Bear Creek Corridor Post-Almeda Fire Vegetation Assessment

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Prepared For
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Submitted To

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Rogue Valley Council of Governments (RVCOG) contracted with Siskiyou BioSurvey LLC to conduct an assessment of the vegetation along Bear Creek in Jackson County, Oregon. The 279-acre project area is defined as publicly-owned lands, within the floodplain, and within the burn scar of the 2020 Almeda Fire (Figure 1).

RVCOG, in coordination with other partners in the Bear Creek Restoration Initiative, seeks to improve ecological conditions along this critical riparian corridor that was impacted by high-severity fire in September 2020. The purpose of the assessment is to understand the present conditions of the vegetation along Bear Creek and to inform prioritization and approaches to ecological restoration efforts.

This document presents the methods used to sample the vegetation, summarizes results, and provides recommendations for ecological enhancement in the project area. This report accompanies the spatial data set that includes the plot data, special vegetation polygons, invasive plant polygons, and georeferenced photographs.

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1
INTRODUCTION

Rogue Valley Council of Governments (RVCOG) has been engaged in restoring native vegetation and ecological functions along Bear Creek and its tributaries for many years. The Bear Creek Restoration Initiative (BCRI) was formed in 2019 following a forum of regional organizations that were already engaged or interested in restoration along the Bear Creek Corridor. BCRI represents a long-term effort to restore habitat and ecosystem functions with an understanding of social and public safety considerations including fuels density and fire risk. BCRI seeks to understand vegetation conditions along the riparian corridor to inform approaches to restoration and ecological management in the coming years.

The 2020 Almeda Fire burned along Bear Creek and the adjacent communities of Ashland, Talent, and Phoenix. The fire burned at high-severity through most of its path killing most of the trees and shrubs at least back to the root crown. In the second year after the fire, vegetation growth is robust as is typical in post-fire ecosystems given the nutrient enriched soils and abundant sunlight. The vegetation presently includes occasional remnant trees that survived the fire, resprouting native trees and shrubs, abundant invasive species, barley planted for erosion control, and a mix of planted and naturally seeded forbs.

2
METHODS

Workers gathered data over the 279-acre project area in five layers: vegetation plots, special vegetation polygons, invasive plant polygons, georeferenced photographs, and non-vegetation features. The project was set up in the ESRI application Field Maps to create facility of data gathering in the field and ease of transition into spatial data products. Figure 2 shows the layers of data gathered at an example location.

2.1 VEGETATION PLOTS

Vegetation plots were conducted at a ratio of one plot per half acre. Workers gathered data at 558 plots in the 279-acre project area. The project area was overlayed with a grid of half-acre squares with one plot recorded within each square. Plot locations were determined in the field to achieve the best distribution of plots within the corridor. Plots were circular with a 55-foot radius, which is equal to approximately one-fifth of an acre (0.2 ac.). The plot shape and size were adjusted when necessary to capture the vegetation within a particular topographic position, often elongated along the creek bank in narrow portions of the riparian area. The data recorded at each plot includes the remnant canopy cover of trees that survived the fire, the cover of each native tree and shrub species, a list of the three most abundant herbaceous species, cover of each invasive species, and cover of barley.

2.2 SPECIAL VEGETATION POLYGONS

Workers mapped areas of special vegetation in the field. The areas mapped include both ecological assets and liabilities, and are different from the normal riparian vegetation in the surrounding area. Examples include dense patches of native shrubs, species of interest or conservation value, native upland trees, and open areas dominated by non-native and invasive plants.

2.3 INVASIVE PLANT POLYGONS

Workers mapped areas of high-priority invasive species that are not common throughout the project area. While all invasive species were documented in the vegetation plots, the invasive plant polygons were reserved for those less common species where site specific information is valuable for understanding their distribution and informing control efforts. Extensive areas of reed canary grass (*Phalaris arundinacea*) were mapped where it extended beyond the creek banks. The data gathered included at each occurrence includes the total area, cover, and estimated number of plants.

2.4 GEOREFERENCED PHOTOGRAPHS AND NON-VEGETATION FEATURES

Workers took georeferenced photos at selected locations to visually document conditions in various parts of the project area. They also mapped and documented certain non-vegetation features including dump sites, fill mounds, and old discarded equipment.

3
VEGETATION DATA ANALYSIS

The data gathered in plots was queried for various parameters to gain an understanding of the diversity and cover of native woody plant species in the project area and how those characteristics are distributed. Herbaceous species data was analyzed for species dominance. Invasive species characteristics were analyzed to convey the frequency and cover of invasive species in various parts of the project area. The list of plant species observed in the course of fieldwork totals 198 species (see Attachment A).

3.1 NATIVE TREE DIVERSITY AND COVER

A table showing the number and percentage of plots with various native tree characteristics is shown in Table 1.

Table 1: Number and Percentage of Plots with Various Native Tree Diversity and Cover Characteristics

Characteristic	Count**	Percentage
Plots with ≥ 25% remnant native tree canopy	61	11%
Plots with ≥ 25% combined* cover of native trees	253	45%
Plots with ≥ 55% combined* cover of native trees	68	12%
Plots with ≥ 5 species of native trees	40	7%
Plots with ≥ 4 species of native trees	131	23%
Plots with ≥ 3 species of native trees	322	58%

*****Combined covers indicate the sum of covers of each individual species; this number is generally larger than the cover all native trees measured together.
** Of 558 total plots.

The data describe the impact of the high-severity fire on the riparian canopy. Only 11 percent of the plots had ≥ 25% remnant canopy. That percentage will likely decline further as burned but still living trees die over time. Less than half of plots (45%) have ≥ 25% combined cover of native tree species and only 12 percent have ≥ 55%. The cover of each tree species consists mostly of resprouts of fire killed trees and some seedlings that are still years away from providing overhead canopy. The number of native tree species per plot ranged from three to four species in 81 percent of plots with only 7 percent of plots having five or more. Plots with four (4) or more species and ≥25% combined cover of native trees are shown in Figure 3. The frequency and average cover of native trees species over all plots is shown in Table 2.

Table 2: Frequency and Cover of Native Tree Species

Characteristic	Frequency	Avg. Cover
black cottonwood *(Populus trichocarpa)*	84%	15%
Oregon ash *(Fraxinus latifolia)*	65%	5%
narrowleaf willow *(Salix exigua)*	31%	2%
Pacific willow *(Salix lasiandra)*	31%	3%
Scouler's willow *(Salix scouleriana)*	24%	2%
white alder *(Alnus rhombifolia)*	9%	<1%
bigleaf maple *(Acer macrophyllum)*	7%	<1%
California black oak *(Quercus kelloggii)*	9%	<1%
Oregon white oak *(Quercus garryana)*	5%	<1%

Black cottonwood is by far the most common species with the highest cover seconded by Oregon ash. Each of three most abundant willow species were present in 24 to 31 percent of plots with covers averaging 2 to 3 percent over the project area. White alder and bigleaf maple were present in 9 and 7 percent of plots, respectively, and had less than 1 percent cover overall. California black oak and Oregon white oak were present in 9 and 5 percent of plots respectively and also had only trace average cover in the project area. Frequency and cover of black cottonwood has likely increased since the sampling occurred due to vigorous summer growth and new sprouts and seedlings.

3.2 NATIVE SHRUB DIVERSITY AND COVER

A table showing the number and percentage of plots with various native shrub characteristics is shown in Table 3.

Table 3: Number and Percentage of Plots with Various Native Shrub Diversity and Cover Characteristics

Characteristic	Count**	Percentage
Plots with $\geq$ 25% combined* cover of native shrubs	28	5%
Plots with $\geq$ 3 species of native shrubs	38	7%
Plots with $\geq$ 2 species of native shrubs	125	22%
Plots with $\geq$ 1 species of native shrubs	305	55%
Plots with 0 species of native shrubs	253	45%

*****Combined covers indicate the sum of covers of each individual species; this number is generally larger than the cover all native shrubs measured together.
** Of 558 total plots.

The data describe the impact of the fire, but also point to a plant community highly altered by decades of invasive species dominance. Only 5 percent of plots had $\geq$ 25% combined cover of native shrubs. Shrub diversity was low in nearly all plots with only 22 percent having $\geq$ 2 native species and with 45 percent of plots having no native shrubs at all. Plots with three (3) or more species and/or $\geq$25% cover of native shrubs is shown in Figure 4. The frequency and average cover of native shrub species over all plots is shown in Table 4.

Table 4: Frequency and Cover of Native Shrub Species

Characteristic	Frequency	Avg. Cover
tall snowberry *(Symphoricarpos albus*)	37%	3.5%
native rose *(Rosa sp.)*	16%	<1%
chokecherry (*Prunus virginiana)*	13%	<1%
blue elderberry *(Sambucus mexicana)*	6%	<1%
whitestem gooseberry *(Ribes inerme)*	4%	<1%
mock orange *(Philadelphus lewisii)*	2%	<1%
redtwig dogwood *(Cornus sericea)*	2%	<1%
Piper's Oregon grape *(Berberis piperiana)*	1.3%	<1%
bitter cherry *(Prunus emarginata)*	1.3%	<1%
Klamath plum *(Prunus subcordata)*	0.9%	<1%
Pacific ninebark *(Physocarpus capitatus)*	0.7%	<1%
California hazel *(Corylus cornuta)*	0.5%	<1%

Tall snowberry is by far the most common and abundant species. It was present in 37 percent of plots and is the only native shrub species to have more than one (1) percent average cover over the project area. Native rose species, including Nootka rose (*Rosa nutkana*) and cluster rose (*R. pisocarpa*) were present in 16 percent of plots but still had less than one (1) percent average cover as did all other native shrub species. Chokecherry was present in 13 percent of plots while bitter cherry and Klamath plum were present in 1.3 and 0.9 percent respectively. Whitestem gooseberry was present in four (4) percent of plots. All other native shrub species are very uncommon including species that were likely once dominant along the Bear Creek corridor.

3.3 NATIVE TREE AND SHRUB DIVERSITY AND COVER COMBINED

A table showing the number and percentage of plots with various native tree and shrub characteristics is shown in Table 5.

