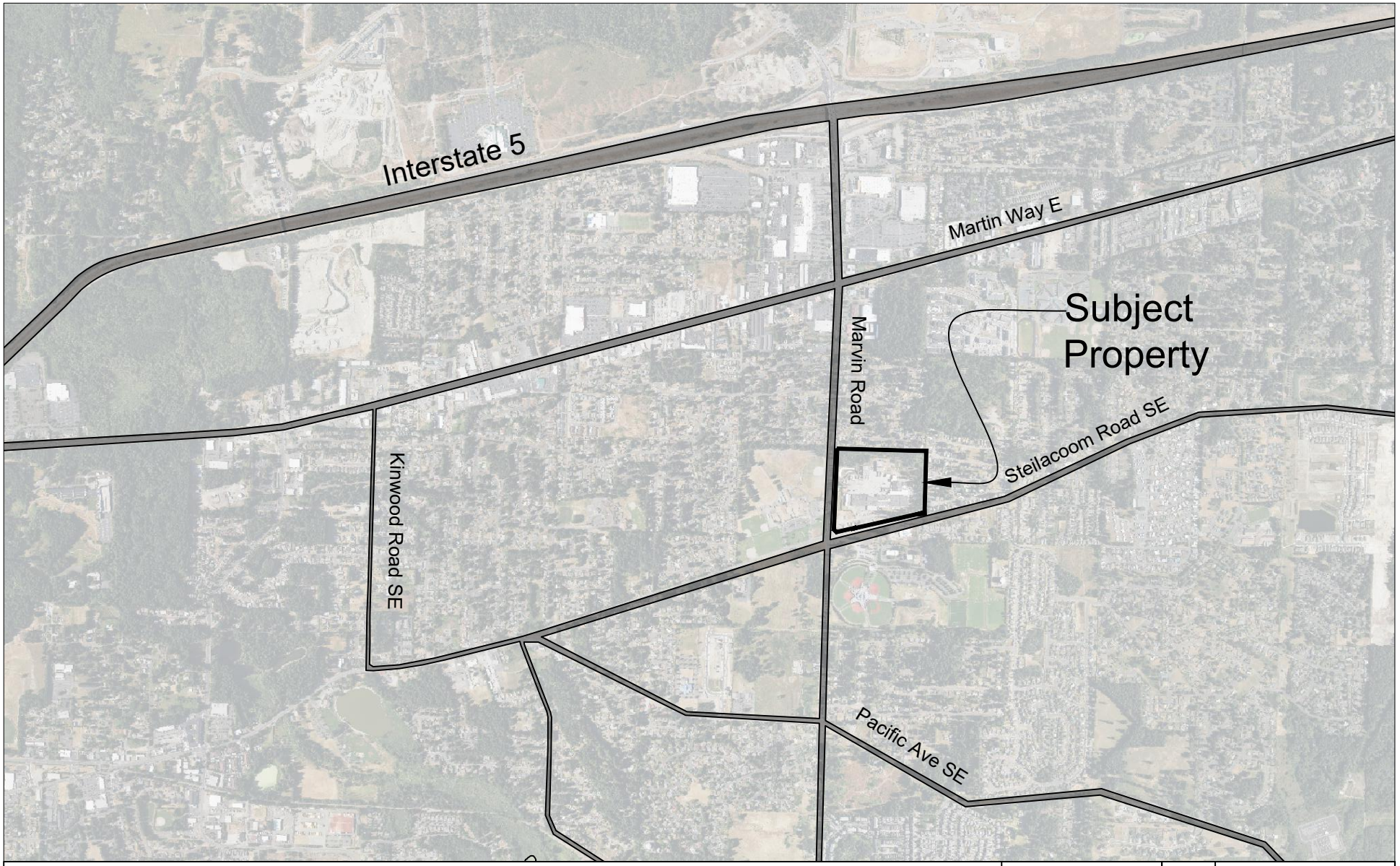


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**Figure 1**

Ostrom Property

Vicinity Map

N

Scale: 1" = 2000'

0 2000'

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**Figure 2**

Ostrom Property

Existing Conditions

N

Scale: 1" = 200'

0 200'

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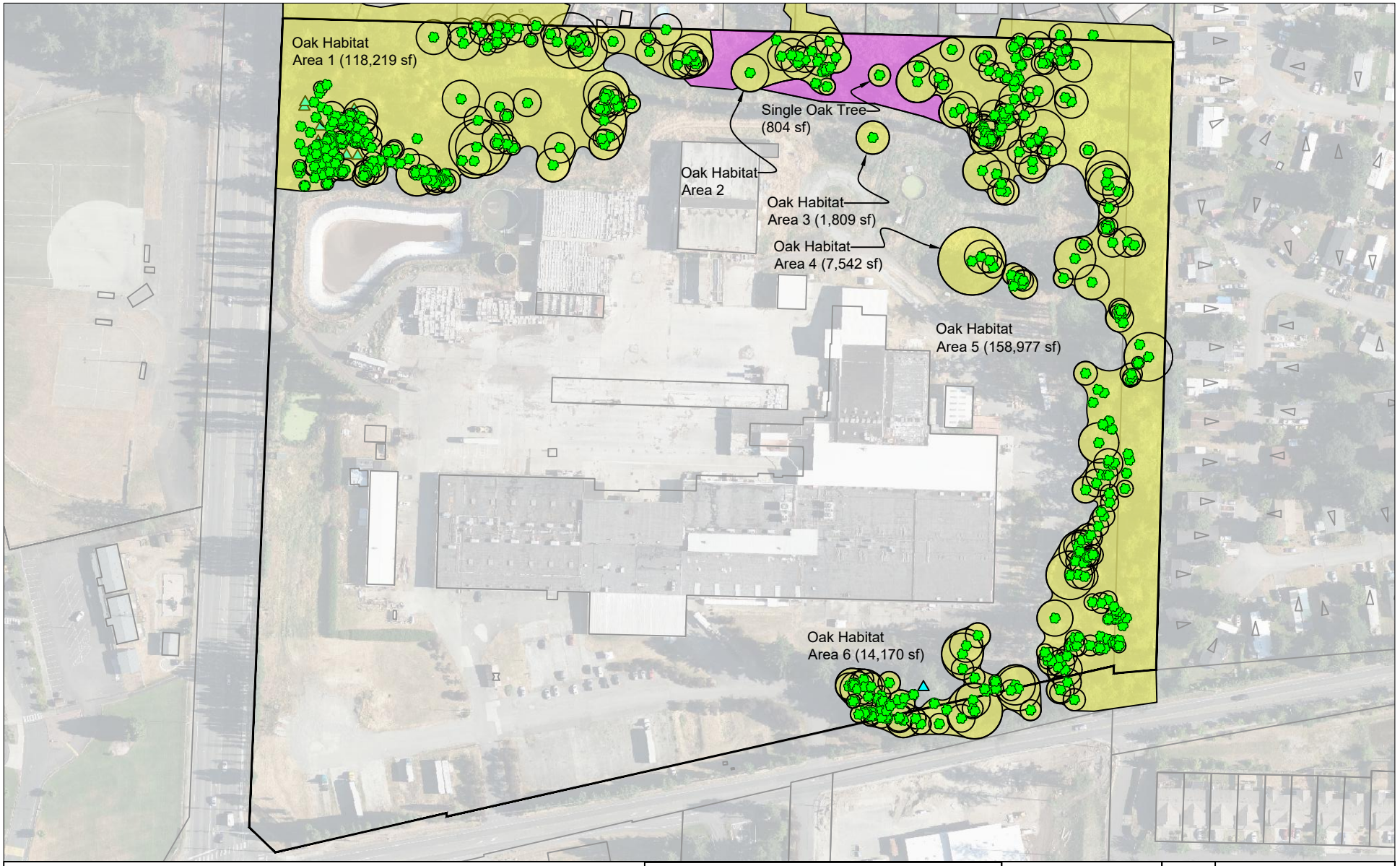


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Oaks Trees

Pacific Madrone

Oak Habitat

Invasive Non-native Weeds

Note: Only the trees on the periphery of the Oak Habitat Areas have been recorded. Many more oak trees occur in the areas than have been recorded.

