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Plant Monitoring Report
Pale Larkspur Survey

PORTLAND, OREGON AND VICINITY

PREPARED FOR:

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PROJECT AUTHORIZATION AND SCOPE OF WORK

At the request of Metro Regional Parks and Greenspaces, Adolfson Associates, Inc. (Adolfson) surveyed populations of pale larkspur (*Delphinium leucophaeum*) and prepared this report. Pale larkspur is listed as an endangered species by the State of Oregon. The purpose of the pale larkspur surveys was to estimate the population size and map the distribution of pale larkspur in designated areas at the Cooper Mountain and Willamette Narrows sites. Metro staff selected target areas for surveying, and Adolfson staff thoroughly surveyed all appropriate habitats in these areas, conforming to the following criteria:

1. Populations were mapped on aerial photos in the field.

2. Population location, size, and extent were recorded with a Global Positioning System (GPS).

3. Population size and distribution of potential threats were also noted.

This report accompanies Geographic Information System (GIS) files and metadata that were developed for the project. Digital GIS files have been delivered to Metro for inclusion in their GIS database.

During the 2002 field season Adolfson also conducted plant monitoring studies for Metro and compiled the Plant Monitoring Report (January 2003). Adolfson collected nested-frequency data at the Cooper Mountain site (described below), where pale larkspur surveys were also conducted. This report refers to pale larkspur populations at Cooper Mountain in relation to their location relative to the eight macroplots where the nested-frequency transects were deployed. The names of the macroplots reflect their different burn histories (i.e. the 1997/2001-I macroplot was burned in 1997 and 2001, while Control macroplots were not burned in recent history).

PALE LARKSPUR ECOLOGY

Pale larkspur occurs in upland prairies, rocky bluffs, moist meadows, and sparse oak woodlands in the Northern Willamette Valley and Southwestern Washington (Wilson, 1998; WDNR, 2000). Seeds germinate in winter and the above ground portion of first and second year plants die back by late spring (WDNR, 2000). Individuals generally do not flower until at least their fifth year (WDNR, 2000). Potential threats to pale larkspur habitat include non-native grasses, which may negatively impact seedling establishment (WDNR, 2000). Other possible threats to pale larkspur habitat may include non-native shrubs that may encroach on the open habitats where pale larkspur occurs.

SITE DESCRIPTIONS

Cooper Mountain

The Cooper Mountain survey areas are characterized as prairie habitats. Oak woodlands surround the prairies. The pale larkspur surveys included some areas along the margins of the prairies with shrubs and Oregon white oak trees (*Quercus garryana*). The larger survey area at Cooper Mountain is a disturbed prairie, portions of which were burned in 1997 and 2001. The burned areas overlap so that some areas were burned in 1997, some areas were burned in 2001, overlapping areas were burned in both years, and other areas have not been burned in recent history. The smaller survey area at Cooper Mountain is referred to as the Upper Prairie. This small prairie is seasonally moist with shallow soils and a diversity of native wildflowers. The Upper Prairie is less disturbed than other prairie habitats at Cooper Mountain and may represent a remnant natural plant community that may have been found historically on sites in the area with similar soil characteristics.

Willamette Narrows

The Willamette Narrows survey areas are characterized as prairie habitats, oak woodlands, and rocky outcrops. The three survey areas at Willamette Narrows included Peach Cove, an area North of Peach Cove, and Rock Island. The Peach Cove survey area was predominantly a woodland habitat with small openings and rocky areas. The survey area North of Peach Cove contained larger openings (prairies) and woodlands. Rock Island had two survey areas located on a series of rocky islands within the Willamette River. The northern survey area was located within a woodland habitat and rocky shoreline. The southern survey area included some small wooded areas, but predominantly consisted of open areas with bedrock substrate and shallow soils.