Table 5: Number and Percentage of Plots with Various Native Shrub Diversity and Cover Characteristics

Characteristic	Count**	Percentage
Plots with ≥ 3 species of native trees and ≥ 3 species of native shrubs	29	5%
Plots with ≥ 25% combined* cover of native trees and ≥ 10% combined cover of native shrubs	47	8%
Plots with ≥ 25% combined* cover of native trees and ≥ 25% combined cover of native shrubs	8	1%

*****Combined covers indicate the sum of covers of each individual species; this number is generally larger than the cover all native trees or shrubs measured together.
** Of 558 total plots.

While 45 percent of plots had three or more native tree species present, only 5 percent of plots also had three or more native shrub species. Only eight percent of plots had ≥ 25% cover of native trees and ≥ 10% cover of native shrubs. Just one percent of plots had both ≥ 25% cover of native trees and ≥ 25% cover of native shrubs. These results describe the depauperate state of the native shrub community. The characteristics of the plant community post fire reveal the impact

of long-term dominance of invasive species. Cottonwood is overrepresented compared with historic conditions because its vigorous saplings are able to compete with the invasives. The most abundant native shrub species, snowberry and rose, are those that have been able to hold their ground and resist invasives.

3.4 HERBACEOUS DOMINANTS

The three most dominant herbaceous species in each plot were recorded in order of dominance. The most abundant herbaceous species are shown in Table 6 below.

Table 6: Dominant Herbaceous Species in Project Area and Number of Occurrences as Dominant

Species	Occurrences as Most Dominant Species	Occurrences as 2nd Most Dominant Species	Occurrences as 3rd Most Dominant Species	Total Occurrences as a Dominant Species
poison hemlock *(Conium maculatum)*	128	87	50	265
Hoody barley *(Hordeum x)*	162	53	23	238
bur-chervil *(Anthriscus caucalis)*	54	70	48	172
ripgut brome *(Bromus diandrus)*	30	39	30	99
prickley lettuce *(Lactuca serriola)*	1	27	38	66
catchweed bedstraw *(Galium aparine)*	13	26	20	59
yarrow *(Achillea millefolium)*	15	16	24	55
black mustard *(Brassica nigra)*	11	15	22	48
Roemer's fescue *(Festuca roemeri)*	5	23	19	47
sweetclover *(Melilotus officinalis)*	14	16	13	43

The herbaceous plant community is almost entirely dominated by non-native species. The most common dominant species was poison hemlock, a pernicious invasive species. The second most dominant species was Hoody barley which comprised the majority of the seed mix that was widely broadcast following the fire for the purpose of covering the bare soils and reducing erosion and sedimentation. It produced an abundant crop of fertile seed in 2021 resulting in an ongoing abundance of this plant (See Section 3.4.1 below). Bur-chervil was also extremely abundant. Yarrow and Roemer's fescue, which were included in the seed mix, are the only two native dominant herbaceous species. Neither are associated with riparian habitats, but both responded well to the seeding in some areas becoming surprisingly abundant.

3.4.1 Hoody Barley

Hoody barely is a fertile, winter-active, short-statured barley variety that was widely seeded after the fire. The average cover over the project area is 10 percent, but covers are much higher in some areas. Fifteen (15) percent of plots had $\geq$ 35% cover, while more than one quarter of plots (27%) had $\geq$ 15% cover. Covers up to 75 percent were observed.

3.5 INVASIVE PLANT COVER

Invasive plants continue to dominate over much of the project area. Invasive species were well positioned to make use of the ample light and nutrients the Almeda Fire provided. While several other invasive species are of pressing concern, poison hemlock and Himalayan blackberry are by far the most widespread. The number and percentage of plots with various invasive species characteristics is provided in Table 7 below.

Table 7: Number and Percentage of Plots with Various Invasive Species Characteristics

Characteristic	Count	Percentage
Plots with ≥ 25% combined* cover of invasive species	105	19%
Plots with ≥ 55% combined* cover of invasive species	52	9%
Plots with poison hemlock *(Conium maculatum)*	207	37%
Plots with ≥ 25% cover of poison hemlock *(Conium maculatum)*	68	12%
Plots with ≥ 45% cover of poison hemlock *(Conium maculatum)*	26	5%
Plots with Himalayan blackberry *(Rubus armeniacus)*	546	98%
Plots with ≥ 25% cover of Himalayan blackberry *(Rubus armeniacus)*	52	9%
Plots with ≥ 45% cover of Himalayan blackberry *(Rubus armeniacus)*	10	2%

*****Combined covers indicate the sum of covers of each individual species; this number is generally larger than the cover all invasive species measured together.
** Of 558 total plots.

Poison hemlock and Himalayan blackberry comprise the majority invasive species represented in the plots. Reed canarygrass (*Phalaris arundinacea*) was the next most abundant species in the plots. Canarygrass cover, however, is usually a function of the proximity of the plot to the creek and the slope of the streambank. Nineteen (19) percent of plots had ≥ 25% combined cover of invasive species, while nearly 10 percent (9%) had ≥ 55% combined cover. Poison hemlock was able to respond fastest to the fire. It was present in 37 percent of plots. Twelve (12) percent of plots had ≥ 25% cover of poison hemlock while five (5) percent had ≥ 45% cover. Himalayan blackberry is virtually ubiquitous across the project area appearing in 98 percent of plots. Nine (9) percent of plots had ≥ 25% cover of blackberry. The plots with the highest covers of invasive species is shown in Figure 5.

4
INVASIVE PLANTS

The Bear Creek riparian corridor has a long history of ecological disturbance that has resulted in the proliferation of invasive species. Some species, such as Himalayan blackberry (*Rubus armeniacus*) and poison hemlock (*Conium maculatum*) are nearly ubiquitous throughout. Several unusual and newly arrived invasive plant species were documented as well. Some non-native species that not generally considered invasive were also documented due to the potential for them to naturalize in the open, recently burned environment. Restoration managers will need to develop an invasive plant treatment and monitoring program that eliminates populations of the species that are not widespread and continually reduces the extent of the species that are.

A list of invasive and potentially invasive species, their Oregon Department of Agriculture designation, distribution in the project area, and recommendations for their control are provided below. Oregon Department of Agriculture (ODA) A List weeds are species which occur in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon likely. ODA B List weeds are species that are regionally abundant. ODA T (Target) designated weeds are species from the A or B list that are targeted for prevention and control by the state's Noxious Weed Control Program.

Ailanthus altissima, tree of heaven (ODA-B List): This species was mapped in five locations. It is sporadically naturalized in our area, but has the potential to become very invasive. Given the open post-fire environment, it should be targeted for treatment to prevent it from naturalizing further.

Arctium minus, lesser burdock (ODA-not listed): This species was present in a few locations. It is abundant on drying unvegetated lake shores, but is not likely to become problematic along Bear Creek.

Arum italicum, Italian arum (ODA-not listed): This is a common perennial garden weed that reproduces by underground tubers. It was mapped in two (2) locations. It has the potential to proliferate in the open post-fire environment and should be targeted for control.

Catalpa bignonioides, southern catalpa (ODA-not listed): This common urban tree has become naturalized in limited areas of our region. It was mapped in 10 locations. Given the open post-fire environment, it should be targeted for treatment to prevent it from increasing further.

Centaurea solstitialis, star thistle (ODA-B List): This annual species is virtually ubiquitous in open upland waste places in the Rogue Valley. Well timed mowing will reduce but not eliminate its ability to produce seed. It is not a priority for control.

Centaurea stoebe, spotted knapweed (ODA-B List): This perennial species is present in one (1) small and one (1) large population in the large open area east of the freeway and west of the creek between Phoenix and Talent. This plant has limited distribution in the valley at present and should be controlled before it spreads further.

Chondrilla juncea, rush skeletonweed (ODA-B List, T): This perennial species is spreading rapidly in our region and has the abilities to become a dominant species. It was mapped in nine (9) locations, the two largest being the large open area east of the freeway and west of the creek between Phoenix and Talent and the area with a gravel trail connecting the greenway to Highway 99 immediately south of Talent. This species should be a high priority for control.

Cirsium vulgare, bull thistle (ODA-B List): This biennial species was seen a few times during the survey. It seldom becomes prolific as it does not compete well with other vegetation. It is not a priority for control except perhaps in public uses areas as it is unpleasant come in contact with.

Conium maculatum, poison hemlock (ODA-B List): This biennial species is a dominant over much of riparian corridor often forming monoculture stands. This species is a high priority for control due to its ability to suppress native vegetation and the increased fire risk presented by its dense dry stalks in late summer. Replacement with native vegetation is the only long-term solution to its dominance of the area.

Crataegus monogyna, English hawthorn (ODA-B List): This species was mapped in three (3) locations. It is more commonly naturalized in wetter portions of our region and only occasional in Jackson County. However, given the open post-fire environment, it should be targeted for treatment to prevent it from increasing further.

Dipsacus fullonum, teasel (ODA-not listed): This biennial species can be aggressive in some situations, but it is often outcompeted by other vegetation. A selection of the sites observed during the survey were mapped. This species should be controlled where proximal to other target invasive species and monitored to see that patches are not increasing, especially around ponds where it has potential to become dominant.

Euphorbia esula, leafy spurge (ODA-B List, T): This perennial species was mapped in 11 locations. It is an aggressive invasive in some area and is a high priority for control.

Euphorbia lathyris (ODA-not listed): This species, planted as an ornamental in landscapes, is sporadically naturalized in the western states. It was mapped in four (4) locations. Three of the four were uprooted. The fourth, near Wranglers Arena, could not be uprooted. These sites should be monitored for additional plants in future years and any additional plants uprooted whenever found.

Hedera helix, English ivy (ODA-B List): This perennial vine was found at eight (8) locations. This species has the potential dominate forest understories to the exclusion of other species. It should be targeted for control. Vines climbing up tree trunks should be cut off at the base as first priority to reduce seed production.

Hordeum x., Hoody barley (ODA-not listed): While not an invasive, this annual species planted for erosion control after the fire is a dominant in much of the area forming solid stands in some places. It may be reducing encroachment by invasive species but also may be limiting re-establishment of natives. Over time, it will likely diminish as other species outcompete it.