**Figure 3**

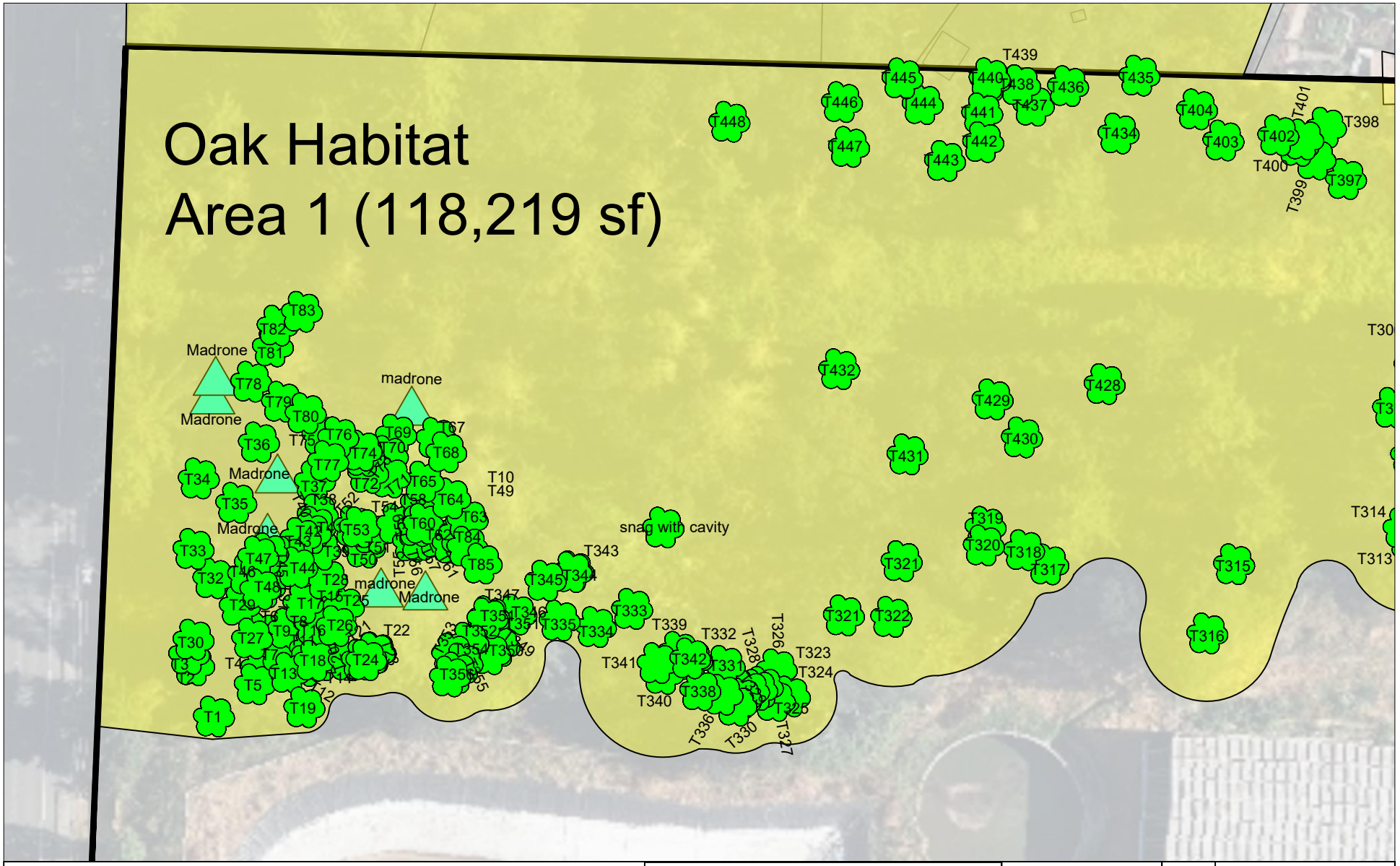
Ostrom Property

Study Results

Scale: 1" = 200'

0 200'

8 September 2022

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Oaks Trees

Pacific Madrone

Oak Habitat

Note: Only the trees on the periphery of the Oak Habitat Areas have been recorded. Many more oak trees occur in the areas than have been recorded.

**Figure 4**

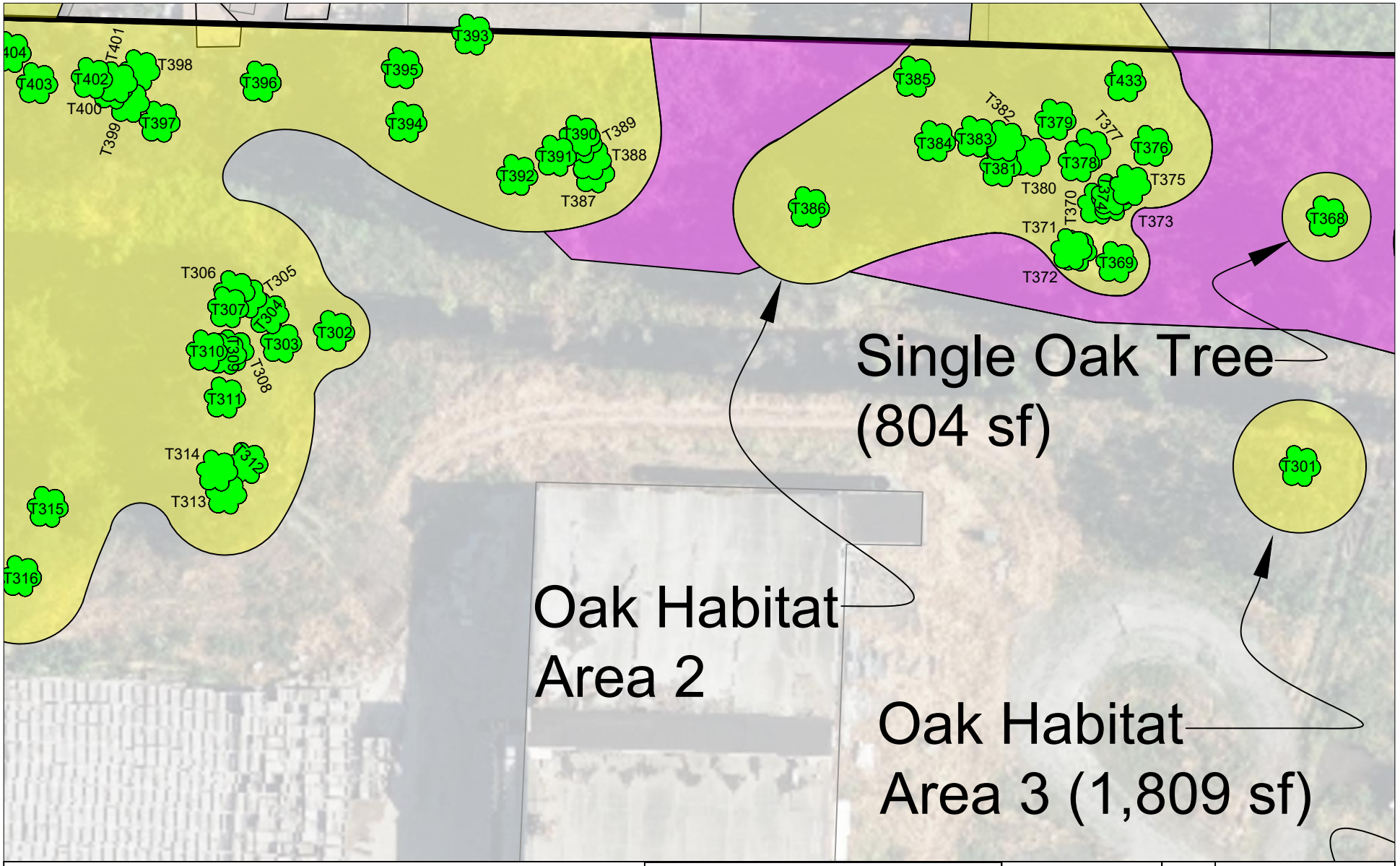
Ostrom Property

Oak Tree Tag Labels

Scale: 1" = 50'

0 50'

8 September 2022

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Oaks Trees

Pacific Madrone

Oak Habitat

Invasive Non-native Weeds

Note: Only the trees on the periphery of the Oak Habitat Areas have been recorded. Many more oak trees occur in the areas than have been recorded.

**Figure 5**

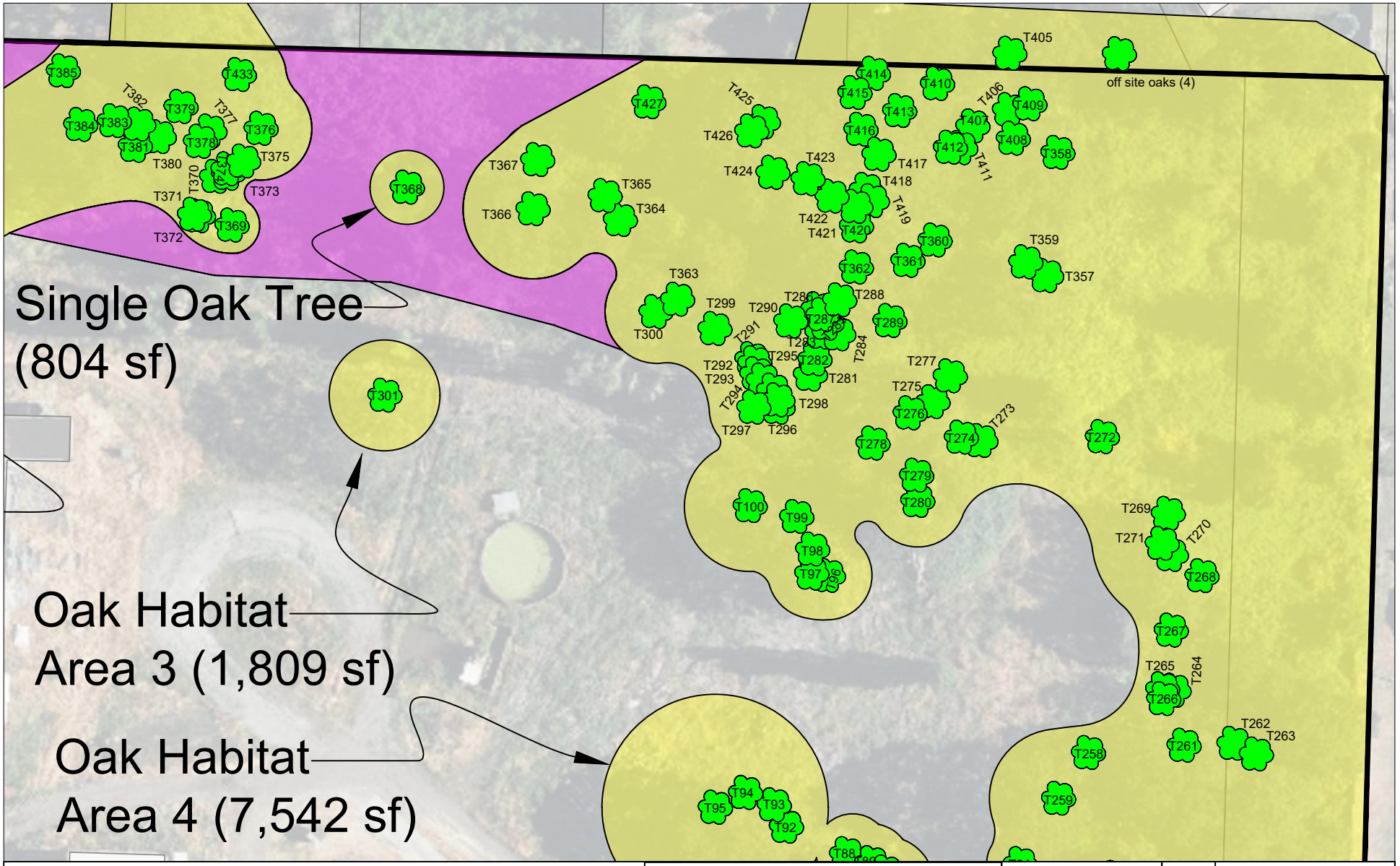
Ostrom Property

Oak Tree Tag Labels

Scale: 1" = 50'