METHODS

Surveys were conducted in May and June 2002, when pale larkspur was flowering. Pale larkspur was identified using the *Flora of the Pacific Northwest* (Hitchcock, 1973). Adolfson surveyed areas designated by Metro staff, including eight macroplots and adjacent habitat areas at Cooper Mountain and three areas at Willamette Narrows (Figures 1 through 4). Adolfson staff flagged the extent of pale larkspur in each of these areas, sketched the populations on field maps, and mapped them using a Trimble survey-grade GPS unit supplied by Metro. The GPS mapping was conducted on June 24, 2002 at Cooper Mountain and on June 26 and 28, 2002 at Willamette Narrows. Adolfson mapped the perimeters of populations and recorded population size estimates. In addition, waypoints were recorded using GPS to mark dense population clusters within mapped areas, and isolated clusters of individuals that were too small to warrant perimeter mapping. The GPS files were subsequently developed into ArcView shape files by Adolfson staff. The general locations and outlines of populations were sketched on aerial photos in the field. Data was also recorded for population size and distribution of pale larkspur, and the

location of potentially threatening species. All metadata was given to Metro staff, for use in their Plant Monitoring GIS database.

POPULATION DESCRIPTIONS

Cooper Mountain

Pale larkspur was observed at the Cooper Mountain site in prairie habitats, including shrubby and woody areas along the margins of prairies. Five populations were mapped at Cooper Mountain (Table 1, Figure 1). These populations are not likely to be genetically isolated from each other, given their proximity to each other and the likelihood that they are bee-pollinated. However, they were separated loosely according to the burn history of the macroplots where they were located.

Potential threats to pale larkspur habitat at Cooper Mountain may include encroaching populations of invasive shrubs such as Scot's broom (*Cytisus scoparius*), dense clumps of vetch (*Vicia sp.*), and non-native grasses such as oat grass (*Arrhenatherum elatius*) and velvet grass (*Holcus lanatus*).

Table 1. Pale Larkspur Populations at Cooper Mountain

Population Name	Macroplot(s)	Estimated Number of Individuals	Potential Threats to Pale Larkspur Habitat
CMSW1	1997	300	Scot's broom
CMNW1	1997/2001-I, 2001-II	1,000	Vetch, oat grass
CMNE1	Control-I and -II	175	Scot's broom, vetch, velvet grass
CM9701E	1997/01-II	150	Oat grass
CMUP1	Upper Prairie	500	Various non-native grasses

1997 Macroplot

The CMSW1 population was surveyed with GPS in the 1997 macroplot (Figure 1). This population contains approximately 300 pale larkspur individuals. Adolfson mapped a dense cluster within CMSW1, which is located near the north end of the population and contains approximately 50 pale larkspur individuals (Figure 1). The rest of this population is loosely dispersed throughout the mapped boundaries of CMSW1.

Pale larkspur habitat in the 1997 macroplot may be limited by encroaching Scot's broom near the dirt road east of CMSW1.

1997/2001-I, 2001-I, and 2001-II Macroplots

A large area, CMNW1, was mapped that spans the 1997/2001-I macroplot, the 2001-II macroplot, and extends into the southern portion of the 2001-I macroplot (Figure 1). This area contains approximately 1,000 individuals dispersed throughout. Some individuals appear to be clustered in and around a drainage swale that begins in the 2001-II macroplot and extends to the south. There are also several areas of 30-50 individuals clustered within the plot. The mapped area extends outside of the macroplot boundaries into the margins of the oak shrub area along the western border.

Vetch occurs in dense clusters along the western border of the population, as well as in a large clump between the eastern border of the population and dirt access road. The dense growth of vetch may limit the germination and establishment of pale larkspur in these areas. Oat grass also occurs in areas throughout this population, and may also affect the distribution of pale larkspur.

Control Macroplots

Pale larkspur was sparsely dispersed in the Control I and II macroplots on the east side of the dirt access road. The area mapped, CMNE1, was located on the eastern boundary of the Control II macroplot, and primarily within the eastern two-thirds of the Control I macroplot (Figure 1). Approximately 150 to 200 pale larkspur individuals occur in this area.

Scot's broom and vetch are encroaching along portions of the eastern border of both Control macroplots. Significant populations of oat grass and velvet grass occur in the western portion of the Control macroplots, and may limit pale larkspur germination and establishment.