Hypericum perforatum, Saint Johnswort (ODA-B List): This perennial species is ubiquitous along roadsides and open areas in our region. It is not a priority for control unless it forms dense stands competing with native vegetation.

Iris pseudoacorus, yellowflag iris (ODA-B List): This perennial wetland species was mapped in 31 locations. It often forms monocultures around pond margins and sporadic along creek banks. It should be strategically controlled in locations where it can be replaced with native vegetation.

Lathyrus latifolius, perennial peavine (ODA-B List): This perennial species is rapidly spreading in our region often forming dense patches of large plants. It was mapped in 51 locations. Without control, this species will spread rapidly in the open post-fire environment and will become a dominant species along the greenway where many of the existing populations are located. It is a high priority for treatment.

Lepidium chalepense, lens-podded whitetop (ODA-B List): One (1) site of this perennial rhizomatous species was found on the edge of Highway 99 south of Talent. It is a high priority for control.

Phalaris arundinacea, reed canarygrass (ODA-B List): This species is ubiquitous along the streambanks of Bear Creek. It was mapped in 24 locations where it extended away from the creek bank. Its rhizomes are resistant to herbicide and it produces ample seed which carried by the creek. It should be controlled as site preparation for restoration planting and manually trimmed or cleared around valuable native plants.

Polygonum cuspidatum, Japanese knotweed (ODA-B List): This aggressive species was mapped at a single location east of Blue Heron Park. It has potential to dominate large areas with perennial moist soil. It is a high priority for control.

Pyracantha sp., firethorn (ODA-not listed): This sporadically naturalized ornamental shrub was found at a single location. It should be controlled so that it does not reproduce additional plants.

Robinia pseudoacacia, black locust (ODA-not listed): This commonly planted tree has become naturalized in many areas of our region. It was mapped in 12 locations. Given the open post-fire environment, it should be targeted for treatment to prevent it from spreading further. It is known to be difficult to kill and may require several treatments to be effective.

Rubus armeniacus, Himalayan blackberry (ODA-B List): This species is ubiquitous along Bear Creek and served as the source and combustible landing place of burning embers during the Almeda Fire. It is a high priority for control due to its ability to exclude native vegetation and its contribution to public safety risk.

Sylibum marianum, milkthistle (ODA-B List): This annual/ biennial species was found at five (3) locations. Plants were destroyed at the two small sites. The largest site contains approximately 150 plants. This is highly unpleasant and potentially aggressive species that produces copious quantities of seed. It is a high priority for control.

Tamarix ramosissima, saltcedar (ODA-B List, T): This species is an aggressive invasive in many parts the western United States. It was found at a single location between Phoenix and Talent east of the freeway on the east side of the creek. It is a high priority for control.

Tribulus terrestris, puncturevine (ODA-B List): This annual species was observed in a single location but due to its late summer development, it would not have been generally detectible at the time the survey occurred, though it is known to occur along the greenway. The fruits produced by this plant commonly attach to and puncture bicycle tires as well as sticking to shoes, socks, and animal fur. Stewardship crew members should be capable of identifying this plant and should remove it when observed.

Vinca major, periwinkle (ODA-not listed): This perennial vine has the ability to cover the forest floor and exclude native vegetation. It was mapped in 18 locations that should be targeted for control before it spreads further.

5
CONCLUSIONS AND RECOMMENDATIONS

Before the Almeda Fire, the Bear Creek riparian corridor contained a highly altered plant community resulting from decades of direct disturbance and the steady encroachment of invasive plants. The Almeda Fire burned at high-severity through most of its pathway along the creek killing the above ground portion of most of the trees and shrubs. Those species that have the ability to resprout are doing so with vigor, yet the emerging plant community is a reflection of the pre-fire composition. The open and fertile habitat provides ideal conditions for invasive species to increase their dominance of the habitat, but also provides an opportunity to increase and strategize ecological restoration and stewardship efforts across this vital ecological and social corridor regionally.

5.1 NATIVE TREES AND SHRUBS IN THE PROJECT AREA

5.1.1 Native Trees

Broadleaved Trees

Acer macrophyllum, bigleaf maple: This species is sparsely represented along the corridor and is likely much less abundant than it was historically. This is a priority species for restoration due to its relatively long lifespan and ability to form a large canopy.

Alnus rhombifolia, white alder: This species is sparsely and sporadically present usually right along the banks of the creek. It is likely much less abundant than it was historically partly due the limited ability of seedlings to compete with invasive species. Due to its inability to resprout from the root crown, it will become even less prevalent without intervention. This is a high priority species for inclusion in restoration planting due to its disadvantages in dealing with fire and invasive species and because its nitrogen fixing capacity which contributes significant quantities of this vital nutrient into the riparian community.

Arbutus menziesii, Pacific madrone: Workers mapped eight (8) polygons containing one or more madrone trees in the project area. This is a highly valuable tree for wildlife foraging that should be included in restoration plantings in adjacent uplands. Special care should be taken to steward resprouting trees.

Crataegus douglasii, Douglas's hawthorn: This species was observed only six (6) times. This thicket-forming tree is a valuable species for restoration planting and is able to compete with invasives once well established. Hawthorn provides valuable wildlife habitat and forage.

Fraxinus latifolia, Oregon ash: This is the second most abundant tree species along Bear Creek. Unfortunately, the arrival of the emerald ash borer in Oregon in 2022 does not bode well for its future here. Stewardship practitioners should anticipate a sharp reduction in the abundance of Oregon ash in the coming years and should not include it in restoration plantings. The coming decline of this species makes restoration efforts to establish other riparian trees all the more critical.

Juglans sp., walnut: Hinds walnut (*J. hindsii*), a species native to California and Oregon, has been documented on Bear Creek and confirmed through DNA analysis. Black walnut (*J. nigra*), native to the eastern United States, is a widely planted species and is widely naturalized in various riparian areas of Jackson County. The two species cannot be confidently separated without fruits, which will not be available from resprouting trees for some years, or DNA analysis. Further, the *Flora of North America* includes the following note about Hinds walnut:

> Before 1850, *Juglans hindsii* was restricted to a few locations (J. R. Griffin and W. B. Critchfield 1972). It has been widely used as a rootstock for grafting *J. regia* and has been planted extensively in many parts of California for this purpose. It is now naturalized in many areas where it apparently did not occur before the introduction of commercial walnut growing. Possibly some of these naturalized populations are introgressed with *J. nigra*, since spontaneous hybridization between *J. hindsii* and *J. nigra* has been reported in areas where both species have been planted. These hybrids are difficult to distinguish from *J. hindsii* unless fruit are present. (G. H. McGranahan and P. B. Catlin 1987).

Workers mapped 49 polygons containing one or more walnut trees each. Stewardship managers should manage for and protect these trees until more is understood about their origin. Whether the walnuts present on Bear Creek are native to the eastern US, the west, or are hybrids, they do contribute the habitat benefits to the riparian ecosystem.

Populus trichocarpa, black cottonwood: This species is likely overrepresented compared with the historic condition due to the ability of its vigorous seedlings and stump sprouts to compete with invasive species. Due to its existing prevalence in the riparian community, especially post-fire, and the abundant seed produced annually, it can be left out or only sparsely included in restoration plantings.

Quercus garryana, Oregon white oak: Workers mapped 28 polygons containing one or more Oregon white oak trees. This is a high-value species for restoration on small upland inclusions, riparian margins, and adjacent uplands. White oak is a drought tolerant and winter saturation tolerant keystone species that comprises an ecological matrix in southern Oregon valleys and foothills. Special care should be taken to steward resprouting trees.

Quercus kelloggii, California black oak: Workers mapped 42 polygons containing one or more California black oak trees. White oak and black oak often co-occur. This is a high-value species for restoration of riparian margins and adjacent uplands. Special care should be taken to steward resprouting trees.

Salix exigua, narrowleaf willow: This shrubby tree is fairly frequent along the corridor. It is resilient to flooding, exposure, and temporary drought and is a valuable restoration species including in challenging locations.

Salix lasiandra var. *lasiandra,* Pacific willow: This is largest of our native willow species and the only one capable of forming a large canopy. Its vigorous resprouts are frequent along Bear Creek within the project area. This is a high-value species for restoration due to its canopy forming capability. Stewardship of this species may involve multi-phase stem density management to support establishment of single-stemmed, canopy-forming trees.

Salix lasiolepus, arroyo willow: This shrubby tree was only found sporadically in the project area. Including it in restoration planting will support community diversity.

Salix scouleriana, Scouler's willow: This shrubby tree is frequent in the project. This species is more drought tolerant than other willow species and could be used in plantings along riparian edges.

Coniferous Trees

A few individuals of three native conifers are present in the project area in uplands: incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), and Douglas-fir *(Pseudotsuga menziesii*). Each of these species likely were historically common along the riparian edges of Bear Creek. Including conifers in plantings on adjacent uplands areas will contribute significant habitat complexity and provide additional opportunities for bird species and the insects they depend on.

Other regionally native conifers could be planted in parks and along the greenway. These include Baker cypress (*Hesperocyparis bakeri*), McNabb cypress (*H. macnabiana*), coast redwood (*Sequioa sempervirens*), giant sequoia (*Sequioadendron giganteum*), and western juniper (*Juniperus occidentalis*).

5.1.2 Native Shrubs

Seventeen species of native shrubs were observed in the project area, though many of these were only very sparsely present. All shrub species had low covers due to the highly altered nature of the shrub community. A selection of native shrub species is described below.

Berberis piperiana, Piper's Oregon grape: Lumped with tall Oregon grape (*B. aquilfolium*) in some treatments, this species is very occasional in the project. Its evergreen foliage, profuse flowers, and fruits make a significant habitat contribution where it occurs. It is a high-priority species for planting in riparian and adjacent upland areas.

Cornus sericea, red osier dogwood: This species is curiously sparse in the project area occurring in only two (2) percent of plots. It was likely a dominant species historically that was highly impacted by disturbance and invasive species. This is a high-priority species for restoration.

Malus fusca, Pacific crabapple: This species was only observed one time in the project area. It is more common in other parts of the state, but has been documented along the Rogue River. Including it in restoration plantings would contribute shrub community and habitat diversity.