0 50'

8 September 2022

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Oaks Trees

Pacific Madrone

Oak Habitat

Invasive Non-native Weeds

Note: Only the trees on the periphery of the Oak Habitat Areas have been recorded. Many more oak trees occur in the areas than have been recorded.

**Figure 6**

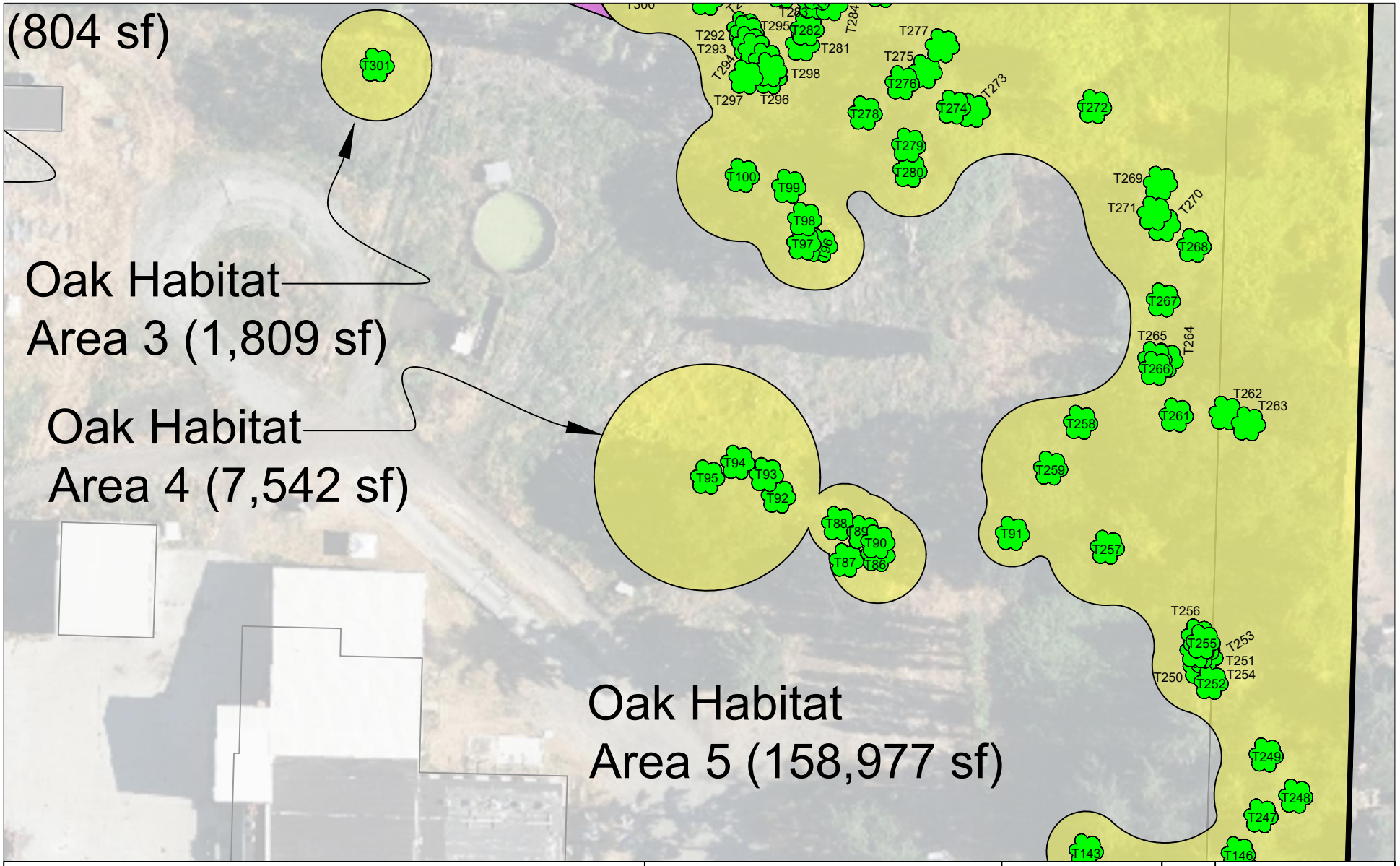
Ostrom Property

Oak Tree Tag Labels

Scale: 1" = 60'

0 60'

8 September 2022

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Oaks Trees

Pacific Madrone

Oak Habitat

Invasive Non-native Weeds

Note: Only the trees on the periphery of the Oak Habitat Areas have been recorded. Many more oak trees occur in the areas than have been recorded.

**Figure 7**

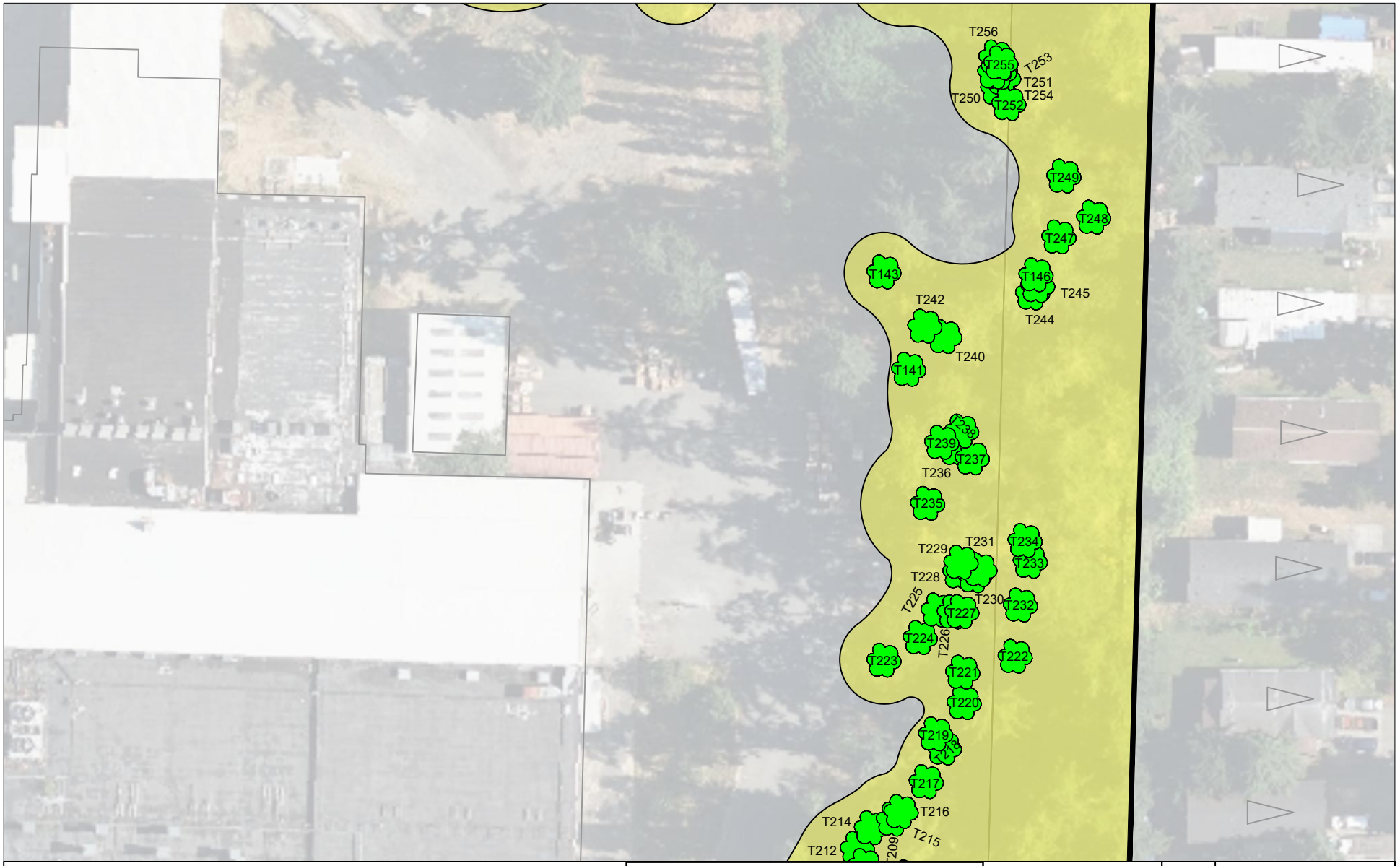
Ostrom Property

Oak Tree Tag Labels

Scale: 1" = 60'

0 60'

8 September 2022

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Oaks Trees

Pacific Madrone

Oak Habitat

Note: Only the trees on the periphery of the Oak Habitat Areas have been recorded. Many more oak trees occur in the areas than have been recorded.