1997/01-II (East)

Adolfson surveyed and mapped the CM9701E population within the 1997/01-II macroplot (Figure 1). This area contains approximately 150 pale larkspur individuals confined to the outer one-third of the macroplot.

A cluster of oat grass in the southwest corner of the macroplot may limit pale larkspur germination in this macroplot.

Upper Prairie

The population in the upper prairie, CMUP1, covers all of this macroplot, excluding the southwestern area where the trail enters from below (Figure 1). Approximately 500 individuals occur in this macroplot. Pale larkspur is concentrated along the margins of the prairie and extends into the adjacent oak woodland in some areas. Several locations along the perimeter of the population were marked with points that denote a dense cluster of individuals (Figure 1). Adolfson was unable to map pale larkspur in portions of the oak woodland due to limited satellite reception through the tree canopy. These areas of incomplete GPS mapping were corrected on the GIS shape files based on field sketch maps. Some of these areas were also associated with dense clusters that were marked with points.

A variety of non-native grasses were noted in the Upper Prairie. However, tall oat grass was not noted, and little occurrence of velvet grass was noted. Hedgehog dogtail (*Cynosurus echinatus*) and soft chess (*Bromus mollis*) commonly occur in the Upper Prairie. The relatively small stature and dispersed distribution of these species may not significantly threaten pale larkspur; however, the potential impact that these species may have on pale larkspur is unknown. The presence of vetch was noted; however, the dense growth that is suspected to limit pale larkspur habitat was not observed in the Upper Prairie. The Upper Prairie appears to have a different disturbance history than the other survey areas at Cooper Mountain and has significantly less coverage of invasive species.

POPULATION DESCRIPTIONS

Willamette Narrows

Pale larkspur was observed at the Willamette Narrows site in prairie habitats and woody areas. Fourteen populations were mapped with GPS in two main regions: six populations at Peach Cove (Figure 2) and eight populations in an area north of Peach Cove near a rental property (Figure 3). A small population was located on Rock Island (Figure 4), but GPS mapping was not possible due to heavy cloud cover. Many of the populations are located relatively close to each other. The populations were separated into smaller clusters of individuals.

Peach Cove

Six populations were mapped in the Peach Cove area (Table 2, Figure 2): WN1 through WN6. WN1 is the northernmost cluster and contains approximately 20 individuals. WN2 is located to the south of WN1. WN3 is located to the west of WN2. A waypoint southwest of WN3 indicates a cluster of five individuals within a circle of five feet diameter. Scot's broom is a potential threat to these plants. WN4 is located to the southeast of WN3. WN5 is located to the south of WN4. A waypoint west of WN5 indicates a cluster of three individuals. WN6 is located to the east of WN5 within a wooded area separating the two populations. The eastern part of WN5 and the southeastern part of WN6 extend into wooded areas, where satellite reception was inadequate for GPS mapping. These two areas of incomplete GPS mapping were corrected on the GIS shape files based on field sketch mapping. Shrubby plant species that may be encroaching on pale larkspur habitat at the Peach Cove area include poison oak (*Toxicodendron diversilobum*), Himalayan blackberry (*Rubus discolor*), trailing blackberry (*Rubus ursinus*), and Scot's broom.

Table 2. Pale Larkspur Populations at Peach Cove

Population Name	Estimated Number of Individuals	Potential Threats to Pale Larkspur Habitat
WN1	20	poison oak
WN2	200	poison oak, Himalayan blackberry, trailing blackberry, Scot's broom
WN3	15	poison oak
WN4	75	poison oak, Scot's broom
WN5	75	poison oak, Scot's broom
WN6	100	poison oak, Scot's broom