Philadelphus lewisii, mock orange: This species was sporadically present often adjacent to oaks and chokecherry. Its persistence indicates its value as a restoration species. It is a somewhat drought resilient species suitable in and around the edges of the riparian area, including rocky areas and on steep banks.

Physocarpus californica, Pacific ninebark: Like red osier dogwood, this species is curiously sparse in the project area occurring in less than one percent of plots. It was likely a dominant species along Bear Creek historically. This is a high-priority species for restoration.

Prunus virginiana, chokecherry: This species is present in patches often co-occurring with oaks. It is resprouting vigorously into dense thickets. These areas should be stewarded to allow for expansion of these patches, as well as planting other compatible native species alongside, giving them the advantage of surviving amidst a well-established patch.

Rhus aromatica, Skunkbush: This is a highly resilient species that was only observed in one location in Ashland. It is common in California, but also occurs near the Rogue River and other parts of Jackson County. It can be included in riparian plantings, but should definitely be included in plantings on adjacent uplands due to its highly resilient nature.

Ribes inerme, whitestem gooseberry: This species is fairly common along Bear Creek and appears to maintain a presence even when significant amounts of invasive species are present. It is often intermixed with other vegetation including invasives. Given its continued presence and its low stature and spreading habit, it is not a high priority for inclusion in restoration plantings.

Rosa nutkana and *R. pisocarpa,* Nootka and clustered rose: These species are common in some areas with some dense patches. Dense patches should be stewarded to allow for expansion and to reduce encroachment of invasive species.

Sambucus mexicana, blue elderberry: This species was somewhat frequent occurring in six (6) percent of plots. This is a large vigorous shrub that provides abundant habitat value to wildlife and is somewhat drought resistant. For these reasons, it is a high priority for restoration plantings, both in and around the edge of the riparian zone.

Symphoricarpos albus, tall snowberry: This is the most common native shrub in the project area with many dense patches capable of resisting encroachment by invasives. Dense patches should be stewarded to allow for expansion and to reduce encroachment of invasive species.

5.2 ECOLOGICAL STEWARDSHIP

Managing the Bear Creek Corridor including areas burned in the Almeda Fire will require long term commitment to stewardship and restoration backed by stable and sufficient funding. While streamside restoration projects like those that have been successful in recent years should continue to be designed, installed, and managed in prioritized locations, all portions of the publicly owned lands in the Bear Creek corridor will require ongoing ecological stewardship to

increase the dominance of native species, restore tree canopy, and reduce the spread of invasives. Implementing stewardship practices everywhere will result in future active restoration sites that are in a better condition with more ecological assets in place when planting projects occur. It will also result in areas of higher quality habitat and ecological functioning without intensive restoration plantings. Building an ecological restoration workforce of persons capable of learning the native and invasive species present along Bear Creek will be essential for effective stewardship.

5.2.1 Stewardship Activities

Ecological stewardship of the Bear Creek corridor would include control of invasive species, manual clearing around native plants, mowing or string trimming, stem density management, fertilizing, and mulching.

5.2.1.1 Control of Invasive Species and Manual Clearing

Controlling invasive species should include the continued and expanded use of herbicides with a prioritized approach and well-timed applications to achieve the greatest results. The populations of invasive species mapped in the project area, species which are not ubiquitous but rather limited in their extents, should be treated as soon as optimal and monitored with follow up treatments as necessary.

Selective hand pulling of invasive species will also be necessary in certain situations. Mowing and string trimming can be used prevent seed set of invasive species, such as poison hemlock, in areas without native vegetation where herbicide was not used and to maintain access trails.

It is essential to avoid herbicide overspray onto the native vegetation. Accidentally killing resprouting native trees while controlling invasives is incongruent with ecological restoration objectives. For this reason, it will be important to clear by hand invasive vegetation around high-value native vegetation. Clearing around native trees and mulching around the base with the slash will reduce competition for water and nutrients, increase soil moisture, reduce soil temperatures, and remove the risk of overspray. Clearing around dense patches of native shrubs will allow those patches to expand and allow for safe use of herbicide beyond the immediate perimeter.

5.2.1.2 Stem Density Management

Most of the fire-killed broadleaf trees along Bear Creek (excepting white alder) are resprouting from the root crown with vigor. While many resprouts emerging in a clump occupies space at the ground level, competition between stems can inhibit the ability of the tree to form a tall canopy. Additionally, stems that die off due to being outcompeted may contribute to fuels loading while providing a trellising structure for invasive blackberry. Gradually thinning resprouted stems in multiple phases over the next ten years will help to regrow the tree canopy while managing fuel loads.

5.2.2 Management Units and Access for Stewardship

Restoration managers may consider dividing the publicly owned portions of the Bear Creek corridor into management units based on geography, access points, and vegetation characteristics. This would be a useful tool to conceptualizing and organizing restoration and stewardship efforts.

At present many portions of the project area are difficult to access. For effective stewardship to occur, all areas must be accessible with reasonable efficiency and capacity to move necessary tools, equipment, and personnel. This may require acquiring access permission through private property at key locations. Additionally, mowed foot trails and possibly trails wide enough for an ATV could be created and maintained to allow work crews to access various sites. Low cost, makeshift foot bridges to allow workers to cross the creek should also be installed in key locations.

5.3 RESTORATION PRIORITIES

Prioritization of restoration efforts requires consideration of multiple layers of costs and benefits, opportunities, and obstacles. A selection of considerations is discussed below.

5.3.1 Riparian Zone

Shading the creek is understood to be a critical objective of restoration efforts, and thus most restoration plantings are installed on the south to west side of the creek. However, unmaintained areas, including those north and east of the creek, often produce an abundant source of invasive plant seed thus increasing maintenance needs and risk of project failure. Invasive plants should be controlled in areas adjacent to restoration plantings to reduce this effect.

Stewardship efforts should focus on protecting and enhancing areas with relatively high diversity and cover of native trees and shrubs, filling in those gaps with native species, and working outward to expand those areas. Areas with relatively high native diversity and cover include areas east of Blue Heron Park in Phoenix, lands adjacent to the Interstate 5 rest area, and the area north and northwest of the confluence of Wrights Creek in Ashland. Comprehensive restoration plantings should be prioritized in areas on the south to southwest sides of the creek that are highly dominated by invasives and in areas where the benefits of restoration can be observed by the public.

5.3.2 Social and Ecological Value of Trees Along the Pathway

Stewardship and restoration activities should focus not only on shading the stream, but also on shading the greenway path. Trees along the path, especially on the south to west side are of particular social value in cooling the path making it more attractive to users. This social value is translated back into ecological value when the community learns about, understands, and benefits from the stewardship of the environment and supports ongoing restoration efforts. This disproportionate value combined with the ease of access provided by the greenway calls for a greater level of attention and stewardship. Resprouting and planted oaks, madrones, bigleaf maples, and conifers should be carefully stewarded to maturity. Fertilizing and thick mulching

with wood chips around tree bases combined with stem density management will greatly accelerate the tree growth and decrease the time until canopy formation in this important zone.

5.3.3 Adjacent Uplands

Restoring riparian edges and adjacent uplands will catalyze the restoration of numerous ecological relationships including the insect and avian communities and the relationships between them (Agrawal et al, 2006). Historically oak woodlands and areas of mixed upland forest abutted and were often intermixed with riparian forests. Native upland trees support native pollinators and serve as the essential ecological component in the life cycles of native insects. These insect communities serve as the essential food source for nesting resident and neotropical birds. Thus, it is important that these areas are not neglected in restoration efforts.

Much of the adjacent uplands are presently in an open, weedy, grassy state and were mapped during the survey effort. Some uplands and riparian edges contain Oregon white oak, California black oak, Pacific madrone, and/ or chokecherry. Stewardship efforts in these areas should: 1) foster the growth of these species, 2) interplant open gaps with underrepresented species, including conifers and upland shrubs, and 3) expand outward with additional plantings, potentially in stages, into open weedy areas where they are present. Riparian planting projects should extend at least up to the edge of the adjacent uplands where possible to allow for upland species to contribute to the plant community diversity. Upland inclusions within the riparian zone, whether natural or dumped fill material, are also good locations to include upland species.

5.3.4 Talent Ponds

The ponds and surrounding wetlands between the greenway and Interstate 5 is one of the most difficult to access locations in the greenway and have a diversity of wildlife that are supported here. Cattail is common along ditches feeding into ponds. Both narrow leaved willow and cattail are dominant on pond edges. Dry mounds in between ponds are often weedy. Jimsonweed (*Datura stramonium*) and blackberry are common. These areas could be enhanced with native plantings and control of invasive species to allow existing natives to expand. Perennially moist areas presently occupied by non-native or invasive vegetation could be planted with natives, including willow stakes, without the need for irrigation.

5.4 USE OF SPATIAL DATA

The spatial data produced in this project include plot data from 558 plots, 186 special vegetation polygons, 236 invasive plant polygons (of non-ubiquitous species), 29 non-vegetation features, and 52 spatially referenced photographs. Combined these data layers serve as a resource for understanding the composition of vegetation along the Bear Creek Corridor.

The analysis of the vegetation plot data provided in this report conveys the general conditions in the project area and highlights some areas with greater or lesser native diversity and cover and the prevalence of invasive species. Restoration managers may wish to divide the corridor in management zones and stratify the data accordingly. They may also wish to query the data in other ways or with different combinations of characteristics than was done in this report. Further, the plot data provides site specific information that will be useful in understanding variability within a given management area.

Special vegetation polygons identify ecological assets and liabilities that will inform stewardship efforts and prioritization. Invasive plant polygons provide the necessary resource to direct treatment efforts and monitor populations over time. Spatially referenced photos allow restoration managers to see how various areas appeared at the time of the survey and provide a useful tool for future monitoring.

6
REFERENCES/ BIBLIOGRAPHY

Agrawal, A. A., J. A. Lau, and P. A. Hambach. 2006. Community heterogeneity and the evolution of interactions between plants and insect herbivores. *The Quarterly Review of Biology* 81(4):349-76.

Burghart, K. T., D. W. Tallamy, and W. G. Shriver. 2009. Impact of native plants on biodiversity in suburban landscapes. *Conservation Biology* 23(1):219-24.