**Figure 8**

Ostrom Property

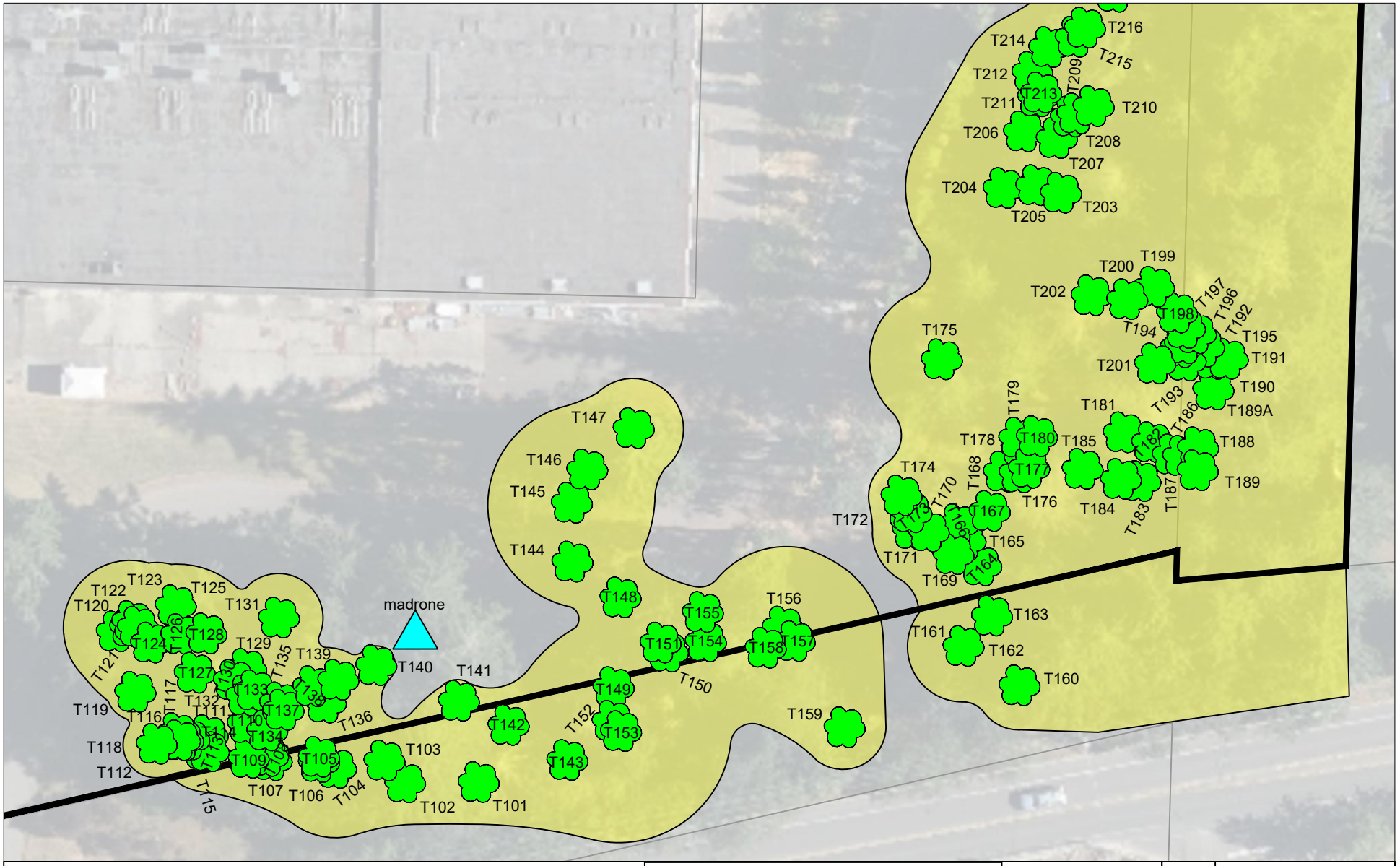
Oak Trees Tag Labels

N

Scale: 1" = 60'

0 60'

8 September 2022

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Oaks Trees

Pacific Madrone

Oak Habitat

Invasive Non-native Weeds

Note: Only the trees on the periphery of the Oak Habitat Areas have been recorded. Many more oak trees occur in the areas than have been recorded.

**Figure 9**

Ostrom Property

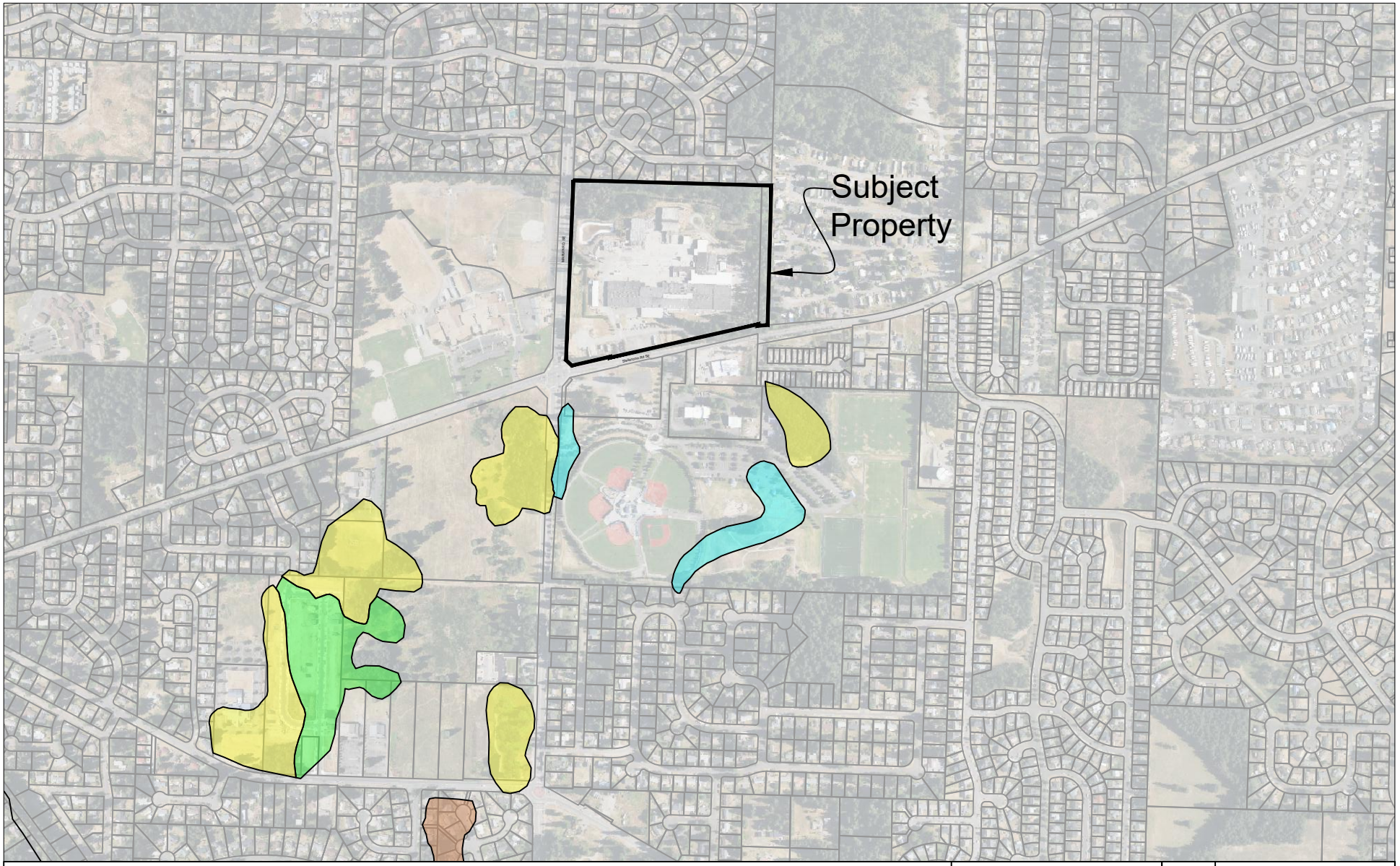
Oak Tree Tag Labels

N

Scale: 1" = 50'

0 50'

8 September 2022

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- Oak-Dominant Forest or Woodland Canopy
- Oak-Conifer Forest or Woodland Canopy
- Scattered Oak Canopy
- Urban Oak Canopy