North of Peach Cove

Eight populations were identified in the area North of Peach Cove: WN7 through WN14 (Table 3, Figure 3). WN8, WN9, WN10, and WN14 are located in open prairie habitats. WN11, WN12, WN13, and WN14 are located in wooded habitats. Because the survey areas were not marked with flags or a fence, WN7 extends south of the survey area, and two populations (WN12 and WN13) were identified north of the designated survey area. WN7 is a large, sparsely distributed population located south of the rental property. All of the other populations are located north of the rental property. WN8 is located just north of the access road into this area. WN9 is located northeast of WN8. WN10 occurs to the east of WN9. WN11 is a small population east of WN10, in a wooded area. WN12 and WN13 occur to the north of the survey area designated by Metro. Due to dense canopy cover, there was inadequate satellite reception to map WN12 and WN13 using GPS. WN12 covers an area that is approximately 18 meters by 10 meters. WN13 covers an area that is approximately ten meters by five meters. WN14 occurs within a wooded portion of the survey area, northwest of WN9. Due to dense canopy cover, there was inadequate satellite reception to map WN14 with GPS. WN14 was added to the GIS mapping based on field sketch maps. Shrubby plant species that may be encroaching on pale larkspur habitat at the Peach Cove area include poison oak, Scot's broom, common snowberry (*Symphoricarpos albus*). Vetch, and some grass species may limit pale larkspur habitat in open areas.

Table 3. Pale Larkspur Populations at North of Peach Cove

Population Name	Estimated Number of Individuals	Potential Threats to Pale Larkspur Habitat
WN7	100	poison oak, Scot's broom, common snowberry, vetch
WN8	75	poison oak
WN9	40	Scot's broom
WN10	10	vetch, poison oak, common snowberry
WN11	10	native shrubs, including common snowberry
WN12	40	possibly grasses
WN13	20	possibly grasses
WN14	10	poison oak, Scot's broom, other shrubs

Rock Island

Two areas on Rock Island were designated for surveying by Metro (Figure 4). Only one small population of five pale larkspur individuals was identified (WN20). This population is located on the east side of the western island, along the northern edge of the southern survey area (Figure 4). It is just outside the wooded area south of the power line corridor. The population covered an area of approximately ten meters by five meters. Due to heavy cloud cover, a GPS reading was not possible at this location. Scot's broom may be encroaching on pale larkspur habitat at WN20. In addition, this small population is located just outside of the power line corridor, and any maintenance activities associated with the corridor may also affect the population. Herbicide spraying has been shown to cause damage to pale larkspur populations (Federal Register, 2000).

CONCLUSIONS

Adolfson identified and mapped five populations of pale larkspur at Cooper Mountain and thirteen at Willamette Narrows. Overall, the dominant competitive species appeared to be non-native grasses, Scot's broom, and vetch. Reducing the occurrence non-native grasses may increase recruitment of pale larkspur by improving seedling establishment (WDNR, 2000). Reversing the non-native shrub encroachment at these sites may increase the potential habitat for pale larkspur. Poison oak was identified as one of the shrubby species that may be encroaching on pale larkspur habitat at Willamette Narrows; however, this native shrub may not be a threat to pale larkspur habitat. Monitoring programs like those of the Metro Plant Monitoring study (Adolfson, 2003) may help determine the interactions of these species with pale larkspur over time.