Flora of North America, Description for Hinds Walnut (*Juglans hindsii*). 2022. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500717

Narango, D. L., D. W. Tallamy, and P. P. Marra.2017. Native plants improve breeding and foraging habitat for insectivorous bird. *Biological Conservation* 213:42-50.

Oregon Department of Agriculture Noxious Weed List. https://www.oregon.gov/oda/shared/Documents/Publications/Weeds/NoxiousWeedPolicyClassification.pdf

Oregon Department of Forestry, Emerald Ash Borer Fact Sheet. 2022 https://www.oregon.gov/odf/Documents/forestbenefits/fact-sheet-emerald-ash-borer.pdf

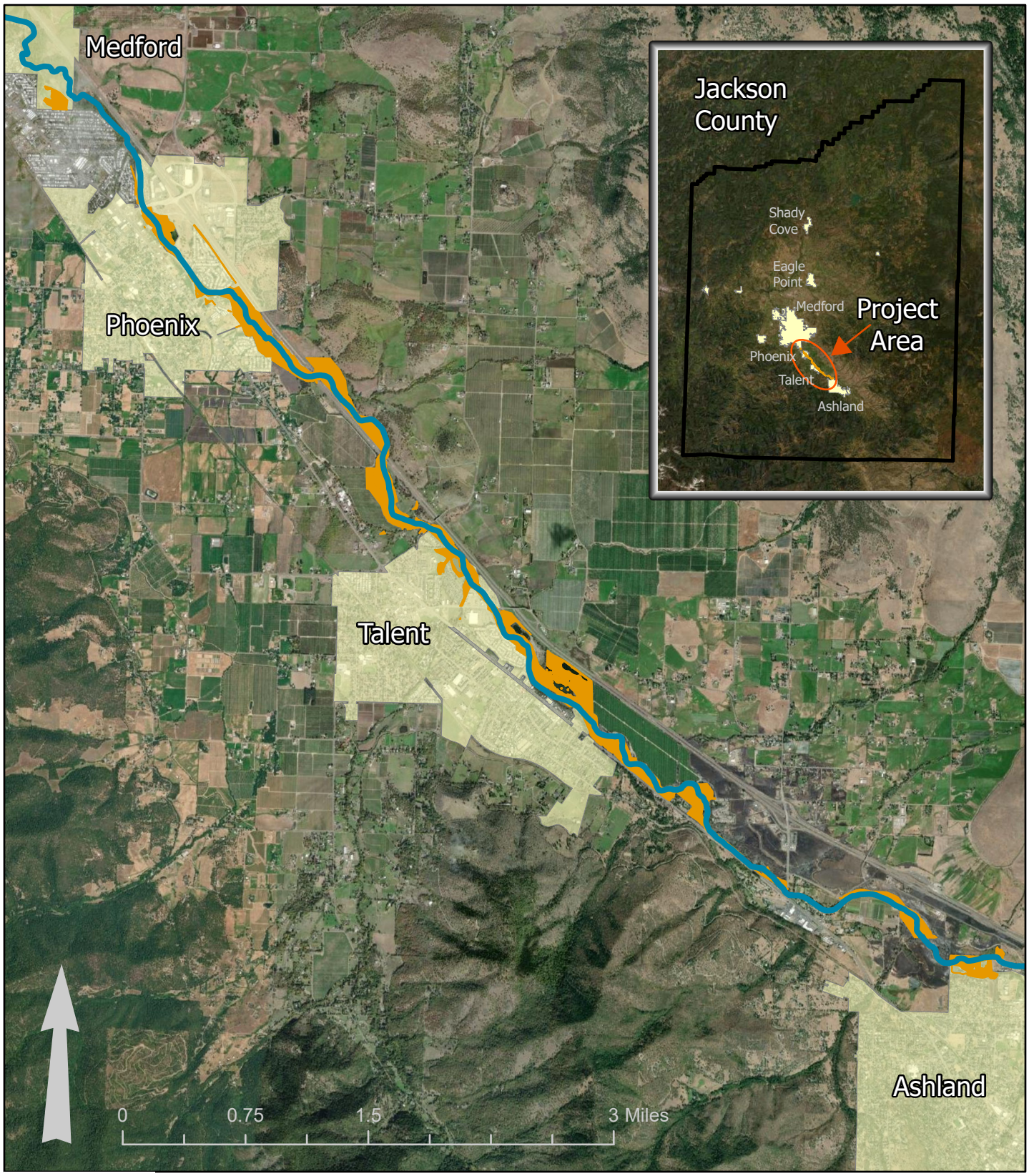
Oregon Flora Project Atlas. 2022. https://oregonflora.org/spatial/index.php

Oregon State University Extension Service, Emerald Ash Borer Resources. 2022. https://extension.oregonstate.edu/collection/emerald-ash-borer-resources

Richard, M. D., D. W. Tallamy, and A. Mitchell. 2018. Introduced plants reduce species interactions. *Biological Invasions.* https://doi.org/10.1007/S10530-018-1876-z

FIGURES

Figure 1: Bear Creek Vegetation Survey Project Area



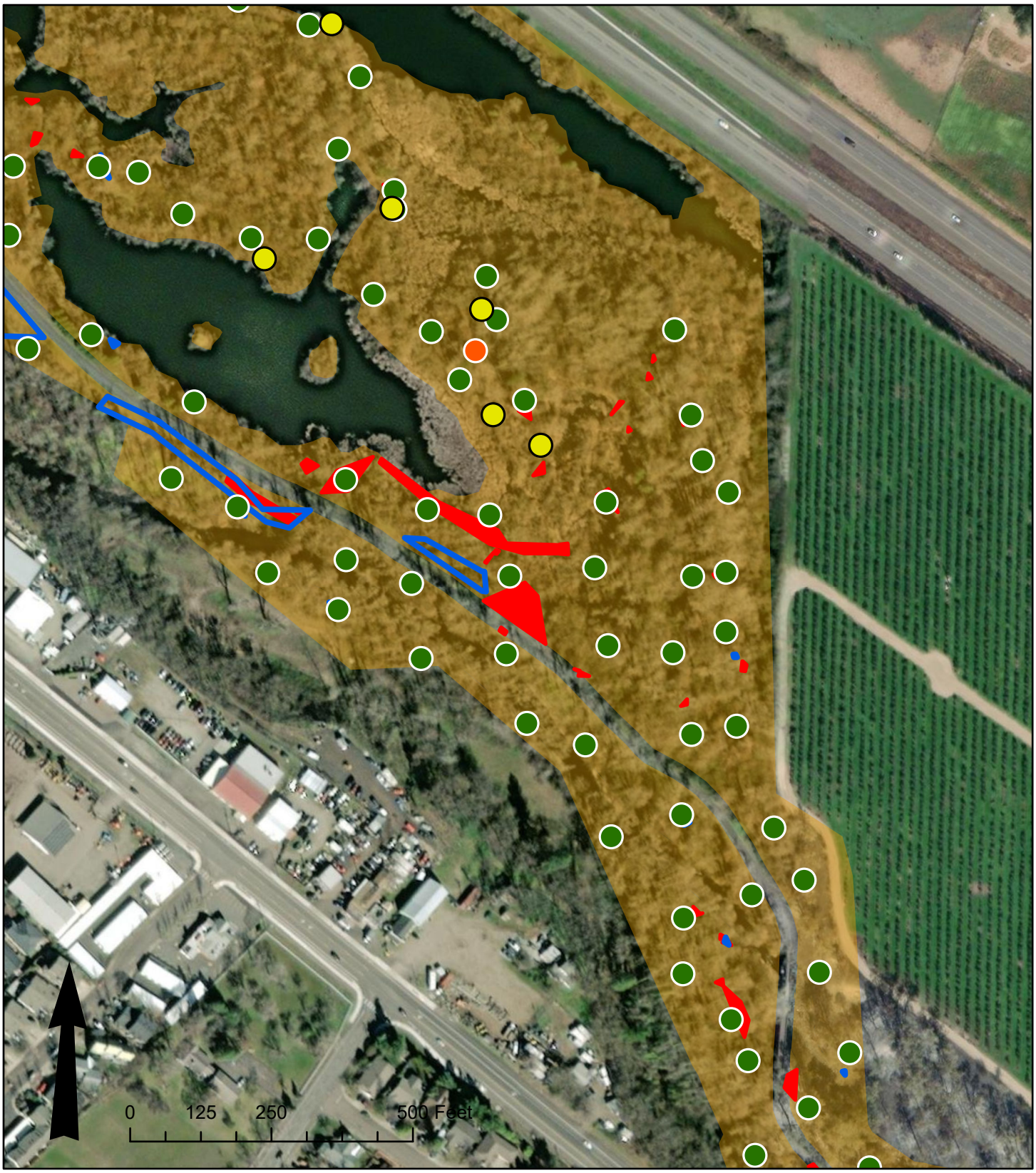
Bear Creek

Project Area

City Limits

This map product is for planning purposes only and may be suitable for, legal, engineering, or survey purposes.
Created: N. Hart-Brinkley 08/2022
Sources: Jackson County, SBS, ESRI
NAD 1983 State Plane Oregon South FIPS 3602 Ft Intl