**Figure 10**

Ostrom Property

DNR
Oaks and
Grasslands

N

Scale: 1" = 900

0 900

8 September 2022

# APPENDIX A

# Photographs

# Abandoned Buildings

Photo 1. Abandoned building from Mushroom farm facility

Photo 2. Northeastern corner of the subject property

Photo 3. Abandoned buildings and derelict facility

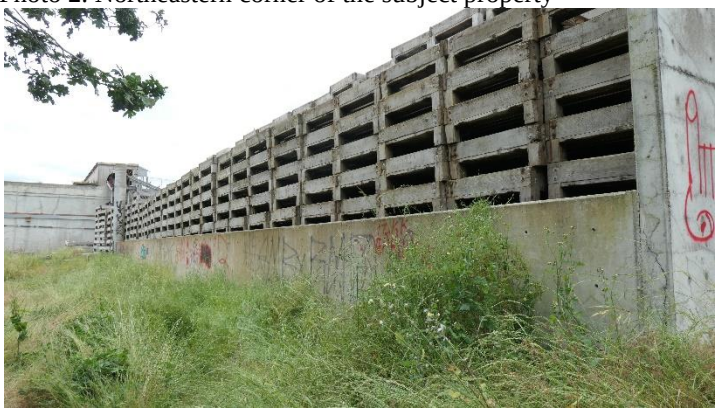


Photo 4. Left over stacks of mushroom farm pallets

Photo 5. Northern view of abandoned mushroom farm

Photo 6. Mowed grass, oaks to right, pallets in background

Photo 7. Internal roads and buildings, oaks in back left

Photo 8. Compressed rock covered by grass

Photo 9. Internal gravel road connecting access to buildings

Photo 10. Mowed grass on compressed gravel, structures

Photo 11. Mowed grass and Himalayan blackberry

Photo 12. Mushroom trays and stacks of mushroom pallets

Photos 13. Abandoned buildings and upkept facility

Photo 14. Abandoned buildings and upkept facility

Photo 15. Internal roads and buildings

Photo 16. Internal roads and buildings

Photo 17. Old mushroom farm mechanical building stripped

Photo 18. Partially demolished building

Photo 19. Abandoned buildings and facility

Photo 20. Abandoned building

Photo 21. Existing shed adjacent to small oak stand

Photo 22. Cluster of mature oaks around existing shed

Photo 23. Mature oaks along northern property fence line

Photo 24. North central property fence line

# Tree Tagging & Data Collection


Photo 25. Oak Tag #31 with Galls on tree branches

Photo 26. Oak cluster on eastern portion of the property

Photo 27. Oak Tag #27 with galls on tree branches

Photo 28. Oak Tag #39 on Northwestern portion of property

Photo 29. Oak Tag #62

Photo 30. Oak Tag #36

Photo 31. Oak Tag #53

Photo 32. Oak Tag #87

Photo 33. Staff collecting points using Trimble Geo 7x

Photo 34. Staff collecting points using Trimble Geo 7x

Photo 35. Tagged oak collected by Trimble device

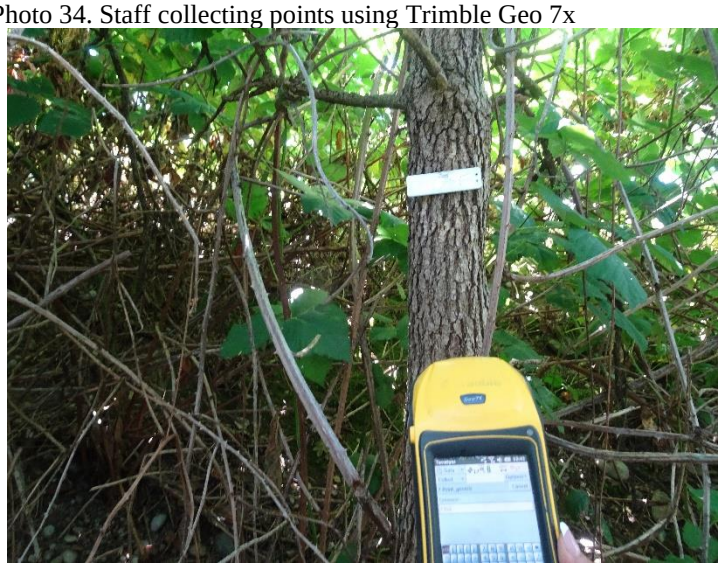


Photo 36. Using Trimble Geo-location for accurate data collection

Photo 37. Staff measuring Diameter at Breast Height (DBH)

Photo 38. Tampered oak tag

Photo 39. Oak Tag #158

Photo 40. Oak Tag #176

Photo 41. Oak Tag #62

Photo 42. Oak Tag #83

Photo 43. Oak Tag #130 On SE corner of subject property

Photo 44. Oak Tag 172 with galls formations

Photo 45. Oak Tag #255

Photo 46. Oak Tag #231


Photo 47. Himalayan blackberry understory vegetation


Photo 48. Himalayan blackberry understory vegetation


Photo 49. Oak Tag #413

Photo 50. Multi-trunked oak tree

Photo 51. Doubled trunk oak tree tagged

Photo 52. Oak trees subsequent to mowing

Photo 53. Oak trees subsequent to mowing

Photo 54. Oak trees subsequent to mowing

Photo 55. Oak Tag #334


Photo 56. Oak Tag #359

Photo 57. Oak Tag #410

Photo 58. Oak Tag #405


Photo 59. Oak tagged all along northern fence line


Photo 60. Oak Tag #446

# Oak Habitat Conditions

Photo 61. Thick poison hemlock dominates areas

Photo 62. Dense thicket of Himalayan blackberry

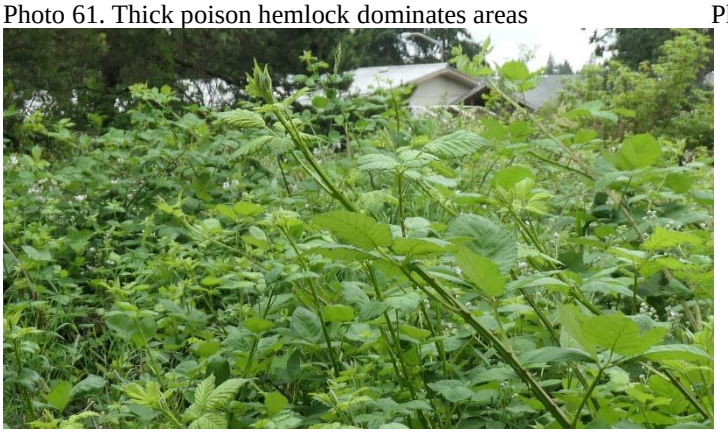


Photo 63. Himalayan blackberry along eastern fence line

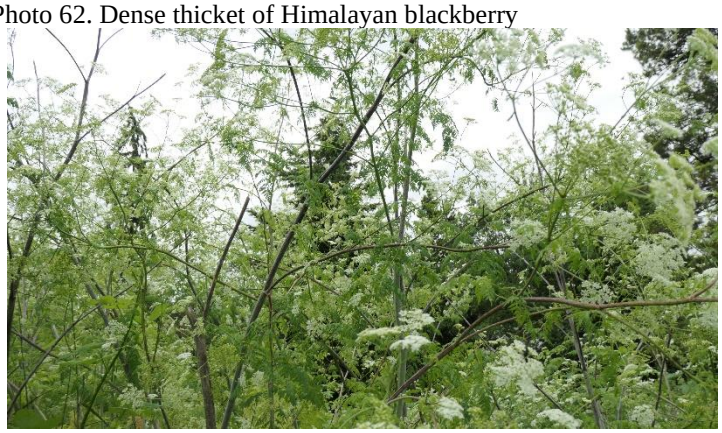


Photo 64. Poison Hemlock (*Conium maculatum)*

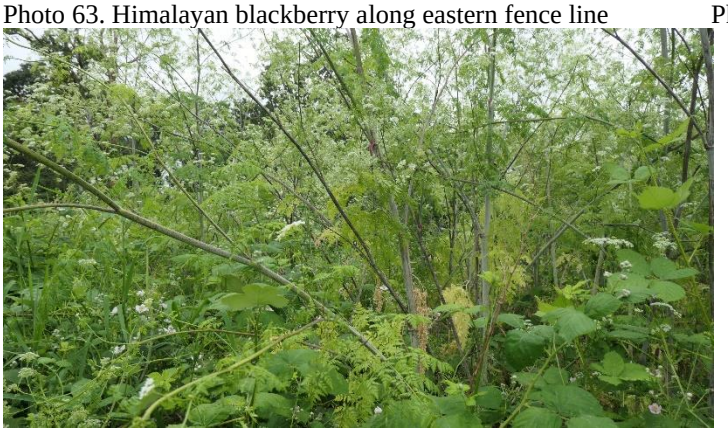


Photo 65. Poison hemlock & Himalayan blackberry

Photo 66. Poison hemlock & Himalayan blackberry

Photo 67. Poison hemlock & Himalayan blackberry

Photo 68. Poison hemlock & Himalayan blackberry

Photo 69. Understory of Himalayan blackberry

Photo 70. Dense thickets of Himalayan blackberry in understory

Photo 71. Field bindweed *(Convolvulus arvensis*)

Photo 72. Pacific madrone (*Arbutus menziesii*)

Photo 73. Non-native purple fox glove (*Digitalis purpurea*)

Photo Tree smothered by English ivy and Himalayan blackberry

Photo 75. English ivy (*Hedera helix*)

Photo 76. Oak stand with little understory vegetation

Photo 77. Trailing blackberry (*Rubus ursinus*)

Photo 78. Tall Oregon grape (*Mahonia aquifolium*) berries

Photo 79. Tall Oregon grape (*Mahonia aquifolium*)

Photo 80. Serviceberry (*Amelanchier alnifolia*)