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APPENDIX A FIGURES

ADOLFSON

NORTH
No Scale

Aerial photo provided by:
Metro Parks, Trails, and Greenspaces

Pale Larkspur Populations

Pale Larkspur Population Waypoints

FIGURE 1.
Cooper Mountain Pale Larkspur Populations
METRO PLANT MONITORING
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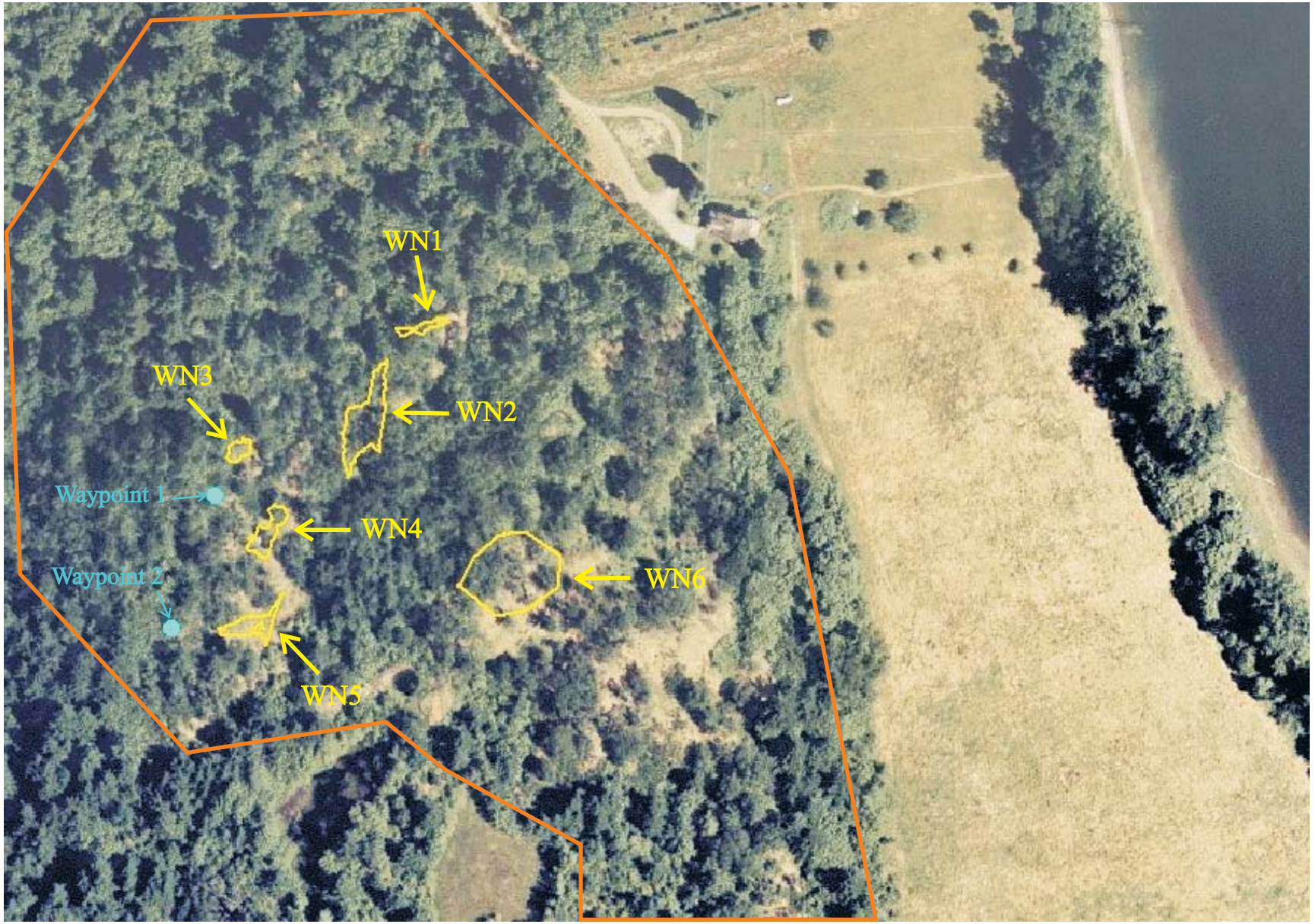