Figure 2: Bear Creek Vegetation Survey: Data Layers



Project Area

Invasive Species

Special Vegetation

Vegetation Plot Point

Non-Vegetation Point

Vegetation Photo

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Created: N. Hart-Brinkley 08/2022
Sources: Jackson County, SBS, ESRI
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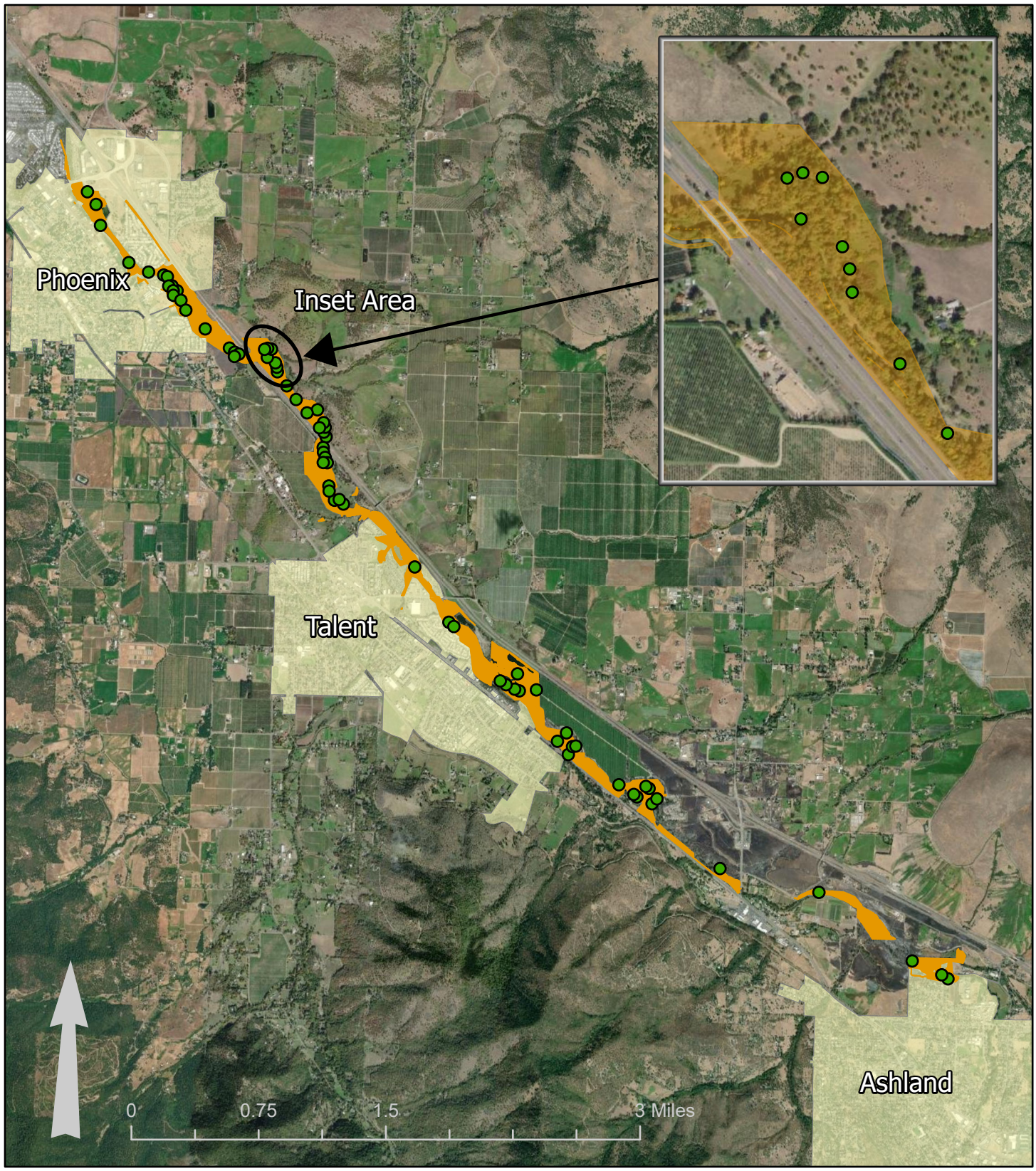
Figure 3: Areas with Higher Diversity and Cover of Native Trees



Project Area

City Limits

Plots with Four or More Native Tree Species and 25% or More Native Tree Cover

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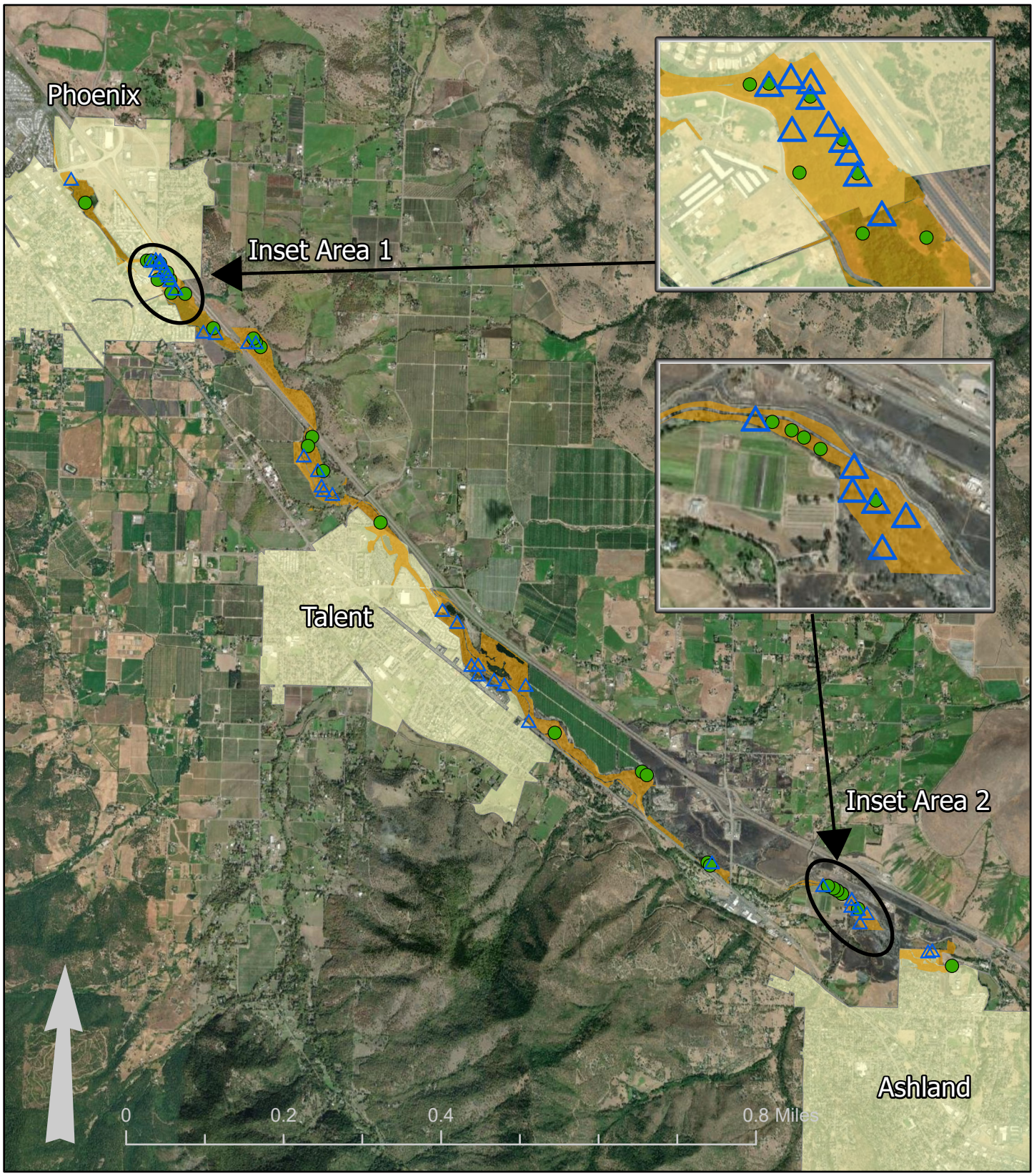
Created: N. Hart-Brinkley 08/2022
Sources: Jackson County, SBS, ESRI
NAD 1983 State Plane Oregon South FIPS 3602 Ft Intl

Figure 4: Areas with Higher Diversity and Cover of Native Shrubs



Project Area

City Limits

Plots with 25% or More Native Shrub Cover

Plots with Three or More Native Shrub Species

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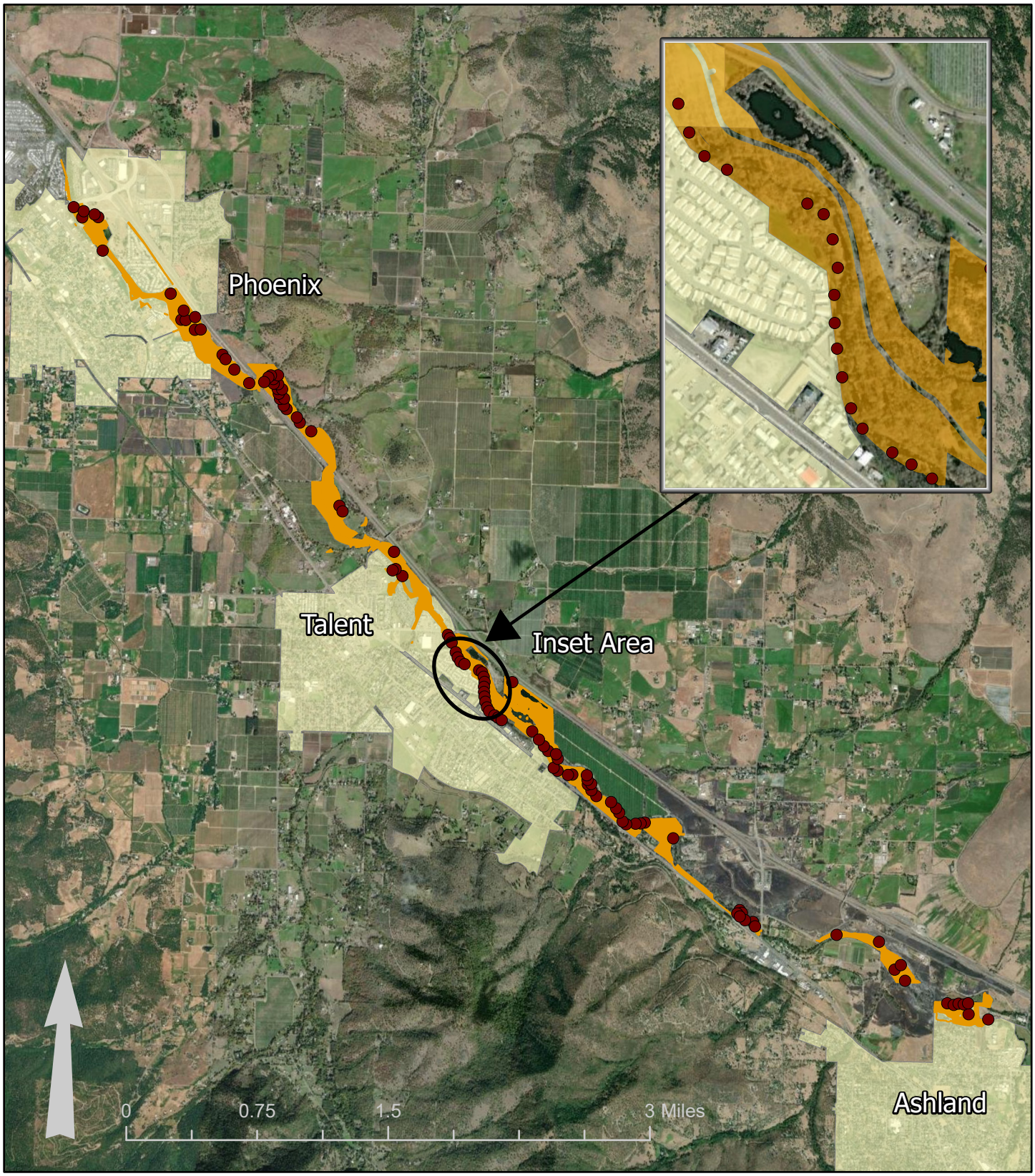
Created: N. Hart-Brinkley 08/2022
Sources: Jackson County, SBS, ESRI
NAD 1983 State Plane Oregon South FIPS 3602 Ft Intl