Photo 81. Galls created by parasitic wasps

Photo 82. Galls created by parasitic wasps

Photo 83. Galls created by parasitic wasps

Photo 84. Galls created by parasitic wasps

Photo 85. Poison hemlock and Himalayan blackberry understory

Photo 86. Himalayan blackberry understory

# APPENDIX B

# Thurston County Geodatabase

# Soils

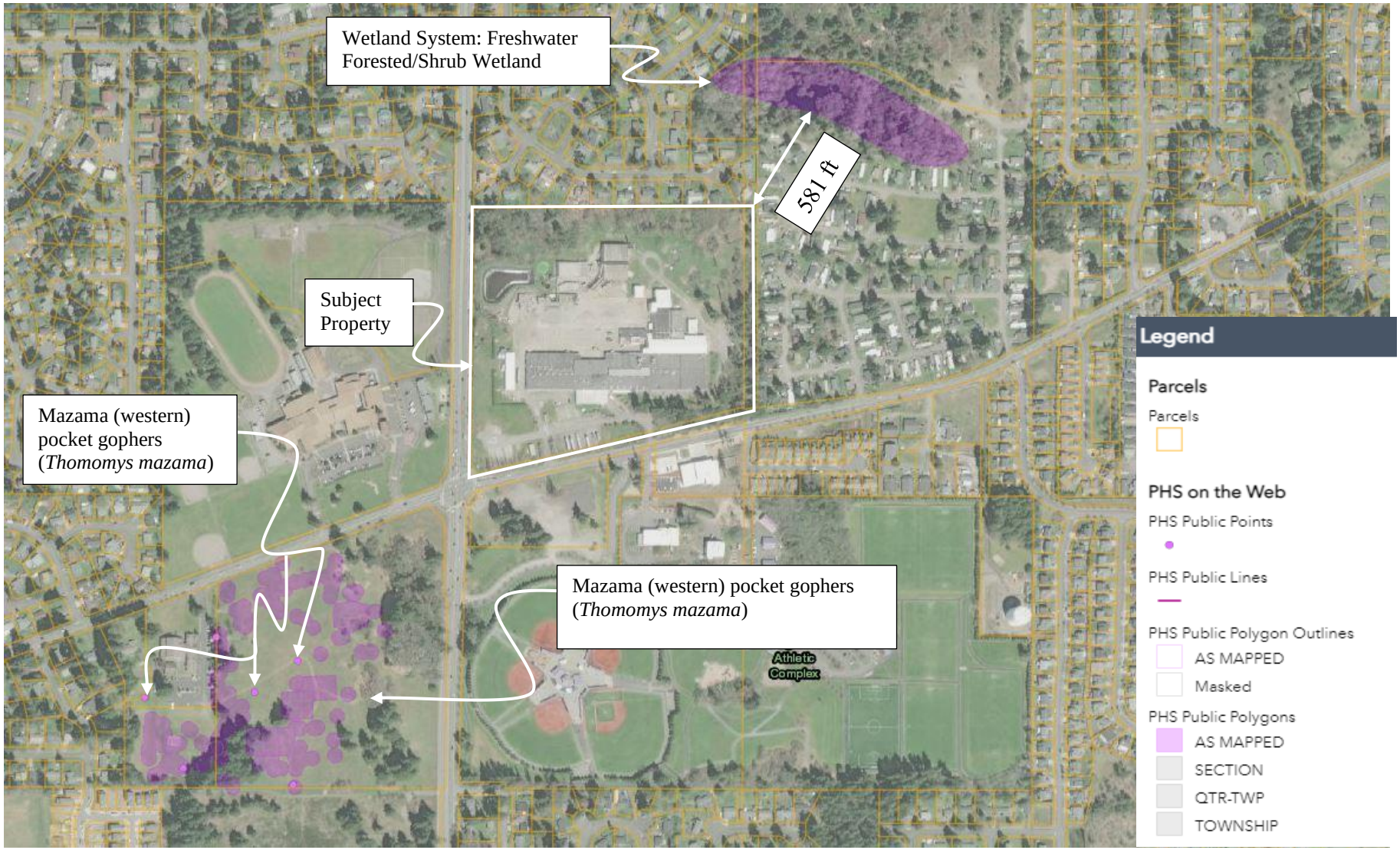

Everett very gravelly sandy loam, 3 to 15% slopes
Spanaway gravelly sandy loam, 0 to 3% slopes
Spana gravelly loam
Subject Property
MARVIN RD SE
PVT ROAD
STEILACOOM RD SE
8TH CT SE
Everett very gravelly sandy loam, 3 to 15% slopes
Spanaway gravelly sandy loam, 0 to 3% slopes
Spana gravelly loam

# APPENDIX C

# Washington State Department of Fish and Wildlife (WDFW)

# Priority Habitat Species (PHS)

# Database


Wetland System: Freshwater Forested/Shrub Wetland
581 ft
Subject Property
Mazama (western) pocket gophers (*Thomomys mazama*)
Mazama (western) pocket gophers (*Thomomys mazama*)
Athletic Complex
Legend
Parcels
Parcels
PHS on the Web
PHS Public Points
PHS Public Lines
PHS Public Polygon Outlines
AS MAPPED
Masked
PHS Public Polygons
AS MAPPED
SECTION
QTR-TWP
TOWNSHIP

# APPENDIX D

# Department of Natural Resources

# Natural Heritage Database


Vancouverian Freshwater Tidal Surge Plain Marsh
North Pacific Lowland Floodplain Forest
Subject Property
Known Wetlands of High Conservation Value
Known Rare Plants and Nonvascular Species of High Conservation Value
Counties