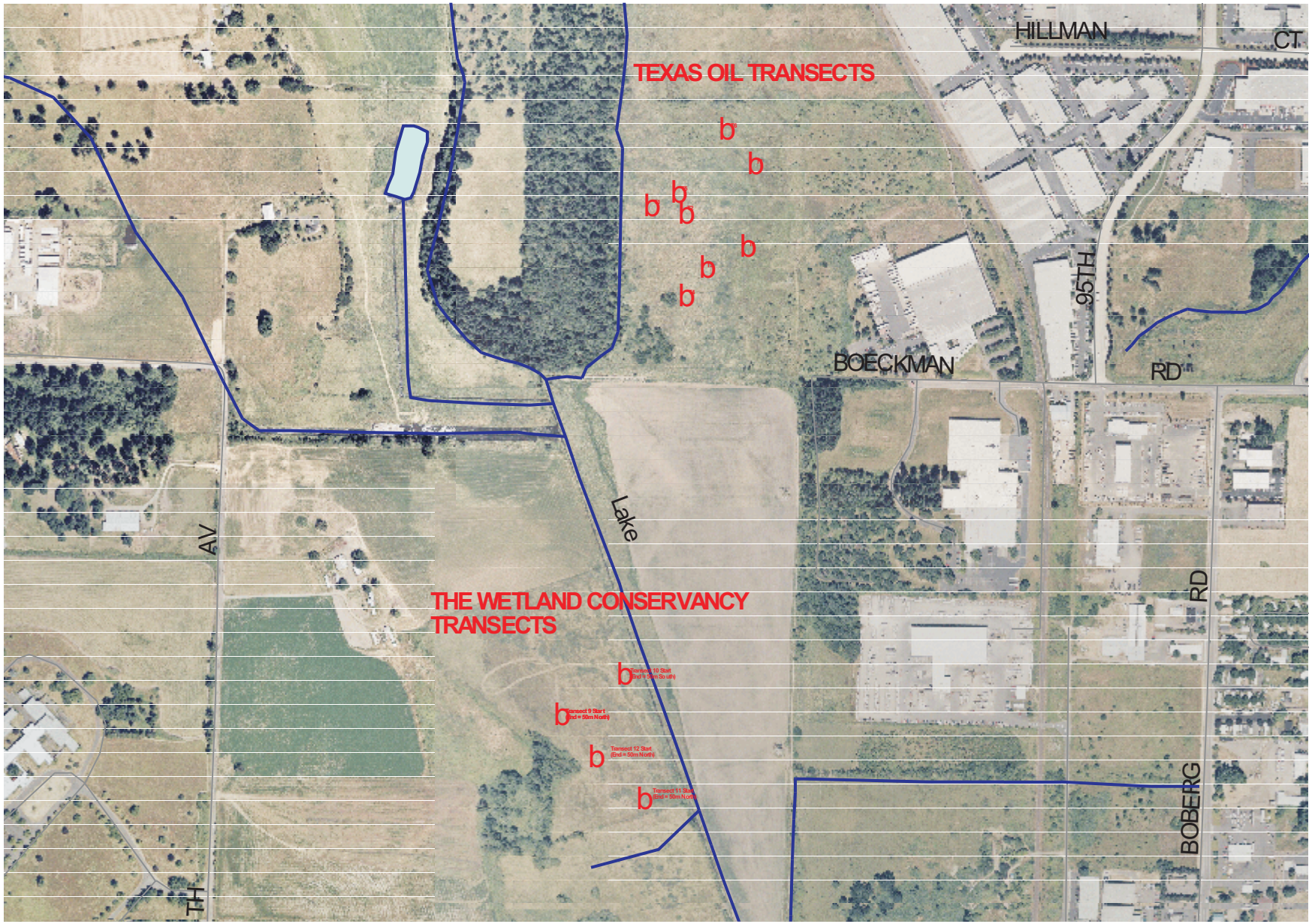
ADOLFSON

NORTH
No Scale

Aerial photo provided by:
Metro Parks, Trails, and Greenspaces

Pale Larkspur Survey Area
Pale Larkspur Populations
Pale Larkspur Population Waypoints

FIGURE 2.
Willamette Narrows Pale Larkspur Populations at Peach Cove
METRO PLANT MONITORING
PORTLAND, OR AND VICINITY



ADOLFSON

NORTH
No Scale

Original graphic by: Metro Regional Parks and Greenspaces

b Transect starting point

FIGURE 3.
Coffee Lake Transects
METRO PLANT MONITORING
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ADOLFSON

NORTH
No Scale

Aerial photo provided by:
Metro Parks, Trails, and Greenspaces

Pale Larkspur Survey Areas

Pale Larkspur Population

FIGURE 4.
Willamette Narrows Pale Larkspur Population at Rock Island
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