Figure 5: Areas with Highest Cover of Invasive Species



Project Area

City Limits

Plot Surveys with 25% or More Invasive Species Cover

This map product is for planning purposes only and may not be suitable for, legal, engineering, or survey purposes.
Created: N. Hart-Brinkley 08/2022
Sources: Jackson County, SBS, ESRI
NAD 1983 State Plane Oregon South FIPS 3602 Ft Intl

APPENDIX A

USDA Code	Species	Common Name	Family	Form
ACMA3	Acer macrophyllum	big-leaf maple	Sapindaceae	TB
ACNE2	Acer negundo	boxelder maple	Sapindaceae	TB
ACMI2	Achillea millefolium	common yarrow	Asteraceae	F
AIAL	Ailanthus altissima	tree of heaven	Simaroubaceae	TB
ALRH2	Alnus rhombifolia	white alder	Betulaceae	TB
ALAE	Alopecurus aequalis	shortawn foxtail	Poaceae	GG
AMAL2	Amelanchier alnifolia	western serviceberry	Rosaceae	S
AMME	Amsinckia menziesii	Menzies' fiddleneck	Boraginaceae	F
ANCO2	Anthemis cotula	dog fennel	Asteraceae	F
ANCA14	Anthriscus caucalis	bur-chervil	Apiaceae	F
ARME	Arbutus menziesii	Pacific madrone	Ericaceae	TB
ARMI2	Arctium minus	lesser burdock	Asteraceae	F
AREL3	Arrhenatherum elatius	tall or false oatgrass	Poaceae	GG
ARDO3	Artemisia douglasiana	Douglas' sagewort	Asteraceae	F
ARIT	Arum italicum	Italian arum	Araceae	F
ASOF	Asparagus officinalis	asparagus	Asparagaceae	F
AVFA	Avena fatua	wild oats	Poaceae	GG
BEPI	Berberis piperiana	Piper's Oregon grape	Berberiaceae	S
BRNI	Brassica nigra	black mustard	Brassicaceae	F
BRRA	Brassica rapa	field mustard	Brassicaceae	F
BRCA5	Bromus carinatus var. carinatus	California brome	Poaceae	GG
BRDI3	Bromus diandrus	ripgut brome	Poaceae	GG
BRHO2	Bromus hordeaceus	soft brome	Poaceae	GG
BRTE	Bromus tectorum	cheat grass	Poaceae	GG
BRVU	Bromus vulgaris	Columbia brome	Poaceae	GG
CADE27	Calocedrus decurrens	incense cedar	Cupressaceae	TC
CABU2	Capsella bursa-pastoris	shepherd's purse	Brassicaceae	F
CAOL	Cardamine oligosperma	few-seed bittercress	Brassicaceae	F
CAAM10	Carex amplifolia	large-leaved sedge	Cyperaceae	GS
CAAQD	Carex aquatilis var. dives	Sitka sedge	Cyperaceae	GS
CALE24	Carex leptopoda	short-scaled sedge	Cyperaceae	GS
CAPA14	Carex pachystachya	thick-headed sedge	Cyperaceae	GS
CAST5	Carex stipata	sawbeak sedge	Cyperaceae	GS
CABI8	Catalpa bignonioides	southern catalpa	Bignoniaceae	TB
CESO3	Centaurea solstitialis	yellow star thistle	Asteraceae	F
CEST8	Centaurea stoebe	spotted knapweed	Asteraceae	F
CHAL7	Chenopodium album	lamb's quarters	Amaranthaceae	F
CHJU	Chondrilla juncea	rush skeletonweed	Asteraceae	F
CIIN	Cichorium intybus	chicory	Asteraceae	F
CIVU	Cirsium vulgare	bull thistle	Asteraceae	F
CLPUV	Clarkia purpurea ssp. viminea	large clarkia	Onagraceae	F
CLLI2	Clematis ligusticifolia	western clematis	Ranunculaceae	V
COMA2	Conium maculatum	poison hemlock	Apiaceae	F
COAR4	Convulvus arvensis	field bindweed	Convulvaceae	F
COCA5	Conyza canadensis	horseweed	Asteraceae	F
COSE16	Cornus sericea	red osier dogwood	Cornaceae	S
COCO30	Corylus colurna	Turkish filbert	Betulaceae	TB
COCOC	Corylus cornuta var. californica	California hazel	Betulaceae	S
CRDO2	Crataegus douglasii	Douglas's hawthorn	Rosaceae	TB
CRMO3	Crataegus monogyna	oneseed hawthorn	Rosaceae	TB
CYDA	Cynodon dactylon	Bermudagrass	Poaceae	GG
CYEC	Cynosurus echinatus	hedgehog dogtail	Poaceae	GG
DAGL	Dactylis glomerata	orchard grass	Poaceae	GG
DAST	Datura stramonium	jimsonweed	Solanaceae	F
DACA6	Daucus carota	Queen Anne's lace	Apiaceae	F
DECA18	Deschampsia cespitosa	tufted hairgrass	Poaceae	GG
DICA14	Dichelostemma capitatum	bluedicks	Lilliaceae	F

USDA Code	Species	Common Name	Family	Form
DIFU2	Dipsacus fullonum	wild teasel	Dipsacaceae	F
ELGL	Elymus glaucus	blue wildrye	Poaceae	GG
EPBR3	Epilobium brachycarpum	parched fireweed	Onagraceae	F
EPGLG	Epilobium glaberrimum ssp. glaberrimum	smoothstem willow-herb	Onagraceae	F
EQAR	Equisetum arvense	common horsetail	Equisetaceae	FN
EQHYA	Equisetum hyemale var. affine	scouring-rush	Equisetaceae	FN
EQTE	Equisetum telmateia	giant horsetail	Equisetaceae	FN
ERPH	Erigeron philadelphicus	Philadelphia fleabane	Asteraceae	F
ERLA6	Eriophyllum lanatum	wooly sunflower	Asteraceae	F
ERCI6	Erodium cicutarium	filaree, redstem storksbill	Geraniaceae	F
ERCA14	Erysimum capitatum	Western wallflower	Brassicaceae	F
ERGU?	Erythranthe guttata *syn: Mimulus guttatus*	yellow monkeyflower	Phrymaceae	F
ESCA	Eschscholtzia caespitosa	gold poppy	Papaveraceae	F
EUES	Euphorbia esula	leafy spurge	Euphorbiaceae	F
EULA4	Euphorbia lathyris	caper spurge	Euphorbiaceae	F
FECA	Festuca californica	California fescue	Poaceae	GG
FERO	Festuca roemeri	Roemer's fescue	Poaceae	GG
FESU	Festuca subulata	bearded fescue	Poaceae	GG
FRLA	Fraxinus latifolia	Oregon ash	Oleaceae	TB
GAAP2	Galium aparine	catchweed bedstraw	Rubiaceae	F
GEDI	Geranium dissectum	cut-leaved geranium	Geraniaceae	F
GERO	Geranium robertianum	herb Robert	Geraniaceae	F
GLHE2	Glechoma hederacea	ground ivy	Lamiaceae	F
HEHE	Hedera helix	English ivy	Araliaceae	V
HOLA	Holcus lanatus	common velvet-grass	Poaceae	GG
HOMAG	Hordeum marinum ssp. gussoneanum	Mediterranean barley	Poaceae	GG
	Hordeum x	Hoody barley	Poaceae	GG
HULU	Humulus lupulus	common hop	Cannabaceae	F
HYPE	Hypericum perforatum	Klamathweed	Hypericaceae	F
	Hypericum sp.	rock rose, cultivars	Hypericaceae	F
HYRA3	Hypochaeris radicata	hairy cat's ear	Asteraceae	F
IRPS	Iris pseudoacorus	yellowflag iris	Iridaceae	F
	Juglans sp.	walnut, undetermined	Juglandaceae	TB
JUNI	Juglans nigra	black walnut	Juglandaceae	TB
JURE80	Juglans regia	English walnut	Juglandaceae	TB
JUEF	Juncus effusus	common rush	Juncaceae	GR
JUEN	Juncus ensifolius	dagger leaved rush	Juncaceae	GR
JUPA2	Juncus pattens	spreading rush	Juncaceae	GR
JUOC	Juniperus occidentalis	western juniper	Cupressaceae	TC
LASE	Lactuca serriola	prickly lettuce	Asteraceae	F
LAPU2	Lamium purpureum	red dead nettle	Lamiaceae	F
LACO3	Lapsana communis	nipplewort	Asteraceae	F
LALA4	Lathyrus latifolius	everlasting pea	Fabaceae	F
LECA5	Lepidium campestre	poormans peppergrass	Brassicaceae	F
LECH?	Lepidium chalepense	lens-podded hoary cress	Brassicaceae	F
LEVU	Leucanthemum vulgare *syn: Chrysanthemum vulgare*	oxeye daisy	Asteraceae	F
LOPE	Lolium perenne	perenial ryegrass	Poaceae	GG
LOCI3	Lonicera ciliosa	orange honeysuckle	Caprifoliaceae	V
LOCO6	Lotus corniculatus	birdsfoot lotus	Fabaceae	F
MAFU	Malus fusca	Oregon crabapple	Rosaceae	S
MANE	Malva neglecta	common mallow	Malvaceae	F
MAOR3	Marah oreganus	wild cucumber	Cucurbitaceae	V
MAVU	Marrubium vulgare	horehound	Lamiaceae	F
MEOF	Melilotus officinalis	white sweet clover	Fabaceae	F
MEOF2	Melissa officinalis	lemon balm	Lamiaceae	F
MEPIC2	Mentha piperita ssp. citrata	bergamot mint	Lamiaceae	F
MEPIP	Mentha piperita ssp. piperata	peppermint	Lamiaceae	F