# APPENDIX E

# Oak Tree Data

**Table 4. Tagged Tree Dimensions from Oak Survey**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 1 | 5. 5 in | 8 ft | Oak woodland |
| 2 | 2.5 in | 5 ft | by downed oak |
| 3 | 5 in | 7 ft | Oak woodland |
| 4 | 9 in | 6 ft | |
| 5 | 1.5 in | 6 ft | |
| 6 | 10 in | 17 ft | |
| 7 | 6 in | 8 ft | |
| 8 | 6 in | 11 ft | |
| 9 | 6, 4 in | 9 ft | Two trucks 1 tree |
| 10 | 6 in | 10 ft | Oak woodland |
| 11 | 7, 4 in | 12 ft | Two oaks side by side |
| 12 | 7 in | 10 ft | Oak woodland |
| 13 | 3 in | 6 ft | |
| 14 | 8, 1 in | 14 ft | Two oaks side by side |
| 15 | 4 in | 4 ft | Oak woodland |
| 16 | 1 in | 3 ft | |
| 17 | 4 in | 6 ft | |
| 18 | 6 in | 6 ft | |
| 19 | 7 in | 9 ft | |
| 20 | 6 in | 12 ft | |
| 21 | 7, 4in | 10 ft | Two small oaks side by side |
| 22 | 5 in | 15 ft | Oak woodland |
| 23 | 4 in | 7 ft | |
| 24 | 3.5 in | 7 ft | |
| 25 | 6 in | 10 ft | |
| 26 | 1, 1in | 6 ft | Two small oaks side by side |
| 27 | 3 in | 15 ft | Oak woodland |
| 28 | 6 in | 9 ft | |
| 29 | 1, 1 in | 5 ft | Two small oaks side by side |
| 30 | 5 in | 10 ft | Oak woodland |
| 31 | 5 in | 5 ft | |
| 32 | 3 in | 2 ft | |
| 33 | 1 in | 2 ft | |
| 34 | 0.5 in | 1 ft | Young sampling |
| 35 | 2 in | 3 ft | Oak woodland |
| 36 | 0.5 in | 0.5 ft | |
| 37 | 4 in | 5 ft | |
| 38 | 3 in | 8 ft | |
| 39 | 5 in | 5 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 40 | 5, 4, 3 in | 10 ft | Three small oaks side by side |
| 41 | 2 in | 8 ft | |
| 42 | 1 in | 2 ft | |
| 43 | 2 in | 3 ft | |
| 44 | 3, 2 in | 8ft | Two oaks side by side |
| 45 | 2 in | 8 ft | Oak woodland |
| 46 | 4 in | 9 ft | |
| 47 | 1 in | 3 ft | |
| 48 | .5 in | .5 in | Young sampling |
| 49 | 2 in | 7 ft | Oak woodland |
| 50 | 5 in | 8 ft | |
| 51 | 1 in | 3 ft | |
| 52 | 3, 2 in | 10 ft | |
| 53 | 1 in | 2 ft | |
| 54 | 2, 1, 3 in | 10 ft | |
| 55 | 4 in | 8 ft | |
| 56 | 3 in | 9 ft | |
| 57 | 3, 2, 2, 1 in | 15 ft | Cluster of small oaks |
| 58 | 3 in | 6 ft | Oak woodland |
| 59 | 1 in | 3 ft | |
| 60 | 3, 2 in | 15 ft | Two small oaks side by side |
| 61 | 5 in | 10 ft | Oak woodland |
| 62 | 4 in | 7 ft | |
| 63 | 5, 3, 2 in | 20 ft | Three small oaks |
| 64 | 4, 4, 2 in | 20 ft | Three small oaks |
| 65 | 2 in | 7 ft | Three small oaks |
| 66 | 4 in | 4 ft | |
| 67 | 4, 3, 3 in | 25 ft | Cluster of oaks/Leaning to one side |
| 68 | 7 in | 20 ft | Leaning to one side |
| 69 | 5 in | 10 ft | Leaning to one side |
| 70 | 5 in | 9 ft | Leaning to one side |
| 71 | 3 in | 3 ft | Oak woodland |
| 72 | 7 in | 9 ft | |
| 73 | 3,1 in | 4 ft | Two small oaks |
| 74 | 2 in | 10 ft | Oak woodland |
| 75 | 8.5 in | 20 ft | |
| 76 | 2 in | 4 ft | |
| 77 | 1 in | 3 ft | |
| 78 | 3 in | 4 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 79 | 1 in | 3 ft | Oak woodland |
| 80 | 3 in | 5 ft | |
| 81 | 4, 4, 3, 2 in | 4 ft | Cluster of small oaks |
| 82 | 4 in | 10 ft | Oak woodland |
| 83 | 4 in | 4 ft | |
| 84 | 3 in | 5 ft | |
| 85 | 3, 4 in | 15 ft | Two small oaks side by side |
| 86 | 17 in | 21 ft | Oak woodland |
| 87 | 11 in | 24 ft | |
| 88 | 12 in | 16 ft | |
| 89 | 12 in | 17 ft | |
| 90 | 9 in | 15 ft | |
| 91 | 14, 10, 11 in | 14 ft | Three trunks one tree |
| 92 | 11 in | 16 ft | Oak woodland |
| 93 | 20 in | 18 ft | |
| 94 | 16 in | 24 ft | |
| 95 | 23, 15 in | 49 ft | Two trunks one tree |
| 96 | 14 in | 19 ft | Oak woodland |
| 97 | 16 in | 19 ft | |
| 98 | 14 in | 24 ft | |
| 99 | 16 in | 19 ft | |
| 100 | 14, 12 in | 28 ft | Two trunks one tree/ leaning to one side |
| 101 | 17 in | 15 ft | Oak woodland |
| 102 | 7 in | 15 ft | |
| 103 | 9 in | 15 ft | |
| 104 | 14, 5 | 25 ft | |
| 105 | 16, 5, 5 | 20 ft | Three small oaks |
| 106 | 7 in | 20 ft | Oak woodland |
| 107 | 6 in | 20 ft | |
| 108 | 5 in | 15 ft | |
| 109 | 5 in | 15 ft | |
| 110 | 13 in | 15 ft | |
| 111 | 4 in | 6 ft | |
| 112 | 5 in | 15 ft | |
| 113 | 5 in | 12 ft | |
| 114 | 9 in | 14 ft | |
| 115 | 6 in | 8 ft | |
| 116 | 5 in | 4 ft | |
| 117 | 5 in | 6 ft | |
| 118 | 5 in | 12 ft | |
| 119 | 8 in | 10 ft | |
| 120 | 16 in | 19 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 121 | 19 in | 24 ft | Oak woodland |
| 122 | 5 in | 10 ft | |
| 123 | 4, 4 in | 4 ft | Two small oaks side by side |
| 124 | 8 in | 25ft | Oak woodland |
| 125 | 8 in | 15 ft | |
| 126 | 9 in | 25 ft | |
| 127 | 5 in | 6 ft | |
| 128 | 9 in | 20 ft | |
| 129 | 6 in | 14 ft | |
| 130 | 4 in | 10 ft | |
| 131 | 7, 6 in | 16ft | Two oaks side by side |
| 132 | 6 in | 9 ft | Oak woodland |
| 133 | 2 in | 8 ft | |
| 134 | 2 in | 6 ft | |
| 135 | 4 in | 6 ft | |
| 136 | 6, 5 in | 20 ft | Two oaks side by side |
| 137 | 1 in | 6 ft | Oak woodland |
| 138 | 1 in | 4 ft | |
| 139 | 3 in | 3 ft | |
| 140 | 2 in | 7 ft | |
| 141 | 4 in | 3 ft | |
| 142 | 5, 5 in | 5 ft | Two oaks side by side |
| 143 | 8, 7 in | 20 ft | Two oaks side by side |
| 144 | 13in | 16 ft | Oak woodland |
| 145 | 15 in | 30 ft | |
| 146 | 13in | 24 ft | Leaning to one side |
| 147 | 14 in | 78ft | Oak woodland |
| 148 | 10 in | 15 ft | |
| 149 | 12 in | 25 ft | |
| 150 | 6.5, 1 in | 7 ft | Cluster of oaks |
| 151 | 5.5 in | 7 ft | Oak woodland |
| 152 | 5 in | 15 ft | |
| 153 | 20 in | 40 ft | |
| 154 | 11 in | 11 ft | |
| 155 | 9 in | 9 ft | |
| 156 | 14 in | 29 ft | |
| 157 | 17 in | 32 ft | |
| 158 | 8 in | 15 ft | |
| 159 | 14 in | 15 ft | |
| 160 | 9 in | 16 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 161 | 10 in | 20 ft | Oak woodland |
| 162 | 6, 6 in | 15 ft | Two oaks side by side |
| 163 | 8 in | 20 ft | Oak woodland |
| 164 | 8 in | 25 ft | |
| 165 | 6 in | 20 ft | Leaning to one side |
| 166 | 3 in | 7 ft | Oak woodland |
| 167 | 5, 5 in | 15 ft | Two oaks |
| 168 | 3 in | 4 ft | Oak woodland |
| 169 | 5 in | 13 ft | |
| 170 | 12 in | 20 ft | |
| 171 | 5 in | 12 ft | |
| 172 | 3 in | 3 ft | |
| 173 | 3 in | 3 ft | |
| 174 | 6 in | 12 ft | |
| 175 | 12 in | 26ft | |
| 176 | 4 in | 15 ft | |
| 177 | 4,4 in | 16 ft | Two oaks side by side |
| 178 | 6 in | 14 ft | Oak woodland |
| 179 | 1 in | 3 ft | |
| 180 | 1 in | 2 ft | |
| 181 | 4 in | 4 ft | |
| 182 | 6 in | 6 ft | |
| 183 | 3 in | 4 ft | |
| 184 | 6 in | 10 ft | |
| 185 | 9 in | 15 ft | |
| 186 | 3,3 in | 9 ft | Two small oaks side by side |
| 187 | 2 in | 4 ft | Oak woodland |
| 188 | 4 in | 6 ft | |
| 189 | 4 in | 10 ft | |
| 189 A | 2 in | 4 ft | |
| 190 | 2 in | 4 ft | |
| 191 | 3 in | 4 ft | |
| 192 | 4 in | 10 ft | |
| 193 | 3 in | 6 ft | |
| 194 | 4 in | 13 ft | |
| 195 | 2 in | 4 ft | |
| 196 | 2 in | 6 ft | |
| 197 | 3 in | 7 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 198 | 4 in | 7 ft | |
| 199 | 4,3,3 in | 13 ft | 3 oaks side by side |
| 200 | 4,2 in | 15 ft | 2 oaks side by side |
| 201 | 2,2,2,2 in | 8 ft | Small oak cluster sharing drip line |
| 202 | 8 in | 12 ft | |
| 203 | 8 in | 19 ft | |
| 204 | 12 in | 35 ft | leaning to one side |
| 205 | 12 in | 20 ft | |
| 206 | 8, 5 in | 14 ft | |
| 207 | 5 in | 20 ft | leaning to one side |
| 208 | 4 in | 13 ft | |
| 209 | 6 in | 15 ft | |
| 210 | 8 in | 15 ft | |
| 211 | 9 in | 19 ft | |
| 212 | 8 in | 20 ft | |
| 213 | 11 in | 30 ft | |
| 214 | 5 in | 15 ft | |
| 215 | 9 in | 20 ft | |
| 216 | 9 in | 15 ft | |
| 217 | 4 in | 15 ft | |
| 218 | 4, 4 in | 16 ft | |
| 219 | 4 in | 6 ft | |
| 220 | 5 in | 13 ft | |
| 221 | 7 in | 13 ft | |
| 222 | 8 in | 12 ft | |
| 223 | 12 in | 19 ft | |
| 224 | 11 in | 20 ft | |
| 225 | 12 in | 23 ft | |
| 226 | 2 in | 6 ft | |
| 227 | 2 in | 7 ft | |
| 228 | 9 in | 21ft | |
| 229 | 1 in | 2 ft | |
| 230 | 2 in | 5 ft | |
| 231 | 3 in | 4 ft | |
| 32 | 4 in | 7 ft | |
| 233 | 2 in | 4ft | |
| 234 | 1 in | 3 ft | |
| 235 | 22 in | 29 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 236 | 3 in | 6 ft | |
| 237 | 3 in | 7 ft | |
| 238 | 3 in | 7 ft | |
| 239 | 3 in | 7 ft | |
| 240 | 3 in | 4 ft | |
| 241 | 5 in | 6 ft | |
| 242 | 2 in | 5 ft | |
| 243 | 9 in | 17 ft | |
| 244 | 5 in | 11 ft | |
| 245 | 7 in | 13 ft | |
| 246 | 9 in | 15 ft | |
| 247 | 6 in | 9 ft | |
| 248 | 7,8 in | 35 ft | two oaks |
| 249 | 3 in | 4 ft | |
| 250 | 8 in | 20 ft | |
| 251 | 5 in | 6 ft | |
| 252 | 3 in | 6 ft | |
| 253 | 3 in | 4 ft | |
| 254 | 3 in | 10 ft | |
| 255 | 7 in | 15 ft | |
| 256 | 6 in | 15 ft | |
| 257 | 11 in | 25 ft | |
| 258 | 8 in | 12 ft | |
| 259 | 30 in | 30 ft | |
| 260 | 9 in | 18 ft | |
| 261 | 14,8in | 21 ft | two oaks side by side |
| 262 | 14, 10 in | 22 ft | |
| 263 | 8 in | 16 ft | |
| 264 | 6 in | 13 ft | |
| 265 | 8 in | 12 ft | |
| 266 | 7 in | 12 ft | |
| 267 | 6, 10 in | 14ft | two trunks one oak |
| 268 | 12,11, 6 in | 22 ft | 3 oaks side by side |
| 269 | 11, 13 in | 32 ft | 2 oaks side by side |
| 270 | 17, 10 in | 30 ft | Two oaks side by side |
| 271 | 14 in | 30 ft | leaning to one side |
| 272 | 5, 14 in | 12 ft | 2 Trunks 1 oak |
| 273 | 12 in | 21ft | |
| 274 | 7,10,8 in | 12 ft | 3 oaks side by side |
| 275 | 19 in | 10 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 276 | 10 in | 14 ft | |
| 277 | 15 in | 32ft | |
| 278 | 12in | 17ft | |
| 279 | 14,14 in | 25ft | Two trunks 1 oak |
| 280 | 16 in | 20 ft | |
| 281 | 8,9,8 in | 28 ft | three oaks side by side |
| 282 | 8 in | 4 ft | |
| 283 | 8 in | 12 ft | |
| 284 | 6 in | 15 ft | |
| 285 | 4 in | 10 ft | |
| 286 | 6 in | 12ft | |
| 287 | 8 in | 14 ft | |
| 288 | 16 in | 20 ft | Large oak |
| 289 | 16 in | 17 ft | Large oak |
| 290 | 12 in | 22 ft | |
| 291 | 12 in | 18 ft | |
| 292 | 17 in | 24 ft | |
| 293 | 11 in | 22ft | |
| 294 | 11 in | 20 ft | |
| 295 | 8,14 in | 22 ft | two trunks one oak |
| 296 | 4 in | 4 ft | |
| 297 | 12 in | 19 ft | |
| 298 | 11 in | 14 ft | |
| 299 | 12 in | 15 ft | |
| 300 | 14 in | 22 ft | six oak cluster 8 DBH each |
| 301 | 28 in | 24 ft | |
| 302 | 8 in | 13 ft | |
| 303 | 6 in | 13 ft | |
| 304 | 7,8 in | 14 ft | two oaks |
| 305 | 10,8 in | 14 ft | |
| 306 | 12 in | 33 ft | Large oak |
| 307 | 12, 12 in | 24 ft | |
| 308 | 12, 12 in | 14ft | two large oaks side by side |
| 309 | 11,11 in | 20ft | two large oaks side by side |
| 310 | 9,9 in | 15ft | two oaks |
| 311 | 16 in | 32 ft | |
| 312 | 11 in | 20 ft | |
| 313 | 15 in | 22 ft | |
| 314 | 9,8 in | 13 ft | two oaks |
| 315 | 14 in | 22 ft | |
| 316 | 18 in | 24 ft | |
| 317 | 6 in | 10 ft | |
| 318 | 8 in | 14 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 319 | 16 in | 22ft | |
| 320 | 4 in | 10 ft | |
| 321 | 11,12 in | 40 ft | |
| 322 | 12,12 in | 25 ft | |
| 323 | 8 in | 8 ft | |
| 324 | 12 in | 17 ft | |
| 325 | 8 in | 15 ft | |
| 326 | 8 in | 8 ft | |
| 327 | 6 in | 7 ft | |
| 328 | 3 in | 4 ft | |
| 329 | 11 in | 16 ft | |
| 330 | 12 in | 17 ft | |
| 331 | 5 in | 13 ft | |
| 332 | 3 in | 10 ft | |
| 333 | 8 in | 15 ft | |
| 334 | 3 in | 5 ft | |
| 335 | 7 in | 15ft | |
| 336 | 8 in | 15 ft | |
| 337 | 4 in | 4 ft | |
| 338 | 3 in | 5 ft | |
| 339 | 4 in | 4 ft | |
| 340 | 10 in | 30 ft | |
| 341 | 4 in | 10 ft | |
| 342 | 3 in | 5 ft | |
| 343 | 7 in | 14 ft | |
| 344 | 6 in | 12 ft | |
| 345 | 4 in | 10ft | |
| 346 | 2 in | 6 ft | |
| 347 | 5 in | 12 ft | |
| 348 | 5 in | 14 ft | |
| 349 | 9 in | 13 ft | |
| 350 | 5 in | 20 ft | |
| 351 | 3 in | 14 ft | |
| 352 | 4 in | 8 ft | |
| 353 | 6 in | 14 ft | |
| 354 | 12in | 18 ft | |
| 355 | 4 in | 10 ft | |
| 356 | 11 in | 16 ft | |
| 357 | 17,16,15 in | 24 ft | Three trunks |
| 358 | 11,11,12,12 in | 25 ft | Four trunks |
| 359 | 10,8 in | 15 ft | Two trunks |
| 360 | 9,6 in | 23 ft | |
| 361 | 10,3,6 in | 14 ft | Cluster of three oaks |
| 362 | 16 in | 16 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 363 | 6,6,6,5,8,9 in | 25 ft | Cluster of six (6) oaks side by side |
| 364 | 8,8,9 in | 20 ft | Three trunks one trunk |
| 365 | 6,6,6,5 in | 14 ft | Cluster of four oaks side by side |
| 366 | 19,19 in | 30 ft | Two trunks one oak |
| 367 | 14 in | 16 ft | |
| 368 | 15 in | 16 ft | |
| 369 | 10 in | 12 ft | |
| 370 | 5 in | 7 ft | |
| 371 | 3 in | 6 ft | |
| 372 | 3 in | 6 ft | |
| 373 | 3 in | 6 ft | |
| 374 | 4 in | 10 ft | |
| 375 | 4 in | 8 ft | |
| 376 | 11,10,8 in | 22 ft | Three trunks one oak |
| 377 | 6,11 in | 25 ft | Two oaks side by side |
| 378 | 3 in | 6 ft | |
| 379 | 17 in | 23 ft | |
| 380 | 10,8,8 in | 18 ft | Cluster of three oaks |
| 381 | 13,13 in | 24 ft | Two oaks side by side |
| 382 | 10 in | 15 ft | |
| 383 | 13 in | 24 ft | |
| 384 | 12 in | 20 ft | |
| 385 | 5 in | 3 ft | |
| 386 | 13,12 in | 27ft | Two oaks side by side |
| 387 | 13 in | 17 ft | |
| 388 | 7 in | 15 ft | |
| 389 | 5 in | 15 ft | |
| 390 | 8,12,16 in | 30 ft | Three oaks |
| 391 | 5,8 in | 25 ft | Two oaks |
| 392 | 13 in | 20 ft | |
| 393 | 18,16 in | 23 ft | Two Oaks |
| 394 | 13 in | 20 ft | |
| 395 | 11 in | 11 ft | |
| 396 | 16 in | 17 ft | |
| 397 | 16,17 in | 28 ft | Two oaks |
| 398 | 14 in | 18 ft | |
| 399 | 9,7 in | 15 ft | Two oaks |
| 400 | 9 in | 10 ft | |
| 401 | 12 in | 17 ft | |
| 402 | 12,13,14,16 in | 40 ft | Cluster of four oaks |
| 403 | 8,8,8,5 in | 20 ft | Cluster of four oaks |
| 404 | 7 in | 14 ft | |
| 405 | 16,7 in | 16 ft | 2 Trunks 1 oak |
| 406 | 19 in | 18 ft | |

**Table 4. Tagged Tree Dimensions from Oak Survey continued**

| Tree Tag # | Dbh (inches) | Dripline (feet) | Comments |
|---|---|---|---|
| 407 | 8,8,7,5,6,6 in | 14 ft | 6 trunks |
| 408 | 15 in | 14 ft | |
| 409 | 16,12 in | 9 ft | 2 trunks one oak |
| 410 | 20 in | 18 ft | |
| 411 | 13 in | 16 ft | |
| 412 | 13 in | 16 ft | |
| 413 | 8.5 in | 11 ft | |
| 414 | 9 in | 11 ft | |
| 415 | 11 in | 11 ft | |
| 416 | 8 in | 3 ft | |
| 417 | 10, 7 in | 8 ft | |
| 418 | 5 in | 3 ft | |
| 419 | 10, 8 in | 6 ft | |
| 420 | 10 in | 6 ft | |
| 421 | 10. 5, 8 in | 8 ft | |
| 422 | 5, 6 in | 10 ft | |
| 423 | 4,10,8,8.5,12,8 in | 14 ft | Cluster of Oaks |
| 424 | 11,3 in | 15 ft | two trunks one Oak |
| 425 | 11 in | 15 ft | |
| 426 | 9.5, 10,6,7 in | 19 ft | 4 Oaks |
| 427 | 12,12.5,10 in | 17 ft | 3 trunks one oak |
| 428 | 8,12,10 in | 20 ft | 3 oaks one leaning to one side |
| 429 | 10 in | 21 ft | |
| 430 | 10 in | 10 ft | |
| 431 | 12, 14 | 20 ft | two trunks one oak |
| 432 | 18 in | 27 ft | |
| 433 | 11,14 in | 20 ft | |
| 434 | 4.5 in | 10ft | |
| 435 | 10 in | 12 ft | |
| 436 | 13 in | 20 ft | |
| 437 | 8.7 in | 17 ft | |
| 438 | 7.5 in | 6 ft | |
| 439 | 8.5,6,6.5 in | 10 ft | Three oaks side by side |
| 440 | 14 in | 18 ft | |
| 441 | 9 in | 20 ft | |
| 442 | 12.5 in | 15 ft | |
| 443 | 15,5 in | 12 ft | Two oaks side by side |
| 444 | 5.5,7 in | 17 ft | |
| 445 | 10,5.5,7 in | 12 ft | Three oaks side by side |
| 446 | 9 in | 20 ft | |
| 447 | 13,4.5 in | 24 ft | Leaning to one side |
| 448 | 10 in | 25 ft | Leaning to one side |