USDA Code	Species	Common Name	Family	Form
MYDI	Myosotis discolor	yellow & blue scorpion-grass	Boraginaceae	F
NAOF	Nasturtium officinale *syn: Rorippa nasturtium-aquaticum*	watercress	Brassicaceae	F
NUPO2	Nuphar polysepala	yellow pond-lily	Nymphaceae	F
PHAR3	Phalaris arundinacea	reed canarygrass	Poaceae	GG
PHLE4	Philadelphus lewisii	Lewis' mockorange	Hydrangeaceae	S
PHPR3	Phleum pratense	Timothy	Poaceae	GG
PHCA11	Physocarpus capitatus	Pacific ninebark	Rosaceae	S
PIPO	Pinus ponderosa	ponderosa pine	Pinaceae	TC
PLLA	Plantago lanceolata	narrow leaf plantain	Plantaginaceae	F
PLMA2	Plantago major	common plantain	Plantaginaceae	F
POAN	Poa annua	annual bluegrass	Poaceae	GG
POBU	Poa bulbosa	bulbous bluegrass	Poaceae	GG
POPR	Poa pratensis	Kentucky bluegrass	Poaceae	GG
POTR2	Poa trivialis	rough bluegrass	Poaceae	GG
POCU6	Polygonum cuspidatum	Japanese knotweed	Polygonaceae	F
POMO5	Polypogon monspeliensis	annual beardgrass	Poaceae	GG
POTR15	Populus trichocarpa *syn: Populus balsamifera ssp. t.*	black cottonwood	Salicaceae	TB
POOC?	Poteridium occidentale *syn: Sanguisorba occidentalis*	western burnet	Rosaceae	F
POSAP?	Poterium sanguisorba var. polygamum *syn: Sanguisorba m.*	garden burnet	Rosaceae	F
PRVU	Prunella vulgaris	self-heal	Limiaceae	F
PREM	Prunus emarginata	bitter cherry	Rosaceae	S
	Prunus sp.	plum, non-native	Rosaceae	TB
PRSU2	Prunus subcordata	Klamath plum	Rosaceae	S
PRVID	Prunus virginiana var. demissa	western choke-cherry	Rosaceae	S
PSME	Pseudotsuga menziesii	Douglas-fir	Pinaceae	TC
	Pyracantha sp.	firethorn	Rosaceae	S
QUGA4	Quercus garryana	Oregon white oak	Fagaceae	TB
QUKE	Quercus kelloggii	California black oak	Fagaceae	TB
RARE3	Ranunculus repens	creeping buttercup	Ranunculaceae	F
RHAR4	Rhus aromatica	skunkbush	Anacardiaceae	S
RIIN2	Ribes inerme	whitestem gooseberry	Grossulariaceae	S
ROPS	Robinia pseudoacacia	black locust	Fabaceae	TB
ROEG	Rosa eglanteria	sweetbriar rose	Rosaceae	S
RONU	Rosa nutkana	Nootka rose	Rosaceae	S
ROPI2	Rosa pisocarpa	cluster rose	Rosaceae	S
RUAR9	Rubus armeniacus	Himalayan blackberry	Rosaceae	S
RUUR	Rubus ursinus	trailing blackberry	Rosaceae	S
RUAC3	Rumex acetosella	sheep sorrel	Polygonaceae	F
RUCR	Rumex crispus	curly dock	Polygonaceae	F
SAEX	Salix exigua	narrowleaf willow	Salicaceae	TB
SALA5	Salix lasiandra var. lasiandra *syn: Salix lucida ssp. las.*	Pacific willow	Salicaceae	TB
SALA6	Salix lasiolepis	arroyo willow	Salicaceae	TB
SASC	Salix scouleriana	Scouler's willow	Salicaceae	TB
SAME5	Sambucus mexicana	blue elderberry	Adoxaceae	S
SAAN2	Sanguisorba annua	prairie burnet	Rosaceae	F
SCAR7	Schedonorus arundinaceus syn: *Festuca arundinacea*	tall fescue	Poaceae	GG
SCTA2	Schoenoplectus tabernaemontani *syn: Scirpus t.*	softstem bulrush	Cyperaceae	GS
SCMI2	Scirpus microcarpus	small-fruited bulrush	Cyperaceae	GS
SEVU	Senecio vulgaris	groundsel	Asteraceae	F
SIMA2	Sidalceae malviflora	dwarf checkermallow	Malvaceae	F
SILA21	Silene latifolia	bladder campion	Caryophyllaceae	F
SIMA3	Silybum marianum	blessed milkthistle	Asteraceae	F
SIAL2	Sisymbrium altissimum	tumbling mustard	Brassicaceae	F
SMCA2	Smilax californica	California smilax	Smilacaceae	V
SODU	Solanum dulcamara	climbing nightshade	Solanaceae	F
SOAS	Sonchus asper	prickly sow thistle	Asteraceae	F
STRI	Stachys rigida *syn: Stachys ajugoides var. rigida*	rigid hedge-nettle	Limiaceae	F

USDA Code	Species	Common Name	Family	Form
SYAL	Symphoricarpos albus	common snowberry	Caprifoliaceae	S
TACA8	Taeniatherum caput-medusae	medusahead	Poaceae	GG
TARA	Tamarix ramosissima	saltcedar	Tamaricaceae	TB
TAPA6	Tanacetum parthenium	feverfew	Asteraceae	F
THIN6	Thinopyrum intermedium syn: *Elytrigia intermedia*	intermediate wheatgrass	Poaceae	GG
TOAR	Torilis arvensis	field hedge-parsley	Apiaceae	F
TODI	Toxicodendron diversilobum	poison oak	Anacardiaceae	S
TRDU	Tragopogon dubius	yellow salsify	Asteraceae	F
TRCA5	Trifolium campestre	field clover	Fabaceae	F
TRDU2	Trifolium dubium	little hop clover, shamrock	Fabaceae	F
TRHI4	Trifolium hirtum	rose clover	Fabaceae	F
TRIN3	Trifolium incarnatum	crimson clover	Fabaceae	F
TRRE3	Trifolium repens	white clover	Fabaceae	F
TYLA	Typha latifolia	common cattail	Typhaceae	F
URDIG	Urtica dioica ssp. gracillis	American stinging nettle	Urticaceae	F
VALO	Valerianella locusta	corn salad	Valerianaceae	F
VEDU	Ventenata dubia	unknown	Poaceae	GG
VEBL	Verbascum blattaria	moth mullein	Scrophulariaceae	F
VETH	Verbascum thapsus	common mullein	Scrophulariaceae	F
VEAM2	Veronica americana	American brooklime	Plantaginaceae	F
VEPE3	Veronica persica	winter speedwell	Plantaginaceae	F
VIEL	Viburnum ellipticum	oval-leaved viburnum	Adoxaceae	S
VIHI	Vicia hirsuta	hairy vetch	Fabaceae	F
VISA	Vicia sativa	Spring vetch	Fabaceae	F
VIVI	Vicia villosa	winter vetch	Fabaceae	F
VIMA	Vinca major	periwinkle	Apocynaceae	V
VICA5	Vitis californica	wild grape	Vitaceae	V
VUMY	Vulpia myuros	rattail fescue	Poaceae	GG

Form Codes Legend

TC = Tree, Conifer
TB = Tree, Broadleaf
S = Shrub
F = Forb
GG = Graminoid, Grass
GR = Graminoid, Rush
GS = Graminoid, Sedge
FN = Ferns and Allies
V = Vine

APPENDIX B

GIS Technical Notes for Bear Creek Vegetation Analysis Project

Data & Sources

- Almeda Fire Perimeter, Jackson County
- Taxlots, Jackson County
- Damage Assessment, Jackson County
- Bear Creek Greenway centerline, Jackson County
- Bear Creek centerline, Jackson County
- National Flood Hazard, FEMA
- Imagery, Phoenix/Talent 2021 under special use conditions, ESRI in other locations

Selection of Taxlots

- Taxlots intersecting the project area and qualify as project area under the definitions described below under Project Area Polygon.
- Involved taxlots and certain right-oof-way acreage totals are calculated, and property ownership is established.

Data Products

- Project area polygon: The project area is defined by lands that are within the Almeda burn scar, are part of the FEMA floodplain, and are publicly owned lands or right-of-way not currently in use as irrigated agricultural lands or contain major development such as parking and ancillary structures.
- Half acre polygon grid: Half acre areas covering the project area, defining locations for vegetation surveys.
- Vegetation plot points: Main survey data collection feature, containing detailed survey information on native trees, shrubs, and invasive species and cover classes.
- Invasive plant polygons: Polygon features highlighting concentrations of invasive species.
- Special vegetation polygons: Polygon features highlighting concentrations of other notable vegetation.
- Non-vegetation points: Information of note for survey collectors and analysts.
- Photos: Photographic data collection of note for survey collectors and analysts.

Method

- Data collection features are created in ArcGIS Pro with domains set for species and coverages where appropriate.
- A photo survey collection is created in Survey123.
- Each data feature is hosted in the ArcOnline environment and added to a Web Map.
- The Web Map is used as a base for a Field Map application.
- Field data collection employs the use of the Field Maps mobile application.
- After data collection is complete, data is scanned for omissions and errors. Corrections or clarifications are made as needed.
- Data is selected to answer specific questions using the Select by Attributes and Select by Location geoprocessing tools in ArcGIS Pro.
- Static maps and an interactive web application data viewer are created to convey project information.
- Hosted feature layers are shared with stakeholder staff for use and download.